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

Podgorica
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Ministry of Education and Science of Montenegro

Proposed by:
Council for Scientific-Research Activity of Montenegro

In compliance with Article 6 of the Law on Scientific-Research Activity ("Off. Journal of RoM", no.71/05), the Government of Montenegro adopts the Strategy for Scientific-Research Activity of Montenegro, for a period of eight years. In keeping with Article 8 of the Law on Scientific-Research Activity, the Government of Montenegro adopts the Strategy upon a proposal of the Council of Scientific-Research Activity.

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Abbreviations

GDP	Gross domestic product
CANU	Montenegrin Academy of Sciences and Arts
COBISS.CG	Co-operative Online Bibliographic System and Service
ECDL	European Computer Driving License
ERA	European Research Area
FP 7	Seventh Framework Program for research and technological development
ICT	Information-communication technologies
SMEs	Small and Medium Size Enterprises
SRA	Scientific-research activities
NPI	National Program for Integrations
OECD	Organization for Economic Cooperation and Development
VAT	Value added tax
S&T	Science & Technology
WAN	Wide Area Network

Contents

1. Introduction

The new development paradigm stresses the importance of capacity building for conquering of 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, with the increased investment into knowledge and development being necessary for transition to the knowledge based society.

Starting from the Stabilization and Association Agreement of Montenegro with the European Union, as well as from the general trends of the globalization process, with the competitiveness of the national economies becoming the basic factor of society development, the Government of Montenegro must be resolute in its intent to build Montenegro as a state oriented towards science and technology. Based on the above mentioned Agreement and the Lisbon Strategy, the fundamental document of EU which the national strategies of the member countries rely on, Montenegro starts development of the Strategy for Scientific-Research Activity (hereinafter: 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-research institutions. In the conditions of an open society and a market oriented economy, knowledge reaches the highest price.

Without scientific-research and development activity, in areas vital for Montenegro, there can be no successful and timely transfer of knowledge from the world treasury, nor of the newly acquired domestic knowledge to support economic development and competitiveness.

Recognition of positive aspirations, scientific achievements and their application, first of all in the country and the region, and then globally as well, is of utmost importance. Familiarization with them through established communication and good relations enables positioning of proper achievements and needs through developement 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 invesetment in the affairs they have already completed.

Comprehension of the knowledge market and its application in closer and wider European environment would ensure to new staff a feeling of exit from anonymity, 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 knew knowledge. In order to reach this kind 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 leads to a rapid increase of employment and growth of GDP.

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

Strategy for SRA cannot be realized without the support of the state, with targeted financing from the public funds, with a clear responsiblity 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 economy in order to ensure mechanisms of mutual and chain action of economy, science and policy, with the securing of social, but also of ecological stability, i.e. sustainable development of Montenegro.

Experience of other countries which went through or are going through the transition processes, can help define 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 of key objectives, independently 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 compliance with the Lisbon Strategy principles, i.e. defining of national priorities and stimulation of reserarch and innovation in view of ensuring overall economic development and more efficient generation of two way flow of knowledge.[1]

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

2. Objectives of the Strategy for Scientific-Research Activity

One can speak about the success of science in a country and the meeting of general development needs only if its interconnection with **education (human resources development) and economy (economic development)** is considered. The basic objective of the Strategy for SRA is to stimulate development of sicence and technology by connecting these factors, and to increase their contribution to development of the society, with the largest possible application of new knowledge and creation of proper knowledge and technologies. In order to achive this objective, the following aims, analyzed wtihin this Strategy, were set:

- Emphasize the importance of science and research in the context of further social-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 undertaken so as to improve and create conditions for dealing with scientific-research activities and indicate to the competent ministries the necessity and legitimacy of investment into scientific-research work,
- Encourage allocation of funds for investment into science and scientific infrastructure in compliance with the recommendations of the Lisbon strategy and propose an adequate dynamics of allocation in relation to the GDP,
- Emphasize the irreplacable role and decisive importance of human potential for development of science and technology, primarily through development of young staff and inclusion into the European research Area - ERA,
- 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 optimization and possible reorganization of the institutional framework for implementation of scientific-research activity in view of more efficient action,
- Stress the importance of the system for scientific informing and the role of information-communication technologies (ICT),
- Stress the importance of favourable legal measures establishment (tax policy measures) and of adequate regulation adoption (eg. for intellectual property protection),
- Identify the most important areas of scientific-research work, bearing in mind the natural, technological and human resources comparative advantages of Montenegro,
- Through adequate action plan define priority areas and activities as well as methods for monitoring realization of adopted tasks,

One of the basic reasons for developing the Strategy for SRA is pointing out to the strategic importance of scientific-research activities as the basic engine of economic and general social development. This is especially important in the conditions when the society, such as ours, 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 programs of mobility and inadequate valorization of the results of its own work.

