



ERAWATCH COUNTRY REPORT 2010: Slovenia

ERAWATCH Network – Independent expert

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Acknowledgements and further information

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The opinions expressed are those of the authors only and should not be considered as representative of the European Commission's official position.

Executive Summary

In 2009, gross domestic expenditure on R&D amounted to €656.9m, which represented 1.86% of Slovenian GDP. This is in nominal terms 6% more than in the previous year. The increase was the greatest in the higher education sector (by 15%) and the business enterprise sector (by 7%). The increase was not just a result of the increase in funds in the business enterprise sector but also of expanded selection of reporting units in 2009.

The highest share among total gross domestic expenditure (GERD) was contributed by business sector again, namely €380.9m, which represented 58% of total sources of funding R&D. The next important share of gross domestic expenditure on R&D was that of the government with €234.2m, which represented 36% of total resources in the GERD. In recent years an increasingly important source of funding R&D in Slovenia has been funds from abroad. In 2009 they amounted to €39.7m, which is 15% more than in the previous year.

The constant growth of R&D investment partly reflect the fact that this has been clearly stated priority in all the main policy papers (National Research and Development Programme 2006-2010 (NRDP, 2005), Slovenian Development Strategy 2005-2010 (IMAD, 2005), National Reform Programme 2005- 2010 (Republic of Slovenia, 2005)). While the ambitious goal of reaching Barcelona target of 3% has not been reached yet, the trend has been positive, both in business as well as in public sector. In view of the serious budgetary constraints, Slovenia may experience certain difficulties in maintaining the current level of R&D and innovation expenditures, especially beyond 2013 with the expected lower support of the Structural funds.

The R&D and innovation policy is implemented through a number of various support institutions and relatively complex set of instruments and measures. Relatively extensive support network is often criticised for its low effectiveness due to insufficient coordination and specialisation, with no clear demarcation of the tasks. Since facilitation of the knowledge flows is an important R&D and development policy orientation, the challenge of coordinated approach to designing the most efficient network, combining the roles of university incubators, technology parks, technology centres, platforms, centres of excellence, regional development agencies, clusters, business promotion centres, etc. in a coherent and transparent support system should be given more policy attention.

The overall assessment of the current range of the support measures has to acknowledge their wide range and rather extensive coverage of different challenges. A closer look reveals overlapping and poor coordination, a relatively high level of user unfriendliness, especially towards the small businesses as well as other 'delivery' problems.

The government has prepared a draft of a new National Research and Innovation Strategy for the period 2011-2020, which has entered into public debate in October 2010. The key emphasis is on better integration of research and innovation, strengthening the capacity of science to contribute to economic and social restructuring, promoting closer cooperation between public R&D institutions and

business sector and providing for increase scientific excellence, partly by increasing competitiveness within S&T stakeholders and partly by providing necessary resources, both human as well as financial. So far, the public debate revealed significant differences among the stakeholders as to the proposed strategy, so the final outcome is difficult to predict.

Yet what is important from the policy mix perspective is that even though the R&D and innovation policy is an important building block of national innovation system (NIS), the policy in this area alone cannot bring about the changes needed in overall socio-economic environment. The very concept of national innovation system is based on interaction between various actors and policies. If R&D and innovation activity are to contribute to the economic growth by technological restructuring and increased competitiveness, then R&D and innovation policy should not be treated as a stand-alone policy, but integrated in overall economic policy of the country and treated with sufficient attention in budget negotiations as well. Relatively low involvement of other ministries and the government as a whole in the on-going discussion on National Research and Innovation Strategy (NRIS) gives little ground for optimistic expectations.

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Insufficient growth of public and business sector investment in R&D	Opportunity: New funds allocated for business R&D within the “crisis package”. Risk: slow-down in economy may further limit the capability of business sector to invest in R&D
Non-coordination of R&D policies towards public sector and for business community	Opportunity: continuous promotion of closer cooperation of public R&D organisations with business sector through instruments like centres of excellence Risk: relatively complex process of restructuring public R&D in terms of priority setting
Significant share especially among SMEs of firms with no R&D activity	Opportunity: concentrate efforts of support institutions on promotion of R&D and innovation in SMEs Risk: unfavourable economic climate may deter SMEs from risk-taking and investing in R&D.

Knowledge Triangle

Effectiveness of knowledge triangle policies

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	Preparation of a new Research and innovation strategy 2011-2020	Strength: A comprehensive framework for broad institutional change in R&D and innovation system, focusing on key deficiencies of the current NIS is proposed by the government. Weakness: some of the novelties suggested by the government face strong opposition in publicly financed R&D (both government and HEI sector), which will make the implementation very difficult.
Innovation policy	See above	Strength: clearly integrated innovation with R&D strategy. Weakness: opposition to changes in R&D may hinder also the changes in innovation policy.
Education policy	Preparation of a new National Higher Education Programme	Strength: Harmonisation of Bologna process in HEI and planned stronger internationalisation of HEI. Weakness: Financial sustainability of the planned reform.
Other policies	Economic crisis exit strategy	Strength: measures to promote economic growth. Weakness: lack of social dialogue, including the

	Recent policy changes	Assessment of strengths and weaknesses
		public sector employees, where social contract has been cancelled by the government.

European Research Area

Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers	Proposed change in legal documents, opening the R&D area to non-EU researchers; change the legislation for HEI to allow programmes in English language at all levels of higher education	Relatively closed and unfriendly labour market, compensation limitations which limits the attractiveness for inflow of R&D staff
2	Increase public support for research	Commitment of the government to 1% of public investment in R&D	Strict budget policy to curtail deficit
3	Increase European coordination and integration of research funding	Introduce more open calls for research funding in the future (new legislation being proposed)	
4	Enhance research capacity across Europe	No change: continuation of the Young researchers programmes and various mobility schemes	Good annual increase in number of young people entering both Young researchers programmes
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	Introduction of the centres of excellence and centres of competence: both measures will contribute significantly to the research infrastructure in Slovenia	Up to now restricted possibility to finance larger R&D investments, with the Structural funds the measures have significantly more financial resources
6	Strengthen research institutions, including notably universities	With the new National HE programme, funding for Universities is to include larger share of grant funding for research	Fragmented research in small groups at the universities
7	Improve framework conditions for private investment in R&D	Continuation of tax subsidy and further synchronisation of support network	Lack of coordination and transparency of the support institutions
8	Promote public-private cooperation and knowledge transfer	New system of financing of public research institutes proposed in the National Research and Innovation Strategy, requiring the PRO to increase a share of business funding	PRO had little incentive to seek cooperation, since evaluation criteria for projects was mostly citation/publication based
9	Enhance knowledge circulation across Europe and beyond	Continue with support for mobility schemes; support the participation of R&D staff in EU projects/ programmes	High level of participation in EU schemes by HEI
10	Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world	No special measure	Sufficient support already available

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	Joint design of policies is increasingly practiced by MHEST and ME: the draft of new National Research and Innovation Strategy was prepared in cooperation of the two and involvement of the Chamber of Industry	Up to now, business sector was less involved in national policy design
12	Develop and sustain excellence and overall quality of European research	The financing will be related to the achieved scientific quality	Already in the current NRDP, evaluation criteria contributed to the increased quality of research
13	Promote structural change and specialisation towards a more knowledge - intensive economy	In principle, the new draft of NRIS addresses this	Promotion was there in all strategic documents, the implementation was weaker
14	Mobilise research to address major societal challenges and contribute to sustainable development	Not much discussion or policy change in this area	Lack of discussion on societal challenges and the role of science
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	The draft RIS devoted some space to promotion of R&D and science	Various attempts made, but little media attention received so far

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1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the '**inter-linkage**' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the '**interlinkages**' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.

Slovenia is among the smaller EU member countries with its 2 million inhabitants and GDP in current prices in 2009 amounting to €34,894m or €17,331 per capita. (SORS, 2010). The level of research and development (R&D) investment in Slovenia in recent years has been around 1.5% of Gross Domestic Product (GDP), with a

noticeable increase in 2008 to 1.66% (SORS, 2010) or in nominal terms €616.9m. Preliminary figures for 2009 indicate a growth of R&D investment by 6% to 656.9 million or 1.86% of GDP.¹ In 2008, the increase was the highest in the business enterprise sector (by 25.7% in real terms).² The share of business sector in total R&D investments increased from 59.2% in 2007 to 63% in 2008 (which represents €387.5m), and was followed by the government sector with 31% (€193.1m), representing also an increase of 2 percentage points (29% of GERD in 2007). As expected, the shares are different for 2009 due to the increased government investment in R&D as a part of “crisis package”.

Table 1: Basic data on R&D funding³

	2005	2006	2007	2008	EU27 (latest year)	
					Average	Year
GERD (euro million)	413	484	529	616.9	237,001	2007
R&D intensity (GERD as % of GDP)	1.44	1.56	1.53	1.66	1.9	2008
GERD financed by government as % of total GERD	37.2	34.4	33.8	31.3	33.5	2008
GERD financed by business enterprise as % of total GERD	54.8	59.3	60.3	62.8	55	2008
GERD financed by abroad as % of total GERD	7.3	5.8	5.4	5.6	8.9	2008
GBAORD (euro million)	167	173	226	189	88,884	2008
GBAORD as % of general government expenditure	1.28	1.26	1.55	2.01	1.52	2008
BERD (euro million)	243	291	324	398	151,448	2008
Business sector R&D intensity (BERD as % of GDP)	0.85	0.94	0.94	1.07	1.21	2008
BERD financed by government as % of total BERD	7.0	5.6	7.1	5.6	7.3	2008

Source: Eurostat; Note: Values in italics are estimated or provisional.

For 2009, business sector’s share has dropped to 58% in total R&D funding and the government’s increased to 36%. In recent years an increasingly important source of funding R&D in Slovenia has been funds from abroad. In 2008, they amounted to €34.5m and in 2009 to €39.6m.

Main actors and institutions in research governance

The Ministry of Higher Education, Science and Technology (MHEST, <http://www.mvzt.gov.si/en/>) is responsible for the preparation of the policy documents in the R&D area, for implementation of R&D policy (that is, implementation of the National Research and Development Programme – NRDP), the public R&D budget and international cooperation in the area of R&D. An advisory body to the government in the R&D area is the National Science and Technology Council, with

¹ What needs to be taken into account here is a decline of 8% in the GDP in 2009 as well.

² According to the SORS (2009) the increase in GERD was not just a result of the increase in funds in the business enterprise sector, but also of expanded selection of reporting units in 2008.

