

Republic of Slovenia
Ministry of Higher Education, Science and Technology

**NATIONAL RESEARCH AND DEVELOPMENT PROGRAMME
FOR THE 2006-2010 PERIOD**

Selected chapters

Pursuant to Article 8 of the Research and Development Act (Off. Gaz. RS no. 96/02) and Article 109 of the Rules of Procedure of the National Assembly of Slovenia (Off. Gaz. RS nos. 35/02 and 60/04), at its session on 16 December 2005 the National Assembly of the Republic of Slovenia adopted the

Resolution on the National Research and Development Programme for the 2006-2010 Period (ReNRDP)

SUMMARY

Slovenia's Development Strategy, which the Government adopted at its regular session on 23 June 2005, and which among other things includes Slovenia's commitment to implement the Lisbon Strategy, is a strategic document which gives the role of the chief driving force behind growth and employment to knowledge and creativity. In addition to introduction of the euro, the most important national objectives are therefore increased R&D, enhanced creativity and innovation and a higher level of technological development.

Research and development are placed at the forefront of Slovenia's development. Since people are the main actors and a measure of progress, the development of society must expand the opportunities for every one to live a long, healthy and high-quality life and also take the principles of sustainable development into account. Through a balanced emphasis on the spiritual, intellectual, economic, social and environmental aspects of development, Slovenia will continue to move in the direction of a socially responsible country built on the qualities of individuals and hence on the qualities of the entire society.

Regarding expenditure on research and development (R&D), Slovenia ranks in the middle among European Union (EU) member states and has an appropriate ratio of public and private investment in R&D. However, in terms of the share of R&D expenditure in gross domestic product it lags behind the most successful EU countries by a factor of two, and just slightly less than this behind the Lisbon targets. In the last few years the number of scientific publications has grown rapidly but, despite this, there is a lagging behind the EU average in terms of scientific and technological productivity, especially in the area of highly cited papers and patents. Slovenia is clearly unsuccessful in the effective use of R&D funds, in the definition of its R&D priorities and the application of research results for faster economic and social growth. The situation in the area of the use of knowledge is especially worrying. Only one-fifth of companies are engaged in innovation activities, which ranks us among the last four countries on the expanded EU list. A further widening of the gap between Slovenia and developed countries would hinder economic growth and preclude the achievement of other development targets.

The vision of the National Research and Development Programme is to create new knowledge, to transfer internationally accessible knowledge for the public good and for economic consumption, and to increase capabilities for mastering technological advances as the main source of national competitiveness and social and human progress. The enhanced stimulation of joint efforts between the research and business sectors, and stronger initiatives for joint R&D projects between science and business are needed in Slovenia. Research and development must first and foremost contribute to the advancement and success of the country and its citizens. Hence the priority emphasis is on those scientific fields which are vital for the maintenance and development of the state and the national identity.

Through its various measures, the programme, is oriented to the quality and effectiveness of research in Slovenia. It stimulates the mutual linking of education, research and entrepreneurship and improves the mobility of knowledge, ideas and people within society. Parallel to this, other policies must ensure a social and economic climate which generates demand for knowledge and creativity, provides increased public investment, and motivates the private sector to boost its investment in research and development, to promote its co-operation with research organisations, employ top professionals and to begin to look at R&D as an investment.

The programme's main objectives (Chapter 2) are:

- To increase the influence of R&D in Slovenia, especially by stimulating R&D and innovation co-operation between companies, the research sphere and intermediaries that transfer technology and innovation to companies.
- Increase investment in R&D to 3% of GDP by 2010 in accordance with the Barcelona target. Of this, the goal is to double private sector investments in R&D to 2% of GDP and to increase public sector investments in R&D to 1% of GDP. Additional public funds for R&D shall be distributed between technological development and science in a ratio of 80:20.
- Increase the quality of R&D which must, like economic activities, display globally comparable quality, competitiveness, innovativeness, rationality and efficiency. International quality standards will be applied consistently by redefining the mission of higher education and research organisations, introducing overall supervision of public R&D activities and reforming the evaluation system through incentives and legislation, and by strengthening international co-operation in R&D via enhanced engagement in the European Research and Higher Education Area.
- Strengthen human resources in R&D and increase their humanistic orientation by educating young people in the spirit of free and open creativity, curiosity and awareness of the importance of personal knowledge, and by encouraging equal opportunities for women and men in science and research; stimulate an increased share of R&D personnel in the economy, encourage the international and interdisciplinary mobility of researchers and attract the potential of Slovenians living on the other side of the national borders and around the world.
- Develop a supportive environment for R&D by cultivating a modern understanding of the role of knowledge and science in social and economic development as a key investment for social and economic advancement, and by creating a friendly environment for making bigger investments in science, technology and entrepreneurship.
 - Increase the number of high-tech and innovative companies which are based on the successful transfer of knowledge and R&D results and which drive the country's technological development. By increasing the funds for entrepreneurship (the Slovenian Enterprise Fund) and developing the start-up and risk-capital markets, Slovenia will establish a legislative and financial environment that stimulates the creation and growth of high-tech and other innovative companies.