3. Harmonization 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 is defined by the Law on Scientific-Research Activity of Montenegro ("Off. Journal of RoM", number 71/05). Under this law, the Strategy for SRA should determine the following: priorities in scientific-research activity; indicative amount of resources for funding priorities; financial resources plan, the need for scientific-research infrastructure and the system of scientific informing. Among other, scientific-research activity is based on the need for wider inclusion into the European Research Area (ERA) and Framework Programs of the European Union (FP7), on introduction of international quality measures, as well as an increased investment into scientific-research activity.

The Law provides for the establishment of the Council for Scientific-Research activity in charge of drafting and proposing to the Government the Strategy for Scientific-Research Activity of Montenegro, covering a **period of eights years (2008-2016).**

Apart from the Law on Scientific-Research Activity, as the basic legal act defining this area, the Law on Montenegrin Academy of Sciences and Arts (»Off. Journal of RoM«, number 24/93, 30/94) and the Higher Education Law (»Off. Journal of RoM«, number 60/03) are of particular importance, as well as a number of strategic documents of Montenegro.

Alignment of the Strategy for SRA with the current legal acts of Montenegro implies an iterative process, i.e. permanent harmonization and complementing of the Strategy and of the legal regulation. It is to be expected that certain recommendations, given in view of implementing the objectives of Strategy for SRA quoted in the previous chapter, are not harmonized 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 undertaken in a timely manner in order for every decision made to be harmonized with the valid legal regulation.

Thus, for eg. adoption of a number of stimulative measures for engaging in scientific-research activity and an optimum organization of the institutional framework for realization of scientific-research activity, can cause amendments to the existing legal acts, and particular attention should be paid to the area of intellectual property protection.

3.2 Strategic documents of Montenegro

Strategy for scientific-research activity should be harmonized with the most important documents defining development directions and objecitves 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: **Development directions of Montenegro as an Ecological State, National Strategy of Sustainable Development of Montenegro and the Physical Plan of Montenegro**. Other similar documents, development strategies for particular sectors (energy, transport, agriculture, tourism, small and medium size enterprises and other), have a significantly narrower scope and deal primarily with sustainable development of those activities.

Development directions of Montenegro as an ecological state[2]

[2] *The Government of Montenegro adopted the Document in March 2001*

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

What connects this document with the future strategic document in the area of scientific-research work is the targeted emphasizing of science and education as the basic prerequsites of sustainable development which are to 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]

Represents further elaboration of development guidelines as defined by the *Declaration on Ecological State*. Montenegro needs a sustainable development concept which 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 vision, stresses in particular the need to speed up 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.

Physical Plan of Montenegro[5]

The physical 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 wider introduction of those principles which 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 of a large number of development problems of Montenegro, 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 Program for Integration of Montenegro into EU (NPI)[6]

document, which the Government adopted in its draft form, is an important act for future development of scientific-research activity.

The most important short-term priorities (by 2010) are: reform of the statistical system in the aeras of science and research; expension and development of the national contact persons network for the Seventh Framework Program 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 by-laws.

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[3] *Adopted at the session of 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 Governemtn of Montenegro in April 2008*

Also, this document envisages adoption of the Strategy for Scientific-Research Activity, which should, among other, 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 potential, human and material resources necessary on the road of European integrations.

Joint recommendations of the above quoted documents, which refer to scientific-research activity, and which are confirmed also by the Strategy for Scientific-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 need for environment protection),
2. Development should be based on knowledge i.e. science should play the key role in meeting of future development challenges,
3. The scientific-research activity should be raised to a higher level, primarily through a significantly increased financial support of the state.

4. Institutional framework for scientific-research work development

4.1 University

The universities integrate the teaching and the scientific process in view of training staff, producing young scientists and developing research which results in new knowledge and scientific methods. Scientific-research activity in Montenegro was dominantly realized at the University of Montenegro, as well as at the scientific-research institutes. Unfortunately, due to various cirumstances, primarily lack of financial resources, during the past 15 years the intensity of scientific-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 engaged in the Bologna Process implementation at undergraduate studies level. The first steps were also made in view of recognition of the scientific-research work in the form of financial support to scientific development, publishing of works in refereed journals and participation at scientific meetings. However, master and doctoral studies programs were frequently developed without any fundamental analysis of the infrastructure and human resources potentials and long-term formation of the scientific-research process, without which these programs 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 too.

Having this in mind, now is the last moment to make an essential shift in the area of scientific-research activity at universities in Montenegro, through adequate strategies of scientific-research activity and higher education, which are to be created in synchrony.

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

Conclusions and recommendations

- Organize doctoral studies through financing of scientific-research programs based on the experience of developed European countries and create the necessary preconditions for internationalization of the scientific and teaching process,
- Establish a Fund for Financing the scientific-research activity within Ministry of Education and Science. In case of need, and if justified, operationalization of these resources in the future can be performed by means of the Agency for Science or the Agency for Science and Higher Education (which is 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-research work, accreditation of scientific-research institutions and higher 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 data base of all the scientific-research workers in Montenegro based on internationally recognzed parameters, in order to consider the human resources potential and make realistic development plans. To this view, it is necessary to complete the already initiated activities for estabilshment of E-CRIS (Current information system in Montenegro), which cannot be realized without additional financial resources, or 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 at

universities and other institutions, through an obligatory co-financing if they deal with the priority development areas of Montenegro,

