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Resolution on Research and Innovation Strategy of Slovenia 2011-2020

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1 Introduction

At the beginning of the 21st century, we face challenges that will affect the fundamental restructuring of the world as we know it today. According to the latest data, Asia will play a key role in the global realities of this century. It is already a global manufacturing centre and major exporter, and a continuation of current trends will by 2025 result in supremacy of Asia over the USA and Europe in science and technology. Asia will chiefly develop itself as a centre of research and development of the business sector. Demographic changes in Europe will lead to a sharp rise in public expenditures to ensure the needs of an aging population. Environmental migration will be added to growing political and economic migration. The world will face shortages of natural resources such as energy, food and water, and major threats associated with climate change¹.

These challenges call for critical reflection and investigation of the causes of this situation, and require above all a change of lifestyle and changes in our socio-economic behaviour. The processes that we are witnessing place even stronger emphasis on the need for creativity and knowledge as assets for fulfilling an individual which and can provide him a proper place in modern society, and enable social inclusion, a sustainable lifestyle and a sustainable economy, all of which lead to a high quality of life and a fairer society.

With regard to social responsibility, Slovenia recognises a long-term commitment to science and development by establishing their important role in social progress and as a foundation of well-being for its citizens. We are aware that without the joint presence and intertwining of different scientific disciplines progress of societies and technologies cannot be understood. Slovenia supports a comprehensive integration of science and the strengthening of its autonomy and institutions while supporting harmonised interdependence between science, development and innovation, which is unique in providing overall social progress and well-being.

State of affairs

According to assessments from 2010, the quality of life in Slovenia is relatively good. It is ranked in 29th place² on the Human Development Index among developed countries, while the capital Ljubljana is ranked 81st among 215 cities³ on the quality of life scale. The European innovation scoreboard based on statistical figures through 2008, ranks Slovenia among the innovation followers with most indicators close to the European average. Similarly, ranking of the world's most innovative countries⁴ puts Slovenia in 24th place according to the indicator of successfulness of innovations, and first among the countries of Central and Eastern Europe. The achievements and discoveries by Slovenian science in all areas are encouraging and are an appropriate starting point for further development. The number of scientific publications in relation to public investment in R&D puts Slovenia above the EU27 average, and just below this average for the economic impacts of science.⁵

The onset of the global crisis in 2008 in Slovenia almost wiped out its progress in economic and social development over the past decade, which was already inhibited by manipulated privatisation and abuses in the 1990s. The crisis has revealed a number of structural weaknesses, particularly the fact that Gross Domestic Product (GDP) growth in

¹ Luc Soete et al., *World in 2025*, 2009.

² *Human Development reports*, United Nations Development Programme, 2009, <http://hdr.undp.org/en/statistics/>.

³ <http://www.mercer.com/home>.

⁴ *A new ranking of the world's most innovative countries*, Economist Intelligence Unit Limited 2009, http://graphics.eiu.com/PDF/Cisco_Innovation_Complete.pdf.

⁵ A more research-intensive and integrated European Research Area, Science, Technology and Competitiveness.

Key figures report 2008/2009, EC, 2008, ISBN 978-92-79-10173-1, http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf.

Slovenia is too dependent on low technology industries and traditional services, which limit the competitiveness of the economy. In these harsh conditions, Slovenia has to focus on raising the cohesiveness of society and competitiveness of its economy while consolidating and restructuring its public finances. For this, Slovenia is relying on creativity and knowledge, which are fundamental values and the sources of the country's future wealth. In order to establish the knowledge society, further development in all scientific areas is needed; only responding to social challenges from multiple diverse angles can give a comprehensive perspective that leads to appropriate action. In addition, it is of a key importance to encourage the partnership between science and its users, cultivating new, sustainably set technologies that are closely associated with scientific findings and future fields. The Research and Innovation Strategy of Slovenia (RISS) is a programme document for achieving social objectives such as improved living standards for all and an improved quality of life. These objectives will be achieved through the establishment of a modern research and innovation system, which will contribute to increased knowledge and understanding of society, respond to its challenges, increase the value added per employee, and provide quality workplaces and living environment. RISS is based on the Development Strategy of Slovenia and is in accordance with the Europe 2020 documents and leading initiatives of the EU with the aim of achieving synergies in society. It reasonably relates to the National Programme for the Development of Higher Education 2011–2020 (NPVŠ), and together they constitute the "knowledge triangle", which is at the heart of the strategic reflection on further development of the Slovenian and global society. Upon its preparation, studies⁶ by the international group of experts under the auspices of the Organisation for Economic Co-operation and Development (OECD) and by the group in the context of the open method of European Union (EU) coordination were considered which examined the Slovenian research and innovation environment and public policies in these areas in the autumn of 2010, and subsequently provided recommendations to optimise them.

Vision

By 2020, a responsive research and innovation system, co-created by all stakeholders and open to the world, will be established. This system will be firmly entrenched in society, be in its service, will respond to the needs and ambitions of the citizens and enable the resolution of major social challenges of the future, such as climate change, energy, lack of resources, health and aging. As a result, the work of researchers, developers and innovators will gain greater acclaim influence in society. By adapting legislation, a legal framework for the operation of the system will be established in 2012.

It will ensure open space for dialogue, while its governance will be democratic and economic. The involvement of stakeholders will prevent duplication while promoting and achieving relevant synergies. All actors will fully enjoy the benefits and advantages of the free flow of knowledge and technology between sectors, and promotion and dissemination of scientific knowledge will encourage responsible behaviour and social consciousness of the common good. The gaps between research, education and innovation will be overcome, and their common denominators will include partnership, lifelong learning, deeper awareness, and sustainable development.

The reputation and attractiveness of the research profession will also grow due to advanced infrastructure and normative conditions that will lead to effective and efficient implementation of the most complex research. Human beings will be at the heart of the system because only through the human resource development we are able to achieve higher levels of development. Research institutions will have a strategic, financial and

⁶ Maja Bučar with Andreja Jaklič and Boštjan Udovič, *National system of innovation in Slovenia*, Faculty for Social Sciences, Ljubljana, 2010, [http://www.mednarodni-odnosi.si/cmo/CIR/CIR4National System of Innovation in Slovenia.pdf](http://www.mednarodni-odnosi.si/cmo/CIR/CIR4National%20System%20of%20Innovation%20in%20Slovenia.pdf).

OECD review of Slovenia's innovation policy: Overall assessment and recommendations – preliminary draft, OECD, Paris, 2010.

Policy Mix Peer Reviews: Country Report – Slovenia, European Union Scientific and Technical Research Committee, Brussels, 2010.

managerial autonomy, but also responsibility for the implementation of their socially relevant missions. The government will place research and innovation at the heart its policies and assure adequate financial support. As soon as 2012, 1 % GDP of public investment will be allocated to research and development and 1.5% of GDP by 2020. Improvements in economical development will be manifested through implementing a higher-technology structure of the economy and a higher added value per employee as a result of technological and non-technological innovations. This will increase the competitiveness of the economy while the fiscal and supportive environment will encourage new and increased corporate investment in development, and higher quality workplaces in particular.

Objective

To establish a modern research and innovation system that will allow for a higher quality of life for all through critical reflection of society, efficiency in addressing social challenges, increased value added per employee, and assurance of more and higher quality workplaces

2 Effective governance of the research and innovation system

Governance of the innovation system in recent years shifted from a linear model, which assumes that economic efficiency follows research efficiency, to the second generation system, which is no longer focused on technology but based on the interactive organisational model, which creates conditions for success. However, in the last decade the world has faced realisation of the third generation system, which is horizontal and requires a well-coordinated process of planning, implementation and evaluation of policies among all stakeholders involved in the innovation system and continuous adaptation of the institutions in the field of research, technology and innovation to the changing environment. The process is open and democratic while sharing of responsibilities in formulating the research and innovation system is unequivocal.

State of affairs

Since 2010, coordination of policies in Slovenia has been performed by the Umbrella Working Group for Harmonization and Coordination of Slovenia's Development Planning, who observes Slovenia's Development Strategy⁷, National Development Programme of the Republic of Slovenia for 2007–2013⁸, National Reform Programme for 2008–2010⁹ (Europe 2020¹⁰) and the budget of the Republic of Slovenia for each financial year. The policies are implemented through the national budget. Competences for research and innovation policy are shared between the Ministry of Higher Education, Science and Technology (MVZT), the Ministry of Economy (MG) and in part by the Government Office for Development and European Affairs (SVREZ) and the Government Office for Local Self-Government and Regional Policy (SVRL). The Ministry of Economy implements its programme through the Public Agency for Entrepreneurship and Foreign Investments (JAPTI), the Public Agency for Technological Development (TIA) and the Slovenian Enterprise Fund (SPS). MVZT delegated the implementation of most of its measures to the TIA and the Slovenian Research Agency (ARRS).

⁷http://www.svrez.gov.si/fileadmin/svez.gov.si/pageuploads/docs/Strategija_razvoja_Slovenije/SRS_dispozicija_17feb2011.doc

⁸http://www.svrl.gov.si/si/zakonodaja_in_dokumenti/zakonske_podlage_s_podrocja_politike_spodbujanja_skla_dneqa_regionalnega_razvoja/drzavni_razvojni_program/0

⁹http://www.svrez.gov.si/fileadmin/svez.gov.si/pageuploads/docs/Razvojni_dokumenti/NRP_koncna_17.11.2010_FINAL.doc

¹⁰http://www.svrez.gov.si/si/delovna_podrocja/nova_evropska_razvojna_strategija_do_leta_2020/strategija_evropa_2020/

The subject is also covered by two advisory bodies of the Government of the Republic of Slovenia, the Council for Science and Technology (SZT) and the Competitiveness Council (CC).

A consequence of the fragmented system of governance of research and innovation is a mismatch between policies and responsibilities and duplication of instruments, as well as poor implementation of the adopted strategic documents, notably the existing National Research and Development Program¹¹ (NRRP).

The increased extent of tasks and responsibilities and particularly the ambitious planning of development, new instruments and more active participation in the international scientific and innovation environment also increase the responsibilities of the competent bodies in the field of science, technology and innovation. However, this was not followed with the reinforcement of the expert staff at the competent ministries to allow adequate preparation and implementation of the policies, an issue which was highlighted in the inspections performed by the international experts. It is reflected in several lost opportunities, both nationally and international.

Objectives

The objective is to achieve better governance through the following measures:

1. Establishment of an effective common governance system for the research and innovation system, involving all stakeholders

The system will be based on horizontal and cross-sectoral coordination at all levels of decision-making and institutional tiers. It will build on trust and open communication among all stakeholders. Management will be at the highest level, where it will be the responsibility of a separate group of ministers (the Umbrella Working Group for Harmonization and Coordination of Slovenia's Development Planning), in which MVZT and MoE will be responsible for research and innovation. This will provide close association of the implementation of RISS and of Slovenia's new industrial policy. The subject will be covered by a single government advisory body, the Council for Research and Innovation, which will liaise with key stakeholders and replace the Council for Science and Technology and the Competitiveness Council. All key stakeholders will participate in the Council for Research and Innovation, and its composition will be determined by legal and executive provisions. A system for effective networking at all levels will be established, with the main driver being efficiency of governance. Implementation of RISS will be institutionally supported by augmenting highly qualified staff at the competent ministries and reforming public agencies. The agencies will be partners in providing technical guidance and evaluation of policy implementation. Funding and implementation of the various programmes will be transferred primarily to the professional executive institutions.

2. Monitoring the implementation and evaluation of the effects of RISS

Implementation of the programme will be based on professionalism, transparency and cost-effectiveness.

To achieve the objectives of RISS it is imperative to ensure regular monitoring of the implementation of the imposed measures. In order to increase system efficiency and effectiveness, the existing measures need to be continuously evaluated and, if necessary, improved, stopped or joined by new ones. The latter must be developed in consultation with key stakeholders. The system should be upgraded rather than succumb to duplication and fragmentation.

Because of the inseparable nature of R&D in higher education and the public research sector, we will establish common monitoring of the implementation and evaluation of the effects of both programme documents for the areas of higher education and research and innovation activity. Together, an independent group of experts will monitor the

¹¹ Uradni list RS, št. 3/2006.

achievement of the set objectives, the effects, and implementation of measures and report annually to the competent advisory bodies to the Government of the Republic of Slovenia for the field of higher education, science and technology. After examining both documents together, the bodies will report on the implementation of the programmes to the Government of the Republic of Slovenia and make proposals for new measures and measures for more effective implementation of both documents. The Government of the Republic of Slovenia will report to the National Assembly every other year.

RISS measures are funded through the national budget of the Republic of Slovenia and established by the competent ministries in accordance with the Strategy. The monitoring system in accordance with indicators of RISS is further elaborated in the programme budget, including target values projected until 2014. In 2015, a thorough assessment of RISS will be conducted; it will include the evaluation of measures and the achievement of targets as a basis for updating the strategy for 2015-2020.

3. Periodic evaluation of the effectiveness of all support and executive institutions

Executive institutions and agencies will realise their mission in accordance with the principles of efficiency, responsibility and transparency. Efficiency and quality of all support (e.g. agencies) and executive institutions (e.g. public research organisations; PROs) will be evaluated on the basis of measurable indicators, which will ensure transparency, professionalism and ethical standards. The evaluations will be performed by domestic and international experts.

Measures

	Measure	Responsibility	Deadline	Indicator
1	Formation of a uniform Government advisory body – the Council for Research and Innovation will replace the Council for Science and Technology and the Competitiveness Council	Government of the RS (science, technology, innovation*)	2012	Legal regulation
2	Annual independent monitoring of the implementation of RISS	Government of the RS (science, technology, innovation, economy), Council for Research and Innovation	2012–2020	Reports to the Government and the National Assembly
3	Evaluation of impacts of the instruments of RISS with measurable indicators	Government of the RS (science, technology, innovation, economy)	2011–2020	Reports
4	Reinforcement of highly qualified personnel composing the competent ministries	Government of the RS (public administration, science, technology, innovation, economy)	2011	Augmentation of highly qualified staff at the competent ministries
5	Evaluation of the impact of policy measures on the development of innovation in society with measurable indicators (a permanent inter-ministerial working group for drafting of better regulations and removal of administrative barriers in public administration)	Government of the RS (public administration)	2011–2020	Share of removal of administrative barriers in the area of competitiveness
6	Evaluation of support and executive institutions with measurable indicators	Government of the RS (science, technology, innovation, economy)	2011 and 2014	International evaluation report

* Hereinafter, the text in brackets relates to the competent ministries responsible for each measure. In this case the competent ministry is the Ministry of Science, Technology and Innovation. If responsibilities are shared, the responsible ministry is listed first. The indication of the competent ministry also includes its executive institutions (e.g. agencies).