Especially promising fields for Slovenia are those that enable the expansion of knowledge, scientific impetus and economic efficiency based on the values of a socially responsible society, and those which directly support the faster development of fundamental economic areas and where broad European priorities can be followed:

- information and communication technologies (ICT);¹
- advanced (new) synthetic metal and non-metal materials and nanotechnology;
- complex systems and innovative technologies;²
- technologies for a sustainable economy;³ and
- health and life sciences.⁴

These are areas that according to recent analyses reveal the greatest potential for increasing economic competitiveness and productivity, and achieving higher added value in exports, for Slovenia's recognition in the international community, and for the progress of both the economy and the entire society. The selected technologies are those that could have a major impact on economic growth and greater employment and that are important for the good of the whole of society. During the 2006-2010 period, funds for these areas of research have to be increased in real terms. New institutions are already being established in these fields (company clusters, technology networks and research centres of excellence⁵ etc.), which connect the most influential actors from academia and the business world. The priority areas of research and development also include various other fields that are not directly connected with the target of economic competitiveness. In the changing international environment, especially in the process of globalisation and Slovenia's accession to the EU, these are fields that contribute:

- to basic knowledge about humanity and society, important for Slovenia's national development;

¹ *Computer science and informatics are included.*

² *Also including process control technologies.*

³ *Technologies in the domains of energy and environmental protection: technologies for the efficient use of energy, use of new and renewable energy sources, a safe and healthy environment, sustainable construction, preservation and control of environmental quality (earth, forest, water, air), quality of food, health, products etc.*

⁴ *Interdisciplinary research in the fields of the natural, technical, engineering and biotechnical sciences, pharmacy and medicine which are related to European directions in the area of the quality of life.*

⁵ *The definition of centres of excellence is given in Section 4.8, while more specific priority fields in which such centres are already operating are listed in the Appendix.*

- to the understanding of humanism, national identity and recognition, to the knowledge of modern Slovenian history and the maintenance of its wealth of natural and cultural heritage, including research on the Slovenian language;
- to boosting the efficiency of the state and developing a modern democratic society;
- to the understanding and management of social processes and risks that arise along with new technologies, global economic development, changing demographic structures and the added complexity of managing modern societies (*6); and
- to national security and the positioning of Slovenia in the international arena.

The tasks of institutions participating in R&D (Chapter 5):

- The universities must achieve international competitiveness and quality in their research work in order to train top professionals, they must become more open to international projects and programmes and student and teacher exchanges; research and teaching activities must be inseparably linked; professional standards have to be made stricter and more uniform; and inter-university competition must be established.
- National research institutes (government research institutes of national importance) must perform as much research as possible for the Slovenian economy or in the public interest, i.e. research relevant to Slovenia and in support of economic growth and social advancement.
- The private sector must become a much stronger partner of the R&D sector in universities and national research institutes (NRIs) since this is the only way it will be able to efficiently use the funds allocated for economic development.

This programme presents both an opportunity and a challenge for Slovenia. Through the envisaged increased financing it offers the research and development sector better working conditions and at the same time an opportunity to direct its best capacities towards the good of Slovenia. It also stimulates all scientists, researchers, developers and innovators to take on an entrepreneurial attitude and direct their research achievements towards business success.

The Government of the Republic of Slovenia in co-operation with the National Assembly of the Republic of Slovenia will carry out the following priority measures in order to achieve the set objectives:

1. To improve the allocation of existing funds and annually increase public funding for research and development by approximately 0.1% of GDP, which today means around EUR 26 million,⁶ with which among other things it will be possible to:
 - improve the research infrastructure at universities, NRIs and centres of excellence;
 - raise the number of participants in the Young Researchers Programme from 250 to 350 per year (the new graduates should mainly enter business-oriented fields);
 - co-finance the establishing of as many new high-tech companies as possible;
 - provide greater opportunities for R&D to contribute to the development of new products in larger companies and for the market penetration of these new products under established brand names;
 - arrange and equip land for three technology parks near the universities;
 - increase the number of top foreign experts doing visiting research in Slovenia to the level of 5% of all researchers;
 - strive to achieve a higher share of highly cited papers in international journals; and
 - significantly increase support for the popularisation of scientific and technical disciplines and science in general in the media and throughout the education system.
2. To change the structure of R&D investments by, among other things, gradually expanding the share of specific applied research and development research and boosting the share of project financing.⁷
3. To introduce a new expert system for evaluating projects and other categories of tenders following the example of leading European countries so as to guarantee the highest possible objectivity of the evaluations.

⁶ The estimate is based on the statistical GDP data for 2004 which were the latest available official GDP data at the time of preparing the NRDP.

⁷ Project financing complements the currently prevailing programme financing of R&D from the government budget.