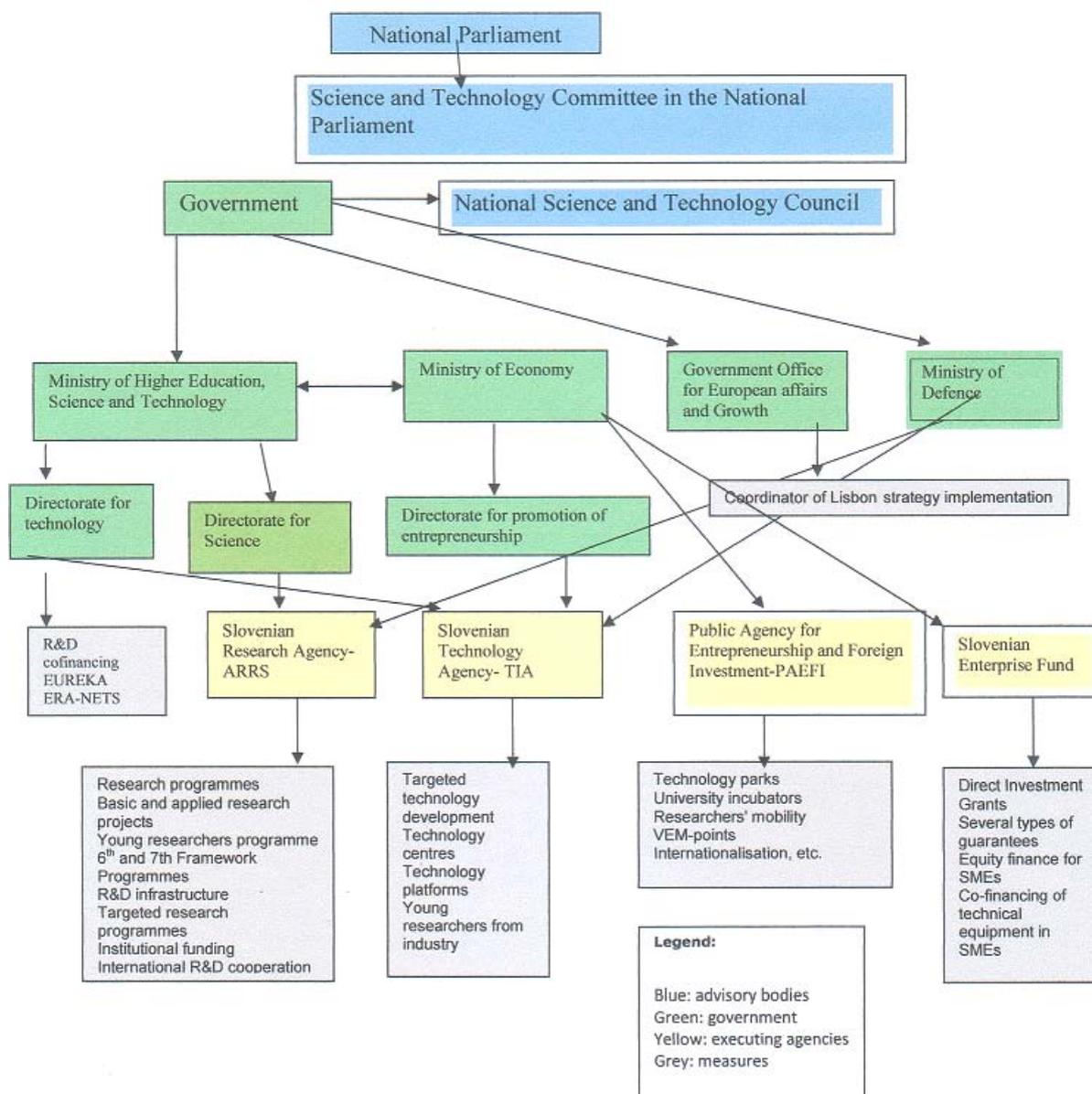
³ Data in the table are taken from Eurostat and the figures for 2007 are based on preliminary data, while data in the text are taken from final data for 2008, released by Statistical Office of RS in 2010 (SORS, 2010a) and preliminary data for 2009, released by Statistical Office in Oct.2010 (SORS, 2010b).

members from the research community, higher-education institutions, the business community and the government⁴. For the execution of R&D and innovation policy, two special public agencies have been established: [Slovenian Research Agency](#) (SRA) and [Slovenian Technology Agency](#) (TIA⁵). The first is responsible for the execution of public research financing, for the professional and independent selection/evaluation process of R&D projects and programmes and the monitoring of research implementation. The Slovenian Technology Agency is in charge of programmes promoting innovation and technology development.

The [Ministry of Economy](#) (ME) is covering the programmes in which entrepreneurship and innovation policy are combined, so certain of its policy measures are also relevant for R&D, such as the researchers' mobility scheme or support to technology parks. Some of the programmes and measures of the ME are executed by TIA, while several measures, more focused on the entrepreneurship promotion, are entrusted for the execution to the [Public Agency for Entrepreneurship and Foreign Investment](#) (PAEFI). In addition, Slovene Entrepreneurship Fund has several measures supporting SMEs and their development activity. In recent years, [Ministry for Defence](#) (MD) has become more engaged in financing R&D as well by running two major programmes, one with SRA (Knowledge for peace) and one with TIA (Technologies for peace). The [Government Office for European Affairs and Growth](#) is responsible for the implementation of the Slovenian Development Strategy (IMAD, 2005) as well as the National Reform Programme for Achieving the Lisbon Strategy Goals (SVR, 2005). The Office also coordinates the preparation of the annual National Report on the Implementation of the National reform programme – NRP for Achieving the Lisbon Strategy Goals. The Government Office of Local Self-Governance and Regional Development coordinates the EU Cohesion Funds.

⁴ ERAWATCH Research Inventory Slovenia

⁵ See: http://www.tia.si/o_agenciji,533,0.html

Figure 1: Overview of Slovenia's research system governance structure


Source: Own elaboration

The institutional role of regions in research governance

Due to the size of its population (2 million), Slovenia is in the current financial perspective considered as a single region at the NUTS 2 level. Still, for the purposes of cohesion policy, it was agreed that two cohesion regions were formed.⁶ Gradually, development of regional research infrastructure is planned. In the National Development Programme for the financial perspective 2007–2013 (NRP, 2007) and in the NSRF⁷ (NSRF, 2007), the government planned the development of several regional business-infrastructure-technology centres, where, besides the development of the necessary business infrastructure, there is also envisaged the development of

⁶ ERAWATCH Baseload Inventory Slovenia

⁷ http://www.svlr.gov.si/fileadmin/svlr.gov.si/pageuploads/KOHEZIJA/Programski_dokumenti/NSRF_Slovenia_18_06_07_Unoff_eng_trasl.pdf

R&D and innovation facilitators. This corresponded with the planned decentralisation of higher education as well as the decentralisation of R&D resources. During 2008, Ministry of the Economy issued several public calls for the assessment of viability of setting up such regional centres. In 2010, it was decided to limit this programme to a smaller number of regional development centres, for which a public call is to be issued in Nov. 2010.

Main research performer groups

In 2008, 16,243 people (headcount) were employed in R&D activity in Slovenia, of which 40% were women. Of these, 10,124 were researchers. While the business sector invests more in R&D than government does, the combined number of researchers in public research institutions (in 2008) in full time-equivalent (FTE) positions (in HEI 1,795 and in research institutes 2,156) is higher than in business (3,058). The business sector, on the other hand, employs a significantly larger number of technical personnel in R&D (2,519 in FTE comparing to 683 in public research institutes and 216 in higher education sector), suggesting that the activity is more 'development' focused. This is supported also by the figures on educational attainment of R&D personnel, where the number of employees with PhD, while on the increase,⁸ is still very low in business R&D – only 10% of all researchers or 411 in comparison with 1,213 in public R&D institutions and 2,452 in HEI.

Table 2: Gross domestic expenditure on R&D (GERD) by sources of funds and sector of performance, Slovenia, 2009 (preliminary data)

Sources of funds	Business sector	Government sector	Higher education sector	Private non-profit sector	GERD
	1000 EUR				
Total	424,399	136,351	95,669	463	656,882
Business enterprises	355,869	15,944	8,782	289	380,884
Government	49,966	109,706	74,439	130	234,241
Higher education	-	-	1,889	-	1,889
Private non-profit organisations	-	26	171	6	203
Funds from abroad	18,564	10,676	10,388	37	39,665

Source: SORS, 29 Oct. 2010

As much as 64.6% of R&D activity in 2009 (SORS, 2010b) was carried out by the business sector, especially in pharmaceutical industry (37.2% of total intramural BERD in 2007) and various industries grouped statistically under "fabricated metal products, machinery and equipment, instruments and transport", accounting for 39.5% (SORS, February 2009). These sectors have traditionally been important R&D performers and have maintained constant increase of investments. Only 11% of business sector R&D investment comes from the service sector, in spite of the fact that services account for 65.9% of GDP (2008).

⁸ From 2006 the number has increased by 37% (SORS, various years)

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

Slovenia has committed itself to Lisbon and Barcelona objectives of increasing R&D investment to 3% of GDP in all its strategic documents: Slovenian Development Strategy 2005-2010 (IMAD, 2005), National Research and Development programme 2005-2010 (NRDP, 2005) as well as in the National Reform Programme for Achieving the Lisbon Strategy Goals (Republic of Slovenia, 2005).

The government has significantly increased public sector R&D expenditures in 2009 as one of the measures to combat the economic crisis. According to the SORS (February 2010), total planned government budget appropriations or outlays on R&D (GBAORD) in 2009 amounted to €276.7m and increased by as much as 46%, compared to 2008. This has raised the share of the public sector in R&D spending by 0.27 p.p. compared to 2008.⁹ The expectations of IMAD (2010) that the business sector cannot be expected to increase R&D expenditure in 2009, due to the significant decline of economic activity in 2009 as well as the available assessments of expenditure on innovation activity¹⁰, was confirmed by the preliminary data released in end Oct. 2010, reflecting a modest decline in business R&D investment (-2.6% in real terms). In comparison with other new EU member states¹¹ Slovenia still has the highest level of business expenditures for R&D, since as much as 58% of GERD comes from business sector.

Table 3: Gross R&D expenditures (GERD) in Slovenia, 2000–2009, current prices

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
In million €	256	310	339	320	380	413	484	500	617	656
Per capita €	128	155	170	160	190	206.5	242	250	308	319
% of GDP	1.41	1.52	1.49	1.3	1.42	1.46	1.59	1.45	1.66	1.86

Source: SORS (various years)

⁹ Share was calculated based on the first estimates by SORS (2010), whereby GDP in current prices in 2009 amounts to €34,894m.

¹⁰ Expenditure on innovation activity include: investment in R&D, purchase of equipment, acquisition of external knowledge, expenditure on training, and on introduction of innovations on the market.

¹¹ Here we refer to the EU enlargement in 2004 and 2007.