3 High-quality research in the public sector

3.1 Greater autonomy and responsibility in public research organisations

Public research organisations (PROs) as defined by the applicable legislation are public entities established by the Republic of Slovenia or another public entity authorised by law which meet the conditions to execute R&D activities. PROs include public research and infrastructural institutions and higher education institutions established by the Republic of Slovenia (or another public entity authorised by law). According to the applicable legislation, public service in the field of R&D activities is, in addition to the PROs, also exercised in the form of research programmes by the programme groups with legally delegated public and private individuals under concession. For the needs of this document, these contractors are also considered as PROs.

As the main researchers, PROs form the centre of the research and innovation system that is rapidly evolving and changing. In such changing circumstances, it is crucial to provide the best possible conditions for their work. Their effective functioning and performance in achieving the research mission determines the outcome of implementation of the complete research and innovation system. The latter should therefore ensure considerable autonomy (in terms of management, finance and research) while the PROs themselves must bear the social responsibility to effectively convey scientific discoveries to society and its subsystems.

Scientific excellence is one of the foundations of an innovative, knowledge-based society. The development of scientific excellence is mainly based on fundamental progress in science extending beyond the borders of existing cognition. Fundamental progress in science can only be achieved through research free of preset priorities and based only on the primal curiosity of researchers. Therefore this area of scientific development should be implemented within autonomous research organisations where the only measure for the assessment of scientific work is globally comparable excellence. Universities and institutes are independent in developing fields in which they might achieve outstanding breakthrough results, thereby making important contributions to the world's bank of knowledge.

Significant changes in the innovation system are reflected in the organisation of R&D activities in companies where traditional research departments are replacing experts by placing their development and innovation activities closer to the market. This introduces significant changes to the scope of research in the public sector as it expands R&D cooperation between companies and between the business and public sectors. On the other hand, internationalisation/globalisation of R&D is growing strongly, and both national and European public research areas are increasingly exposed to international competition; therefore, they will have to be adapted and trained to the new situation and thus remain attractive to the business sector. The mobility of researchers, students and teachers is increasing, as is the competition to attract the best among them. The international market in higher education is developing, where international systems also contribute through their evaluation and quality control. Industry, service sectors and other users of knowledge constantly need new knowledge and skills, and lifelong learning and education in the workplace are becoming increasingly important components of the research and innovation system.

All of these processes, which take place in the research and innovation system in Slovenia and worldwide, require the most current, high-level work and organisation in the public research sector.

State of affairs

Following independence and during transition, Slovenia has managed to maintain relative stability in its public R&D sector despite the restructuring of the economy, where many large companies since independence have lost a large part of the market, closed or

reduced their R&D departments. Increased public expenditures devoted to R&D in the early nineties compensated for the business sector's reductions in R&D investment and maintained a high level of scientific development. Due to the shift of R&D from the business to public research sector, the focus has shifted towards basic research. Despite an upturn in investment in R&D in the business sector in recent years, its cooperation with the public sector remained at a fairly low level.

As a result, the Slovenian public research sector is characterised by small differences in the types of R&D activities in higher education and public research institutions (PRI). Thus the degree of cooperation between public research institutions and the users in Slovenia is only slightly higher than in the higher education sector. In 2008, the contribution of Slovenia's business sector in the budget of the higher education sector was 10.1% versus 12.7% in that of public research institutes. This leads to duplication of content, poor cooperation among the researchers from various institutions and the fragmentation of R&D realm.

On the other hand, PROs cannot properly adapt to global processes for their strategic development, as this is prevented by the current system of funding research groups. The centre of decision-making on development occurs at the level of a basic research cell, i.e. a programme group, and not at the level of the individual institution that would fully manage its operation. According to the OECD test methodology, in Slovenia the share of institutional funding in the overall public funds of PROs is 22.2%, which is the lowest share among the 13 countries covered in the OECD study. The current administrative situation of researchers in PROs according laws governing the system of civil servants and the salary system in the public sector does not allow for the development of excellence in the R&D system.

The possibility of employing researchers outside the administrative status of civil servants would attract top-level experts (also foreign) to institutions and motivate them using methods characteristic of industry, thereby enabling the institution to meet its development objectives more easily. At the same time, this would eliminate anomalies the system brings to a particular group of scientists without considering different, sector-dependent circumstances.

For monitoring high-level research, data on the number of publications, number of citations, number of highly cited publications, the impact factor and number of patent applications to certain patent offices is typically used. In the period 2004-2008, Slovenia produced 5,840 publications per million inhabitants in journals indexed in the ISI bibliographic databases, ranking it 7th regarding publications in that period in the EU, which accounts for 155% of the EU average. Regarding number of citations per million inhabitants in the same period, Slovenia holds the 13th position between EU countries with 18,062 citations per million inhabitants reaching 95% of the EU average. Regarding the impact factor, i.e. the average number of citations per publication, Slovenia is placed in 22nd position among EU countries, with IF 3.09 and 61% of the EU average, which shows that Slovenian authors attract relatively poor attention. With 62 highly cited publications per million inhabitants in the period 1998-2008, Slovenia reached 151% of the EU average and the 13th place in the EU.

Objectives

The objective is to increase autonomy and responsibility of PROs, which according to their mission contribute significantly to building a successful research and innovation system. On the one hand, results of PROs will make a contribution to the basic progress of science and technology, and, on the other hand, to the development of society and the economy. Three factors are therefore required:

1. Increased international visibility and competitiveness of Slovenian science on a European and global scale

Encouragement of basic research will follow the efficient European Research Council (ERC) model, with special emphasis on establishing a comparable European system of evaluating the applications and results of research.

2. Differentiation of the mission and the role of the higher education sector and institutes

In the process of diversification PROs will define their own mission and strategy, building on the development of areas and activities where they are or might be particularly successful. All PROs will develop basic knowledge and cooperation with users; however, research institutes will focus more strongly on such cooperation than universities. Smaller research institutes which are almost exclusively funded by public resources will be joined or integrated with the universities based on an in-depth discussion with the stakeholders.

3. Establishing an evaluation system of PROs' research activities

In order to establish adequate monitoring of research and innovation system functioning, efficient institutional evaluation is needed that takes into account a wide range of measures in establishing definitive findings. The essence of institutional evaluation is an independent external evaluation (foreign and national reviewers), which is not based exclusively on quantitative data. The evaluation system will be developed by the agencies responsible for research and technological development in cooperation with the competent ministries and other stakeholders. Evaluation criteria will be based on the evaluation of results and impact in scientific fields. One set of criteria (number of publications with high impact factor, citations, research work growth index, cooperation among PROs, etc.) will be aimed at measuring the scientific excellence of the institution and international visibility of the basic research work. Another set of criteria will address cooperation with the users and measuring social relevance of the research work. In accordance with the mission, the latter will be more prominent in the evaluation of research institutes and will, among other things, take into account revenues from licensing, number of patents in patent offices performing a complete test, number of spin-off projects from the PRO and applicative success of the PRO (cooperation with the business sector or projects between PROs and users, recruitment of students, junior researchers and researchers in the development departments in the companies, the percentage of research taking place in the priority areas of Slovenian Technology Platforms, the percentage of research to support projects of social interest, and others).

4. Autonomy and responsibility of PROs to enable their strategic development in accordance with national priorities

With gradually increasing institutional funding due to reduced/terminated programme funding, we will ensure greater autonomy and responsibility in preparing the strategy for human resources management and development/programme strategy to PROs. R&D activity has to take place within a partnership in which a PRO assumes responsibility for the employees and for different social environments, i.e. all its system components and for society as a whole.

Institutional funding of R&D activity of the higher education sector and institutes will be harmonised and will include two pillars: one fundamental, the other development. The fundamental pillar will provide stable funding of R&D activity of PROs, and the development pillar will provide additional funding depending on fulfilment of the mission of institutions and achievement of preset objectives and will be based on the results of the evaluation of PROs.

A modified method of funding PROs will allow the achievement of objectives of the RISS while respecting their autonomy to organise their own institutional strategies and ways in which to fulfil the set objectives. Public funding mechanisms will be designed to allow more independent decision-making by PROs on use and integrated management of resources earmarked for institutional funding.

In addition to the transition to institutional funding of institutions regarding stable funding, the existing project funding of research work through the "research hour" unit will be replaced by (co)funding the actual costs of projects.

Institutions will gain greater autonomy in recruiting and managing human resources, since researchers of a particular institution will be able to withdraw from the salary system due to the agreement between those involved. We expect and we wish that the management and employees of research institutions will make a common proposal as to how to regulate the salary system and the rights and duties of the employees, with one

possibility being a collective contract between public research organisations as the employers and unions as the employees. The existing regulation of rights and responsibilities can be a starting point for the new system. Until the legislation is changed, the management of the institutions and the employees will be able to make proposals concerning the administrative status of the employees. The new salary system will be uniform for the higher education and research positions. In this case, the basic rights and duties will be regulated less rigidly, in accordance with the Employment Relationship Act¹².

Measures

	Key objective of the sector			Selected indicators with target values
	<p>Successful, up-to-date public research sector</p> <p>Excellent, internationally visible research</p>			<p>Excellence in science</p> <p>Share of national scientific publications among 10% of the most cited publications in the world</p> <p>Integration with the needs of the economy</p> <p>Joint publications by researchers from PROs and companies (% of all publications)</p> <p>Share of PRO income from intellectual property rights in the total PRO income</p> <p>Integration with international research</p> <p>International scientific publications (scientific publications co-authored with foreign researchers) per million inhabitants</p>
	Measure	Responsibility	Deadline	Indicator
7	Association or integration of universities and smaller institutes funded mainly from public resources	Government of the RS (higher education, science)	2014	Legal regulation
8	Establishing an evaluation system of PROs	Government of the RS (science, higher education)	2011	Rules with a systematic set of measures Evaluation of PROs in 2012, subsequently every four years
9	The introduction of stable funding of PROs, the extent depending on the results of evaluations	Government of the RS (science, higher education)	2013	Legal regulation
10	In cooperation with unions and PROs, preparing a uniform salary system and conditions for promotion and work of non-	Government of the RS (science, higher education)	2013	Legal regulation

¹² Uradni list RS, št. 42/2002, [79/2006-ZZZPB-F](#), [46/2007](#) Odl.US: U-I-45/07, Up-249/06-22, [103/2007](#), [45/2008-ZArbit](#), [83/2009](#) Odl.US: U-I-284/06-26.

	administrative personnel within the civil servants system, which will harmonise the awarding of researchers and higher education teachers			
11	In cooperation with unions and public research organizations, preparing the option for researchers to exit the salary system of civil servants.	Government of the RS (public administration, science)	2013	Legal regulation
12	Transition from the "research hour" unit to (co)funding the actual project costs	Government of the RS (science)	2012	legal regulation

3.2 Transfer of knowledge

Knowledge is the fundamental asset in the world of today. According to the OECD, Slovenian science is on average of rather good quality, but it lacks higher accountability to the society by which it is mostly funded, an appropriate legislative framework to award those who are above-average and a system of joint or associated initiatives for the research sector and companies. A research and innovation system that guarantees social inclusion, along with a sustainable approach in lifestyle envisages further development and use of newly generated knowledge in society, aiming at the provision of a better quality of life for everyone. Special attention should be paid to the management and to the transfer of technologies that reveal the success rate of scientific and research work from the point of view of the society which actually provides funds for the research work; at the same time the management and transfer of technologies create possibilities for a better and more efficient use of newly acquired knowledge for the benefit of the society. Flow of knowledge and good governance in the field of intellectual property are key elements in successful cooperation among public research institutions and industry that result in new products, processes and services. Knowledge as it relates to the transfer of knowledge and of technologies is of key importance for the creation of high-tech spin-off enterprises from the PROs which can exploit the results of the research and development activities. Non-technological transfer of knowledge to society may contribute to its cohesion, health and creativity and an overall higher quality of life.

State of affairs

In Slovenia, there is no holistic approach to regulating the field of transfer of knowledge. The majority of activities are based on ad hoc initiatives from different actors. The largest number of activities arises from some public research institutions and higher educational institutes, while the state institutions in the majority of cases do not undertake enough pro-active roles. Two institutes have established liaisons in the form of independent units for the transfer of technologies, namely the Jozef Stefan Institute and National Institute of Chemistry, while the University of Maribor has the TechnoCenter of the University of Maribor, the University of Primorska operates by means of the University Incubator of Primorska, and the University of Ljubljana has established a special Office for Research, Development and Intellectual Property. In 2009, an informal network of Slovene experts for technology transfer was created (SI.TT). In other ways networking, the flow of information on good practices and approaches to regulation in comparable foreign systems make it possible for the Office for Intellectual Property (UIL) to integrate with the projects of EPO, and the IJS to be involved in the CERN TT Network, and similar cases may be noticed with memberships of Slovene experts in organizations like ASTP and AUTM.

The field of knowledge and technology transfer is supported by relevant legislation, as Articles 21 and 22 of the Employment Related Industrial Property Rights Act¹³ define the conditions for the adoption of inventions and for their management within the framework of public research organisations.

¹³ Uradni list RS št. 15/2007- official consolidated text.

Qualitative implementation of activities and of procedures for knowledge transfer can be achieved only by adequate human resources support and stable working conditions, which is subject to appropriate education and training, to a systematic approach in financing the knowledge transfer activities and to the establishment of a generally favourable environment (from the legislative point of view and in agreement with social acceptance of the activity).

The current situation is reflected in the fact that the return of public investment into the economy, which actually enables public financing, is relatively low in comparison with similar institutions abroad. The statement refers to the cooperation between knowledge institutions with private enterprises (contractual research and research for development of a component or of a prototype) as well as to the licensing of the newly generated knowledge acquired through public means, and to the creation of new enterprises on the basis of this knowledge.

Objectives

Improvements in the flow of knowledge will be achieved by the following means:

1. Creation of an environment that favours efficient knowledge transfer

In such an environment, the knowledge transfer is to be defined as a key strategic mission of PROs towards society. The system will stimulate cooperation and create trust and good integration into the research sphere. Possibilities will be given for the acquisition of entrepreneurial skills and of entrepreneurial culture among students, as well as for the simple establishment of enterprises. The arrangement of a system of technology transfer offices (TTO) and metrics for the evaluation of the system's efficiency will be established. It will be intended for the knowledge and technologies transfer from PROs as well as for the transfer between PROs and individuals (researchers, innovators and artists) and companies. It will strengthen and make use of knowledge essential for evaluating ideas and realising the best of them applied to innovation projects which are likely to be successful in terms of business. The existing quality core of TTOs will thus be reinforced and integrated into a comprehensive support environment, and stable funding will be provided. The emphasis will be given on evaluating their success rate as regards achieving knowledge and technologies transfers in the forms of licensing, spin-off enterprises (number of enterprises and employees), income growth, etc.