4. To significantly improve supervision of the implementation of the National Research and Development Programme, the execution of research work and the achievement of the announced research results, including a definition of the measures to be taken if the objectives are not achieved.
5. To ensure: (i) a detailed definition of the vision, mission, responsibilities and duties of NRIs; (ii) the standardisation and simplification of their operations and management; and (iii) a more precise definition of the rights and obligations of management bodies, as well as persons in charge of research projects and programmes (responsibilities and rights regarding financial and patent matters, in addition to matters relevant to project content).
6. To adopt legislation which will provide:
 - the transparent establishment of ‘spin-off’ companies at universities and research institutes, whereby the role of government and private funding and the way of establishing mutual obligations must be precisely defined;
 - the development of a flexible and attractive labour market in the area of R&D that connects higher education, research and commercial institutions; and
 - the employment of foreign professors and researchers at Slovenian universities and NRIs.
7. To adopt legislation which will stimulate:
 - investment in research, development and human resources; and
 - the circulation of professionals among higher education institutions , NRIs and enterprises.

The programme’s objectives are quite demanding. Some of them are on the very limit of feasibility. But if we do not set ambitious goals and do not demand support for them we will be doomed to mediocrity. In science and technology, however, there can be no tolerance of this. With this programme we are not deciding how well developed, wealthy and socially aware Slovenia will be in the near future, but where it will stand after some decades and beyond.

CONTENTS

SUMMARY

1. SITUATION AND FRAMEWORK

- 1.1 Situation
- 1.2 SWOT analysis
- 1.3 Relevant policies of the Republic of Slovenia
- 1.4 Relevant policies of the EU
- 1.5 The world

2. VISION AND OBJECTIVES

- 2.1 Enhancing the influence of R&D in Slovenia
- 2.2 Improving the effectiveness of investments in R&D and the quality of results
- 2.3 Increasing investments in R&D
- 2.4 Strengthening human resources in R&D
- 2.5 Developing a supportive environment for R&D
- 2.6 Increasing the number of high-tech and innovative companies

3. PRINCIPLES

- 3.1 National development and authenticity
- 3.2 Autonomy and responsibility
- 3.3 Public access
- 3.4 Competitiveness and co-operation
- 3.5 Quality and impartiality
- 3.6 Partnership between public and private sectors
- 3.7 Ethics
- 3.8 Equal opportunities
- 3.9 Entrepreneurial spirit and creativity

4. TASKS

- 4.1 Defining priority areas
- 4.2 Defining priority mechanisms
- 4.3 Increasing investments in R&D and changing their structure
- 4.4 Improving conditions for carrying out R&D
- 4.5 Increasing the transfer of R&D results to the external environment
- 4.6 Improving the system of supervision
- 4.7 Monitoring implementation of the NRDP
- 4.8 Improving international co-operation

5. INSTITUTIONS PERFORMING R&D

- 5.1 Business sector
- 5.2 Universities
- 5.3 National research institutes
- 5.4 Intermediaries

6. PROGRAMMES, MEASURES AND INSTRUMENTS

- 6.1 Review of programmes, measures and instruments

7. MAIN SOURCES AND REFERENCES

8. APPENDIX

SECTION 6: OVERVIEW OF PROGRAMMES, MEASURES AND INSTRUMENTS

The programmes, measures and instruments of the research policy of Slovenia in the 2006-2010 period must be agreed upon at the government level. The harmonised operations of all activities and subjects in the field of R&D must also be ensured, including structures for accelerating the transfer of knowledge. Only in this way will implementation of the NRDP bring about synergetic effects and consequently lead to an economic breakthrough and a higher quality of life.

The key measures of the research and development and innovation policies in the upcoming five-year period are defined in the Slovenia's Development Strategy, within the framework of two development priorities:

1. The efficient creation, two-way flow and application of knowledge for economic development and high-quality jobs.
2. A competitive economy and faster economic growth.

The measures from Slovenia's Development Strategy are shown in the following tables, along with more detailed measures for implementing the research and development policies set out in the preceding sections of the NRDP.

PERMANENT MEASURES	RESPONSIBLE
Interministerial co-ordination in areas relevant for increasing the competitiveness of the Slovenian economy, technological development and innovativeness.	Competitiveness Council or other body
Additional budgetary funds for research shall be distributed between technology and science in a ratio of 80:20 such that funding for technological development and innovation will reach 0.45% of GDP in 2010.	MVZT; MG
Qualification of agencies for the systematic and target-oriented implementation of programmes and measures in the field of technological development and innovation (linking up with development policy and the private sector, operations in line with entrepreneurial principles, the establishment of modern support mechanisms for technological development and innovation).	TIA; JAPTI, MVZT; MG
Issuing calls for proposals for financing research activities pursuant to the adopted NRDP.	MVZT; MG; ARRS; TIA; JAPTI
A gradual increase of funds for higher education (up to 2% of GDP in 2010).	MVZT
Stimulating the technological and market restructuring of companies and their competitiveness, including the aspect of sustainable development.	MG
The horizontal stimulation of FDI (Foreign Direct Investment) in high and medium-high technology, in quality jobs (with high added value and qualification requirements) and in centres for SE Europe, as well as encouraging the integration into the Slovenian economy of companies with foreign capital.	MG; JAPTI