The public sector financing commitments are being implemented through the national budget, currently planned in two-year cycles. Most of the funding decisions are based on already committed resources through various long-term existing programmes of SRA and TIA on the one hand and on the other, the necessary input from the national budget for the measures and programmes to be implemented through Structural Funds co-financing. The budget system has certain in-built stability, which makes it difficult to implement sudden significant increase in allocation of public funds to R&D, but at the same time avoids sudden reduction of the resources available to public R&D programmes. The budget increase witnessed in 2009 to compensate for potential decline in R&D investment of the business sector was to a large extent the result of shifting some of the resources derived from Structural funds from the infrastructure projects to the R&D sector.

Table 4: Gross domestic expenditure on R&D (GERD) by sector of performance and field of science, Slovenia, 2009 (in thousand euro)

Field of science	Business sector	Government sector	Higher education sector	Private non-profit sector	GERD
Total	424,399	136,351	95,669	463	656,882
Natural sciences	167,721	70,313	11,487	30	249,551
Engineering and technology	245,457	17,181	44,538	315	307,491
Medical sciences	2,553	6,139	13,177	0	21,869
Agricultural sciences	1,406	5,090	939	0	7,435
Natural sciences and engineering - Subtotal	417,137	98,723	70,141	345	586,345
Social sciences	6,173	20,331	15,305	69	41,879
Humanities	1,089	17,298	10,223	49	28,658
Social sciences and humanities - Subtotal	7,262	37,629	25,528	118	70,537

Source: SORS, Oct.29th, 2010

More dynamic investment in research is developing in private sector. The introduction of corporate income tax subsidy on R&D expenses resulted in positive reaction from business sector, with the business sector investment in R&D growing from €91m in 1997 to €380.8m in 2009. The level of tax subsidy has been increased in 2010 from 20% of allowed deduction of R&D expenses from corporate income tax to 40% of R&D investment regardless of the region where the investment takes place and to 60% in the case of investment in a region 15% below Slovenian average (Official Gazette, 64, 2010).

The public R&D funding follows the institutional scheme of R&D system: SRA is in charge of financing basic and applied research primarily in public research sector, while TIA and the MHEST by itself finance the R&D activity in business sector or in projects, where both public and private R&D institutions are involved. In addition, resources of the Ministry of Economy are provided through PAEFI for measures supporting the mobility of researchers and the running of intermediary institutions (technology parks, university incubators etc.).

Major share of the SRA funding is taken up by so called Research programmes, where contract period is usually five years- this by itself secures important part of

public R&D investment. A gradual shift in the structure of financing with a reduction of share of programme financing in favour of more project-based financing was planned in the on-going NRDP (2006-2010), but the recent analysis of SRA showed that from 2005 to 2008 this had not been implemented (SRA internal evaluation, January 2009). SRA annual budget for 2010 is €184.8m.

TIA has been involved in R&D financing for business sector, but up to 2008 in much smaller amounts - annual budget was under €30m. More resources were planned already for 2008, but were not fully distributed due to the delays in issuing of public calls for some of the new measures¹². In 2009, €51m was distributed through TIA's different support programmes (joint development-investment projects, young researchers from industry, technology for security and peace, technology platforms, etc.), only to decline again in 2010 due to the decision of MHEST to run the call for competence centres by itself and Ministry of Economy to entrust the call for development centres to PAEFI¹³.

The funding structure is expected to change significantly with the new National Research and Innovation Strategy (NRIS), prepared by the MHEST for 2011-2020. The proposal is opened for public discussion till end Nov. 2010, and is triggering heated debates in research sector. The government proposes a shift from individual programme funding to more institutional funding both for public R&D institutions as for HEI, but at the same time expects more ambitious involvement of the institutes in engaging with business sector to finance higher percentage of their research activity. For the HEI, block funding of research as part of the regular activity of university professors is proposed, which should be allocated autonomously by the university. Since the proposal is in the early stage of the consultation process, it is difficult to predict the final outcome.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

The National Reform Programme 2008 recognised the inability of Slovenia to achieve the 3% R&D investment target by 2010, as originally planned. The target was postponed to 2013, but that was decided before the economic crisis. With austerity measures planned for 2011 and 2012 and the budget outlay for these two years, no increase in public R&D funding is planned. This stability, which in view of serious cuts of some other government expenditures is seen by MHEST as relative success, is likely to be maintained throughout the remaining part of 2007-2013 financial perspective, since significant number of measures for the promotion of R&D has been incorporated in the Operational Programme for Strengthening Regional Development Potentials and thus needs to be steadily supported by the national resources as well. With the proposed NRIS, even a gradual growth of public resources is predicted for the period following 2012, but subject to increased efficiency of R&D sector.

¹² Most of the measures have been included under the Operational Programme for strengthening regional development potentials, under priority »Competitiveness and research excellence« (OP Regional, 2007). This makes the execution a much more complex procedure, since each call not only has to be screened by the Ministry responsible for a particular measure but also by the Government's Office responsible for the implementation of OP as a whole.

¹³ TIA expected to be the implementing agency for both and had its annual programme evaluated at nearly €104m.

One of the strengths of resource mobilisation in Slovenia has been the growth of business R&D investment. Further growth depends on the enterprises currently inactive in R&D and innovation: their involvement in R&D needs to be promoted along with sufficient increase of the absorption capacity for new knowledge/technology. This is a much more complex task, which the government is trying to achieve through design of different mobility measures, support to development & investment projects (where resources are not only available for research part of the project, but also its developmental and investment component in initial production capacities), support to intermediary institutions, which provide consultancy to small and medium enterprises (SMEs) and special calls, focusing on start-up companies. These measures, along with raising awareness and promoting R&D and innovation have as their objective the increase of business R&D investment to the level of 2% of GDP by 2013. The Slovene Enterprise Fund (SEF)¹⁴ supports the start-ups in technology parks and university incubators through direct subsidies. The measure was started in 2007 and has been further expanded in 2008, providing also a continuous support to the newly established firms, which have already received an initial subsidy to meet their further development costs. SEF provides for supplementary guarantees, which helps SMEs in obtaining bank loans.

The [Chamber of Industry and Commerce](#) has launched a venture capital fund in 2006 to assist enterprises in new ventures in high-tech areas¹⁵. The government has been planning since 2005 to form a private-public partnership to start a venture capital fund, and has in 2008 got the legal clearance, but by 2010 SEF decided to provide indirect support by providing equity finance to private venture capital firms. Overall, venture capital is still relatively underdeveloped in Slovenia. There are several smaller private venture companies, which do not necessarily finance projects in Slovenia only. First within PAEFI, an initiative was launched to form a club of so called "Business Angels"¹⁶, through which successful individual entrepreneurs support new potentially profitable projects, proposed by individuals. For the potential entrepreneurs support programmes under the Operational Programme "Developing of Human Resources" (OP Human, 2007) are also of interest: several programmes in entrepreneurial training are planned with special attention to employability, self-employment, life-long learning, entrepreneurial and management skills etc.

In addition to the government, several other institutions are also involved in promoting entrepreneurship. The Chamber of Commerce and Industry provides info desk to new entrepreneurs and offers consultancy, so does the Chamber of Crafts. Local communities, especially larger ones, like the City of Ljubljana, have their own entrepreneurship promotion centres, where SMEs can find necessary information and support for their ideas. Also, some private consultancy firms are engaged in providing assistance to SMEs, either through voucher scheme, financed by PAEFI or their service is being subsidised by the local community.

Important segment of the new NRIS is devoted to the promotion of R&D and innovation activity in business sector, from supporting cooperation between public and private R&D to high tech start-ups and/or spin-offs. This is seen as necessary not only for meeting the national R&D investment targets but particularly due to the required transformation of the business sector towards higher value added activity.

¹⁴ See: <http://www.podjetniskisklad.si/index.php?id=86>

¹⁵ RSG Capital – venture capital management, <http://www.rsg-capital.si/eng/intro>

¹⁶ See: <http://www.poslovniangeli.si/Domov/o-klubu.aspx>

2.2.3 Providing qualified human resources

In terms of human resources, Slovenia compares well with EU average, but of course is lagging behind the top countries like Finland or Sweden. The share of researchers in total employment in Slovenia is 0.71%, with EU27 average at 0.68%.

Table 5: Researchers by sector of employment (FTE), 2008

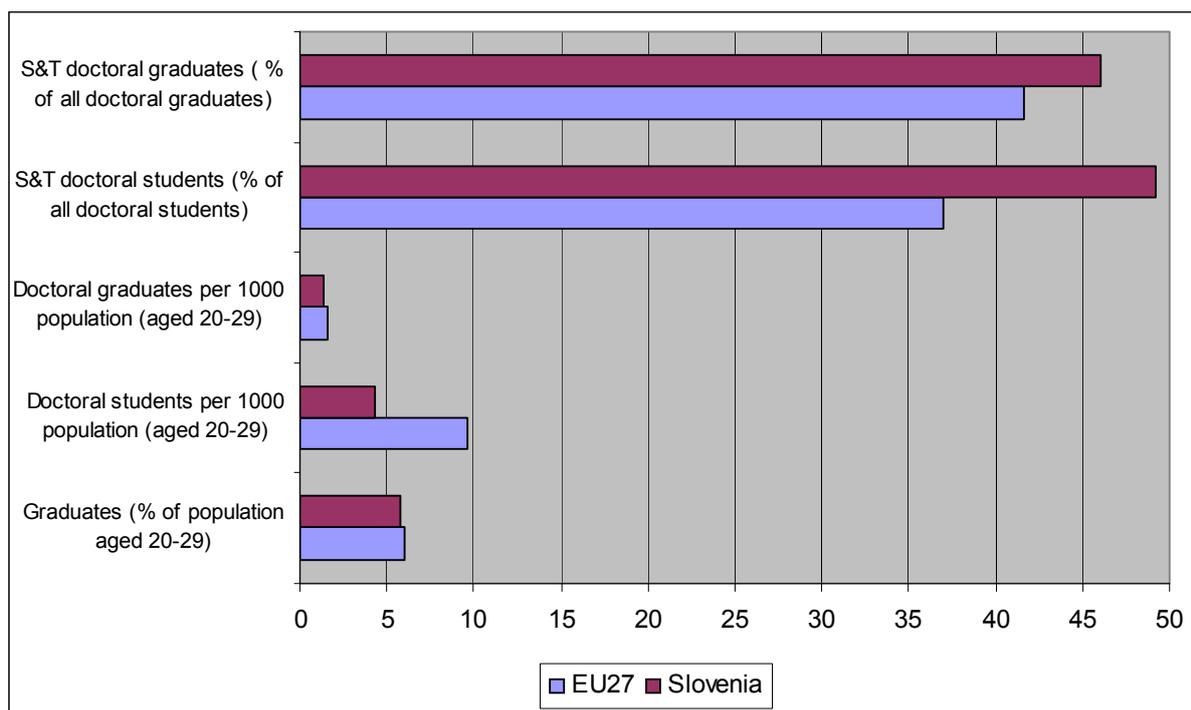
FTE	Business sector		Government sector		Higher education sector		Private non-profit sector		Total	
	total	female	total	female	total	female	total	female	total	female
Natural sciences and engineering - Subtotal	3,006	677	1,612	618	1,385	525	17	4	6,020	1,824
Social sciences and humanities - Subtotal	52	18	545	285	410	194	6	4	1,013	501
Total	3,058	695	2,157	903	1,795	719	23	8	7,033	2,325

Source: SORS, 2009

No detailed analysis on whether there is lack of candidates for job openings in R&D sector has been undertaken, but business firms occasionally report on difficulties in finding the engineering and IT experts, especially for openings outside major cities. The unemployment data shows that among registered unemployed there are 8.2% of job seekers with tertiary education¹⁷, but mostly from humanities and social sciences. Recent trends show increase in number of young people with completed higher education, looking for their first employment. Of specific concern is the recent increase in unemployment of people with PhD. According to the Employment Agency, there has been considerable growth of their number: from 40 people in 2008 to 63 in 2009 and 66 by the first quarter of 2010. The highest share of unemployed PhDs (32%) is in the field of natural sciences, followed by technical science (27%) and social sciences (21%) (Kozmus and Vrečko, 2010).