2. Building an efficient system for the protection of intellectual property

National guidelines (manual) for regulation of rights arising from intellectual property will enable the enterprises to get acquainted with the conditions for the implementation of the intellectual property rights of PROs; transfer/access will be transparent and quick.

3. Fostering the culture of patent acquisition with thorough premeditated patent policy and through development of legislation for the intellectual property field

This will enhance sensible acquisition and exploitation of new patents in the academic, R&D and business sectors. The culture of innovative thinking should be stimulated at all educational levels; long-term desired results depend exclusively on constantly improving generic understanding of the significance of this field. Solutions for involving stakeholders in results usage (distribution of rights arising from intellectual property among the researcher or inventor, institution and commercial agent) must be incorporated.

4. Determining the knowledge transfer as a key strategic mission of PROs

In view of the optimal functioning of the knowledge transfer system, the PROs should be well aware of the significance of the field and they should determine it as a significant part of their visions and strategic documents.

5. Building a relationship of trust and good integration into the research environment

In view of attaining relevant objectives, trust should be established among all the key actors (research sphere and state institutions), thus an adequate flow of knowledge and

information will be made possible and consequent synergies of those effects may be achieved.

Measures

	Key objective of the sector			Selected indicators with target values
	Successful transfer of knowledge from PROs into industry and the social environment			Share of business resources in funding of PRO research Joint publications by researchers from PROs and companies per million inhabitants Share of PRO income from intellectual property rights in the total PRO income
	Measure	Responsibility	Deadline	Indicator
13	Regulation of intellectual property rights among stakeholders in commercialisation of research results	Government of the RS (economy, science, technology, innovation)	2013	Regulation
14	Establishment of support for patenting by PROs	Government of the RS (science, technology, innovation, higher education)	2012	Number of supported patent applications by PRO Share of supported patent applications which ended in granted patents Share of supported patent applications which ended in commercialised patents
15	Establishment of a scheme for stimulation of entrepreneurship with young PhDs ¹⁴	Government of the RS (science, technology, innovation, higher education)	2012	Number of newly created enterprises by young PhDs
16	Enhancement of offices for knowledge transfer (TTO) from PROs into industry Establishing an evaluation system of TTO	Government of the RS (science, technology, innovation, higher education)	2012–2020 2011	PRO income from licensing New enterprises, spin-offs from PROs (number of enterprises, number of employees, revenues) Number of PRO patents commercialised within a year after the patent has been granted
17	Attracting PROs to solving challenges of social development	Government of the RS (science, technology, innovation, higher education)	2011–2020	Share of resources for central social challenges in national budgets for R&D activity (e.g. objectives of "efficient use of natural resources" and "renewable energy resources")

3.3 Co-operation in R&D area within the EU and worldwide

The increasing globalisation demands an improvement of the scientific and technological excellence and of sustainable development. Without increasing of the scientific and technological co-operation in the European and worldwide context, it is not possible to address effectively the challenges which are crossing the national and continental borders. Globalization calls for new and different approaches and methods on local, regional and national level. On a global international level the co-ordination of the R&D policies, instruments and measures has become a necessity, compelling also for Slovenia.

¹⁴ Young PhDs are PhDs in the first seven years after being awarded their doctorates.

The international R&D co-operation must be based on principles of reciprocity, equality and mutual well-being as well as on efficient protection of intellectual property. Such a co-operation is of key importance for development, sharing and dissemination of knowledge throughout the world, and also a basis for increasing the mobility of researchers or "brain circulation" in a spirit of strengthening the European research area, and broader.

State of affairs

Slovenia is officially participating in the EU Framework Programmes for Research (FP) since 1999. The preliminary data from the European Commission (EC) for Slovenia on its first two years of participation in the Seventh Framework Programme show that Slovenia is being represented by 0.9 % of the participants. Therefore, Slovenia receives 0.6 % of all the allocated EC funds which is relatively successful, considering that it has 0.4 % of the EU population. On the other hand, the success rate of applicants (number of participants in selected projects in comparison with participants in all applications) is only ca. 15 %, which sorts Slovenia among the last few in the EU (24th place or 25th place in EU-27), indicating that applications are poorly prepared. Also, Slovenia is not very successful considering the number of co-ordinators and participation in tenders of European Research Council, but is more involved in intergovernmental programmes EUREKA and COST.

Bilateral co-operation of Slovenia on R&D area has been increasing rapidly after Slovenia has gained its independence, due to larger recognition of Slovenian R&D within European framework, and in wider context. The aim was faster inclusion in the EU, and also deepening the co-operation with the other countries (neighbouring countries, Western Balkans countries, advanced non-European countries and regionally important countries). With the new strategy we wish to exceed the mobility in the framework of bilateral co-operation, and upgrade it in particular with priority countries of the Slovenian foreign policy by 2020.

Slovenia is starting co-operation also in activities of the OECD and the European Space Agency (ESA).

Objectives

The aim is to improve international co-operation, namely:

1. The increase of international multilateral co-operation

We will be supporting opening of the Slovenian R&D area to the EU Member States and associated countries to the EU framework programme – mainly by the system of national contact points (NCP) for EU FP and representatives in relevant Programme Committees of the European Commission – which needs to be adapted to the changed circumstances. Upon development or entry into the new instruments, we will strive for simplicity, transparency and prevention of their duplication in order to make the system as simple as possible for the researchers and the business sector. By means of financial incentives we will further support inclusion of Slovenian researchers in European research programmes and networks, so to also include to the greatest extend the companies which develop and/or commercialise newly generated knowledge.

2. The increase of international bilateral co-operation

It will be directed towards neighbouring countries and regions, Western Balkans countries and so called BRIC countries (Brazil, Russia, India, and China) that are becoming new world centres of R&D, and towards other complementary countries in the research area.

We will be constantly improving bilateral co-operation with the most advanced countries in the world, as for example USA, Korea and Japan, while the co-operation with the other countries will be supported in accordance with the interests of the scientific sphere and foreign policy orientations of the Republic of Slovenia.

By strengthening the bilateral research co-operation with the countries of South-East Europe, and in particular with the Western Balkan Countries, Slovenia must become an attractive hosting country for the excellent researchers and enterprises from these areas.

A special emphasis will be given to cross-border R&D co-operation, since it has the most direct impact on knowledge transfer to the local economy.

We will gradually switch from financing mainly mobility to encouraging research projects as prevailing form of bilateral co-operation.

New guidelines will be recorded in the Development Plan for Bilateral International Co-operation of the Republic of Slovenia in the Area of Research and Development in the 2012-2020 Period. The Ministry of Higher Education, Science and Technology is responsible for its preparation, and shall submit it to the Government of the Republic of Slovenia for adoption.

Measures

	Key sector objective			Selected indicators with target values
	Targeted and quality international co-operation			International scientific publications (scientific publications in co-authorship with foreign researchers) per million of inhabitants
	Measure	Responsibility	Deadline	Indicator
18	Measures for increasing the scope of international co-operation and the scope of participation of the Slovenian partners in international research projects	Government of the RS (science, technology, innovations)	2011–2020	Budget funds for international co-operation Increasing the number of scientific publications in co-authorship with foreign researchers The amount of national funds in international research projects with Slovenian participation (without research infrastructure) The amount of foreign funds, obtained by Slovenian researchers by means of co-operation in international research projects (without research infrastructure)
19	Development Plan for Bilateral International Co-operation of the Republic of Slovenia in the R&D Area in the 2012-2010 Period	Government of the RS (science, technology, innovations)	2012	Adoption of the plan Proportion of priority countries in the value of all the bilateral contracts Proportion of research projects in common funds for bilateral co-operation. Amount of funds for bilateral scientific projects

3.4 Public funding of research and development

Public investment into research and development constitutes one of essential foundations of research and innovation system, since, in the majority of cases, determines its outcome, and is a requirement for autonomous scientific work. For effective carrying out of the RISS objectives, the long-term stable financing of research and development activities needs to be assured. On the other hand, the amount of public investments does not present only an incoming variable into this system, but it also reflects the very functioning of the system itself. The Barcelona goal, as a part of the Lisbon Strategy, in the EU Member States sets the target to achievement of the 3 % of GDP investment into science and research. One third of these investments (1%) should arise from public

funding, while the other two thirds (2%) from the economy. The majority of the EU Member States have not yet attained this goal, and Slovenia, according to the current trends in public investment, is to attain the goal already by the 2012.

State of play

The funding of research and development activities in Slovenia bears the following characteristic features:

- In spite of the ambitious goal to carry out the Barcelona target of the 3% of GDP going for research and development by 2010, the share of funding for research and development activities has in 2008 attain only 1.65 % of GDP or the amount of 616.9 MEUR of gross national expenditure. In this connection, the share of the state budget amounted to 0.52 % of GDP or to 193.1 MEUR, and the share of total public sources (together with public inflows from the abroad) to 0.57 % GDP or to 212.9 MEUR.

- From the funds for research and development (R&D) from the state budget (being a slightly different aggregate than the Barcelona one)¹⁵, Slovenia in 2008, allocated to state sector or public research institutes 45.8 %, to higher education sector or higher educational establishments 41.2 %, followed by 12.2 % to private sector, by 0.7 % to non-profit private sector and by 0.1 % to foreign sector. Share of the budgeted funds for R&D in higher educational sector in a number is too low, since currently, in the statistical report, the money used by the state to cover research work, carried out by researchers in the framework of their gainful employment, is not presented. This money is included in the funds for pedagogic activity, and will have to be corrected in the future.

- Funds for research in the business sector are, understandably, intended almost exclusively for natural science and technical science (99 %), while the share of funds for these sciences in researches, conducted by public research organisations, is 77 %, and for social science and humanistic 23 % (data for 2008). Furthermore, typical for Slovenia is relatively low use of funds for research and development in the service sector (in 2008, the service activities used 16 % of funds, spent for research in the business sector, and at the same time, contributed 55 % of added value, created in the economy).

The funding system for research activities in Slovenia is characterized by relatively high number of different instruments, which leads to its fragmentation, and lowers effectiveness of invested funds. Also, we still have not developed a comprehensive system of ex-post analyses of scientific results, which could be used for measurement of concrete societal impacts of the research work, financed by the state.

Objectives

The aim is to improve the system of public funding for research and innovation. It will be reached by the following:

1. The increase of funds for research and development activities

In 2010, the Government has adopted the target of joint venture by public and private sector into research and development in the amount of 3 % GDP by the year 2020. For this purpose, the Coalition Agreement 2008–2010 anticipates public investments in the amount 1 % of GDP already in 2012.

The Council for Science and Technology has in grounds for RISS set this goal even higher - joint ventures in the amount of 3.6 % GDP by the year 2020, of which public funds amount to 1.2 %. In Slovenia, the share of funds for research and innovation activities shall increase in the framework of European cohesion policy funds, both in the current and in the future programme period.

The increase in public investments into research and development activities will be achieved by the growth of national and structural funds, intended for research and

¹⁵ This aggregate includes all the funds, intended for research and development by national state budget, regardless of where they are used (consequently, also outflows abroad), however, the indicator of Barcelona target includes all the funds for research and development, used within the state, regardless of where they come from (consequently, also inflows from abroad).

development activities. The share of the latter will increase in the future financial perspective; however, national, structural and other European funds (e.g. operative programmes) will be used synergistically. The areas and activities for development of research and innovation system in the EU programme period 2014–2020 will be defined in the Research and Innovation System Development Plan with National and Structural Funds 2014–2020. The Ministry of Higher Education, Science and Technology, and Ministry of Economy are responsible for its preparation, and shall submit it to the Government of the Republic of Slovenia for adoption.

2. Enhancement of frontier ¹⁶ research

The research policy will support frontier research, having the most significant importance for science and social development, and will be, upon increase of public investment into frontier research, increasing the funds. There are no prospects for an efficient applicative work and for a transfer into economy if there is no science of excellent quality, and at the same time, only a generation of academic knowledge - lacking potential and actual implementation in the economy - is not sufficient. Besides, the traditional border line separating basic research from applicative research becomes more and more blurred. The frontier research that will not be limited by priority area will be carried out complementary with projects and regular work at universities, enabling transfer of the excellent knowledge to the future generations.

3. Encourage projects in co-operation with the innovative economy

Upon increasing of public funds investments into research and development, we will allocate additional funds to incentives for projects in co-operation with innovative economy, final goal being achievement of the 60:40 ratio in favour of the latter.

4. Increase the diversification of sources of funds for research and innovative activities, and within this framework, ensure environment for development of donor activities as private financing source of growing importance

We will encourage donor activities for science and research, inter alia, with tax relief. Long-term development of donor activities is necessary for better integration of research activities with the society, and consequently, improved position (reputation) of the researchers and innovators in the society. The key prerequisite for donor activities is trust in science as a catalyst of the development, and of establishing a creative, knowledge-based society. Considering that the segment of donor activities is an important part of co-financing of research activities in the developed countries, the goal of RISS is to encourage the long-term development of this segment in society, also by means of tax relief, bearing in mind that this is a continuing process, having much longer horizon than the expected for the current financial crisis.

5. Enhancement of the investments into research and development activities in the business sector

A special attention should be paid to the investments into research and development economies.

For encouragement of such investments, the supporting measures of the state are of extreme importance, figuring in wholesome financial resources for development of products, processes and services, and in tax exemptions for investment into R& D and into market development.

Measures for the encouragement of the investments into research and development economies are explained in detail in the chapter 5.1.

Objectives and measures

	Key sector objective			Selected indicators with target values
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The expression frontier research in the entire document encompasses basic and pioneer research.

	Achievement of the high investment into research and development activities, in accordance with national values for so called Barcelona target			Public investments in R&D as % of GDP and as indirect effect Gross domestic expenditure for R&D as % of GDP
	Measures	Responsibility	Deadline	Indicator
20	Effective use of public funds for R&D	Government of the RS (science, technology, innovation, higher education, economy)	2011–2020	Improved values of effect indicators (output) compared to input for at least 20%
21	Tax relief for companies as the encouragement for investments into R&D	Government of the RS (science, technology, innovation, economy)	2013–2020	Improvement of tax relief instrument
22	Encourage research projects of public research organisations in co-operation with innovative economy	Government of the RS (science, technology, innovation, higher education)	2011–2020	60 % of public funds for R&D are directed into projects, involving participation of economy
23	Encouragement of frontier research	Government of the RS (science)	2011–2020	Increase of funds for frontier research
24	Increasing the share of funds for research and development, and innovation activities in Structural Funds	Government of the RS (science, technology, innovation, higher education, economy)	2011–2020	Percentage share growth
25	Document Synergic Use of Funds from Diverse Sources for Strengthening Research and Development System (national, structural, and European, such as OP and CIP).	Government of the RS (science, technology, innovations, economy, regional policy, development, European affairs)	2011	Document
26	Action plan for financing the strengthening of research and development system with national and Structural Funds 2014-2020	Government of the RS (science, technology, innovation, economy, regional policy, development, European affairs, finance)	2013	Adoption of the plan
27	Establishment of the framework for development of donor activities in supporting investments into R&D	Government of the RS (science, technology, innovation, higher education)	2015	Legal regulation

3.5 Ethics in research and of the researchers

The growing integration of research and innovations into social environment, and search for solutions of fundamental problems and questions posed by the society, together with the difficulty of the assessment of research and development activities results on human life, and on the environment, create growing need for the researchers to be aware of ethical issues. At the same time, the research profession requires a high degree of integrity and a strong sense of responsibility, because, particularly in a small area, like the Slovenian one, researchers often encounter situations that could be understood as a conflict of interests, or they may interfere with reputation of the research institution and the research profession in general.