RESEARCH AND INNOVATION POLICY MEASURES AFTER INTRODUCTION OF THE NRDP	RESPONSIBLE	TIME
Technology foresight programme: - establishment of co-ordinating bodies at the SZT - definition of priority areas.	MVZT; MG; SZT	2006
Establishing a Competitiveness Council or other co-ordinating body for interministerial co-ordination in fields relevant to boosting the competitiveness of the Slovenian economy, technological development and innovation – among other things for the harmonisation of activities aimed at founding new high-tech companies, increasing the proportion of innovative SMEs, raising the number of researchers in the business sector, the orientation of public procurement policy towards knowledge-intensive products and services etc.	Govt. RS	2006
Redesigning the 'Young Researchers for Business' Programme by improving its attractiveness and effectiveness, and gradually increasing the funds for its operations.	MVZT; MG	2006
Establishing an internationally comparable and transparent expert system for evaluating R&D proposals and results.	MVZT; MG; ARRS; TIA; JAPTI	2006

RESEARCH AND INNOVATION POLICY MEASURES AFTER INTRODUCTION OF THE NRDP	RESPONSIBLE	TIME
Stimulating a supportive environment for innovation through financial assistance to companies in the field of technological development: <ul style="list-style-type: none"> - development of new technological programmes in partnerships involving companies, research institutes and the government in the next 3-5 years; - formation of technology cores (R&D units or concentrated R&D activities in a company); - drawing up a permanently open call for proposals for co-financing SMEs' development projects; - drawing up a call for proposals for stimulating investments in the development of new technologies, products and services; and - the simplification of procedures, especially for SMEs. 	MVZT; MG	2006
Removal of administrative barriers to entry in the register of researchers.	ARRS	2006
Designing a programme for increasing investments in the research infrastructure including its internal linking and increased exploitability (with favourable price conditions for public research organisations, intermediaries and companies).	MVZT	2006
Drawing up a methodology for evaluating the economic and social relevance of research projects and programmes.	MVZT; ARRS; TIA; JAPTI; MG	2006
Changing the system of financing public research organisations so that it rewards their co-operation with the private sector (including the establishment of 'spin-off' companies), their international R&D co-operation and impact and improve researchers' participation in the commercial exploitation of research results.	MVZT; MG	2006
Changing the criteria for the accreditation of higher education study programmes in order to ensure that the international comparability and competitiveness of the programmes are respected, and that doctoral programmes are only offered by institutions that demonstrate high-level scientific results in their fields.	MVZT; SVŠ	2006
Introduce differentiated scholarships and differentiated criteria for financing higher education institutions (including greater financing for the research infrastructure) with the goal of encouraging enrolment in science, technology and engineering studies, including computer science and informatics.	MDDSZ; MVZT; MG	2006
Designing a government programme for encouraging foreign direct investment and the required restructuring.	JAPTI	2006
Upgrading the strategy for the development of broadband networks.	MG; MVZT	2006
The development of systemic solutions for attracting Slovenian and foreign companies or investments in economic zones and technology parks at the regional level, including a more suitable land development policy.	MG	2006
Ensuring the operation of the existing university incubators.	MG; MVZT; ARRS; TIA; JAPTI	2006
Increasing the efficiency of drawing down funds from EU structural funds.	SVLSRP; competent ministries	2006

Establishment of a promotional programme entitled 'Knowledge – an investment in Slovenia's future'.	MVZT; MG	2006
Establishing a system for integral analysis and monitoring in the domains of R&D, implementation of the NRDP and the effects of government budget investments in R&D.	MVZT; MG	2006
Linking the increase of government budgets for higher education with the achievement of reference criteria and advancements in international comparisons of quality (changing legal bases – the Higher Education Act) with appropriate changes to the missions of universities, organisation of the system etc.	MVZT; SVŠ Universities	2006
Establishing and ensuring the operation of university patent offices and technology transfer offices.	MG; MVZT; ARRS; TIA; JAPTI	2006
Linking different methods of allocating state incentives (state aid, structural funds, research and development, foreign direct investment, active employment policy, tertiary and lifelong learning, state investments etc.) in a unified system.	SVLSRP; competent ministries	2006
Harmonising all programmes and projects with the objectives of the NRDP.	MVZT; MG	2006