The number of students enrolled in tertiary education relative to the number of the population aged 20–26 increased from 29.9% in 2000 to 41% in 2008/2009. As noted by IMAD (2010), in the academic year 2008/2009, participation of the generation at enrolment age in tertiary education (53.1%) was close to the Slovenian Development Strategy target (55%). The government has tried to encourage enrolment by offering better scholarship options to S&T students as well as limiting the enrolment in the most popular programmes (law, economics, social sciences), yet so far these measures have only slowly resulted in shifts in students' preferences. In 2005, the share of S&T tertiary students at all levels was 21.0%, by 2008 it has increased to 25.2% of all enrolled (114,391 students) (SORS database on education).

¹⁷ See: <http://www.ess.gov.si/files/1528/MI070810.pdf>

Figure 2: S&T doctoral graduates in Slovenia and EU27 in 2006

Source: Eurostat (2010)

One of the most serious problems of country's higher education is the question of efficiency of studies. In the academic year 2008/2009, the share of repeat students enrolled in full-time undergraduate study programmes and long non-structured master's study programmes stayed at about 10%.¹⁸ The average duration of studies of full-time university graduates is among the highest in Europe. In 2008, the average duration was 6.7 years (2007: 6.8 years).¹⁹ The low efficiency of studies is also seen by comparing data on the number of students in tertiary education per 1,000 population aged 20–29, where Slovenia is well above the EU average,²⁰ with data on the number of graduates of tertiary education per 1,000 population aged 20–29, where Slovenia lags behind the EU average.²¹ The dynamic of growth of new higher education students has not been followed with adequate increase in the number of teaching staff²². This affects the quality of education, partly responsible for efficiency of higher education.

The programme of young researchers has been one of the most successful Slovenian instruments in stimulating young people to pursue scientific careers. Launched in 1985, it provides funds for post-graduate studies and PhD work. Young researchers participate in research work during their postgraduate studies on basic research or R&D applied research projects, they have regular, fixed-term employment contracts, the Ministry of Higher Education, Science and Technology finances via the Slovenian Research Agency their salary, social contributions, as well as material and non-material costs for research and postdoctoral study. Funds for the

¹⁸ The share of repeat students enrolled in the first year is slightly higher.

¹⁹ Data from EUROSTUDENT III (2005–2008), available for 2006 or 2007

²⁰ In 2007, the ratio in Slovenia was 40.1, the EU average was 28.6 (IMAD, 2010).

²¹ In Slovenia, the number of graduates in tertiary education per 1,000 population aged 20–29 was 57.7 (EU27: 59.9).

²² The student/professor ratio in Slovenia was 23.0, significantly above EU19 (only OECD members of EU) average of 16.4 in 2005 (IMAD, 2008: 113).

training of junior researchers are allocated for a fixed-term, up to a maximum of four years and six months for a science Ph.D. programme (doctorate). Between 200 and 250 new junior researchers complete the training programme every year, with the same number of new junior researchers being included in the programme. In cooperation with the Ministry of Economy, a new sub-programme was opened in 2001 specifically to young researchers from business sector that pursue graduate studies, attracting initially around 30 students per annual call. In 2008, the financing had been supplemented by the European Social Fund and planned resources increased to the level of €5.96m. This should make possible to annually add 80 new young researchers to the scheme. This measure is a direct response to the lack of highly skilled researchers in business R&D and has been well received by the enterprises. It opens, however, a question of sufficient number of candidates for both schemes of Young researchers, in particular of the candidates from Science and technology (S&T) area.

The human resource issue is addressed also by the measure, introduced by the Ministry of Economy in 2006, under which a transfer of researchers from public research institutions to business R&D units is supported. The measure is implemented via Public Agency for Entrepreneurship and Foreign Investment – PAEFI²³ and it provides for co-financing of the salaries of the researchers who have been working in public R&D units and are to move to business sector. The success rate of the uptake of such mobility scheme in 2006 was modest, so several modifications were introduced in 2007 and 2008 to make it more attractive. One of the novelties is the encouragement of the transfer of highly-skilled personnel from large enterprises to the small ones. The specific criteria is that the researchers eligible are those with engineering or natural science background and that they should continue working in the same area of research. The goal for 2009 was to achieve at least 30 transfers from public R&D to business sector and another 10 from large corporations to small and micro firms.

2.3 Knowledge demand

This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.

Economic and financial crisis, which hit Slovenia hard (GDP dropped by 8% in 2009) disclosed passive and slow restructuring of Slovenian economy, rather than planned efforts in strategic documents, aimed at restructuring and creation of high value-added jobs. The insufficient competitive capacity of the economy has also been a consequence of insufficient consolidation of factors relating to efficient use of knowledge and innovation in economic development. This suggests that the recent measures supporting business R&D have not yet resulted in a positive change, but in view of the fact that most of the increased financing only started in 2008 and 2009, it would be unrealistic to expect this.

To improve the identification of knowledge demand as well as business opportunities, supported by new knowledge the Competitiveness council was established in 2008. The objective was to help identify the priorities for Slovenian science and technology development by bringing together the actors in public research organisations and the business community in 10 so called “development groups”. Their task was to suggest future direction of allocation of public R&D funding. Yet the impact of their work was

²³ See: <http://www.podjetniski-portal.si/content.aspx?docid=8587&rootnodeid=9>

not translated in the funding priorities of the main stakeholders (MHEST, SRA, Office for Growth, Ministry of Economy, TIA). Partly this can be explained by many other more pressing issues on the government's agenda due to the financial/economic crisis and partly to the fact that during 2010 the government is preparing a new National Research and Innovation Strategy (to replace what was up to now five-year National Research and Development Programme), where a new institutional set-up, financing and allocation of R&D resources are proposed.

According to the Law on Research and Development (2002²⁴) the ministry responsible for science needs to prepare the draft text of basic policy document in the area of R&D. For the new programme, the government first asked the Council for Science and Technology to prepare the Guidelines, which were agreed by the members of the Council in June 2010. On the basis of these, the government prepared a draft version of a new programme, where, to stress its focus on stimulating business R&D and innovation, even the title of the document has changed. In mid-October the document was, according to the law, opened for *public discussion* among different stakeholders. The Slovenian Chamber of Industry and Commerce is traditionally asked to organise the debate on behalf of the business sector, being the forum for business to express its opinions on various government policies. This is the opportunity for business sector to specify its expectations from R&D policy as well as assess if the priorities proposed are in accordance with their knowledge demand. The draft NRIS was discussed by the Chamber in beginning of November 2010 and received support from business community²⁵. In particular, the stress on increased support for both technical and non-technical innovation was welcomed as well as several new measures proposed for strengthening the cooperation between business and public R&D sector. Still, the business community feels that research has so far not been contributing sufficiently to the competitiveness of Slovenian economy. The planned reorganisation of support agencies was welcomed and further elimination of red tape, especially in connection with the support measures, co-financed through Structural funds, called for. The Chamber also suggested a change in evaluation criteria for R&D personnel, where the contributions to business results should be acknowledged on equal footing with scientific publications.

Research efforts to address major societal challenges

The current structure of public R&D funding depends on bottom-up selection of research priorities, so no structured effort to focus the research towards major societal challenges has so far been initiated. The only tool to finance such projects, but on a limited financial and time scale, are the Targeted Research Projects where government offices and ministries commission research relevant for their policy making.

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

²⁴ See: http://zakonodaja.gov.si/rpsi/r07/predpis_ZAKO3387.html

²⁵ http://www.gzs.si/slo/storitve/politike_in_zakonodaja/stalisca_gzs/52254

2.4.1 Quality and excellence of knowledge production

The backbone of Slovenian knowledge production in public sector is the 47 research institutes and four universities. More than 30% or 1,805 of researchers (in FTE) in 2006 were employed in research institutes, and only slightly fewer (1740) at higher education institutions. Except for the largest public institute Jozef Stefan Institute with more than 800 employees only few research institutes employ more than 50 people. Even smaller research groups exist at the universities, where current regulations allow regular teaching staff with 100% pedagogical assignment to participate on top of these 100% in the amount of 20% of FTE in publicly funded research²⁶. It is quite customary that each department / chair is involved in research around the topic of their own interest, but some faculties / universities have their own research institutes as well²⁷.

The improvement of quality and excellence in knowledge production has been one of the major goals of the old NRDP. Among the specific targets in this category were: increase in number of articles and citations as recorded in ISI Web of Knowledge, Essential Science Indicators as well as increase in participation of Slovenian researchers in international projects (Sorčan et al., 2008). Several policies have been introduced with this in mind. Probably most direct impact on the increase of quality (especially if measured by bibliometric criteria) has been the evaluation system for publicly funded research and the promotion criteria in R&D and higher education sphere. The evaluation of socio-economic relevance of research was also introduced, but based only on the indicator of generated additional resources from non-budget sources.

This increased attention to publicising has resulted in high growth of output in public research sphere – Slovenia ranks 6th among OECD+ countries in terms of ratio between scientific publications and R&D expenses in the period 2004–2006. Since 2002, Slovenia has an annual average growth rate of 8% in publications, resulting in 30% increase by now (Sorčan et al., 2008: 71–8).