State of play

In Slovenia, the questions of ethics in research are dealt with by the Commission of the Republic of Slovenia for Ethics in Medicine, being an independent body and Ethical Commission for the Experiments on Animals, operating at the Ministry of Agriculture,

Forestry and Food. The Commission of the Republic of Slovenia for Ethics in Medicine has a long tradition, being one of the oldest national ethics commission in the world, and has contributed its share to forming of European ethical standards for biomedical research on human. This covers the Council of Europe Oviedo Convention on Human Rights and Biomedicine, and additional Protocol on Biomedical Research to Oviedo Convention. Both of them are legal and ethical instruments with force of law, and Slovenia ratified them as one of the first countries. Regarding the ethics of research on human, they are both directly applicable in practise. Slovenia has some special aspects regulated in respective laws, e.g. research on human embryos, handling human cells, tissues and other. Moreover, it promptly follows the development of ethics in biomedicine, and continues to co-operate in creating international standards, e.g. guidelines for ethical assessment of research.

Partly, the ethical control over research on the other areas, for example in social sciences, is not yet set, where the rights of people, included in the research, can be violated. Due to the fast development of science and the use of its achievements, the need for ethical assessment of all scientific projects as requirement for commencement of work is becoming more and more explicit. This also applies for the areas, where the probability of direct violation of human rights and ethic norms seems small. The possibility of so called double use of achievements also needs to be taken into consideration. This can involve unforeseen misuse - making of a new weapon or means for criminal or terrorist activities, unacceptable interventions for the benefit of individual or society. Consistent with the tendencies in the developed world, it will be reasonable to consider the ethical control over publishing which should not affect the freedom of science and freedom of spreading its results. In any case, the legislation and legal arrangements will have to be supplemented in accordance with the development across the world. In addition, the acceptance of codes of moral integrity and good practise in science that will be a basis for forming such codes as well in all the scientific institutions will be important.

Objectives

The aim is to ensure high level of ethical awareness of researchers at their work and outwards.

1. For assessment of ethnicity of research outside biomedicine, the needs for new independent sector commissions for research ethics are indicated. In co-operation with all the stakeholders we will prepare systematic institutional arrangement of dealing with the ethical questions in all the important areas, following the example of the European Union countries.
2. A national code of ethics, honour and good practices in science will have to be adopted. It could serve as a basis for codes of individual research institutions.
3. Court of Honour for the scientific area needs to be established.

Measures

	Key sector objective			
	High ethical standards in public research and development activities in Slovenia			
	Measure	Responsibility	Deadline	Indicator

28	Establishment of Court of Honour for the scientific area consisting of the topmost impartial and ethical irreproachable members of the scientific community	Government of the RS (science), SASA	2012	Constitution of Court of Honour for the scientific area
29	Institutionalised examination of ethical issues in science	Government of the RS (science), SASA	2012	Adopted plan
30	Public debate on guidelines for ethics in science	Government of the RS (science), SASA	2014	Formulating the guidelines in the national code of ethics, moral integrity and good practice in science

4 Establishment of capacities in support of research and development

4.1 Strengthening human resources

In Slovenia, the awareness of importance of human resources development is present for a long time. Parallel to the recognition of the importance of science for the general social and economic development, the strengthening of human resources in science has a predominant place in the medium-term national research and development programmes.

State of affairs

In 2008, there were 16243 employees in research and development activities, of which 10123 (62 %) researchers. Measured with the employment under full time equivalent (FTE), we had 7032 FTE researchers, of which 3058 (43 %) in the business sector, 2156 (31%) in the state sector (public research institutions), 1795 (26%) higher educational sector, and only 23 (0, 33%) in the non-profit private sector. The highest growth among the researchers was detected in the business sector, namely 58 % between 2005 and 2008. The proportion of researchers in the business sector has therefore achieved 43 % in 2008 which is slightly below the EU 27 average (46 %). The international comparison of the proportion of FTE researchers among the employees places Slovenia with 0.71 % above the EU 27 average (0.68 %), and still under the EU 15 average (0.75 %).

The proportion of employees with doctoral degrees is gradually improving. In 1990, among the employees in research and development activities, there were only 12 % of doctors of science, and in 2008, 25 % the proportion of doctors of science among the researchers was 41 % in the same year (e.g. 39 % in Ireland), of which the lowest ratio was in the business sector (10 %, in Ireland 14 %), but in higher educational sector 62 % (in Ireland 56 %), and in the state sector 46 % (in Ireland 71 %).

In terms of age and gender the structure of Slovenian researchers is satisfactory, since the share of researchers aged 34 years or younger is increasing. This share amounted to 34 % in 1990, and already to 39 % in 2008. At the same time a program of "Young researchers" includes increasing number of women, especially in the field of biotechnical science, medicine, social sciences and humanities, where women also have a majority share. Current share of women among the researchers amounts to 34 % for Slovenia, and exceeds the EU 27 average (30 %). However, in the academic sector, there were only 17 % of women with a title of full professor in 2007.

According to the data from 2008, among the employed researchers the majority works in the area of technical science (42 %) and natural science (34 %), followed by social science (9 %), medical science (7 %), humanities (5 %), and biotechnical science (3 %).

Objectives

The aim is to achieve a greater development of human resources, namely:

1. Increase the number of researchers and developers in the economy

Excellent research staff will be attracted by the introduction of incentive measures in the field of tax, labour, immigration and other legislation. We will design a comprehensive system of encouragement mechanisms for increasing the mobility of personnel between public research organisations and economy, for employment of researchers in companies, for "a lease" of researchers, and for strengthening research and development capacities in the economy. The costs of employers for researchers and developers in the companies will be comparable or lower to those in the neighbouring and other applicable countries.

A special emphasis will be given to personnel in natural science and technics, including encouragement of study in these areas on tertiary level. In addition to developing personnel, as wide as possible circle of employees needs to be included in the innovation processes.

2. Increasing the number of doctors of science

Upon the selection of areas, the principle of integral development of all the disciplines will be protected when determining the number of doctoral candidates to whom the state will co-fund the study costs, and in particular, there will be more funds for the areas that will be designated as national priorities, based on recognised competences and competitive advantages in science and in economy.

3. Strengthening the qualifications of the personnel

The strengthening of the personnel qualifications has to be systematic, and is based on the lifelong learning. Newly generated knowledge in the relation to the acquisition of management skills and the preparation of national and international R&D projects are of particular interest for researchers. In addition, researchers will have to gain knowledge on new managerial techniques, communication, intellectual property rights, and entrepreneurship.

4. Ensuring effective inter-institutional and interstate mobility of researchers

We will enable the integration and mobility of researchers between different public research organisations. Equalisation of status of researchers at the institutes and university teaching staff will contribute to this aim. Interaction and mobility between public research organisations and industry will be systematically encouraged through technology platforms and other mechanisms.

Slovenia must open more to the EU and the rest of the world regarding the intellectual and work movements. Therefore, we will encourage international mobility of researchers which significantly contributes to their quality, and to attractiveness of research career.

We will systematically encourage integration and mobility of researchers between public research organisations and economy, and inclusion of the excellent professionals from the companies into educational and research system.

5.

Improvement of career opportunities for researchers, and inclusion of the gender equality principle

The basic requirement for establishment of career opportunities for researchers is effective information network on possibilities of research work in Slovenia and abroad. It is necessary to create a living environment that will attract people from abroad, and encourage domestic researchers for international mobility. Foundation for the establishment of career opportunities is also an introduction of encouraging statutory provisions which will assure social security for researchers, favourable working conditions, and clear employment procedures.

National efforts for the development of research careers will be, according to the substantive premises and intention, comparable to the international ones, regardless of the area of research work, and primarily in conformity with the European premises for common framework of the scientific career development.

It is necessary to reduce vertical segregation, therefore, support from a decision making level for changes, and modernisation of research organizations, are very important. The first is necessary to adopt measures for gender equality, to change legislation, and to focus attention to the role of gender in research, in pedagogic work, and in management

of institutions. The basic requirement for such support is a good acknowledgment with importance of gender equality. Therefore, with a help from professional body Commission on Women in Science, we will support promotion activities, follow the principle of balanced representation of both genders when appointing working bodies within the competence of MVZT, and when preparing legal acts and other strategic documents. The areas and activities for improving career opportunities for researchers in all the career periods, and for ensuring the gender equality principle, will be defined in Action Plan for Improving Career Opportunities for Researchers in all the Career Periods, and for Ensuring the Gender Equality Principle. MVZT and MG are responsible for its preparation, and shall submit it to the Government of the Republic of Slovenia for adoption.

Measures

	Key sector objective			Selected indicators with target values
	Strong, quality and adequately allocated human resources in research activities			Share of researchers in the FTE among persons in employment Share of researchers in the business sector Share of researchers with foreign citizenship among all the researchers
	Measure	Responsibility	Deadline	Indicator
31	Encourage study in natural and technical sciences (scholarships, promotion)	Government of the RS (higher education, science, technology, innovations)	2011–2020	Increasing the number of graduates in natural and technical sciences in the tertiary field of education to 1000 inhabitants aged between 20 and 29 years.
32	Scheme for the growth of the number and the share of researchers in business sector, inter alia: <ul style="list-style-type: none"> - updating the incentives for employment of researchers in the business sector - subsidization or imposed upper limits for social security contributions, paid by the employers in the companies - co-financing activities by the business sector for strengthening education and training of the employed in the R&D area, and organisational improvements in this area - content extension of the tax relief for the companies for investments in R&D (already including expenditures for new researchers) with relief for educating personnel from the business sector 	Government of the RS (science, technology, innovations, finance) Government of the RS (science, technology, innovations) Government of the RS (finance, science, technology, innovations) Government of the RS (science, technology, innovations, finance) Government of the RS (science, technology, innovations)	2011–2020 2011 2014–2020 2012–2014 2014	Increase of the number and the share of researchers in the business sector (unit: FTE) Increase of the number and the share of PhDs among researchers in the business sector (unit: FTE)

33	Encouragement of interstate mobility of researchers - elimination of administrative, technical and tax barriers for international mobility in both directions - systematic measures for encouragement of international mobility in both directions, inter alia - forming international compatibility of mechanisms for recognition of researchers' qualifications	Government of the RS (science, higher education, technology, innovations)	2011-2020	Share of PhDs who have for at least three months studied, worked or researched abroad in the last 10 years Share of researchers with foreign citizenship among all the researchers Share of foreign students among the new PhDs
34	Action Plan for Improving Career Opportunities for Researchers in all the Career Periods, and for Ensuring the Gender Equality Principle	Government of the RS (science, technology, innovations)	2012	Adoption of the Action Plan

4.2 Specialization

Excellency on the world-wide basis is necessary for successfulness in the global world. Similar to comparative advantages in economy theory, a lack of critical mass and limited resources in smaller and less developed regions due to complexity of scientific problems, and due to the size of necessary investments in the infrastructure, speak in support of knowledge and competencies concentration in the selected fields. Such a concept of specialization of a country or of a region that exploits local advantages, given features, characteristics, and prior investments into the establishment of capacities and of scientific excellence, enables the development of quality domestic competences and leading position in these areas upon the most optimal use of financial resources.

State of affairs

The Resolution on the NRDP 2006-2010 followed the example of Central European priorities and provided five broad priority fields (information and communication technologies, advanced (new-emerging) synthetic metallic and non-metallic materials and nanotechnologies, complex systems and innovative technologies, technologies for sustainable economy, health and life sciences). At the same time, it also defined narrower technological fields by means of technological feasibility studies. It has been foreseen that the SZT after a two year period, executes a detailed evaluation of priority setting, and complements the list of priorities where necessary.

The broadly identified fields in the NRDP 2006-2010 could not provide for implementation of the concept of the specialization. For this reason, the funding for research and development has been spread around a wide spectre of activities in a balanced way until 2009, which interfered with the establishment of a critical mass of capacities that would ensure a possibility of quality in a global context.

Although the Council for Science and Technology did not carry out the evaluation of priority fields, the past years have been marked with numerous attempts for set out narrower thematic priority fields. The Study on »Technological Foresights and Slovene Development Priorities« (2008, Institute of Economic Research) and the documents on National Technological Platforms were based on qualitative analyses, complemented by quantitative data on implementing enterprises, and on research groups and their competencies. The Report on Results of Identification of Narrow Priority Development Themes (2008, TIA - Technology Development Agency), and the recommendations of the governmental counselling body The Competitiveness Council (2009) that are based on evaluations of a large number of co-operating experts from the economy and the science, are also important. Additional guidelines have been elaborated on the basis of the

evaluation of the Call on Centres of Excellence (2009) which involved evaluations by national and by foreign experts that had taken into account social implications and qualities of the public research sphere and co-operating economy. On the basis of all these studies, the Government took a decision on seven narrow priority fields for the Competence Centres. In the past two years, we awarded over 120 MEUR from public funds to those set out 15 priority fields by means of tenders for Centres of Excellence and Competence Centres for the period till 2013, and started implementing specialization of the Slovenian science and technology. Complementary to these fields, eight industrial sectors have been pointed out and supported with 185 MEUR within the framework for Development Centres of the Slovene Economy.

The prior efforts point to the future development of specialization fields in Slovenia. Instead of on a basis of a top-down decision that could have been made by the policy, possibly supported by expert opinions in studies of technological foresights or by opinions from the economy and from the researchers, the development of smart specialization fields has been established as a permanent and open process that involves all the key stakeholders. The use of specialization conception is becoming implemented with larger extend of public funds on the selected fields.

Objectives

The aim is to create smart specialization fields of state or region, on which Slovenia will be able to establish itself as excellent and competitive country in the international context. RISS as a long-term strategic document defines a way of formulating and evaluating fields of specialization, and not the fields themselves, that must be chosen on the basis of permanent, inclusive and top-down open process, and substantiated with comparative analyses of competences in the individual fields that contribute to solving social problems.