- Finance education of scientific staff at prestigeous universities abroad in the areas for which there are no real conditions in Montenegro,
- Create conditions for exchange of scientific achievements and connecting of researchers by holding scientific meetings and conferences at the territory of Montenegro,
- Using the internationally recognized methods (OECD evaluation), perform an analysis of scientific-research work in the past 10 years, on the whole and 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 Higher Education of the Ministry of Science and Education aimed at realization of the above recommendations. In order to complete the process it is necessary to increase funds allocated for these purposes at the state level. Also, the Higher 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 and by every individual for election into an adequate title and for being elected as 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 in relation to governments, industry and other professional organizations from which they obtain financial support that must not influence their independence. Even though work programs of national academies differ, they mainly include the following activities:

- Promotion of science, scientific-research and artistic work and coordination of activities in the area of scientific-research and artistic work,
- Organization, realization and coordination of scientific-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 programs in the area of science and innovation of mechanisms for their implementation,
- Award of prices and recognitions for achievements in the area of science and arts.

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

By concurrence of a number of events the position and role of Montenegrin Academy of Sciences and Arts (CANU) in the period so far was not determned in compliance with European experience and trends in this are. The potential of CANU for promotion and preservation of cultural heritage and development of language and culture, creation and realization of scientific-research policy in Montenegro has not been used optimally. CANU has developed a lively international and inter-

academic cooperation, realized scientific-research projects, scientific meetings and debates, at the local and international level, with the desire 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.

Conclusions and recommendations

- Intensify the advisory role of CANU 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 CANU scientific institutions of national importance which also need program financing,
- Coordinate multidisciplinary projects of national importance at the level of the Academy,
- Establish a special fund within Academy from budget resources and private donations for stimulating activities of young researches and build the existing fund for award of prices for achievements in the area of sicence and arts,
- Develop a libarary of refereed publications as a centre of scientific and technological information within the Academy.

4.3 Scientific-research institutes

At the moment there are three scientific institutes in Montenegro: Institute of History, Institute for Sea Biology and Institute for Foreign Languages (Institute for Biotechnology has been transformed in the Faculty of Biotechnology). Apart from these, there are also institutes within business organizations, as well as a number of agencies and centres; Agency for Geological Research, Hydrometeorology Agency, Seizmology Agency, Centre for Eco-toxicological research, Institute for Public Health, Institute for Ferrous Metallurgy and the Agency for Environment Protection, Agency for Protection of Monuments of Culture and other. Organizational scheme and the field of operation of these institutions has changed since their establishment until the present day. They operated as independent organizations or within the University of Montenegro. Financing was of the program type (various kinds of temporary or permanent expert services) and project one (realization of scientific-research projects). In essence, the program component of financing was the dominant one. An optimum form of organization 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, or disappear, depending on the needs 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-research institutions they must meet certain conditions with regard to staff and equipment. These institutions play a special role in the scientific-reserach process at the level of master and doctoral studies.

Conclusions and recommendations

The importance of the above institutes for Montenegro is indisputable. Having that in mind, an optimum manner of organization 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 realizing the scientific-research projects at the national and international market, without additional financial support. If program financing is adopted as dominant, there is danger of transformation of these institutions into classical agencies in which service activity will prevail. With regard to this, the most acceptable variant is paralel, program and project financing, with the two components being separate and independent. Program financing would be secured by competent ministries based on defined activities permanently performed by these institutions for the needs of the ministry. Project financing would be realized in the area of scientific-research work. In this regard, institutes would not have priority, but would opearate under the same conditions as other subjects in Montenegro, depending on their potential and market conditions. This would stimulate development of institutes, transformation of agencies into institutes or establishment of new institutes. In the oposite case, institutes would be transformed into classical agencies. The manner of institutes and agencies organization should not be specified in advance. They can operate independently or within other institutions, depending on their needs and conditions at the market. No matter what their form of organization is, it is necessary to define the conditions they must meet in order to be accreditied as scientific-research institutions or centres of excellence and thus obtain the right to use adequate program resources for scientific-resarch work.

There is a wide spectrum of program areas of special importance for Montenegro, which should be separately specified for each institute and offered to the competent ministry which would ensure permanent financial resources for the realization of particular activities. When scientific-research work is in question, these institutions have at disposal the necessary staff and equipment for successful inclusion into priority areas of research at the national and international level as well as for realization of research work of students at master and doctoral studies of universities in Montenegro. Program activities would enable permanent survival of these institutions, while their development and scientific-research position would depend on the initiatives and activity. In view of realization of the above conclusions it is necessary to:

- Carry out accreditation of all the institutes and define their legal subjectivity,
- Provide for sustainability of program financing of institutes which study topics of national importance.