Also important indicator of quality is the citation index, which has been built in all evaluation systems currently applied (both by the SRA as well as by the Universities in their promotion criteria). The share of Slovenian science in all citations is rather small (0.11%), but the rate of growth is again quite impressive with more than 16% during the period 2002–2006 (*ibid.*, data taken from Thomson ISI Science Indicators 2006). In terms of impact factor, Slovenia is below OECD and EU (4.89) average at 3.13 (relative impact factor is 0.68%) (*ibid.*: 76). More encouraging is the comparison of publication results with the level of GDP (seventh place) and the resources available for R&D (publications/GERD) where Slovenia was in the sixth place for the period 2004–2006 (Thomson ISI Science Indicators 2007, reproduced in Sorčan et al., 2008: 78). For appropriate assessment of these results, one needs to take into account the size of Slovenian research sector as well as the resources available.

Looking at the sector distribution of publication results, the highest share (59%) comes from natural sciences, followed by technical sciences (19%) and medicine (15%). The relative impact factor shows somewhat different ranking: for technical sciences the relative impact factor is 0.81, followed by agricultural sciences (0.78)

²⁶ This explains the difference between the head count of the number of persons employed in R&D in higher education (3,552) and the figure expressed in FTE (1,740).

²⁷ For example, Faculty of Economics at the University of Ljubljana has its own Research centre with 137 researchers, most of them being involved also in teaching (but not all of them); many similar specialised research centres exist in faculties in the fields of natural sciences and medicine.

and natural sciences (0.69). What is characteristic for all scientific fields is gradual increase in relative impact factor in the recent period (from 2002 onwards).

In 2005 Slovenia recorded 1,104 scientific publications per million inhabitants, while the EU15 average was 1,028 and the average for EU27 887 publications per million. By 2008 this figure had increased significantly – Slovenia had 1,637 publications, EU15 average was 1,176 and EU27 average was 1,037 publications per million (ISI, National Indicators 2008). This achievement places Slovenia on fifth place within EU.

The number of patent applications filed by Slovenian applicants at the European Patent Office (EPO) increased considerably in 2008. Nevertheless, with 63.7 patent applications per million of population,²⁸ Slovenia still lags behind the EU average (131.1) although it ranks in the middle of all EU Member States (14th) and is ahead of almost all other new members (IMAD 2010). The number of patents in a certain country depends on several factors related to human capital, production structure²⁹ and a supportive institutional environment. It is particularly evident that the countries with a higher number of researchers³⁰ in the business sector also present higher numbers of patents per million population. It is therefore important to note that over the last two years and throughout 2000–2008, the number of researchers in Slovenia has increased mainly in the business sector.

What can be observed from the 2008 and 2009 data collected by the Institute for Information Science through SICRIS (Slovenian Current Research Information System) in terms of reported patents and patent applications by the registered R&D units, the numbers are relatively equally spread among the three sectors: business R&D units, HEI and public research institutes. In view of the current relatively poor promotion of patenting at HEI and insufficient legal arrangements (the regulating on the patenting procedure and distribution of potential income from patents is left to the individual university/research institute), the results are encouraging. Also, several patents and patent applications have been reported by the Centres of excellence, which are the product of a new measure to stimulate concentration of research potential in key priority areas, selected on the basis of both, scientific excellence and business interests (more on centres of excellence in chapter 5). Since the first centres of excellence were established in 2005, figures of 33 patents in two years and 48 patent applications are impressive and confirm that the measure has been the correct one (Bucar et al., 2010).

²⁸ In 2008, Slovenian applicants filed 129 patent applications at EPO, which is 12.2% more than the year before when they filed 115 applications (EPO Annual Report 2008, 2009).

²⁹ A low share of final products in the production structure has a negative effect on patenting since the suppliers of intermediate products are less motivated to apply for patents.

³⁰ Expressed as full-time equivalent (FTE)

Table 6: Patents and patent applications according to sector of applicant (2008 and 2009)

	2008		2009	
	Patents	Patent Applications	Patents	Patent Applications
Business sector R&D	80	78	77	73
HEI	73	59	87	98
Public research institutes	96	33	61	132
Centres of excellence	26	7	7	41
TOTAL	249	170	225	303

Source: Calculated from data of IZUM-SICRIS, 2010

In spite of the progress made in recent years, Slovenia is, as are other new member states, under the EU average in the category of 'innovation throughputs', as seen from the figure below. This is one of the areas where more systematic research is also needed to see what are the reasons behind relatively low activity in the field of intellectual property rights in business sector.

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

Slovenia established an independent national evaluation agency for higher education in May 2010, but the agency has not yet issued the guidelines for the accreditation of the higher education programmes or for their evaluation. The accreditation of the programmes / new faculties / new universities was previously done by the Higher Education Board at the MHEST³¹, which was also to perform the evaluation of the universities, but it was found that an independent agency is needed. The new programme on higher education 2011-2015 makes the evaluation the basis for financing of higher education institutions, so the preparation of the guidelines is very sensitive and important task for the new Agency and has raised a lot of public debate.

Changes in the evaluation processes, aiming at increasing the quality of knowledge production, are proposed in new policy documents as well. The key element in terms of quality is the introduction of evaluation at the level of the institutions (research institutes/ higher education institutions) and not only at the level of research programmes, which is the practice by Slovenian Research Agency today. Should the two documents (National Research and Innovation Strategy and the National Programme for Higher Education) be accepted as they are proposed, the higher education as well as the public R&D sector will have to undergo relatively radical transformation within next few years. Due to the on-going public debate and harsh criticism from many stakeholders the outcome is difficult to predict.

³¹ The Board has often been criticised as subjective and politically biased, since the members are appointed by the Minister. Also, several of their decisions on accreditation of various higher education programmes submitted particularly by private institutions have been criticised as not being based on quality assessment but on the political orientation of the founders.

2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

2.5.1 Knowledge circulation between the universities, PROs and business sectors

Over the years, Slovenia has built relatively extensive R&D, innovation and entrepreneurship support network. Several bridging institutions were introduced with the aim of improving knowledge flows from public R&D institutions to business enterprises. The key objective of setting up this wide variety of support institutions has been the promotion of the cooperation between public R&D sphere and business sector.

The promotion of knowledge transfer has been set as one of the national objectives supported also through the Operational Programme for Strengthening Regional Development Potentials (OP SRDP) as a part of the financial perspective 2007-2013. This is to provide additional financial resources to support the network of bridging institutions and offers a good opportunity to build a more transparent and user-friendly support network. Further changes in industrial policy and in the system of financing research activities so as to encourage cooperation between research companies and industry were planned in NRP 2008-2010, including the continuation and expansion of the joint R&D projects.

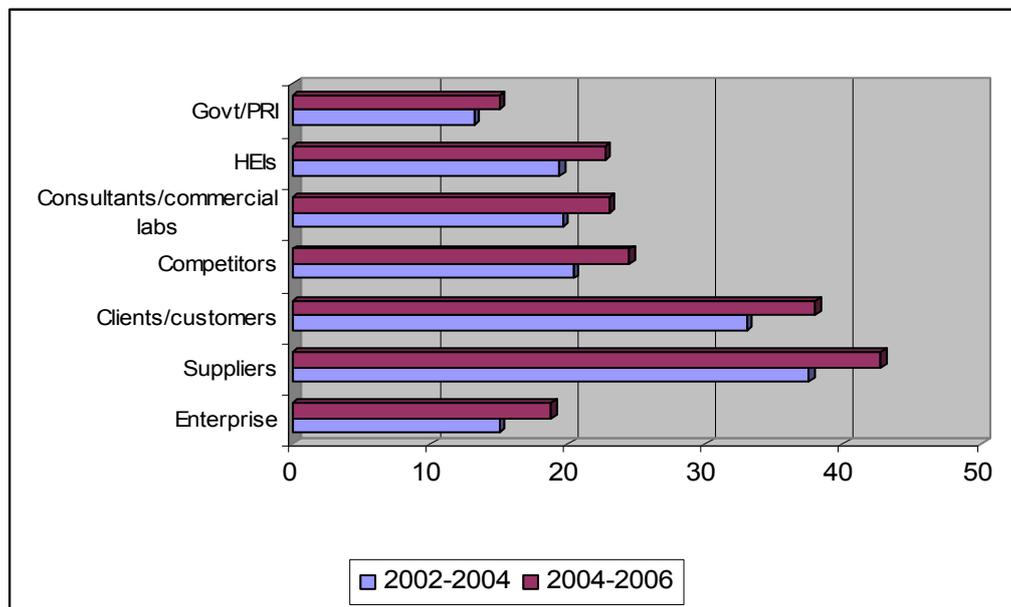
According to CIS 2002–2004 and 2004–2006, the cooperation of innovation active enterprises is on the increase in all categories. The most dynamic and closest is the cooperation with the suppliers on one hand and the customers on the other. This could be expected in the production value-chain. The degree of innovation cooperation places Slovenian enterprises on the fourth place in EU. An increase in cooperation is recorded also in cooperation of innovative enterprises with HEI and public research institutes, even though this is the least active area of cooperation. The key objective of setting up a wide variety of support institutions has been the promotion of the cooperation between public R&D sphere and business sector. This, however, seems to remain one of the deficiencies of the Slovenian R&D and innovation system.

Here, a certain level of criticism is due of the public R&D sector, where the preparedness for change and reorientation towards the needs of the business sector has been rather weak. The public sector employs a large share of the Slovenian science community. Its 'detachment' from daily business challenges, in part the consequence of the insufficient system support,³² is often the biggest barrier to more active cooperation. In spite of several suggestions made by the different actors (business sector, foreign and domestic evaluators of NIS) to adjust the promotion

³² The allocation of public funding (SRA) is based primarily on the publication and citation record of research groups.

criteria in HEI and public research institutes and put more emphasis on the practical experience of researchers (trying to measure the business impact of research, not just scientific excellence), the changes introduced in recent years have actually put additional emphasis on scientific excellence based on publications and citations.

Figure 3: Share of innovative enterprises cooperating by innovation activity with other subject 2002–2004 and 2004–2006



Source: SORS (2006, 2007)

The low relevance of public research units for innovation activities of enterprises is reflected also in the answers the enterprises quote as the source of relevant information for their innovation activity. As seen in the figure below, only very small amount of information, coming from public R&D is considered relevant by the business.

Table 7: Highly important sources of information for innovation, as a percentage of innovative enterprises (year 2006)

	No.	No. of Innovative firms	Share
Within the enterprise or enterprise group	788	1,379	57
Suppliers	411	1,379	30
Clients/Customers	618	1,379	45
Competitors or other firms in the same sector	277	1,379	20
Consultants	101	1,379	7
Universities and other HE institutes	80	1,379	6
Government and Public Research Organisations	29	1,379	2
Conferences, Trade fairs, exhibitions	240	1,379	17
Scientific publications	138	1,379	10
Professional and Industrial associations	83	1,379	6

Source: CIS 5

Several successful companies have, however, established links with public research either at universities or research institutes and formed permanent teams of researchers from both sides. According to their statements, it took some time to find a common language and to develop fruitful cooperation, but in the end, the result is beneficial to both sides (Bučar and Rojec, 2009). The measure, which proved to be

very effective in stimulating the cooperation between the public R&D and the business sector, is the financing of young researchers from business sector. Even though this was not the prime objective of the measure,³³ the young researchers provided a communication linkage between their employer – the business firm and their educator – HEI. This often resulted in more intensive cooperation in R&D field. On the other hand, several measures aimed specifically at supporting the cooperation between public and private R&D units, were often not known to the enterprises (like the mobility scheme, for example).