Adopting systemic measures for increasing the amount of income that public research organisations obtain in the market.	MVZT; MG	2006
The adoption of implementing regulations for the establishment of a central register of organisations which mediate the transfer of knowledge.	MG; MVZT	2006
Establishing a programme for increasing international co-operation and fostering Slovenia's international recognition in the field of R&D and innovation, including support for attracting quality foreign researchers to Slovenian companies and universities.	MVZT; MG	2006
The adoption of suitable legal bases and implementing regulations in order to ensure the operation of the state based on the rule of law (protection of investors and investments and industrial property, data confidentiality, competitiveness clauses, protection of claims, payment discipline etc.).	MF; MG; MVZT	2006
Designing a national innovation system (NIS) and the implementation of the Slovenian Regional Innovation Strategy (SLORITS) based on co-operation between the universities, research institutes, support institutions, the government and companies, and including a programme for the further development of existing intermediaries or for the establishment of new ones according to the results of prior feasibility studies.	MVZT; MG; TIA; JAPTI; SVLSRR	2006
Establishing a network of technology centres that will be connected with industrial clusters and technology networks (especially for the transfer of knowledge to SMEs) and ensuring their operation. Designing a programme for modernising the research infrastructure of the technology centres.	MVZT; MG	2006
Ensuring the operation of existing technology networks within the framework of technology programmes and in priority areas; ensuring links between the strategic documents of technology networks and national strategy documents.	MVZT; MG	2006
Establishing new technology networks.	MVZT; MG	2006
Providing a stimulative tax environment that contributes to greater investment in research and development.	MG; MF; MVZT	2006
Increasing financial incentives and technical assistance to small and medium-sized companies for responding to calls for proposals within the framework of EU programmes.	MVZT; MG	2006
Designing instruments for encouraging the transfer of science and technology researchers from public research organisations and from abroad to the private sector: research grants, subsidised salaries, tax measures and loans, financing of projects performed outside the public sector (postdoctoral projects).	MF; MVZT; MG	2006
Introducing system measures for increasing the mobility of researchers.	MVZT; MG	2006
Providing financial support for the return of Slovenian professionals from abroad, providing at least 100 one-year fellowships for visiting foreign researchers in Slovenia and at least 200 one-year fellowships for research work abroad.	MVZT; MG	2006
Establishing and ensuring the operation of a programme entitled 'Slovenian National Development and European Humanism' – a programme of research in spiritual and ethical dilemmas in connection with the tradition of European humanism, the role and importance of language in national and intercultural frameworks, interdisciplinary reflections of science and its importance for national development.	MVZT; ARRS; MK	2006 perm.
Changing the criteria for awarding titles to teaching and research faculties and the system of financing in higher education towards a greater consideration of the work of teachers and researchers in the international arena, the economy and other fields where the results of research are applied, and ensuring support for such operations. The consistent international comparability of accreditation standards and procedures, with the elimination of 'inbreeding', and a further elaboration of evaluation methodology for research in the humanities which cannot be evaluated adequately using the standard quantitative procedures of international evaluations.	MVZT; SVŠ Universities	2006
Strengthening the sabbatical year system to stimulate interuniversity, intersectoral and international mobility.	MVZT; SVŠ Universities	2006
Establishing a simple and transparent system for stimulating competitiveness focused on key objectives: development of a new programme for increasing entrepreneurship and the competitiveness of companies.	MG	2006
Establishing at least two new technology parks and developing, restructuring and networking the existing ones.	MG	2006
Adopting legal bases and implementing regulations in order to provide support for domestic and foreign investments, especially in technology and innovation projects.	MG	2006

Through the merging of existing funds, income from privatisation and with the participation of the private sector, forming a risk capital fund for financing high-tech small and medium-sized companies. Issuing a call for proposals to include at least 50 companies.	MF; MG MG	2006 2006
Improving access to start-up and risk capital, and simplifying and lowering the cost of bank loan procedures.	MF; MG	2006
Supporting the application of the most important managerial techniques for the management of changes and creating a business model to attain business excellence in Slovenian companies; developing the management of human resources and knowledge management.	MG	2006
Technology foresight programme: - definition of more specific fields within the existing broad priorities; and - checking the appropriateness of the priorities.	MVZT; MG; SZT	2007
Establishing a system for the supervision and monitoring of public R&D institutions in order to create a successful national innovation system: - redefining the mission and vision of public research organisations; - drawing up five-year plans; - introducing external evaluations and self-evaluations of public research organisations; and - periodical evaluations of agencies.	MVZT; MG; SZT; SVŠ; ARRS; TIA; JAPTI	2007
Reorganising the education and research systems: their integration and linking according to priority areas, the possible establishment of a science and technology university.	MVZT; MG	2007
Redesigning the education system with the goal of educating young people in the spirit of creativity, curiosity and awareness of the importance of personal knowledge, and educating them in terms of an awareness of gender issues.	MŠŠ; MVZT; MG	2007
Ensuring the successful operation and systemic co-financing of at least eight research centres of excellence in priority areas of research and technological development.	MVZT; MG	2007
Changing the ratio between programme and project financing (40%: 60%), and in the framework of basic research giving priority to targeted basic research.	MVZT; ARRS	2008
Developing European university centres of excellence and introducing joint programmes with foreign universities.	MVZT; SVŠ Universities	2010
Establishing an efficient network of centres for lifelong learning.	MŠŠ, MVZT, MDDSZ	2010

ABBREVIATIONS

ARRS	Slovenian Research Agency
JAPTI	Public Agency for Entrepreneurship and Foreign Investment
MDDSZ	Ministry of Labour, Family and Social Affairs
MF	Ministry of Finance
MG	Ministry of the Economy
MK	Ministry of Culture
MŠŠ	Ministry of Education and Sport
MVZT	Ministry of Higher Education, Science and Technology
SVLSRP	Government Office for Local Self-Government and Regional Policy
SVŠ	Council for Higher Education (advisory body to the Government)
SZT	Science and Technology Council (advisory body to the Government)
TIA	Slovenian Technology Agency

Appendix I

INDICATORS OF THE KEY NRDP OBJECTIVES (1)

Data for Slovenia relate to 2002 while data available for 2003 are added in brackets. For other countries or country groups, data for the latest available year, and exceptionally projections, are used.
Primary data sources: SORS for Slovenia and New Cronos database for other countries.