4.4 Library capacities

Library-information system as well as the information system in the scientific-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-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 in order to organize the overall libarary activity at the University, to develop a unique library-information system and to supervise the work of all libararies in the higher education sector. Due to inadequate infrastructure and lack of adequate staff, the University library was not able to realize the envisaged tasks, during a long period of time. Beginning with 2000 a number of significant steps were made in order to improve the state in this area. Automatization of operation and networking of libraries into a unique library-information system COBISS.CG(Co-operative Online Bibliographic System and Service) was started, education and professional development of library staff, implementation of libarary standards, modernization of library services and other. The library materials were partly processed and available on-line in the form of bibliography entries. Access was provided to the electronic data base EBSCO.

Development of a register of researchers and projects at the University of Montenegro has been initiated, based on the universal application platform E-CRIS (Current information system in Montenegro). Unfortunately, these highly positive undertakings have not been completed. EBSCO data base can to a certain extent satisfy the needs in the area of social sciences and medicine, while it is absolutely insufficient for technical sciences.

The existing professional staff is dispersed accross faculty libraries, the Central library »Đurđe Crnojević«, library of CANU, with excessive decentralization reducing the efficiency of their work. Every library need not have "everything", but the network user obtains everything s/he needs. The library fund can be centralized or divided into several sections located closer to their users. Centralized systems have an advantage in academic and economic respect, unless there is need for extremely frequent use of particular refereed publications.

Conclusions and recommendations

- Finish initiated activities in order to realize COBISS.CG. In order for this system to be 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 need to submit the already requested data,
- Allow access to a higher number of data bases,
- Adopt one of the possible models of centralized organization. Having in mind the fact that library premises are soon to be constructed in 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 organization of the library system with the minimum economic costs,
- Define a unique library-information system with efficient university network which is to include the Central and other libraries from the territory of Montenegro,
- Adopt a financing model for the library-information system which 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 above recommendations should be realized in order to establish an efficient system. Having this in mind, as well as the fact that the largest number of recommendations can be realized without significant financial investments, the recommendations have not been prioritized. Those for which there are real financial and human resources should be realized first, while the necessary measures should be undertaken for the realization of the remaining recommendations.

4.5. Academic network

Academic network should provide for 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-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 obvious lack of good quality staff of almost all profiles of ICT, even though education in this area is organized at several units of the University of Montenegro. Almost all up-to-date hardware and softwre can be purchased on the market of Montenegro. The prices are burdened by the obligatory VAT. ICT companies from the region participate in almost all realized pojects in the area. This shows that local companies do not possess their own capacities for bigger projects. There is evident lack of legal regulation, standards and norms in this area at the level of Montenegro.

Conclusions and recommendations

Information system efficiency is of crucial importance, not only when development of scientific-research work, but also the functioning of all state bodies is in question. It depends primarily on adequate infrastructure which enables rapid transfer of data. This infrastructure should be owned by the state, which can be realized without major investments in view of the relatively small territory our state covers. 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 in view of integration of MREN (Montenegrin Research and Education Network) into the European academic network GEANT. The network would be used by all the university centres and state bodies. A draft project for this network has been developed in the Information System Centre of the University of Montenegro,
- Reduce or abolish VAT for purchase of computer equipment, the price of Internet connections (ADSL, ISDN), textbooks and literature, as is the practice in many European countries,
- Adopt the necessary legal regulation and standards in the area of ICT,
- Stimulate ICT companies for cooperation with educational institutions,
- Introduce international standards in education of adults working with computers, eg. 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 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: harmonization of transition to orientation of a knowledge based society which supports the policy of development of human resources, work force and labor market, development of information society, strengthening of economic competitiveness and regional development which would reduce regional development differences. The review of EU policy measures in the area Science-Technology-Innovations[8] indicated the need to strengthen 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 innovativity, Montenegro maintains the existing state which, from the view of dynamic changes in the world, does not allow for stimulation of development. An obvious deficiency is also the weak link between the scientific-research, educational and economic sphere, which negatively affects the human resources development, technological development as well as export competitiveness.

Small and medium size enterprises in our region are at the forefron of project leadership. It is difficult to apply this situation to our conditions due to the fact that these are quite different types of small and medium size companies such as companies arising based on the knowledge generated at universities and technology incubators. Montenegro has mainly small and medium size enterprises which engage in simple production and services. Their interest for investments into projects of technological development is practically negligible. In order to encourage them to invest into research, the state should support industrially oriented projects which can be realized on the market.

Inadequate approach to external financing and various credit lines is a joint problem of all small and medium size enterprises. The problem is even more acute in financing of scientific-research work, due to potential risk 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 be one of the indicators on how to motivate financing by the industrial sector.
Montenegro belongs to the group of countries which began creating the legal and institutional frameworks in the area of innovations, as well as for motivating small and medium size enterprizes (SMEs), but it still has a long way to go to implement the legal norms and create the national program for stimulating innovations. Creation of links between the SMEs and the scientific-research institutions is still in an early phase. There are no examples of inter-company clusters or networks. An important segment in stimulation of innovations is also more efficient protection of knowledge and assistance for transfer of knowledge. The issue of intellectual property protection is imposed as one of the basic issues which have to be resolved at the institutional and legislation level.