Two measures for enhanced specialization:

1. Establishment of formulation and evaluation of fields of specialization

This shall be permanent and bottom-up open process of recognition and selection of priority fields. The latter will be identified on the basis of incentives by individual stakeholders, and substantiated with comparative analyses of their competencies, either within the framework of research and innovation policies, or either of industrial policies. Selection and development of the selected priority fields will be subject to internal and foreign evaluations every second year, which may lead to changes in the earmarked support to particular priority fields. Therefore, the programmes will be based on partnerships among quality segments of public and of private sectors, and they will be complemented by the establishment of target capacities (e.g. personnel and infrastructure).

2. Increasing the extend of funding in the fields of specialization that enable building of domestic competences and competitive advantages in the science and the economy

We will invest additional funding into the selected smart specialization fields, and at the same time, we will continue to support projects in all the other fields, based on the excellence and perspectives for growth and development, enabling development of newly generated knowledge and competences, and ensuring scientific broadness.

Measures

	Key objective of the specialisation			Selected indicators with target values
	Rise of scientific and economical competitiveness			<p>Excellence in science Share of national scientific publications among 10% of the most cited publications in the world</p> <p>Productivity Value added per person in employment</p> <p>Technological complexity of the economy Share of high-technology and middle-high technological products in the export of products</p>
	Measure	Responsibility	Deadline	Indicator
35	Permanent evaluation and recognition of the fields of specialisation	Government of the RS (science, technology, innovation, economy)	2011–2020	Comparative analyses of competitive advantages and competences
36	Investments into development of competences and strengthening of development cores in the fields of specialisation	Government of the RS (science, technology, innovation)	2011–2020	<p>Budget share for science and technology, intended for fields of specialization</p> <p>Relative factor of influence of publications in the research areas, covered by the fields of specialization, in comparison to relative factor of influence for the entire Slovenia - <i>changes 2010-2014-2020</i></p> <p>Expenditure for R&D per researcher in economic activities, covered by specialization, in comparison to such expenditure of the business sector - <i>changes 2010-2014-2020</i></p>
37	Attracting Pros into solving challenges of social development	Government of the RS (science, technology, innovation, higher education)	2011–2020	Share of resources for central social challenges in national budgets for R&D activity (e.g. objectives of "efficient use of natural resources" and "renewable energy resources")

4.3 Research infrastructure development

Research infrastructures are facilities, resources or services that encompass larger sets of research equipment or instruments, and they complement knowledge resources such as collections, archives and database. They are engines of innovation and the basic condition for research work. At the same time, in particularly larger and medium-sized infrastructures, are essential for excellence of this work and for conducting the most sophisticated research. Around 50000 researchers from Europe are using at least 300 large research infrastructures every year. This results in 3000 to 6000 research articles with very high impact, chains of patents, spin-offs from Pros, and contracts with the

industry. Their use enables answering to important social challenges, such as human health, climate changes, aging of the population, and energy supply, monitoring and responding to changed social relations, values and behaviour of individuals, and helps industry to develop new high-performance materials and medicines, and to monitor the environment.

Access of Slovenian researchers to developed and large research infrastructures is therefore essential for reaching and maintaining level of scientific development on the globally comparable level. This access can be provided by construction of national research infrastructure, and by international integration in the establishment of such common infrastructure. By 2020, several tens of new research infrastructures will be ready, and Europe will be among the leading in the world in terms of e-infrastructures. The network of all the research infrastructures will reinforce human resources in science, enable free movement of people and ideas within the European research area, and with the cooperation among the higher education sector, economy and research institutes, encourage emergence of new innovation ecosystems.

State of affairs

In Slovenia, research infrastructure is wide spread (there is no adequate overview of duplications of equipment within institutions), partly obsolete, and in most cases does not attain the critical mass neither the excellence, comparable with large European and global research infrastructures.

The main instrument for development of research infrastructures are various forms of co-financing by Slovenian Research Agency, which by means of calls of proposals and direct allocation of funds subsidizes purchases of equipment to organisations, the activity of which is an infrastructural condition for carrying out the national research programme. For purchase of new equipment the Slovenian Research Agency earmarks from 2 to 4 MEUR annually, in addition to 7 to 8 MEUR for infrastructural programmes of research institutions.

Under competitive conditions, larger part of foreign research infrastructures can be accessed. However, the needs of Slovenian researchers to access international research infrastructures (which Slovenia is not a member of) are far larger from actually realised.

In 2009, eight new Centres of Excellence (COs) have been established, out of which four will allocate more than half of assigned funds (8 to 10 MEUR) to purchase of research equipment until 2013, and can therefore, together with excellent researchers, represent the critical mass in a sense of a research infrastructural centre: COs for nanosciences and nanotechnologies, for integrated approaches in chemistry and protein biology, for low-carbon technologies, and CO for the Study of Structures and Interactions in Biotechnology and Pharmacy for research in biotechnology, pharmacy, and matter physics.

Objectives

The aim is to provide access to excellent research infrastructure, namely:

1. Better exploitation of the existing national research infrastructure

To grant access to research equipment, which is at disposal of PROs in Slovenia, a transparent and publicly accessible virtual centre (portal) will be established, enabling fast and clear overview of available capacities, together with registration and information for all the shareholders on how to access this equipment. Such centre will link to similar centres in nearby countries. This way, we will link the equipment together, and increase its exploitation, enabling the international exchange of spare capacities, and establishing a mechanism for the usage of the available capacities. State will continue to assure a part of funds for maintenance and functioning of research infrastructure in the PROs. Access to research infrastructure will be granted to all the users under the same conditions, following the measures of scientific excellence and importance.

2. Upgrading and constructing new research infrastructure in priority areas

For reaching the critical mass and the scientific excellence, Slovenia will be developing national research infrastructure in priority areas, complementing the areas of smart specialization, and contributing to a balanced development of the society. The areas and activities for reaching these aims will be defined by Research Infrastructures Development Plan 2011-2020. The MVZT is responsible for its preparation, and shall submit it to the Government of the Republic of Slovenia for adoption. The selection of the areas will be evaluated and revised in line with the process, defined in Chapter Specialization.

In longer term, the aim is to reach critical mass and scientific excellence in at least one scientific field, to bring together the international partners to form an infrastructural centre on the highest global level in Slovenia, and to place this research infrastructure on the European agenda in developing research infrastructures.

3. International integration upon accessing large research infrastructures

It is reasonable for Slovenia to provide itself access to large research infrastructures until 2020, by co-operation in international projects, evaluated as the priority projects and described in the national Research Infrastructures Development Plan 2011-2020. Slovenia will aspire to participate in international infrastructural projects in a manner most suitable for it, following the principle that the benefits of Slovenian contributions to international research infrastructures must be larger for our science than in case of these resources invested in national infrastructure of this kind. In this connection, the Slovenian contributions will have to be spent in the largest possible extent within the national economy or directly returned to it as soon as possible.

Measures

	Key sector objective			Selected indicators with target values
	Strong, up-to-date, well exploited and internationally supported research infrastructure (RI)			Budget funds for research infrastructure (RI) per researcher in the public sector
	Measure	Responsibility	Deadline	Indicator
38	Arrange open access to research infrastructure per public research organisation	Government of the RS (science, technology, innovation, higher education)	2012	Legal regulation Share of external RI users in the common hours of equipment usage
39	Establishment of virtual centre for access to RI, and of mechanism to access spare capacities	Government of the RS (science, technology, innovation)	2012	Public access to virtual centre Number of registrations for spare capacities through virtual centre
40	Concentration of the funds for a new RI on the selected areas	Government of the RS (science, technology, innovation)	2012	Increasing of the funds for a new RI on the selected areas
41	Establishment of national centres for medium-sized RI	Government of the RS (science, technology, innovation)	2020	Two new centres
42	Ensuring conditions for the European RI centre in Slovenia	Government of the RS (science, technology, innovation)	2020	The head office of European Research Infrastructure Consortium in Slovenia
43	Inclusion in international RI centres (projects)	Government of the RS (science, technology, innovation)	2012	International RI centres, at which Slovenia is participating as co-investor - <i>funds for this purpose as % of all the funds for RI</i> International RI centres, at

				which Slovenia is participating as a user, based on paid "fee" - <i>funds for this purpose as % of all the funds for RI</i>
44	Adoption of the Research Infrastructure Development Plan	Government of the RS (science, technology, innovation)	2011	Adopted plan

4.4 Development of business-innovation infrastructure

Innovations are one of the most important elements of economic growth, and at the same time, the answer to social challenges. Entrepreneurs are those who play a central role in the innovation process, as they are adding commercial value to ideas and knowledge, and generating employments. For the development of a competitive economy it is extremely important to establish the effective business-innovation infrastructures.

Business-innovation infrastructure includes government executive institutions, entities of the supporting environment, defined in the Supportive Environment for Entrepreneurship Act¹⁷ (ZPOP-1), and also other public and private institutions, and financial intermediaries that provide support for entrepreneurs and enterprises in developing their business ideas.

While research and development are still very important part of the innovation process, new value in companies is, due to the changed nature of innovations and changed role of stakeholders, primarily created by the interweaving of several different activities. In the modern business environment, the process of innovation is conducted in co-operation with suppliers, customers, competition, higher education sector, scientific research organizations, and of course other companies. This network allows for everyone, especially for small innovative companies, to overcome numerous obstacles and limitations related to their size, limited resources or stage of development, and in particular, the difficulties in accessing funds, partnerships and markets, limited technological capacities, and lack of managerial skills.

Business-innovation infrastructure must support the concept of open innovation and networking that include small, medium and large enterprises, higher educational institutions, research institutes, various government institutions, and other stakeholders in the innovation process. It must ensure support not only to technological, but also non-technological innovations. This means that special attention has to be paid to management, organisational changes, new business models, design and creativity, marketing, and in general to the development of capability to control and to adapt to the changes. Non-technological innovations and industry, creative in such a manner, are important in particular in service activities which present a substantial share of the Slovenian economy. Entrepreneurial-innovation infrastructure includes also wider regulatory environment, and general atmosphere, encouraging creativity, innovation, and entrepreneurship.

State of affairs

Slovenia has developed a broad business-innovation infrastructure with a large number of implementing and supporting institutions, the biggest shortcoming of which are high fragmentation and inconsistency.

The mission of diverse implementing institutions and their responsibility for achieving the objectives of development policy are not defined clearly enough. The programmes and measures are duplicating and are not integrated; therefore, the system is opaque, insufficiently exploited and not efficient enough, and unstable.

¹⁷ Uradni list RS, št. 102/2007.

In Slovenia, based on encouragement measures by the state, diverse public and private institutions were established that connect companies and PROs, and ensure supporting services for them (e.g. technological centres, technological parks, entrepreneurship and university incubators, clusters, and technological networks ...). By means of Supportive Environment for Entrepreneurship Act, the legal bases are set for co-investments of the state into development of services by supporting institutions, but are being carried out partly and unsystematically. The role of these supporting institutions in comparison to public implementing agencies is not clear; therefore, the programmes and measures are duplicating in places.

System of monitoring and evaluating of the effects is not established.

To create a positive innovation microclimate, Slovenia must continue to move towards strengthening the culture of creativity, innovation and entrepreneurship, as defined in Chapter 6.

Objective

The aim is to establish a comprehensive and high quality network of supporting institutions, namely:

1. Improving effectiveness of operation of implementing institutions

With integration and restructuring of public implementing institutions from the areas of research and development, innovations and entrepreneurship, the duplication upon preparing and carrying out of measures of development policies, will be eliminated. Bigger efficiency of operation will be ensured by means of clearly defined mission, tasks, and responsibilities for achieving the objectives of the development policy, and for regular evaluation of their work, in accordance with measures from the Chapter 2. Their expert and cost effective implementation of various public functions is going to be verified, and the potential for their optimisation by the transfer of powers to the most qualified public or private institutions examined.

2. Updating the network of supporting actors in entrepreneurship and innovation

To make better use of entrepreneurial and innovative potentials and to encourage linking in the economy, and also between research, educational and cultural organisations, individuals (researchers, innovators, and artists) and the economy, we will form comprehensive strategy for the development of the network of supporting institutions (as for example, technological and development centres, clusters, design centres, technological parks, incubators, ...) which can assure additional supporting services for the wider circle of users by means of inclusion into the network. A special attention will be paid to the development of services in support of implementing new business models, and of encouraging international integration. In this framework, an efficient and easy access to facilities of current R&D infrastructures is also needed, along with promoting technology transfer or activities for technology transfer offices, as defined in Chapter 3.2.

By means of forming comprehensive network of supporting institutions, we will enable users' better transparency and easier access to these services. Larger reliability and forecast of functioning of the entrepreneurship-innovation infrastructure will be ensured by financing multi-annual programmes of individual institutions, selected according to the quality of services and by means of regular evaluation of the implementation successfulness.

3. Improving transparency and accessibility of information on public calls

The measure calls for the establishment of a single portal for the publication of all public calls, along with a search engine for interested users, and implementation in accordance with the Public Finance Act¹⁸ and the provisions on public and transparent publication of public tenders, which is at the moment assured with the publication in the Official Gazette of the Republic of Slovenia. The portal will become a single and sole point for

¹⁸ Uradni list RS, št.11/2011- official consolidated text.

publishing all public calls, by the example of publication of calls for public procurement, and at the same time, will result in simplification, and reduction of the costs.

Ukrepi

	Key sector objective			Selected indicators with target values
	Comprehensive, quality and solid network of supporting institutions for favourable innovation environment			Population of the companies Net accrual of companies Innovation Net accrual of companies Share of companies which introduced either technological or non-technological innovation, among all the companies Innovation co-operation Share of SMEs, co-operating with other companies and/or PROs in innovations, among all such companies Number of successfully transferred inventions by individuals into economic usage Industrial property Number of patent applications according to PCT¹⁹ per MEUR GDP Number of protected trademarks per MEUR GDP (Community trademark) Number of protected designs per MEUR GDP (Community design)
	Measure	Responsibility	Deadline	Indicator
45	Restructuring of public agencies for technological development JAPTI and TIA	Government of the RS (economy, science, technology, innovation)	-{}-2011	Evaluation Report on JAPTI and TIA - assessment of expert and cost effectiveness
46	Development of new services and supporting subjects for strengthening innovation process, including services for implementing new business models	Government of the RS (economy, science, technology, innovation)	2012	Changes in user structure of supporting services according to the area of activity Changes in user structure of supporting services according to the size of companies Number of successfully transferred inventions by individuals into economic usage Share of companies which introduced technological innovation, among all the companies Share of companies which introduced non-technological innovation, among all the companies Share of companies in service activities which introduced

¹⁹ Patent applications according to PCT (International Patent Cooperation Treaty) = PCT patent applications

				innovation among all the companies in services activities
47	Open platform for integration or networking (e-Environment)	Government of the RS (economy)	2012	Establishment of platform
48	Single portal for publication of all public calls	Government of the RS (public administration)	2011	Introduction of the portal

4.5 Information infrastructure supporting innovation system

Information and communications technology (ICT) infrastructure is one of the key strategic pillars for European research and innovation policies. Innovations and related economic and social developments are mostly dependent on the pace of scientific progress which is today possible only with open and cross-border cooperation of scientists from all over the world via broadband network. In addition, the contemporary science for modelling complex systems and processing very large amounts of data bases deploys more and more opportunities, offered by ever larger computer power, and almost unlimited possibilities for storage of vast amount of scientific data bases.