Dasa Bole Kosmac (MHEST) in co-operation with the SORS, IMAD and ICC (2)

May 2005

INDICATORS OF THE KEY NRDP OBJECTIVES	Initial situation						Rates of growth (a)					Data sources	
	Slovenia	EU-15 average (b)	1/3 EU-25 average (b,c)	Austria	Finland	Ireland	period (d)	Slovenia	EU-15	Austria	Finland		Ireland
Public and private investment in R&D. R&D expenditure													
1.1. Gross domestic expenditure on R&D (GERD) as a percentage of GDP	1,53 e	2,01	2,69 (1,87)	2,19	3,46	1,09	98-2003	1,9	1,7	4,2	4,0	- 2,2	SORS, New Cronos, Statistics in focus
1.2. Percentage of GERD financed by the business sector	60,0	54,6	63,2 (51,6)	41,8	69,5	65,2	98-2002	3,4	1,0	0,02	2,14	:	Statistics in focus
Human resources in R&D													
2.1. Number of researchers (FTE) per 1000 labour force	4,7	6,8	8,9 (6,6)	6,6	14,8	5,2	98-2002	2,1	2,7	7,8	5,0	5,0	SORS, New Cronos, OECD
* women researchers as a percentage of total researchers (head count)	f 35,1	29,9	42,6 (35,4)	18,8	29,1	29,4	98-2002	0,8	:	:	:	:	SORS, KF 3-4
2.2. New science and technology PhDs per 1000 population aged 25 to 34 years	0,6 (0,6)	0,6	0,8 (0,5)	0,7	1,0	0,6	98-2002	9,1	3,4	8,2	2,0	- 0,8	SORS, New Cronos
* percentage of women among new science and technology PhDs	40,2 (32,9)	:	:	26,2	33,6	34,8	98-2002 (03)	8,8 (2,2)	:	6,7	5,6	- 4,5 (4,2)	SORS, New Cronos
2.3. Business enterprise researchers (FTE) as a percentage of national total	g 34,9	49,2	61,9 (51,1)	62,6	55,1	66,7	98-2002	0,7	2,0	:	1,5	2,4	SORS, New Cronos, OECD
* share of PhDs among business enterprise researchers (FTE)	h 9,5	:	:	:	:	:	98-2002	8,0	:	:	:	:	SORS
Transfer of knowledge													
3.1. Percentage of business enterprise expenditure on R&D (BERD) financed by government	5,0	5,7	13,9 (9,5)	5,5	3,2	3,3	98-2002	-6,4	:	:	:	:	SORS, New Cronos
3.2. Percentage of government intramural expenditure on R&D (GOVERD) financed by industry	10,7	7,8	15,0 (10,5)	3,1	14,2	8,8	98-2002	-14,8	:	:	:	:	SORS, New Cronos
3.3. Percentage of higher education expenditure on R&D (HERD) financed by industry	9,0	6,8	10,8 (7,2)	1,7	6,2	5,3	98-2002	-5,5	:	:	:	:	SORS, New Cronos
Innovation and innovation co-operation													
5.1. Percentage of small enterprises with innovation activity	i 12,7 j	38,4 k	44,0 (40,1)	41,6	39,8	:	l	:	:	:	:	:	SORS, New Cronos
* percentage of small enterprises with innovation activity in manufacturing	14,3 j	40,8 k	47,6 (41,0)	42,5	43,7	:	l	:	:	:	:	:	SORS, New Cronos
* percentage of small enterprises with innovation activity in services	11,6 j	36,2 k	42,9 (34,8)	41,3	36,5	:	l	:	:	:	:	:	SORS, New Cronos
5.2. Percentage of small enterprises with innovation activity involved in innovation co-operation	36,4 j	20,6 k	41,4 (32,5)	17,9	39,7	:	l	:	:	:	:	:	SORS, New Cronos
* percentage of small enterprises with innovation activity involved in innovation co-operation (manufacturing)	36,6 j	19,4 k	36,7 (28,2)	15,7	41,8	:	l	:	:	:	:	:	SORS, New Cronos
* percentage of small enterprises with innovation activity involved in innovation co-operation (services)	37,2 j	22,6 k	44,9 (37,2)	19,9	38,4	:	l	:	:	:	:	:	SORS, New Cronos
Scientific and technological productivity													
6.1. European patents per million population	32,7 (36,1)	161,3	242,7 (148,1)	174,8	310,9	89,9	1998-2003	16,1	6,1	6,1	5,2	13,5	New Cronos
6.2. US patents per million population	8,4	72,8	111,0 (68,1)	65,4	158,6	32,4	1998-2002	- 3,0	6,0	7,3	8,0	12,3	New Cronos
6.3. Highly cited papers as a % of total number of scientific publications	m 0,59	1,21	1,41 (1,24)	1,02	1,25	1,31	n	:	:	:	:	:	KF 1
The impact of R&D on economic competitiveness													
7.1. Share of exports of high-tech products in total national exports	4,7 (5,6)	16,1	22,2 (15,1)	15,7	20,9	35,3	o	7,6	1,2	8,7	1,2	- 4,5	SORS, New Cronos
7.2. Share of value added of knowledge-intensive services in total value added	p 26,7 (26,9)	37,2	45,0 (30,0)	23,7	29,8	30,0	98-2003	2,2	:	1,9	6,7	15,0	SORS, KF 3-4
7.3. Share of value added of high- and medium-high-tech industries in total value added	r 10,7 (11,2)	8,0	11,7 (7,6)	7,2	12,0	23,5	98-2003	2,9	:	5,1	6,3	6,2	SORS, KF 3-4
* share of value added of high-tech industries in total value added	s 3,9 (4,6)	:	:	:	:	:	98-2003	6,5	:	:	:	:	SORS
* share of value added of medium high-tech industries in total value added	s 6,8 (6,6)	:	:	:	:	:	98-2003	7,7	:	:	:	:	SORS
Investment in promising technologies													
8.1. High-tech venture capital investment as a % of GDP	t 0,15	0,24	0,49 (0,24)	0,14	0,57	0,31	n	:	:	:	:	:	EIS 2002
8.2. ICT expenditure as a % of GDP	u 6,80	6,21	6,9 (6,5)	6,10	6,6	4,6	2000-2001	- 5,6	- 3,9	- 2,4	- 2,9	- 14,8	EIS 2004