Issues of intellectual property resulting from research financed from public funds has so far not been regulated by special legal acts. It is necessary to train personnel at the level of public 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 of the intellectual property right at the national and international level. The possibility of using technical assistance of the European

Commission (like TAIEX program) for these purposes can be considered[7]. All the scientific-research institutions in which products of knowledge i.e. intellectual property is created, should establish bodies, procedures and regulations to regulate intellectual property management – from the issue of the author's right 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 securing of financial resources for intellectual property protection (especially patents).

Conclusions and recommendations

- Stimulate financing of research and innovation, by private and economic sector, through state participation of up to 50 % in applied and development projects,
- Stimulate research-development cooperation between scientific-research institutions and companies, by instigating connecting of research groups,
- Support investments into development of technological networks and new technologies in those areas where there is already 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 of development,
- Increase the porousness of our economy for world technologies and innovations, which requires preparedness, both in terms of staff and technological infrastructure. For the realization of this objective, system reorganization measures are necessary and modernization 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 operation such as technological parks and incubators, which should be established at universities and financed as infrastructure centres,
- Introduce incentive measures for crediting the scientific-research work. Efficient and guaranteed crediting mechanism can be an attractive means for investment into scientific-research work,
- Stimulate strengthening of research-development departments in companies and development of public research institutions,
- Ensure marketing support and consulting service for all the stakeholders in reserach and innovatons,
- Establish relevant bodies and ensure technical support for training of staff, developmet of procedures and informing of research community on intellectual property issues.

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

6. International cooperation

Montenegro possesses some experience in the opening of national scientific-research programs in the context of bilateral agreements with the countries from the region and EU countries.

Active interdisciplinary 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 Program (FP7) is reduced mainly to projects of coordination and support. Participation in big research projects is minimum. Out of the total numbe of projects financed 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 said that Montenegrin academic community used the possibilities of TEMPUS III program relatively well with 55 realized projects[10].

Student mobility was realized by means of CEEPUS, TEMPUS, INTERREG, WUS-Austria programs, IAESTE, SEE-ERA.NET. In the period of 4 years, around 350 students were engaged in mobility on various grounds. Within the activities of Montenegrin Academy of Sciences and Arts, participation in activities of ALLEA, EASA, EMAN, IACSEE, ICSU, CEEN was realized as well as envisaged activities on joint projects and study visits with 22 national academies of sciences and arts [11].

Montenegrin academic community records an increased number of applications in the Seventh Framework Program, with the status of associated country, in NATO SPS program, to which Montenegro has been associated since March 2007 and in the new cycle of TEMPUS IV program (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-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, Agency for International Cultural, Educational and Technical cooperation (ZAMTES)**.

Activities should be undertaken to improve the existing opening of scientific-research programs. Today in Europe over 80% of research financed by the state sector is realized at the national level. The Framework Programs of the European Commission mainly contribute to the European dimension. There are weak connections between the national programs of particular states and the national and European research programs.

Conclusions and recommendations

- A group of measures referring to exchange of information in decision making process, transfer of technologies and exchange of results can influence favourably internationalization of national programs. These are stimulation of international cooperation through contacts

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

within financed projects in various states and mobility of researchers as the base for creation of successful international cooperation,

- In order to encourage to a wider extent the international cooperation of Montenegro, a number of concrete measures need to be undertaken, which would establish infrastructure necessary for stimulating international cooperation and involvement into the European Research Area,
- Provide full support to more active participation of researchers in relevant European and international programs, 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 is to possess a well arranged data base of participants in all international cooperation activities. The creation of a network of contact persons for various thematic areas within the Seventh Framework Program and other international programs needs to be completed,
- Systematically motivate application of researchers to calls, primarily within the Seventh Framework Program, by informing the public in a timely manner, over contact persons, on the new calls and conditions of application,
- Speed up accession of Montenegro into program EUREKA which at the international level stimulates involvement of economy and private sector in the system of scientific-research activity financing,
- Encourage participation in COST program by means of adequate administrative mechanisms which so far have not come to life in Montenegro, and by informing extensively the academic public on the possibilities offered by COST,
- Extend the existing bilateral cooperation as a very popular experience in exchange of results of scientific-research work and begin intenstive activity for establishment of extensive multilateral cooperation,
- Intensify regional cooperation because there is possibility for a large number of joint research actions interesting for the whole region, with relatively balanced level of scientific-research activities,
- Network and connect better Montenegrin research and scientific organizations with other national and European agencies for promotion of science and research and their financial organzations, with the aim of stimulating and enhancing cross-border activities.

7. Priorities of SRA

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

The above approaches can be recognized in paralel in many strategies, with one or the other having a predominat role.

7.1 Thematic priorities

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

- Increase of the domestic product in Montenegro,
- Harmonization with the strategic documents of Montenegro; the National Strategy for Sustainable Development, the Physical Plan, Development directions of Montenegro as an Ecological State, Energy Development Strategy etc, as well as the existing laws in the area of higher education and scientific-research activity,
- The possibility to join international projects with the existing scientific-research potential (staff and equipment), i.e. affirmation of research in the areas which can be competitive at the European level,
- Creation of conditions for further development of scientific-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, quoted 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 and scientific-technological and cultural development of Montenegro. Progress of science implies recognition of the best quality researchers, promotion of sicentific 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 which are to 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 which should be devoted special attention to.
- **Ecology** Montenegro declared itself an ecological state, which is in line with its strategic docments 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 biolgocial resources have a priority place.