In recent years, ICT infrastructure has crucially changed the way researchers work which is demonstrated with new research approaches and methods in many research fields. This change, named E-Science²⁰ can be compared to "scientific renaissance" which is the basis for modern science.

State of play

To keep its integration in modern research flows, Slovenia has to accept this paradigm and secure budget for development and maintenance of needed e-Infrastructure which will ensure "to make full use of the emerging distributed forms of research activity (e-Science) based upon international research networks made possible by the availability and quality of European network infrastructures like GEANT and e-Science GRID-networks."²¹ Slovenia is connected into GEANT and e-Science GRID-network through activities of the public institute ARNES, the functioning of which is ensured with funding by the MVZT. To support complete development of broadband connectivity, has in 2008 adopted Strategy of development of broadband networks in Slovenia.

Objectives:

1. Strengthen the basis of scientific e-Infrastructure which supports Slovenian research community

Basic components of scientific e-Infrastructure are dependable and fast broadband optical networks enabling connection to international research network GEANT2 and e-science GRID-network, which enable scientists to solve complex questions more efficiently and faster, to access ever increasing scientific data bases, and to participate in international virtual multidisciplinary research groups or to have the possibilities to prepare new research environments. One of the basic components of scientific e-Infrastructure is also national point for high performance computing.

2. Free access to research data from public funding

Free access to raw data from public funding via Internet, also free of charges, will improve and increase knowledge and information transfer. This way, we will prevent duplication in research, increase efficiency of research work, and enhance the return of the public funding for research and development.

²⁰ ICT Infrastructure for e-Science COM(2009) 108, 5. 3. 2009.

²¹ Competitiveness Council, 22-23 November 2007, (www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/intm/97225.pdf).

Ukrepi

	Key sector objective			Selected indicators with target values
	Establishment of modern, ICT infrastructure for an expansion of science in Slovenia			Broadband penetration rate
	Measure	Responsibility	Deadline	Indicator
49	Implementing Strategy of development of broadband networks in the Republic of Slovenia.	Government of the RS (information society, telecommunications)	2013	Selected indicators in Strategy of development of broadband networks in Republic of Slovenia
50	Support to functioning of public institute ARNES	Government of the RS (information society, telecommunications, science)	2011-2020	Annual budget funds for ARNES
51	Inclusion of the field of ICT development to support R&D infrastructure in National programme of information society	Government of the RS (information society, telecommunications, innovation)	2011	National programme of information society
52	Ensuring functioning of national co-ordination centre for GRID-technology, SiGNET NGI	Government of the RS (information society, telecommunications, science, innovation) ARNES	2011	Functioning of the centre
53	Ensuring and spreading functioning of stable and high performance ICT-infrastructure for educational, scientific, and cultural sphere (Eduroam, AAI).	Government of the RS (information society, telecommunications, science, higher education)	2012-2020	Functioning of high performance ICT-infrastructure for educational, scientific, and cultural sphere
54	Ensuring access to high performance computer capacities for PROs.	Government of the RS (information society)	2014	Activating the access
55	Preparation of action plan for free access to data from publicly funded research	Government of the RS (science)	2014	Action plan, harmonised among relevant actors in Slovenia

5 Innovative economy

5.1 Accelerating private investments into R&D

Investments in R&D are one of the key factors for competitive capability of companies. Therefore, creating simulative environment and conditions for increase of private investments, is a priority of the state.

State of affairs

In recent years, the scope of investments of the private sector into research and development has been increasing in Slovenia, and approaching EU average, but is still far from the most successful countries. This progress also shows a positive influence of tax incentives for investments into R&D, but their share in Slovenia is still lower than in the majority of the most successful countries. There still remains the fact that above-average investments and the trend of increasing investments into R&D in the private sector remain limited to only certain sectors of activities and a small group of companies, whereas the vast majority, in particular small businesses, invest into development way below the average, and are also capable of exploiting the advantages of innovation activities below the average.

Also the amount of investments of public resources for R&D in the economy has significantly increased in recent years, especially due to the use of funds provided by European structural and cohesion policy. In addition, incentives to the companies are mostly intended for implementing R&D projects in connection with public research sector. Direct (non-refundable) financial incentives for investments into research and development have favourable effects, but the sources are limited, and not sufficient for covering actual needs, in particular, because of the reduction of sources from European structural policy. The shortcomings are shown mainly at ensuring access do refundable sources of financing for investment into R&D, and into projects with higher risk, not typically acceptable by the financial market. Access to (mainly commercial) sources of financing of the development is, according to success indicators of innovation system (EIS 2009), far under the EU average (67 % average).

Objectives

The aim is to increase private investments into R&D, namely:

1. Strengthen incentives for increasing private investments into R &D from public funds. We will direct 60% of these public funds into projects in co-operation with the economy, as defined in Chapter 3.5. Also, a special emphasis will be given to improvement of companies' access to commercial sources of financing for research, technological development, and commercialisation of new products and services, based on their own knowledge. To increase financial capabilities for these purposes, the additional public funds will be directed into instruments of financial engineering through existing financial institutions, in order to achieve the strongest possible financial affect, and at the same time, ensure access to favourable (debt and equity) financing resources for R&D activities on diverse levels of development.
2. Support the employment of researchers or developers in economy. Measures are stated in Chapter 4.3.
3. Strengthen the system of tax incentives for investments into R&D

A positive effect of tax incentives for investments into R&D is confirmed for the economy and clearly demonstrates the efficiency of the measure and multiplicative effect to the economy, although the level of incentives in so far lower as in numerous developed countries. A complete comparative analysis of the systems in applicable countries will be made, a proposal for the optimisation will be prepared, and accordingly also an update of this measure. The purpose is to expand the existing level of tax relief or to expand existing relief for investments into R &D also to investments into human resources development and lifelong education, and to simplify the implementation system in a way that it will be encouraging for wider public, especially for small businesses.

Measures

	Key sector objective			Selected indicator with target value
	Increase of private financing, mainly by the business sector, into R &D			Private investments in R&D as % of GDP
	Measure	Responsibility	Deadline	Indicator
56	Increased public funding for R&D projects responding to needs of the economy	Government of the RS (science, technology, innovations)	2012	60 % of public funds for R&D are directed into projects, responding to needs of the innovative economy Extend of private investments into R &D, encouraged by public sources

5.2 More innovative start-up companies

The environment for innovations is changing. In the past, innovation policy emphasized investments into R&D, but now we need to take into consideration the entire invention and innovation process. Innovations are not just science and technology; they also encompass new marketing methods and changes in the way of company organization, their business practices and relationships with external stakeholders. Within this framework, establishing new businesses by supporting entrepreneurship and innovations is becoming a central figure. New innovative companies are a group with specific needs. Since they mainly enter with new products and technologies, and to large extend (between 30 and 50 %) on the global market, they face even more obstacles than the other small companies when accessing outer financing resources, information, and connections with markets.

The significance of new and small businesses in the process of innovation has increased, as they develop and introduce new products in a more efficient way. They are using technological and business opportunities that are often neglected by already established enterprises. In addition, they adapt more easily to the market demands, cover not yet exploited niches, and provide the commercialization of knowledge that is created at high-education and research institutions. New and innovative companies co-operate in the movement of knowledge, and are both users and sources of knowledge and penetrating business ideas at the same time.

State of affairs

For simplified establishment of companies, Slovenia has made an enormous progress by introducing the points VEM (all at one place) that ensure general informing of entrepreneurs, and the online system e-VEM that allows for a fast and affordable registration of a company. Instruments were created in order to support the companies at early stages of their development, such as subsidies for the start-up of innovative companies, voucher system of training for potential entrepreneurs and rising enterprises, and incentives for self-employment.

Despite the progress in recent years, Slovenian environment still does not sufficiently support assuming risk, entrepreneurship and responsibility for the realisation of undertakings. Consequently, activity and development of small, particularly high-tech companies, are still very weak (e.g. in the area of pharmacy, bioscience and nanotechnology). This is also reflected in less than 5% share of high-tech exports and two to three times lower added value per worker than in applicable countries of EU (Finland, Ireland, the Netherlands and Austria).

Nevertheless, Slovenia is achieving high level of knowledge of researchers in individual technological areas of the public sector, and the amount of co-operation with enterprises is also increasing. Relatively large start-up investments in the area of high technology make it difficult for new and innovative companies to emerge. Due to insufficient incentives and not enough transparent and also unregulated environment, researchers and other individuals and groups do not assume risks and do not create high-tech companies. In addition, public research organizations that are not provided with sufficient support to commercialize research results and actively manage intellectual property rights, passively contribute to this state as well.

Objectives

The main goal is to increase the influx of new innovative companies, namely:

1. Create stimulating environment for the commercialization of knowledge in PROs

These measures are described in Chapter 3.2. (Knowledge Transfer) and encompass regulations in the area of legislation that will enable and stimulate institutions and researches to create spin-offs from the PROs, the development of innovation infrastructure for founding spin-off from PROs, and an efficient system of intellectual property rights management.

2. Set up complete scheme of financial and other incentives for the start-up and initial running of businesses

Existing measures of financing with grants have turned out to be effective, but not sufficient. We will strengthen debt and equity financing resources with instruments that will stimulate financial institutions and private undertakings to invest into seed capital. Experience have also shown that financial incentives are effective in early stages of development if they are connected with the transfer of knowledge and experiences for leadership, development of activities and marketing in new enterprises. Financial incentives will be complemented with the development of services, supporting newly founded enterprises, in order to make the support comprehensive and adapted to actual needs.

3. We will form measures to support these start-up companies, entering global markets (so called BornGlobals). In connection with the foreign policy, and programmes for encouragement of internationalisation of the companies, we will establish a system, supporting new global enterprises to connect with innovation centres, international networks, and potential partners. Through institutions of supporting environment, we will be strengthening programmes for training and international integration. We will direct incentives for development of the venture capital market in such a manner to stimulate co-investments of foreign specialized trusts into new innovative companies in Slovenia.

Measures

	Key sector objective			Selected indicators with target values
	Increase the number of high-technological micro and small-sized companies with fast growth of new ones			Number of newly founded high-tech micro and small-sized companies (annual growth or growth of the target period, expressed in index of increased number of these companies compared to previous comparative year or period) Share of high-tech companies in the whole number of micro and small-sized companies
	Measure	Responsibility	Deadline	Indicator
57	Comprehensive system of support to newly founded companies	Government of the RS (economy)	2011-2020	Number of companies, included into start-up schemes Availability of seed capital sources
58	Support to start-up companies, entering on the global market	Government of the RS (economy, science, technology, innovation)	2011-2020	Extend of investments by specialized trusts of venture capital into companies

5.3 Faster growth of innovative companies

Innovative and fast growing companies are a big unused potential for economic growth, and the creation of added value. They are also a key factor of structural changes and a source of dynamics in many sectors.

With existing measures and focus on the phase of company founding, state is not contributing enough to economic growth and employment. The basis for such thinking is the fact that only 1.7% of all emerging and new SMEs have expressed an extraordinary growth potential (which means that in a 5-year period, they will create at least 100 new work places), and they actually contribute 50% of all new work places created. 90% of new work places are created by one quarter of newly founded SMEs.²² These facts show

²² Global Report on High Growth Entrepreneurship (GEM), 2007.

a big opportunity for directing activities in the area of encouraging growth of businesses and orientation to the areas with high added value, whether they are technological or not.

The key obstacles, identified by fast growing innovative companies are access to outer sources of financing for development of products and internationalisation, access to highly qualified personnel, to information about markets, and also a legislative system, particularly from the point of view of patenting and standardisation.

State of play

Slovenia has developed a wide range of instruments for helping companies grow. The progress has been made in equity financing by forming a venture capital fund, in order to support companies with a clear growth potential, but also with a higher risk rate. We also strengthen debt finance in forms of micro-guarantees, guarantees with interest rate subsidies, and direct loans. But there is still much room for improvement of support system by directing measures towards innovative companies with great growth potential which work in areas with high added value.

International comparisons (European Innovation Scoreboard 2009) show that Slovenia is far behind according to indicators of innovative companies growth; in relation to growth and employment in technologically intensive sectors, in particular services (72 % of EU average), in relation to intensity of implementing new solutions and products in the market (67% of the average), and in relation to share of high-technological services in export (43 % of the average).

At the same time, the state can do much more to develop markets and policies on the side of the demand that have effects on innovations. One of the instruments that are available but have not been properly used so far is "innovative and green" public procurements.

Slovenian economy does not have sufficient internal market, which is severely limiting the development of new products and technologies. Therefore, in order to encourage fast growth of innovative companies, we need to promote the internationalization of operating activities, connecting and networking outside national frameworks, and upgrading other instruments for strengthening international co-operation, more effectively.

Objective

The main aim is faster growth of innovative companies, namely:

1. Improve the system of access to the capital and other incentives for innovative companies.

By means of directing public funds to financial institutions, we will strengthen sources for debt and equity financing of companies' development projects (Chapter 5.1.). For initial development and fast growth of innovative companies, equity finance is of great importance, bringing not only capital but also knowledge, market connections and access to international value chains. The already established venture capital fund that encourages development and investments of private funds will be further strengthened so that it will influence the development of venture capital in Slovenia more actively, by inviting foreign specialized funds, encouraging co-investments and strengthening connections with international market.

2. Special attention paid to groups of fast growing companies

We will pay special attention to these fast growing companies that show a clear potential of international breakthrough, and fast growth.

We will establish open system of support to strategic R&D projects for products and services of new generations, and to strengthen their position on the market. Namely, the existing system of incentives for carrying out strategic R &D projects by companies or groups of companies is not adapted to actual needs. Therefore, an open programme will be introduced which will enable fast and prompt responding to recognised opportunities

for technological breakthrough of companies or groups of companies with new solutions or products on the global markets. The measure will be closely linked to measures of the industrial policy for recognising opportunities in individual sectors or areas of convergence technologies, and to measures for recognising and supporting priority areas, presented in Chapter 3.3. The support to fast growing companies has also wider synergy effects in form of linking with other companies, suppliers, and local partners.