2.5.2 Cross-border knowledge circulation

Increased participation of Slovenian researchers in international R&D cooperation is one of the objectives of the NRDP and is actively promoted through various measures. Co-financing is provided for the participation of Slovenian researchers at international conferences and for their membership fees in international research associations. Also, preparation of the project proposals for EU Framework Programmes is encouraged not only via providing technical and information assistance, but is also financially stimulated. More and more research programmes are open to foreign participation, even though seldom financial support is provided for the foreign participant. Slovenia has signed numerous bilateral agreements on cooperation in S&T field and is actively engaged in several multilateral programmes with the ambition to secure itself access to international knowledge.

2.5.3 Main societal challenges

As already mentioned, there is no systematic prioritisation of specific research fields, addressing societal challenges, either for the national or for cross-boarder knowledge circulation.

2.6 Overall assessment

Table 8: Summary of main policy related opportunities and risks

Domain	Main policy related opportunities	Main policy-related risks
Resource mobilisation	<ul style="list-style-type: none"> Continued support to R&D in business sector; Higher education reform to stimulate enrolment in S&T studies. 	<ul style="list-style-type: none"> Pressure for public budget allocation to other, non R&D related issues and consequent relative decline of public funds available for R&D; Insufficient measures to support human resource development in S&T area.
Knowledge demand	<ul style="list-style-type: none"> More attention to the identification of knowledge demand in business sector via technology platforms; Planned systematic encouragement of public R&D units to generate more funding from business sector. 	<ul style="list-style-type: none"> Insufficient policy coordination; Lack of appropriate mechanisms to translate knowledge demand of business sector in public R&D priorities; Pressure from large R&D institutes to maintain the current level of public financing and not make them more dependent on business sector.

³³ The measure aimed at increasing the educational structure of the researchers employed in business R&D units.

Domain	Main policy related opportunities	Main policy-related risks
Knowledge production	<ul style="list-style-type: none"> • Regularity of evaluation procedures in public R&D; • Proposed systematic development of independent evaluation body in higher education and in public R&D. 	<ul style="list-style-type: none"> • Powerful lobby groups within public R&D who have strong impact on evaluation criteria; • Difficulty in assuring objectivity in relatively small R&D and higher education community.
Knowledge circulation	<ul style="list-style-type: none"> • Additional financial resources to support knowledge transfer; • Attention in new NRIS to building of a transparent and sufficiently client-friendly support network. 	<ul style="list-style-type: none"> • Fragmented support network/ instruments for knowledge transfer; • Low absorption capacity of SMEs, especially small enterprises.

Table 9: Main barriers to R&D investments and respective policy opportunities and risks

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Need to cut down government expenditures in view of the budget deficit	Demonstrate to other ministries the positive impact of investing in R&D and innovation by measurable targets for public and business R&D
Slow recovery of business sector from economic crisis and thus difficulties for the firms to maintain R&D investment at current level	Continue tax subsidies for R&D investment

3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The [Communication Better careers and more mobility: A European Partnership for Researchers](#) proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of [EURAXESS – Researchers in Motion](#). Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

The mobility of researchers, professors and students has increased significantly since the membership of Slovenia in EU. The government actively supports the participation in various mobility programmes through the Centre of the Republic of Slovenia for Mobility and European Educational and Training Programmes (CMEPIUS). The centre is a public institution working in the field of international projects and international mobility. It was established in October 2003 and continues the work of the previous EU Programmes Agency. It performs two main tasks:

- co-ordinating the Lifelong Learning European Community Programme (successor of SOCRATES and LEONARDO da VINCI), and
- supporting development in education and training.

CMEPIUS pursues national programmes of mobility (bilateral and multilateral scholarships of the Republic of Slovenia and scholarships for Slovenes living abroad) and activities of some other European programmes in the area of education and training, including Erasmus Mundus, the eTwinning National Support Centre, and the European Language Label initiative. Within the activities of the European Research Area (ERA) the Centre also acts as a Bridgehead Organisation for the EURAXESS networking project and performs the function of the National Mobility Centre.

While there is no central data base on mobility, the CMEPIUS reports in its annual report of 2009 that 9409 students participated in their EU programmes, 7980 teaching staff and 847 international joint projects (Comenius, Gruntvig, Leonardo) in area of education were carried out. But typically, at HEI as well as at research institutes international mobility can be organised independently as well, through own resources and these figures are not available publicly.

While the outside mobility has expanded significantly, the inward mobility is still restrained. One of the barriers still existing in Slovenian higher education is legal binding to provide teaching and teaching material in Slovenian language. Gradual introduction of joint PhD programmes at different universities allows for greater flexibility in use of language and opens doors to students from abroad. The proposal of the new National Programme for Higher Education includes the change of the current legal requirement and further encouragement of 2nd and 3rd level of university programmes to be prepared in foreign languages and in cooperation with foreign higher education institutions.

SRA has introduced a special measure where financing is provided to a visiting renowned researcher from abroad³⁴, who joins for up to three months to one of the research programme groups and helps increase the international publication output of the Slovenian team. This measure was introduced to help Slovenian researchers increase the quality of their work and not primarily to promote mobility, for which several bi-lateral cooperation agreements are available as well as EU programmes (Marie Curie, for example).

Slovene research institutions and universities have only in the last two years entered into 17 Marie Curie host driven actions that offer research training to young researchers within the first five years of their research careers and that provide engagement also to experienced researchers. As a host country to foreign researchers, Slovene research institutions experienced some problems in structuring an adequate monthly income for the hosted researchers, due to discrepancies

³⁴ See: <http://www.arrs.gov.si/sl/progproj/rproj/razpisi/08/razp-tuji-razisk-09.asp>

between the national regulation (treating researchers as civil servants) and the awarded funds of the European Community which had impact on the attractiveness of Slovene host institutions. In July 2010 an amendment to the national legislation was adopted, which released the payment of European funds (or funds from other international – multilateral resources) to foreign researchers.

While there is little systematic research on inward mobility, R&D institutes report on complicated legal procedures for obtaining working / residence permit for non-EU researchers. Slovenia duly adopted the European Directive on Scientific Visa from 2005 into its legislation by amending the acts on foreigners and on the employment of foreign workers, due to the progress in the field of facilitating the migration of highly skilled workers in Europe, further changes in the Slovene legislation for the field are in preparation.

3.1.2 Providing attractive employment and working conditions

The majority of public research organisations in Slovenia have so far not signed the Charter for Researchers. The MHEST is actively working on promotion of the signature and elimination of the remaining obstacles in cooperation with other government departments (Ministry of Labour, Ministry of Internal Affairs). The reluctance so far derives from certain collision of the Slovenian national legislation regarding remuneration of public researchers, which needs to follow the Public Sector Wage System Act and a collective agreement for all public sector employees. Slovenia recognized the principles and recommendations expressed in the European Charter for Researchers and in the Code of conduct for the employment of researchers in November 2008 when the two documents, the Charter and the Code were signed by the Rectors' Conference of Slovenia. In 2010 the University of Maribor was awarded the acknowledgement of excellence in Human Resources by the European Commission.

The MHEST participates in European efforts to promote the principles of the European Partnership for Researchers and undertakes involvement in the preparation of European strategic documents in the field of human resources in science and technology.

Salaries in public research organizations are regulated through a Public Sector Wage System Act and a collective agreement for all public sector employees³⁵. To certain extent, the individual research institutes may increase the salaries of their staff on account of so called "market funds" (the earnings from research financed by business sector), yet this option is limited especially for public (state) research institutes. Slovenian labour market for researchers is not a particularly open one: much of the recruiting is in- house, through the Young researchers programme. The lack of possibilities that the public salary system offers for differentiation of remuneration, based on quality is often heard complaint from directors in public R&D organizations and is even more pronounced within the universities. Among the changes proposed for the future in the new National Research and Innovation Strategy is also the exclusion of research staff and higher education staff from the public sector wage system act to allow for more flexibility in remuneration. Yet this proposal was attacked by the Union, since they fear it would lower the social security of the employees in public R&D.

³⁵ See: http://www.mju.gov.si/en/legislation_and_documents/legal_acts_in_force/

Promotion of women in science has been for several years in the forefront of the MHEST policies with a special working group dedicated to this issue. Specific arrangements exist for young researchers in case of maternity leave³⁶, where their status can be extended for the period of their absence from work. Same applies also for women working at higher education: their status is maintained and the leave does not count into re-election time frame. There are no national policy level regulations which would in any way discriminate on the basis of gender, yet statistics still show that the higher up the academic ladder one moves, fewer women can be found. Also, among research programme group leaders or heads of research project proposals, approved by SRA, there is clear gender discrepancy (ibid).

3.1.3 Open recruitment and portability of grants

Only exceptionally open recruitment is practiced by public R&D institutions. So far, the public grants through Slovenian Research Agency are usually institution- bound, so portability does not apply.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

Social security is high for the research staff with permanent positions. But more and more, new/ junior job openings in public research sector are on limited-time basis only, for the duration of the Young Researchers programme funding or the duration of the individual project/ programme. While in principle all public calls are opened to EU nationals, in practice it is not noticeable that there would be growing inward researcher mobility.

According to the information provided by the Ministry of Labour, out of all workers posted abroad in 2010 from Slovenia, only a small proportion were researchers. Taken this number into account, the biggest share can be identified as university scholars, particularly language assistants posted by a Slovenian university to another university. A significant number of posted employees can also be identified as employees in the Slovenian pharmaceutical companies, both those that have foreign ownership as those who have majority Slovenian ownership and who are posted to other units of the same group/holding. Significant numbers of posted workers can also be identified as employees of the automobile and domestic appliances industries, mainly workers with special technical knowledge/engineers, which are posted to other units of the same group/company in other EU MS.

Out of all the workers posted abroad from Slovenia by far the largest percentage falls on the neighbouring countries of the EU, namely Austria and Italy, followed closely by Germany. Significant numbers of posted workers can be observed also to France, the Czech Republic, Hungary, Switzerland, Poland and the Benelux countries.

Considering posting of researchers only, it has to be pointed out once again, that the large majority of them follow the established corporate channels, i.e., tend to be posted to another branch of the same corporate group. Therefore, the large majority of researchers from pharmaceutical industries are posted to Germany, Switzerland and Poland, researchers/engineers from automobile industry tend to be posted to France, Switzerland, Germany and Hungary, as employees from the domestic appliances industry are mainly posted to the Czech Republic.