- **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 on the 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, because the overall importance is reflected in its multifunctionality. Development of agriculture at the same time means also management of huge resources (37% of the total territory of Montenegro). Modern concept of agriculture development and agrarian policy observe development of agriculture and village areas in integrity. Such integral approach includes also forestry, as an important segment of natural resources management. In view of 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 directed to research of energy potential, renewable energy sources typical for Montenegro, as well as for improvement of energy efficiency, having in mind that in this field we are among the last in Europe.

The above mentioned topical areas should be taken into consideration when annual investments of budget funds are planned, over competent ministries, for program co-financing of adequate scientific-research institutions and realization 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 the Media, Ministry of Energy, Ministry of Health, Labor and Social Welfare, Secretariat for Development). In cooperation with the Ministry for Economic Development additional support of the banking sector needs to be secured for the realization of scientific-development projects and stimulative conditions be created for foreign investments into research and development.

7.2 Functional priorities

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

The problem of disproportionate representation of various fields of sicence in project proposals arises in distribution of annual funds for science, and therefore in order to develop equally all feilds of science

it is necessary to determine their mutual relationship in the distribution of funds for fundamental research. To date, Montenegro has not applied a special system of funds distribution according to the areas of science. One of the models, which could be accepted in our country, is represented in the European Research System in the Framework Programs:

- Natural-Mathematical Sciences and Engineering – around 40%
- Life Sciences – around 35%
- Social Sciences and Humanities – around 15%
- Multidisciplinary research – around 10%

Bearing in mind the above quoted criteria, priorities can be established among the good quality applied and development projects which apply for budget funds. At the moment when the problem arises of too big a number of very good quality applied and development projects in various fields of sciences, the Ministry of Education and Science (or the competent Agency) should conduct national prioritization according to the well known methodologies («Prediction in science and other.).

Insead of establishing thematic priorities, for the Ministry of Education and Science it is more important to make the so called functional prioritization, i.e. to define priority policies and measures intended for removal of barriers and deficiencies in the research system and stimulation of its growth. These 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 of this Strategy implementation 2008-2016, according to the recommendations stated in this document, priority functional areas of scientific-research activity, which the measures from the annual work programs of the Ministry of Education and Science should be directed to are:

- Implementation of measures for building the human resources potential for scientific-research activity, through program stimulation of increase in the number of researchers and better conditions for work,
- Research infrastructure enhancement through regular investments of budget funds into modernization of existing capacities, their augmentation and an open approach,
- Application of measures for connecting the research sector with economy by means of joint development projects,
- Increase of investments into research in the sector of economy.

8. Financing of scientific-research activity

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

All EU member states have established a statistical system which allows them to monitor this, while candidate countries are at the end of such a process. On its way to EU, Montenegro has also undertaken initiatives for reform of the statistical system is science.

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

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

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

Montenegro should start investing more appropriate scale of budget funds into research and technological developmet, because the scale of investment into this area so far was insufficient in comparision with the norms of the community we aspire to.

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

According to the existing available data being collected by MONSTAT, we can obtain some data from two categories of indicators: Investment into scientific-research activity and Montoring of those employed in science.

We remind that MONSTAT does not have a data collection methodology harmonized with that of EU, but works according to the old, UNESCO's methodology, which was 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 side, the Ministry of Education and Science has not innovated the procedures and standards for licencing, i.e. external evaluation of scientific-research instititions and registration into the Register, and accordingly there is no real picture both in the public and in the private sector of the degree of activities, staff competences and degree to which instituitons dealing with this activity in Montenegro are equipped.

Reform of statistics in this area is one of the priorities of the Ministry of Education and Science and Monstat, which has been included into the National Plan of Integrations.

In the process of accession to the European Union, Montenegro has an obligation to adopt the **European Commission Regulation on Statistics on Science and Technology** (Commission Regulation No 753/2004). It states precisely a list of statistical variables which each of the countreis must secure through standardized statistical reserach (Fraskati and Kanbera manuals), activities and sectors covered by them, sections of results, frequency and deadlines for transfer of data to Eurostat etc.

These are the following statistical data:

1. Statistics on research and development
    1.1 The number of staff engaged in research and development (absolute number)
    1.2 The number of staff engaged in research and development (equivalent to the full working time)
    1.3. The number of researchers (absolute number)
    1.4. The 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 reserch and development in the Law on Budget
    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) which in most cases can be secured through other existing statistical or other sources of data (eg. from social or economic statistics).