(1) See comments on the table on the next page.

(2) MHEST stands for the Ministry of Higher Education, Science and Technology, SORS stands for the Statistical Office of the Republic of Slovenia, IMAD stands for the Institute of Macroeconomic Analysis and Development, ICC stands for the Institute for Civilisation and Culture.

Appendix 1a: COMMENTS ON THE TABLE OF INDICATORS OF THE KEY NRDP OBJECTIVES

GERD is an abbreviation for *gross domestic expenditure on R&D*.

: not available

- (a) Calculations for growth rates are in accordance with the methodology applied in the EU for the indicators concerned.

Growth is mainly indicated as the average annual rate of growth g of an indicator I between the first year – year a and the last year – year b . The measure is used in the collection of Key Figures and is calculated using the following formula:

$$g = (I_b/I_a)^{1/(b-a)} - 1$$

The one exception is the data from the European Innovation Scoreboard (indicator 8.2), where the growth or trend is calculated as the percentage change between the value of the indicator in the last year observed and its average value in the three preceding years, separated from the last year observed by a one-year break (example: the growth rate in the 2001 indicator is calculated as the percentage difference between its value in 2001 and its average value in the years 1997–1999).

- b) In averages for groups of countries, the weighted arithmetic mean is usually calculated whereby the effect of the weight of an individual country on the entire group is taken into consideration (examples: the effect of Germany as a large country on the common result is usually greater than that of Denmark; a country with a strong population group of a typical age for study at university influences the common result to a greater extent than a country with a smaller population of this age when observing the characteristics of university students etc., depending on the indicator). The weighted arithmetic mean is important, for example, for comparing the EU as a political-economic group with the USA, Japan etc., while a simple arithmetic mean shows the average of national scoring (regardless of the rate of influence of an individual country on the common result). When catching up with individual countries or assessing our position with reference to the average EU results or the best one-third of EU member states per individual indicator, the more appropriate data is thus the simple arithmetic mean of the national values for this indicator. Averages in the Scoreboard are thus calculated as non-weighted arithmetic means.

Averages in the Scoreboard only include those countries for which the appropriate data are available (at least 2/3 of all countries, but for the most part considerably more or all). Where there are no or insufficient data, the calculation for the average is omitted.

- c) The average of the upper one-third of the EU-25 per an individual indicator refers to the simple arithmetic mean of the national results for those countries that are the most successful of all EU member states in terms of an individual indicator and that rank among the top eight countries. The data in parentheses are given for the so-called ‘marginal state’ of the upper one-third of the EU-25, i.e. the country that is ranked last, i.e. the eighth of the top eight countries in terms of a given indicator.

- d) Normally, the calculations are for five-year periods but where there are insufficient data an adjustment of the available data is needed.

- e) Assessment for 2003: 1.53

- f) For the purpose of international comparability, data for head count have been used because only these data were available for the EU. Since the data for this indicator in the New Cronos database are incomplete we used the figures published in KF 2-3, which mostly refer to 2001 or 2000.

- g) In indicator 2.3 we also used OECD data due to the extremely deficient data from the New Cronos database for this particular indicator. Because the OECD data only include OECD member states and the data for the new EU member states (not all of which are members of the OECD) in the New Cronos database are surprisingly complete, we combined the data from both sources but the source for an individual country remains the same for all years. Wherever data from both sources are available, they are identical or very similar, which makes our solution more readily acceptable (a similar solution was used by the Institute for Civilisation and Culture with some data for scenarios of Slovenia’s catching up with the upper one-third of EU-25 member states).