3. Encourage systemic measures for the development of market through innovative public procurements

With public procurements, the state can enable the development and testing of new products and services on national market (flagship projects), and therefore accelerate the development of new products, services or processes in the global market, making an important contribution to a faster growth of innovative companies. From this point of view, public procurements are important in particular when solving social challenges – aging of the population, management of the environment, renewable sources of energy, etc.

We will prepare an action plan and a system for implementation of innovative public procurements on all levels, which will enable development and implementation of innovative solutions on the market. We will introduce a concept of demonstration and testing into the system of public procurements in order to also encourage implementation of new solutions into the system of standardization and technical legislation. Analyses show that for the increase of innovation, the system of standardisation is as important as the system of intellectual property rights protection. Such aspect should not be neglected, since demonstration projects enable inclusion of companies, in particular SMEs, in the processes of standardisation, and at the same time, apply more and more important model of innovating from the point of view of the end user, and simultaneously contribute to establishment of Slovenian knowledge on the broader market.

4. Strengthen international development and business cooperation

Because the market for the companies is global we will pay special attention to the inclusion of companies into international and open innovation systems, and international value chains. This means that we will support companies with entering into international chains, take part in international projects and strengthen their capabilities for a competitive performance by introducing required standards and necessary organisational changes and knowledge.

International R&D cooperation is a wonderful source to acquire access to up-to-date knowledge and to become a part of the most advanced networks and consortiums, that is why we need to support it even more by including the best public and private organisations into international industrial projects, also by financing participation on events that enable access to strategic information, decisions and participation. In addition to international cooperation, we need to encourage interdisciplinary industrial projects that offer new possibilities and different mechanisms of connections of companies.

5. Create encouraging legislation environment

When defining priorities, we will, inter alia by means of international scales of competitiveness, identify factors which are of key importance for successful growth of national system of innovations, and pay special attention to them, and also to the key inhibitors. This is of key importance for the growth of companies. Within this framework, legislation in the area of companies, employment and taxes as well as standardization and technical regulations are of great importance. We will establish favourable treatment of companies when they pass to the next size class, which bears even bigger significance in changing business environment.

Measures

	Key sector objective			Selected indicator with target values
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	Increase the growth and dynamics of the innovative SMEs development			Number of fast growing SMEs innovative companies (non existing in 2011).
	Measure	Responsibility	Deadline	Indicator
59	Improve access to financing redssources and further development of the venture capital market	Government of the RS (economy)	2011–2020	Investments of venture capital as % of GDP Share of state funding in overall venture capital in the country Accessibility of venture capital sources - WEF
60	Support at the inclusion and establishment of companies in international value chains	Government of the RS (economy, science, technology, innovation)	2012	Increasing value added per employee in the companies - recipients of funds in comparison to increasing value added in companies baseline
61	Preparation of the Action Plan and the system of innovative public procurement	Government of the RS (finance, science, technology, innovation)	2012–2020	Adopted plan Share of public procurements for innovative products and services in all public procurements
62	Supporting strategic R&D project for breakthrough to the global markets	Government of the RS (science, technology, innovation, economy)	2012	Number of companies, leading in niche markets (champions)
63	Arrangement of business environment in accordance with the Action Plan based on the Small Business Act	Government of the RS (economy)	2012	Regular monitoring and updating of Action Plan Introducing changes of business environment. Progress in the GEM assessment of the business environment

5.4 Strengthening companies' innovation capabilities

In today's world, companies must constantly and systematically develop and wisely and quickly introduce new business models, organisational solutions, innovative products, master new business connections and markets, thereby strengthening their innovation capabilities. This is the only way they are able to compete in the global environment or even be one step ahead of their competition. It is about strengthening the managerial, organisational and technological capabilities with which companies maintain and increase their competitive advantages.

State of affairs

Slovenia was hit by the economic crisis even harder than many countries due to the structure of its economy with a large, prevailing processing industry with low added value and due to its strong export orientation. In 2007, these activities produced 68.3% of exported Slovenian goods and services and employed 41.9% of all workers in companies; that is why it is one of the weakest as well as the most important segments of Slovenian economy in terms of export significance and the number of workers. In 2007, the added value per worker was only EUR 31,235 (in 2000, the average in low-tech industries in the EU was EUR 42,000) and a 4.3% profit share in its revenues. Slovenian companies primarily fall into the segment of low and medium technological difficulty, are not sufficiently active in the area of research and innovation and are competitive in the global market mainly in segments with strong competition, which is why they are under strong pressure in terms of prices. Another problem is that within Slovenia's structure of products there is only a small share of finished products, since individual components, segments and processing of products prevails. This means that numerous companies are only able to control individual components of innovation activity, with an emphasis on process and less on product innovation.

Another side to this is that the service industry, which represents a large proportion of the Slovenian economy and has an added value of 62% of the total economy, does not use innovation capabilities to a sufficient extent. Innovation opportunities are unrealised in public services such as health care, environment and public administration.

Due to inadequate business models and a poor focus on development, most Slovenian companies still operate on the basis of economies of scale, where the main emphasis is on quantity and less on added value. Development possibilities for the Slovenian economy are limited by the potential of marketing Slovenian products and services and the small share of sales to end-customers. The Slovenian economy does not have a sufficient internal market which limits the development of new products and technologies and makes it difficult to enter the global market.

Objectives

The main goal is to strengthen innovation capabilities of companies and thereby increase added value, create quality jobs and promote the long-term competitiveness of the economy. Measures in this field strongly relate to policies in education and industry. To reach this goal, adequate incentives are needed:

1. Incentives to strengthen innovation capabilities of companies

To create this, encouraging restructuring of companies' business models is the most important. RISS will encourage companies to focus on long-term restructuring of their business models, product strategies and leadership systems and the inclusion of creative industries. It will direct measures towards strengthening managerial, organisational and technological capabilities of small and medium-sized companies in particular. The programme will particularly encourage different forms of horizontal and vertical integration of companies in supply chains, technological networks and clusters and service providers.

2. Incentives for the development and introduction of new products, services and markets

Encouraging the development and faster introduction of new products and services as well as the development of new markets includes a series of measures to support commercialisation of knowledge, which is recognised as one of the key deficiencies in the existing system of R&D support. The support encompasses direct incentives for the development and formation of products and indirect financial and fiscal incentives for their market testing and introduction. With public procurements that include innovations RISS can accelerate the introduction of new solutions and thus create demand. The possibility and effectiveness of introducing additional tax incentives for the development and introduction of new products (tax holiday) will be tested.

3. Encouraging internationalisation

Innovation and internationalisation of companies are two intertwined determinants of growth and competitiveness. Internationalisation and successful performance in foreign markets is dependent on the innovation capability of companies, and on the flip side performance in foreign markets and integration in international chains strengthens the innovation capability of companies. A review of development policy measures in the field of internationalisation, competitiveness and innovation will be prepared, as well as a comprehensive programme of measures which support them and provide synergies. The measures will be focused on encouraging internationalisation, inward investments which bring knowledge and international connections enabling improved performance of companies in foreign markets, and outward investments of Slovenian companies which strengthen their technological and innovation capabilities. A closer association with the programmes of international development cooperation will also be established.

4. Incentives for augmenting innovation in the area of services

Services are closely integrated into raising the competitiveness of other parts of the economy and public sector. Knowledge-based services which enhance innovation in the economy and public sector in a horizontal manner play a special role. Technological innovations are not very important in services: non-technological innovations prevail in

many industries, particularly those with very high added value and mutual complementarity (e.g. pharmaceuticals, ICT). Mechanisms and incentives (the existing and new) to encourage innovation will be adapted in a way to enable service companies or companies in general to enhance technological and non-technological innovation. We will focus mainly on encouraging the development of services in technological branches which provide more sustainable and long-term competitiveness.

3. Implementing and supporting intellectual property rights protection and management in the private sector

Companies' intangible assets and suboptimal intellectual property management offer opportunities not previously utilised to increase competitiveness and increase added value. This programme will give priority to protection and implementation of intellectual property rights over business interest, including complete international testing.

Measures

	Key objective of the sector			Selected indicators with target values
	Increase in innovation capacity of companies to augment international competitiveness of the Slovenian economy			Innovation intensity Share of companies which implemented technological or non-technological innovation among all companies Share of sales of new products for the company and of new products for the market in total sales Productivity Added value per employee Performance in the market Share of high and middle high technology exports of total exports
	Measure	Responsibility	Deadline	Indicator
64	Support to companies in preparing and implementing new products, processes and services in the market	Government of the RS (economy)	2011-2020	Share of companies which implemented technological or non-technological innovation among all companies Share of companies which implement new products and services in the total structure
65	Improved business environment in accordance with the Action Plan based on the Small Business Act	Government of the RS (economy)	2011-2020	Extent of implemented changes and removed administrative barriers Better rating of business environment
66	Preparation of Action Plan to encourage innovation with internationalisation	Government of the RS (economy, science, technology, innovation)	2012	Plan adopted

67	Implementation and support of intellectual property rights protection and management in the private sector	Government of the RS (economy)	2011–2020	Indirect (systemic) impact European high-tech patents per million inhabitants Patent applications according to PCT per billion Euro GDP Protected trademarks per billion Euro GDP (Community trademarks) Protected designs per billion Euro GDP (Community designs)
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6 Promotion of science, creativity and innovativeness in society and education

The driving force of the concept of a knowledge-based society is individuals that approach problems and challenges from a scientific and research point of view. At the same time this concept implies the presence of a societal environment that functions as an incubator for new ideas and scientists. In such a society knowledge and creativity are values, while in the economy they are capital and investment. As such they are perceived in particular by daring individuals who offer knowledge or an idea to everyone on the market and hence contribute to the blooming of the economy and to common progress of the society as a whole. A balanced research and innovation system equips individuals with both knowledge and with the courage and skills for responsible entrepreneurship.

State of affairs

The public image and position of researchers in Slovenian society are inadequate. Their achievements often remain unknown and their work is perceived as insufficiently relevant to society. Citizens are often not aware of the contributions of researchers to solving social problems and the competitiveness of the economy and are typically not familiar with globally recognized findings and products originating from domestic scientists and innovators. The responsibility that the work of researchers and innovators is not recognized is shared by all – the researchers, their institutions, the mass media, and indifferent individuals and also by the research and innovation system, including ministries and executive agencies that insufficiently facilitate such promotion. At the same time researchers also lack courage and particularly entrepreneurial skills and knowledge for the commercialisation of their findings. Such knowledge is acquired by researchers on their own in most scientific fields and most commonly very late in their careers, as the Slovenian educational system at all levels and, most notably at the lower ones, does not provide for such knowledge to a sufficient degree.

Objectives

1) Popularization of science

Establishment of scientific culture and research mentality begins with the education of young people in particular. School curricula are not optimally oriented in this area – insufficient part of their content is dedicated to demonstration of different modes of using science and knowledge. We will therefore strive for an increase of such content.

Science must become a matter of curiosity of the young. Through promoting activities and supporting centres that enable spending leisure time in touch with science, RISS will strive to bring science closer to them and establish the basic infrastructure to practically test their ideas.

2) Promotion of creativity, innovativeness and the culture of entrepreneurship

For the development of an innovative Slovenian society it is necessary to promote entrepreneurship and create a positive climate to stimulate creativity, innovativeness and entrepreneurship. The values of creativity and innovativeness should be better communicated in all media and at all levels of the educational process. It should be adapted to enable independent thinking, problem solving, creativity, inventiveness, entrepreneurship and development of other personal skills, and to encourage realisation

of ideas and entrepreneurship particularly at later levels of education. Inclusion of established professionals from the entrepreneurial sector into the tertiary level educational process will provide qualification of more students and improve the quality of research work of the young.

3) Renovation of study programmes at the tertiary level

In modernising university and higher education study programmes, more attention will be paid to measures and content supporting and encouraging creativity, innovativeness, goal-orientation and entrepreneurship. One of the accompanying activities of tertiary level study should include student networking with employees and potential sources of funding, which enables career development. To achieve this, universities and the state have to develop appropriate mechanisms, e.g. meetings with socially established graduates (alumni) and visiting lecturers who are successful entrepreneurs and young student entrepreneurs, networks of connections with chambers of commerce and individual companies, guided and targeted meetings of students of technical trades and business, seminars on entrepreneurship, start-up of company, creativity, legal issues for company success and reputation management, individual mentoring of business ideas, etc. Modernisation of professional study programmes will include participation of companies, specifically to help define competence profiles of study programmes, taking into account the balance between the general academic approach and industry needs.

Measures

	Key objective of the sector			Selected indicators with target values
	Reputation of science and a high innovation culture in society			Reputation of science Innovation culture Share of companies active in innovation among all companies
	Measure	Responsibility	Deadline	Indicator
68	Wholesale promotion of science and innovativeness in society and promotion of research achievements and inventions	Government of the RS (economy, science, technology, innovations, higher education, culture)	2014	Increase of resources for promotion from 1 million Euro in 2010 to 2 million Euro in 2014
69	Wholesale promotion of creativity, innovativeness and entrepreneurship for the young	Government of the RS (economy, culture, education, higher education, science, technology, innovations)	2011-2020	Promotion strategy and action plan put into effect Increase of practical programmes of creativity and entrepreneurship for primary and secondary schools – establishing a network of creative schools modelled after eco-schools Share of schools included in the network among all schools Number of young people included in workshops or competitions per 1000 pupils

7 Appendices

7.1 Approximated funding for RISS implementation

The basis for the RISS for 2011-2020 should be the awareness that spending money for R&D is not primarily a cost but an investment which is expected to increase the value of the invested funds by several times in the long term. A well-coordinated and targeted approach to providing adequate support to R&D activity is required for Slovenia's long-term competitiveness and building a knowledge-based society.

The RISS follows an ambitious goal of combining scientific, development and innovation activities, which is in accordance with the EU strategy – Europe 2020. The key measures of the proposal are also financially evaluated while others are primarily normative, and their direct financial impact is insignificant. The basis for financial planning is to channel 1% of public funding into R&D until 2012 and then 1.2% until 2020. Increased public funding will also enhance multiplier effects in the private sector, where we want to increase investments in R&D and gradually achieve the target investments in R&D in the amount of 2.4% GDP until 2020 by means of by systemic and financial incentives.

The resources to achieve the target goals are anticipated from an intense increase of national funds, and notably by a significant increase of investments in R&D through European cohesion funds. Strategic documents and operational programmes for using these funds will therefore have to be adapted accordingly, since an important resource for funding this area will cease upon expiration of the existing financial perspective, and will have to be replaced by new resources to the same or larger extent.

Breakdown of required funding is shown in Table 7.1.