Table 1 includes the following data:

a. funds allocated from the state budget for RTD, as % of GDP (GBAORD)
b. total spending on RTD (GERD), as % of GDP

Table 1. Data on investments into RTD [12]

Year	*GBAORD*				*GERD*			
	MN	*EU-25*	*Max*	*Min*	*MN*	*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			

[12] *Data on GDP 2002-2006 are the official data of Monstat; data no spending on RTD in Montenegro are the data of Monstat, they, however, include only research in the higher education sector (financed from the state budget, private companies or other sources); Data on investments into RTD in EU countries are data of Eurostat (Eurostat, R&D Statistics – OECD MSTI 2006)*

Table 2. Review of funds allocated for science from the Budget over 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 realzation	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 €	NI projects (equipment)	NI 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%

8.1 Scope of financing

Montenegro cannot set to itself the objective of following the EU and allocating 3% of GDP for science by 2010, but it can make various hypothetical projections in order to analyze the severness of the problem and chose the variant which is the most acceptable and the most realistic. According to some predictions for the Region, it is possible to allocate a minimum of 1% for RTD until 2011. One should be realistic and notice that allocation of 1% in 2011 will be difficult to realize.

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

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

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

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

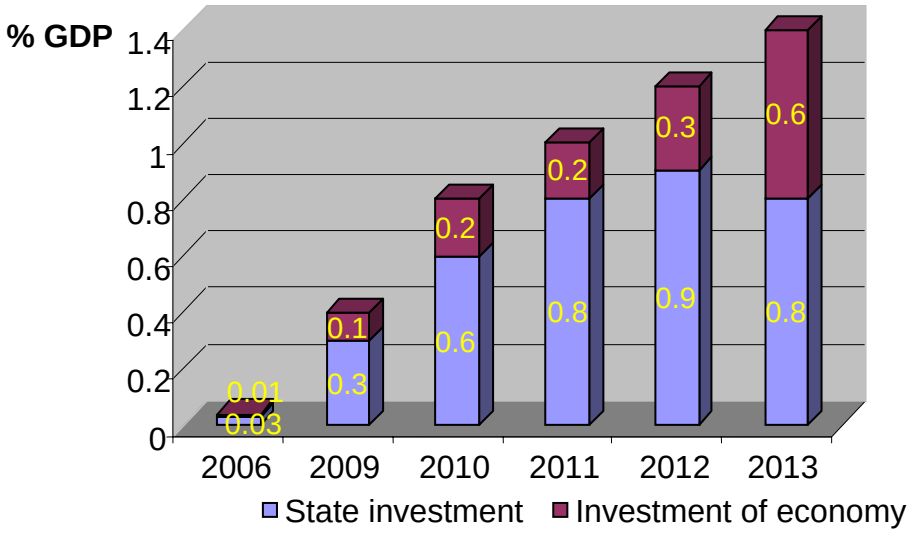

Figure 1: Proposal for growth of investment into SRA by 2013

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

A new structure of economy is only emerging in Montenegro and its technological and export aspirations are still at a low level, as well as the awareness of management structures of competitiveness as the measure of their survival, and thus also their readiness to invest into development and innovation. On the other side, 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) proposed the dynamics of increase of investments into research, technological development and innovations for the five year period between 2009-2013.

If such an increase of investments into RTD were attained, a positive response of the economy could be expected after 2013 and its increased investment into development and applied research, as well as an increased cashflow 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 investments of the state funds should, first of all, be directed for the purposes of the University of Montenegro, higher education institutions and scientific-research institutions in Montenegro (in compliance with the Law on Scientific-Research Activity) in view of achiving the following objectives:

- Modernization of scientific-reserach infrastructure, without which no competent doctoral studies can be realized, nor young generations be trained for modern technological society. A model of rational organization of laboratories with the establishment of multi-disciplinary centres should be accepted. Such centres would gather internationally recognized researchers, and have the critical mass of competencies for mentorship to young PhD 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 for interenationally 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 data bases), it is necessary to allocate funds for creating conditions for life and work of scientists from diaspora who whould accept to return to Montenegro. In paralel with this it is necessary to initiate the already established bilateral cooperation between the University of Montenegro and the universities in developed countries, and to provide from these funds conditions for stay and work of mentors from foreign universities,
- Gradually adopt the model »assistant in research«, apart from the existing »assistant in teaching«. Young research staff (doctoral students) should be engaged at the University by means of projects, from which their salary and all the contributions related to the employment are provided for. This kind of financing the young staff needs to be sufficiently attractive, in order to increase motivation of young people to engage in research. This method would enable the University to complement the scientific-teaching staff in a timely manner and in accordance with its needs, and the economy to obtain modernly trainted work force.
- Activate all the mechanisms for academic staff and doctoral students mobility, all in line with the teaching organization plan at the University. Create conditions for doctoral students to spend at least one semester during their studies at a foreign university, financing this from the European and other programs, as well as from the budget funds. Provide also conditions for PhDs, especially those between 27-34 years of age, to use European and other funds for work at 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 reserach staff,
- Define funds and mechanisms for intensifying cooperation with diaspora and return of recognized staff to Montenegro,
- Establish national awards for scientific-research results, and work continuously on programs for popularization 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. Operationalization of objectives and montoring of the strategy recommendations implementation