³⁶ Slovenia provides for relatively favourable maternity/ parental leave of nearly a full year.

3.1.5 Enhancing the training, skills and experience of European researchers

There is no record of systematic good practice of enhancing the training, skills and experience of research staff. The only requirement that stimulates international teaching / research is the *habilitation* criteria at the universities, where the candidates for full professorship are expected that they have taught / carried out research at foreign institution for specified length of time (time frame depends on institution/ programme, etc.). According to the information provided by the MHEST, the Rectors' Conference of Slovenia and the MHEST participate, on an expert basis, to the activities for the exchange of best practices in the field of introducing stimulating measures for the establishment of favourable conditions and programmes for the development of a scientific career.

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures ([ESFRI](#)) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

Slovenia's public research sector is relatively fragmented and only within the largest institutes³⁷ is the issue of national research infrastructure a relevant one. While SRA provides annually funding for research equipment, the actual realisation of these funds is relatively low (€2.3m in 2009; in 2010 SRA plans €4.9m). This is mainly due the fact that for research infrastructure investments, the research institutes have to provide at least 20% funds from other sources, either from business sector, through international projects, or more recently through centres of excellence. The financing of the latter includes considerable funding for the research infrastructure, which will in selected research areas significantly increase the availability of modern facilities.

The exact share of public R&D resources for investment in research infrastructure is difficult to assess, since some of the funds are distributed by SRA (specific call for research equipment as well as financing of institutional costs of public (state founded) research institutes), some directly by the MHEST as infrastructure

³⁷ For example, the largest public research institute, Institute Jozef Stefan (<http://www.ijs.si/ijsw/JSI>) has currently 799 employees (not all are full time equivalent), accounting thus for 24% of all employed in public R&D sector.

investments to higher education and PRO and some through specific calls (like centres of excellence, technology centres, etc.).

Within draft National Research and Innovation Strategy, a special section is devoted to the issue of research infrastructure, stipulating the need for a special Slovenian roadmap, annexed to the final version of the Strategy. It also envisages an establishment of a central virtual portal, aggregating all the public research equipment, displaying their available capacities in real or near-to-real time and enabling all R&D units from public and private sector to apply for these capacities as well.

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

Slovenia is participating in *European Strategy Forum on Research Infrastructures* (ESFRI) and is currently working on the selection of priorities for participation in new transnational infrastructures as proposed by ESFRI roadmap. As a small country with limited resources it needs to decide on the principles of selecting where to actively participate with financial input. This strategy is being prepared by the MHEST.

Meanwhile it already participates in the project of establishment and operation of the Facility for Antiproton and Ion Research in Europe (FAIR).

3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System

The national HE system in Slovenia has quite a long tradition. As already mentioned, Slovenia has 5 universities, four national ones and one international (EMUNI). Slovenia has started to introduce the Bologna system only in 2004, and the process has been accomplished by 2009 when all faculties started to conduct renovated programmes. However, the transition process has not been smooth. On one side some faculties have not renovated programmes according to the Bologna guidelines, but merely renamed the courses, while the aim and the teaching methods remained the same. Students are not prepared to accept that the new system focuses more on their individual activities to meet programme requirements.

Currently there is an intensive public debate concerning the new National Programme on Higher Education proposal. Namely, the programme argues for centralisation of the Bologna system, which would require that all universities and within them all departments have to accept the 3+2 formula. As some of them have "4+1 formula" now, they oppose strongly the 'centralisation process', arguing that some sciences are specific and should not be part of the 'melting pot'.

In relation to the specific mission and roles, most of the attention of Slovenian universities is devoted to the teaching, this being the main financial criteria. While research performance is gradually receiving more attention, it is highly decentralised and typically performed in very small research teams. This makes it difficult to assess the impact of HEI, since little systematic data on research output is generated. So far, only University of Ljubljana publishes publicly accessible Annual report, which includes data on R&D results as well as the ranking of the University (see table below).

Table 10: R&D indicators for University of Ljubljana, 2008

ISI journals articles, 2008: Total ISI for UNI 1668 (or 45% of total for Slovenia). By field: calculated on the basis of University data on individual members of all scientific publications, not only ISI.	Natural Sciences	532,0
	Engineering and Technology	567,0
	Medical Sciences	443,0
	Agricultural Sciences	788,0
	Social Sciences	290,0
	Humanities	264,0
University position in 'Shanghai Ranking' ³⁸		401/500
University position in Times Higher Education Supplement (THES) ³⁹		401-500
University position in Leiden Ranking, Green and Orange Rankings ⁴⁰		green: 239 orange: 183

Source: Analytical report of University of Ljubljana, 2008. Available at: http://www.uni-lj.si/files/ULJ/userfiles/ulj/o_univerzi_v_lj/letno_porocilo/Analiza_poslovanja_2008.pdf

3.3.2 Academic autonomy

Universities as well as accredited higher education programmes are autonomous in their performance, and are funded by the state-budget for the approved programmes. The allocation of government's funds is given yearly and is based on the students' inscription as well as on cost assessment of different programmes on per student basis. HEI are autonomous as far as selection of rectors and deans as well as recruitment of personnel. In terms of salaries, HEIs have to follow the Public Sector Employees Collective Agreement. They do have autonomy in terms of looking for additional funds, but have to follow agreed tuition fees for the programmes, co-financed by the government (second and third level of studies).

The members (named Faculties) of each individual university enjoy considerable autonomy in certain fields (selection of cadres, planning of employment, especially of non-pedagogical employees, internal organisational structure and work programmes), however university as a whole is a legal entity. The relations between members and the headquarters of the university are specified in the university Statutes. Typically, recruitment of rector/ deans is an internal process, regulated in the Statutes as well.

The new draft Programme for Higher Education introduces many changes in this area and increases significantly the level of autonomy of universities, but also

³⁸ <http://www.arwu.org/ARWU2008.jsp>

³⁹ <http://www.timeshighereducation.co.uk/hybrid.asp?typeCode=243&pubCode=1>

⁴⁰ <http://www.cwts.nl/ranking/LeidenRankingWebSite.html>

expects them to take upon themselves more managerial responsibilities and accountability.

3.3.3 Academic funding

Currently prevailing funding system for higher education separates the educational funding (which in principle follows the number of students enrolled, the number of staff employed and the number of programmes), from the research one. When it comes to research, HEIs are treated as any other public research unit and apply for research funds through public calls for research programmes/projects at Slovenian Research Agency, so one could say competitive funding prevails. The HEIs can also raise support for the research activity from business sector. Due to relative independence of the research units (often called institutes) it is difficult to clearly establish the amount of financing coming to HEI from different sectors. The national statistics show that in 2008 the only financing received for R&D at HEI sector comes from the sector itself, and that of all R&D in Slovenia, only 0.29% is carried out at HEI (Slovenian Statistical Office, November 2009), which obviously is not the case, rather the university research is included in the government sector, both in terms of financing and performance. HEI employed in 2008 41% of all Slovenian researchers according to head count; or 26% if only full time equivalent is taken into account.

3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](#) in April 2007, the EC Communication "[Improving knowledge transfer between research institutions and industry across Europe](#)" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the trans-national dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

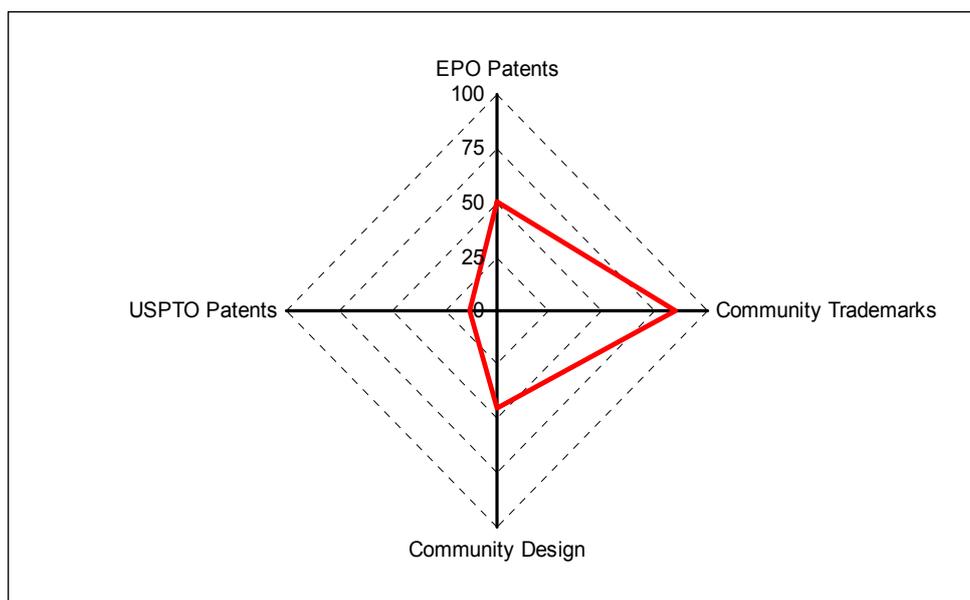
3.4.1 Intellectual Property Policies

The number of patent applications filed by Slovenian applicants at the European Patent Office (EPO) increased considerably in 2008. Nevertheless, with 63.7 patent applications per million of population,⁴¹ Slovenia still lags behind the EU average (131.1) although it ranks in the middle of all EU Member States (14th) and is ahead of almost all other new Member States (IMAD 2010). The number of patents in a certain

⁴¹ In 2008, Slovenian applicants filed 129 patent applications at EPO, which is 12.2% more than the year before when they filed 115 applications (EPO Annual Report 2008, 2009).

country depends on several factors related to human capital, production structure⁴² and a supportive institutional environment.

Figure 4: Slovenian IPR position in relation to EU27 (EU27=100), per capita



Source: Eurostat, 2010 and CIS 5

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Several measures aim at the promotion of entrepreneurship, assistance to start-ups, especially high-tech start-ups and support to intermediary institutions. Most of them are not only aiming to entrepreneurship, but also include elements of R&D and innovation policy. Therefore it is difficult to separate innovation measures from overall support for entrepreneurship: one of such examples is a relatively well established measure of voucher support for the consultancy services, offered to SMEs: the consultancy services can be in several areas, from legal to financial matters, but also in the field of technology and innovation development, patent or trade mark protection, etc. We present some measures introduced to promote public-private knowledge transfer: Young Researchers from business sector, technology parks, business incubators and university incubators, incentives to interdisciplinary teams, innovation environment etc.

Involvement of private sectors in the governance bodies of HEIs and PROs

The level of private sector's involvement in the governance bodies is relatively varied. The public research institutes, established by the government, must have in their management board majority membership of the founder (i.e. government appointees) with the remaining number of the members split between employees and the "users of institute's services". This would usually be representatives of major business partners.