	Current prices				
	2011	2012	2013	2014	2015
Nominal GDP in EUR	37,226,883,413	39,032,875,521	41,466,300,106	44,203,535,586	47,117,748,333
Resources for RISS implementation	577,423,975	580,557,184	590,000,601	620,000,056	650,000,283
1% of GDP – target for investment in R&D until 2015**	313,247,865	390,328,755**	414,663,001**	442,035,356**	471,177,483**
Management	12,257,074	12,328,020	12,478,000	12,701,000	13,420,000
High-quality research in the public sector	138,471,130	165,446,225	165,753,601	175,603,056	185,722,283
International cooperation	19,593,631	19,230,922	20,184,000	21,228,000	22,270,000
Human resources	52,730,169	60,462,461	60,262,000	63,379,000	66,496,000
Specialization	150,298,363	117,967,149	117,906,000	120,177,000	127,448,000
Research infrastructure	25,029,722	41,029,722	45,214,000	52,863,000	60,512,000

Information infrastructure	24,858,187	25,322,424	25,232,000	26,744,000	26,256,000
Increase in private investments	47,975,575	37,099,774	40,592,000	46,364,000	47,136,000
Growth of companies	82,959,719	71,909,054	72,191,000	69,295,000	69,636,000
Strengthening of innovation capability of companies	19.033.992	24.907.330	26.332.000	27.694.000	27.056.000
Promotion of science and innovativeness in society	4.216.413	4.854.103	3.856.000	3.952.000	4.048.000

* for 2011, the adopted budget is shown

** target of 1% investment in R&D will be reached in 2012.

*** the target of 1% also includes the estimate of annual income of researchers directly from the EU framework programmes in the amount of 20,000,000 EUR.

7.2 Indicators of key objectives for monitoring RISS

R&D investments

- Gross domestic expenditure on R&D as % GDP – EU Barcelona objective
 - of which public investments in R&D as % GDP
 - investments of private/business sector in R&D as % GDP

Human resources in R&D

- Graduates of life science and technical programmes of tertiary education per 1000 inhabitants aged 20-29 years - Eurostat
- Share of researchers among persons employed/FTE
- Share of researchers in the business sector/FTE Share of researchers with foreign citizenship among all researchers [Share of foreign students among doctoral students]

Public research infrastructure

- Budget funds for RI per researcher in the national public sector

Transfer of knowledge from the public research environment

- Share of business sector funds in financing research of PROs Joint publications of researchers from PROs and companies per million inhabitants
- Income of PROs from intellectual property rights
- Share of funds for central social challenges in national budgets for R&D

Innovation cooperation

- Share of SMEs cooperating with other companies and/or PROs in innovation among all SMEs

International cooperation and mobility

- Scientific publications co-authored with foreign researchers per million inhabitants
- Share of researchers with foreign citizenship among all researchers
- Share of foreign students among doctoral students

Scientific productivity

- Scientific publications per million inhabitants

Scientific excellence

- Share of national scientific publications among the 10% of the most cited publications in the world

Innovativeness

- Share of companies which implemented technological or non-technological innovation²³ among all companies
- Share of companies which implemented technological innovation among all companies
- Share of companies which implemented non-technological innovation among all companies
- Share of companies in the service industry which developed innovation among all companies in this industry
- Small and medium-sized enterprises (SMEs) which developed innovation on their own or in cooperation as % of all SMEs

Knowledge capitalisation

- Share of sales of new products for the company and of new products on the market in total company turnover
- Number of patent applications according to PCT per billion Euro GDP
- Number of protected trademarks per billion Euro GDP
- Number of protected designs per billion Euro GDP
- European patent applications (EPO) filed by SMEs or individual inventors per million inhabitants
- European high-tech patents per million inhabitants

Economic competitiveness

- Labour productivity: Gross added value per employee
- Added value of the activity with high share of knowledge in the total added value
- Share of employees in activities with a high share of knowledge among all employees
- Share of export of high and middle high technology products in total export of products
- Share of export of services with a high share of knowledge in total exports

7.3 Dictionary

AAI

Authentication and Authorization Infrastructure

ARNES

(Public institute) Academic and Research Network of Slovenia

ARRS

Slovenian Research Agency

ASTP

Association of European Science & Technology Transfer Professionals

AUTM

²³ Monitoring of the **actual innovators** instead of companies active in innovation brings us closer to the approach used in similar EU indicators.

Association of University Technology Managers

GDP

Gross Domestic Product

BRIC

Brazil, Russia, India, China

CERN

European Organisation for Nuclear Research

CIP

Competitiveness and Innovation Framework Programme

CO

Centre of Excellence

COST

European Cooperation in Science and Technology

EIS

European Innovation Scoreboard

EC

European Commission

EPO

European Patent Office

ERC

European Research Council

EU

European Union

EU 27

All members of the European Union (2010)

EUREKA

Intergovernmental programme for market-oriented, industrial R&D activities

FTE

Full time equivalent

GEANT

European multi-gigabit computer network for research and education purposes

GRID

Technology of connecting independent computer capacities with an aim of performing common computer task

IER

Institute for Economic Research

IJS

Jožef Štefan Institute

ICT

Information-communication technology

JAPTI

Public agency of the Republic of Slovenia for Entrepreneurship and Foreign Investments

PRO

Public research organisation

KI

National Institute of Chemistry

MF

Ministry of Finance

MG

Ministry of the Economy

MJU

Ministry of Public Administration

MK

Ministry of Culture

MVZT

Ministry of Higher Education, Science and Technology

NCP

National Contact Points

NMR

Nuclear magnetic resonance

NPVŠ

National Programme for Higher Education

NRRP

National Research and Development Programme

OECD

Organisation for Economic Co-operation and Development

FP

Framework Programme of the European Community for Research, Technological Development and Demonstration Activities

IPCT

International Patent Co-operation Treaty

AIF

Average Impact Factor

RI

Research infrastructure

RISS

Research and Innovation Strategy of Slovenia

RS

Republic of Slovenia

SASA

Slovenian Academy of Sciences and Arts

SI.TT

Network of Slovene experts for technology transfer

SIGNET NGI

National co-ordination centre for GRID-technology

CC

Competitiveness Council

SEF

Slovene Enterprise Fund

SME

Small and Medium sized enterprise

SVLR

Government Office for Local Self-Government and Regional Policy

SZT

Svet za konkurenčnost in tehnologijo

SVREZ

Government Office for Development and European Affairs

SZT

Council for Science and Technology

TIA

Slovenian Technology Agency

TTO

Technology Transfer Office

SIPO

Slovenian Intellectual Property Office

VEM

All at one place

WEF

World Economic Forum

USA

United States of America

ZPOP

Supportive Environment for Entrepreneurship Act

7.4 Starting points and outlines for RISS

Starting points and outlines for RISS were adopted on 7 July 2010 by Council for Science and Technology of the Slovene Government. They are available at the following web address:

http://www.mvzt.gov.si/fileadmin/mvzt.gov.si/pageuploads/pdf/odnosi_z_javnostmi/IZH_ODI%C5%A0%C4%8CA_NRIP.pdf

7.5 Data

We formed:

1. an analysis of NRRP 2006–2010, and an estimate of carrying out the NPVŠ 2007–2010
(http://www.mvzt.gov.si/fileadmin/mvzt.gov.si/pageuploads/pdf/odnosi_z_javnostmi/IZHODI%C5%A0%C4%8CA_NRIP.pdf)
2. indicators of NRRP 2006–2010 realisation
(http://www.mvzt.gov.si/fileadmin/mvzt.gov.si/pageuploads/pdf/odnosi_z_javnostmi/IZHODI%C5%A0%C4%8CA_NRIP.pdf)

When preparing RISS, we took into consideration the national and international evaluations of research and innovative system, and of public policies and their recommendations.

3. Maja Bučar with Andreja Jaklič and Boštjan Udovič, National system of innovation in Slovenia, Faculty of Social Sciences, Ljubljana, 2010
(http://www.mednarodni-odnosi.si/cmo/CIR/CIR4National_System_of_Innovation_in_Slovenia.pdf);
4. OECD review of Slovenia's innovation policy: Overall assessment and recommendations – preliminary draft, OECD, Paris, 2010.
5. Policy Mix Peer Reviews: Country Report – *Slovenia*, European Union Scientific and Technical Research Committee, Brussels, 2010.

We have drawn data also from the following international reports and documents:

6. Human Development reports, United Nations Development Programme, 2009.
(<http://hdr.undp.org/en/statistics/>)
7. Quality of Living worldwide city rankings, Mercer, 2010.
(<http://www.mercer.com/press-releases/quality-of-living-report-2010>)
8. European Commission, The World in 2025, 2009.
(http://ec.europa.eu/research/social-sciences/pdf/the-world-in-2025-report_en.pdf)
9. A new ranking of the world's most innovative countries, Economist Intelligence Unit Limited, 2009.
(http://graphics.eiu.com/PDF/Cisco_Innovation_Complete.pdf)
10. European Commission, A More Research-Intensive and Integrated European Research Area, Science, Technology and Competitiveness. Key figures report 2008/2009.
(http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009_en.pdf)
11. European Commission, ICT Infrastructure for e-Science, 2009.
(<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0108:FIN:EN:PDF>)
12. Global Entrepreneurship Monitor, 2007 Global Report on High-Growth Entrepreneurship, 2007.
(<http://www.gemconsortium.org/download.asp?fid=606>)

7.6 Events and received opinions on the RISS 2011–2010 draft

To exchange opinions, we organised the following consultations with actors in research and innovation system:

- 6. 10.: Consultation DARING SLOVENIA in City Museum of Ljubljana;
- 5.11.: Consultation with rectors, deans, and managers of public research institutions, Hotel Kokra, Brdo;
- 8.11.: Consultation with professional public, the Ministry of Education and Sport hall;
- 8.11.: consultation, organised by Chamber of Commerce and Industry of Slovenia;
- 15. 11.: consultation with the Education, Science and Culture Trade Union of Slovenia;
- 29. 11.: consultation with the Slovenian Academy of Sciences and Arts;
- 6. 12.: consultation with the Slovenian Academy of Engineering.

We published the first RISS draft on 4 October 2010, and upon it received the following written comments (all being published on the MVZT web pages):

1. Irena Šumi, PhD, European Centre Maribor
Publication date: 15. 10. 2010
2. Tomaž Grom, ASI Kamnik
Publication date: 26. 10. 2010
3. Institute of Macroeconomic Analysis and Development of the Republic of Slovenia
Publication date: 2. 11. 2010
4. Scientific Council of Jožef Štefan Institute
Publication date: 2. 11. 2010
5. Srna Mandič, PhD, Centre for Welfare Studies
Publication date: 2. 11. 2010
6. Mitja Guštin, PhD, professor, Science and Research Centre of Koper, University of Primorska
Publication date: 4. 11. 2010
7. Slovenian Research Agency (ARRS),
Publication date: 9. 11. 2010
8. Scientific Council of the ARRS
Datum objave: 9. 11. 2010
9. Marko Juvan, PhD, Institute of Slovenian Literature and Literary Studies ZRC SASA
Publication date: 9. 11. 2010

10. Coordination of Independent Research Institutions of Slovenia (KOsRIS)
Publication date: 11. 11. 2010
11. National Institute of Biology (NIB)
Publication date: 11. 11. 2010
12. University of Ljubljana, Faculty of Arts
Publication date: 15. 11. 2010
13. Scientific Council of National Institute of Biology
Publication date: 15. 11. 2010
14. Scientific Council of National Institute of Chemistry
Publication date: 15. 11. 2010
15. Zdenko Kodolja, PhD
Publication date: 17. 11. 2010
16. Vladimir Boštjan Bregar, PhD,
Publication date: 17. 11. 2010
17. Mojca Pavlin, PhD, University of Ljubljana, Faculty of Electrical Engineering
Publication date: 18. 11. 2010
18. Konrad Ajster
Publication date: 18. 11. 2010
19. Igor Zajc, PhD, Jožef Štefan Institute
Publication date: 18. 11. 2010
20. Government Office of the Republic of Slovenia of Climate Change
Publication date: 18. 11. 2010
21. Association of Slovenian Technology Transfer Professionals (SI-TT) administrative committee
Publication date: 19. 11. 2010
22. University of Primorska - opinions and proposal for amendment.
Publication date: 22. 11. 2010
23. Jožef Vlah
Publication date: 24. 11. 2010
24. Innovation Centre ASI
Publication date: 24. 11. 2010

25. Martin Klanjšek, PhD, 31. Matjaž Ličer, PhD, 31. Samir El Shawish, PhD, Toni Petan, PhD, Erik Zupanič, PhD, Damjan Dvoršek, PhD, David Jezeršek, PhD, Gregor Gunčar, PhD, Sašo Petan, PhD, Nejc Košnik, PhD, Andrej Zorko, PhD, Rok Žitko, PhD, Peter Jeglič, PhD, Miha Fošnarič, MSc, Samo Penič, PhD, Luka Šajn, PhD, Uroš Tkalec, Andrej Mihelič, PhD

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26. NSIS - National Committee of the Slovenian Innovation forum, and business group SPATINOVA

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27. Grega Gostenčnik, Jerneja Penca, Urška Petrovčič (European University Institute)

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28. Committee for Protection of Higher Educational and Scientific Work

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29. Researchers of the Institute for the Ethic Studies

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30. I. class of SASA

Publication date: 30. 11. 2010

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31. Irena Šumi, PhD, European Centre Maribor

Publication date: 15. 12. 2010

32. Konrad Ajster

Publication date: 15. 12. 2010

33. Gašper Tkačik, PhD

Publication date: 16. 12. 2010

34. Slovenian Research Agency (ARRS)

Publication date: 17. 12. 2010

35. Interest group of non-commercial fields in the National Council

Publication date: 23. 12. 2010

36. Educational and Research Institute Ljubljana

Publication date: 23. 12. 2010

37. Ministry of Health

Publication date: 23. 12. 2010

38. Roman Jerala, PhD, national Institute of Chemistry
Publication date: 23. 12. 2010
39. University of Primorska
Publication date: 23. 12. 2010
40. Active Slovenian Inventors (ASI) - letter and proposal for amendments
Datum objave: 24. 12. 2010
41. Slovenian Research Agency (ARRS) - 2
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42. Inoverzum d.o.o.
Publication date: 27. 12. 2010
43. Grega Gostenčnik, Jerneja Penca, Urška Petrovčič (European University Institute)
Publication date: 29. 12. 2010
44. Ministry of Labour, Family and Social Affairs.
Publication date: 29. 12. 2010
45. Ministry of Education and Sport
Publication date: 29. 12. 2010
46. University of Ljubljana, faculty of Chemistry and Chemical Technology
Publication date: 4. 1. 2011
47. Development Initiative of Slovenia (RIS)
Publication date: 11. 1. 2011