Short-term and long-term objectives encompassed by the Strategy must be made concrete through their qualification and elaboration of measures for efficient implementation of recommendations which define deadlines and obligations of particular actors. It is necessary to provide for continuous monitoring and checking of tasks execution, and in particular to define the consequences in case of failure to execute them. Duties 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 presents also the indicators, which can be relatively easily monitored in the quoted time period. The indicators will serve for implemetation of the Strategy which will be effectuated through cooperation of the competent ministries and scientific-research institutions with the Council for Scientific-Research Activity (Council). With time, it will probably be necessary to work on standardization 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 from the Strategy, the Government of Montenegro is to adopt detailed action plans necessary for successful implementation of the proposed measures, on a yearly basis and upon a proposal of the competent ministries. A comprehensive assessment of its implementation needs to be done after five years. Progres made in the achievement of objectives must be the subject of annual reports to be prepared by the Council for Scientific-Research activities and submitted to the Government of Montenegro. Overall coordination of Strategy implementation monitoring 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 to deal with scientific-resarch activity and innovations, who will monitor Strategy implementation in communication with the Council.

When the efficiency of the measures proposed by the Strategy is in question, a special problem can arise due to weaknesses of the system for collecting and processing of data which are obviously present in Montenegro. The selection of adequate indicators by means of which Strategy implementation is to be monitored is vitally important for the efficacy of this process.

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

Annex 1: Action plan

PRIORITY TASKS	MEASURES	TIMELINES	COMPETENT BODIES	INDICATORS
1. Reform of the institutional framework for engagement in scientific-research activity	Establishment of a codified and classified base of researchers	2008-2010	Scientific-research institutions Ministry of Education and Science	Researchers in all institutions presented in the base
	Establishment of statistical monitoring of scientific-research activity	2008-2011	Ministry of finance MONSTAT Ministry of Education and Science	Statistical data are regularly updated and submitted to Eurostat
	Establishment of a fund for financing the scientific-research activity	2008 – 2011	Government of Montenegro Ministry of Education and Science	Established Fund for financing the scientific-research activity
	Establishment of coordination of nationally important multidisciplinary projects at the level of CANU	2008-2010	Government of Montenegro CANU	Number of multidisciplinary projects
	Defining organizational form of scientific-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 data bases	2008-2010	Universities CANU Ministry of Education and Science	Number of integrated libaries with COBIBB Number of data bases which 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 regulation 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 legal regulation in the area of information-communication technologies Number of ICT companies cooperating with the scientific-research institutions

PRIORITY TASKS	MEASURES	TIMELINES	COMPETENT BODIES	INDICATORS
2. Stimulate innovation and technological development	Stimulate financing of innovations in the economic sector	2008-2016	Government of Montenegro Ministry for Economic Development Direction for Development of Small and Medium Size Enterprises Ministry of Education and Science Universities	Increase the share of economic sector in research and innovations (Monstat)
	Stimulative measures for financing scientific-research work	2008-2012	Ministry of Education and Science Ministry for Economic Development	A set of financial mesures for stimulating research
	Stimulate development of public research institutions	2008-2012	Government of Montenegro Ministry for Economic Development	Incrase in the number of public research institutions in this period
	Marketing support and consluting services to all the actors in innovations	2008-2012	Ministry for Economic Development Ministry of Education and Science Agency for Small and Medium Size Enterprizes	The number of institutions using consulting services and marketing services
3. Stimulate international cooperation at all levels of scientific-research activity	Stimulate participation in European and International programs	2008-2016	CANU Universities Ministry of Education and Science	Number of international projects accross all scientific areas
	Reorganization of the system for financing researchers' mobility	2008-2012	Government of Montenegro	Existance of one legal entity responsible for financing mobility The number of students and researchers involved in the mobility programs
	Participation in COST and i	2008-2010	Ministry of Education and	Number of actions in COST

PRIORITY TASKS	MEASURES	TIMELINES	COMPETENT BODIES	INDICATORS
	accession to EUREKA		Science Direction for Development of Small and Medium Size Enterprises	and in 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. Realization of functional priorities of scientific-research activity	Reorganization of institutional administrative structure	2008-2010	Government of Montengro	Reorganized administrative structure of the Ministry of Education and Science – Sector for Science
	Allocation of funds for program financing of research institutions of national importance	2010	Government of Montenegro Competent ministries	Amount of allocated program funds
	Allocation of funds for co-financing the technological development projects and innovations and innovation of regulation for allocation of funds	2010-2012	Ministry of Education and Science Ministry for Economic Development	Determined Rulebook for allocation Amount of allocated funds
	Development of personnel 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 PhD graduates of up to 35 years of age
5. Incrase scale of investment into scientific-research activities	Ensure growth of investement into SRA	2009-2016	Government of Montenegro	Attainment of investment into research and development of a minimum of 1,4% of GDP by 2013. Increase of investments into research and development in the sector of economy in

PRIORITY TASKS	MEASURES	TIMELINES	COMPETENT BODIES	INDICATORS
				relation to the public sector (Monstat)
	Apart from the existing assistants in teaching activate also the model of engagement of 'assistants in research'	2008-2013	Universities Ministry of Education and Science	Number of assistants in research
	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 data bases on researchers

Annex 2: Literature

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