The data for the EU-15 average for indicator 2.3 refer to 2001 (more complete data), while in the calculation of growth rates for the EU-15 in the 1998-2002 period, the data for Luxembourg and Austria are omitted since they are only available for these two countries for one point in time. However, we took them into consideration

in establishing the upper one-third of the EU-25 member states because both Austria and particularly Luxembourg are in a peak position in terms of this indicator.

h) International data on doctoral degrees among business sector researchers are not available but we found data on the share of doctoral degrees among the total population of research personnel in the business sector in Finland, Sweden and Slovakia; in 1999, these shares were 4.4% for Finland, 8.1% for Sweden, 51.1% (!) for Slovakia and 3.4% for Slovenia. Source: Basic Science and Technology Statistics, OECD, Paris, 2001.

i) Indicators 5.1 and 5.2 originally referred to small and medium-sized enterprises (SMEs) but, because the data in the New Cronos database for this group are incomplete, we directed our attention to small enterprises (SEs) in the new calculations. In fact, these data are even more important for the conditions found in Slovenia because small companies hold by far the largest share in the structure of the Slovenian economy, while at the same time they experience the most difficult problems in terms of innovation. Some data:

Size structure of companies in Slovenia in 2003:

Size categories per number of employees	Structure in %
Up to 49 (micro and small enterprise - SEs)	98.5
50 to 249 (medium-sized enterprise - MEs)	1.2
250 and more (large enterprises – LEs)	0.3
Total	100.0

Source: Žakelj, L. (2004). *Development of small and medium-sized companies in Slovenia and the European Union. Workbook No. 6/2004, Ljubljana, UMAR, page 42.*

Share of enterprises with innovation activity among all enterprises, 1998–2000

SEs	12.7
MEs	28.3
SMEs	20.5
LEs	55.4
All	21.1

Share of enterprises with innovation activity involved in innovation cooperation, 1998–2000

SEs	36.4
MEs	49.4
SMEs	42.9
LEs	54.5
All	45.8

Source: SORS

j) Data for the 2001-2002 period, which is covered by the last statistical survey of innovation activity in Slovenia (implemented every second year for a two-year period).

k) The data from the latest EU survey on innovation (Community Innovation Survey 3 – CIS3), covering the 1998-2000 period. Unlike the Slovenian survey, the EU statistical survey is implemented every fourth year and includes three years each time. In both surveys, the financial data (not found in our table) refer to the last year of the reference period and not to the total period included, as is the case with the other data.

l) Since there are methodological differences among the data from the successive statistical surveys on innovation (CIS1, CIS2, CIS3) the growth rates are not calculated.

m) The data apply to the 1997-1999 period since more recent data are unavailable.

n) Only the data for one point in time are known and therefore calculation of the growth rate is impossible.

(o) Growth rate data are also available for the shares of national exports of high-tech products in the world market for these products – this share for Slovenia is decreasing (average annual growth 1996–2001: -1.2%).

- p) The data for Slovenia refer to the years 2000 (2003) or 1998-2003, and for the remaining countries to 2001 and 1996-2001. In the data for the leading countries (the top eight countries or the upper one-third of the EU-25), only data for the EU-15 are taken into consideration because no other data are available.
- r) Data for Slovenia refer to the years 2002 (2003) and 1998-2003, and for the remaining states to 2001 and 1996-2001.
- (s) The common indicator for high- and medium-high-tech industries ranks Slovenia in quite a superior position in the world, even ahead of a number of developed EU-15 member states (for example, France, Denmark, the Netherlands). The activities of medium-high-tech industries contribute decisively to the superior position of our country (in 1999 they yielded almost three-quarters of the entire value of the indicator and in 2002 they represented almost two-thirds of the entire value of the indicator). High-tech industries, which are much more important for the development strength of a certain economy, are regrettably relatively weak in Slovenia; it is therefore reasonable to calculate two separate indicators from the combined indicator, although only figures for the combined indicator are available for international comparisons.
- t) Data for Slovenia refer to 1999, other data to 2001. An older data source (EIS 2002) was used because data for Slovenia are only available there.**
- u) Data for 2003.

Appendix 1b: ABBREVIATIONS FOR THE DATA SOURCES MENTIONED IN THE TABLE

<i>KF 1</i>	Towards a European Research Area: Key Figures 2001: Special Edition: Indicators for benchmarking of national research policies, <i>European Commission – Research Directorate General, Brussels, 2001.</i>
<i>KF 3-4</i>	Towards a European Research Area: Science, Technology and Innovation: Key Figures 2003–2004, <i>European Commission – Research Directorate General, Brussels, 2003.</i>
<i>New Cronos</i>	<i>Eurostat database (Theme 9: Science and Technology, Domain: Survey on innovation in EU enterprises, Collection: CIS3). We later obtained data on innovation for the United Kingdom from the publication Innovation in Europe: Results for the EU, Iceland and Norway, <i>European Commission, Eurostat, 2004 Edition.</i></i>
<i>OECD</i>	Main Science and Technology Indicators Vol. 2004/2, <i>OECD, Paris, 2003.</i>
<i>EIS 2002</i>	European Innovation Scoreboard 2002, <i>Cordis Focus, No. 19, European Commission, December 2002.</i>

EIS 2004 **European Innovation Scoreboard 2004 Database.**

Statistics in Focus **R&D Expenditure in the European Union, *Statistics in Focus 2/2005*, Eurostat –
*European Communities.***

Ljubljana, May 2005