The HEI, which are established by the government, also have a management board, composed of the representatives of the founder (government), representative(s) of teaching staff, representative(s) of students, representative(s) of other employees

⁴² A low share of final products in the production structure has a negative effect on patenting since the suppliers of intermediate products are less motivated to apply for patents.

and representative(s) of employers. In the case of University, such structure of the managerial board is only followed at the level of the university as a whole and not at each individual member, where the management board is usually internally nominated. The most important decision making body is the senate, where no outside involvement is practiced.

In recent years, some HEI have invited more business representatives in their decision-making processes, especially in discussions on new programmes. Some, like the Faculty of Economics have even developed specific tailor-made programmes for business firms. Yet, this is not a systematic approach undertaken by most.

During the discussion of the new draft National Research and Innovation Strategy, closer cooperation between HEI, PRO and business sector was further highlighted. However, especially social sciences and humanities strongly oppose to what they call 'instrumentalisation of science for market needs'. The opposition in academia to enhance private-public cooperation is relatively strong.

Inter-sector mobility

The government has introduced some measures to promote inter-sector mobility, which is still highly limited. The objectives of R&D in public and business sector are so far apart that it is very difficult to cooperate and / or move between the sectors. New forms of cooperation like centres of excellence or the more recent one, centres of competence open new possibilities for increase cooperation and thus also mobility. Proposed changes in the promotion criteria in the draft NRIS with higher recognition for business relevant research could also stimulate mobility.

Promoting research institutions - SME interactions

As already mentioned, several measures focus on promotion of the cooperation between SMEs and PROs, from various forms of R&D co-financing to formation of centres of excellence/ competence centres, where each such form is based on combination of partners from business and public research sector.

Even more active cooperation promotion is proposed in the NRIS, making the level of cooperation a condition for increased public funding for the research institutes.

EU cohesion policy

Slovenia directed significant proportion of Structural and cohesion funds towards R&D and technological restructuring. The broad priorities, addressing R&D in the National Strategic Reference Framework (NSRF) were translated into three operational programmes. The Operational Programme for Strengthening Regional Development Potentials (OP SRDP) is receiving funding from the European Regional Development Fund (ERDF). The operational programme for Human Resources Development is funded by European Social Fund (ESF). Finally the Operational Programme for Environmental and Transport Infrastructure Development is funded both by the ERDF and the Cohesion Fund (CF). The OP SRDP consists of four development priorities⁴³, each with specific measures:

⁴³ More at: http://www.svlr.gov.si/fileadmin/svlrsp.gov.si/pageuploads/KOHEZIJA/kohezija-200207/OP_SRDP_en.pdf

1. Competitiveness and research excellence:
 - Improvement of competitive capabilities of enterprises and research excellence to be achieved with measures like: direct subsidies for joint development-investment projects, strategic research projects, R&D centres of excellence and centres of competence.
 - Promotion of entrepreneurship: subsidies for investment in new technical equipment for enterprises with 1-9 employees, subsidies for investment in new technical equipment for other SMEs.
2. Economic development infrastructure:
 - Establishment of so called economic-developmental-logistical centres (renamed in 2010 in development centres) as well as co-financing of regional entrepreneurship training centres.
 - Information society. Co-financing of R&D projects in e-services and e-content, support in construction and maintenance of broad-band networks in local communities.
3. Integration of natural and cultural potentials:
 - Development of tourist capacities, regional tourist services, youth tourism, etc.
 - Renovation of cultural monuments at local level
 - Sport and recreational facilities
4. Development of regions
 - Regional development programmes
 - Development of border regions with Croatia.

Within specific measures and public calls in the priority areas, the differentiation is made for the applicants depending on the level of development of particular region. This means that the co-financing is larger in the cases of projects from the parts which are under the average level of development (GDP per capita). This way a more balanced regional development of the country is to be secured in the long run. No measure, where structural funds are applied, is addressed to public sector R&D only: always there is a degree of cooperation required and more commonly it is the business entity which needs to be the main coordinator of the project proposal.

Spin-offs

Current legislation makes it very difficult for PRO or HEI to establish a spin-off, since it requires a special permission to be issued by the government. The new NRIS suggests amendment to this legal statute to allow for a more flexible approach. Up to now, the spin-offs are more of an exception and had to cut ties with their "mother" institution completely to avoid legal problems⁴⁴.

3.5 Cooperation, coordination and opening up national research programmes within ERA

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level, and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal

⁴⁴ There were few spin offs from Jozef Stefan, which located in the Ljubljana Technology Park. Today, most of them are private independent SMEs with no formal ties to parent institute.

impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 National participation in intergovernmental organisations and schemes

Increased participation of Slovenian researchers in international R&D cooperation is one of the objectives of the NRDP and is actively promoted through various measures. Co-financing is provided for participation of Slovenian researchers at international conferences and their membership fees in international research associations, preparations of project proposals for EU Framework Programmes is encouraged not only via providing technical and information assistance, but also financially stimulated. More and more research programmes are open to foreign participation. Slovenia has signed numerous bilateral agreements on cooperation in S&T field and is actively engaged in several multilateral programmes with the ambition to secure itself access to international knowledge.

From the viewpoint of the business sector, one of the most successful programmes has been participation in EUREKA programme. A member of EUREKA since 1994, Slovenia has been involved in 158 EUREKA projects with a total budget of €65m. Slovenian companies, research institutes and universities are working on projects in a variety of areas from medicine, biotechnology and the environment to information technology and transport. During 2009, 32 new EUREKA projects were running with Slovenian participation and in 2010 already 38 new projects have been approved.⁴⁵ For 2010, €1m public funds are planned for Slovenian participation in the programme, a significant decrease from €3.5m in 2009 (MHEST 2010 internal data). Slovenia has chaired EUREKA for the period 2007–2008, and successfully participated in the launch of the new EUROSTARS programme, the first one to be jointly financed and implemented by EUREKA and the European Commission. By mid-2010, Slovenia cooperates in 7 EUROSTAR projects.

3.5.2 Bi- and multilateral agreements with other ERA countries

Slovenia is quite active in the field of international cooperation. Firstly, it is involved in different ERA-NETs (<http://www.rtd.si/slo/era-net/predstavitev.asp>) as well as several technology platforms. MHEST has a special measure through which it supports the creation of Slovenian TPs as a platform for further cooperation at the EU level. At the same time it is a member of the several EU research institutions. Secondly, framework projects are also important when discussing Slovenian multilateral R&D activities. According to the final report of the European Commission (June 2008), published by the Ministry of Higher Education, Science and Technology, on the FP 6, Slovenian institutions submitted 3,898 applications and were successful in 616 cases, achieving a rate of success of 15.8%. While most applications were filed by the higher education and R&D institutions, as many as 22.5% were submitted by SMEs and industrial organisations. Out of 503 projects, where institutions from Slovenia cooperated, most projects were in IT area (20%), followed by projects in sustainable development & global change (12%), nanotechnology, materials and

⁴⁵ This usually covers up to 25% of total project costs of Slovenian participant.

processes 9.7% and scientific policy support (8%). Overall, Slovenia participated in all areas of 6th FP, mostly in STREPs 28.2%, in SSA 19.3% and CA 16.3%. The total value of the resources that Slovenia had received was €76.4m, which compares well with €34.8m contribution to the 6th FP. The amounts in individual contracts vary significantly depending on the instrument or the programme.

Even though in principle the priorities of the Resolution on National Research and Development Programme (NRDP) are in line with the EU FP, the Slovenian international research cooperation is still driven predominantly bottom-up. A positive impact of the FP participation is gradual re-orientation towards prioritising research themes (not scientific fields) of a broader nature. More coordination is planned for the future by MHEST both among national priority setting and the ERA as well as among participation in different types of EU funded programmes (joint research infrastructure, business R&D programmes, etc.). Still, one of the least covered areas in NRIS is the international cooperation and participation of Slovenia in ERA.

Finally, from the operational point of view, Slovenia has numerous bilateral agreements for cooperation in Science and Technology. Most of the agreements include provisions for researchers' exchange and joint research projects. Slovenian participation is coordinated through yearly calls issued by SRA. So far in 2010, SRA is co-financing exchange of researchers from France, Czech Republic, Hungary, Denmark, Finland, Bulgaria, Austria, Italy; there is also a call for regional cooperation with Wallonia and Flanders.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

By the end of 2010, Slovenia has participated in 15 ERA-Nets. In most of them, Slovenian cooperation is coordinated by MHEST. Due to series of re-organisations of the MHEST in the area of international relations, systematic data collection is very difficult and mostly relatively old. As for the initiatives undertaken under Art.185, Slovenia participates in EUROSTARS programme, as already mentioned.

3.5.4 Opening up of national R&D programmes

The Young researchers programme is open to applicants from other EU countries. For several other programmes, the opening of the programme is more superficial: it allows for the participation of foreign partners, but with no financial support.

3.6 International science and technology cooperation

In 2008, the European Commission proposed the [Strategic European Framework for International Science and Technology Cooperation](#) to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

The government supports international R&D cooperation and has several financial schemes which help the researchers to participate in international organisations, take part at international scientific events or organise international research conferences in Slovenia. The research content in international R&D cooperation depends on the individual interests, yet the government has signed several S&T cooperation agreements around the world. Specific target countries for cooperation in S&T for Slovenia are the former Yugoslav countries, especially Croatia (Higher education), Montenegro (R&D infrastructure financing) and Bosnia and Herzegovina. In 2010, the implementation of the international research cooperation was still divided between MHEST and SRA, which resulted in somewhat less transparent (and documented) cooperation. It is expected that a more centralised approach to international cooperation is to develop in the coming years, giving MHEST a more prominent role.

3.6.2 Mobility schemes for researchers from third countries

SRA publishes calls for mobility of researchers from the third countries every year. In 2010 the call issued was for researchers from: India, Norway, Turkey, Ukraine, Japan, Brazil and South Korea. In 2009 calls were issued also for researchers from China, USA, Russian federation, Bosnia and Herzegovina, Albania and Macedonia.

4 Conclusions

4.1 Effectiveness of the knowledge triangle

Slovenian innovation system has over the years evolved through complex relationship of relatively influential public R&D sector, increasing presence of business as the key investor in R&D and innovation and a search for optimal governance of innovation policy. In its ambition to secure the country long-term sustainable economic and social development, Slovenia is looking at the national innovation system with expectation to develop R&D and innovation capacities as important sources and determinants of economic growth.

The recent R&D and innovation policy documents are novel in a sense that the R&D and increased innovation efforts by the business sector are seen as the key inputs into increased competitiveness and therefore more dynamic economic growth. This clear linkage of R&D and economic policy has not been so explicitly pronounced in the past. When looking at the Slovenian innovation policy from the perspective of correctly identified challenges and the wide scope of different instruments and support institutions, one could assess the policy as relatively well conceptualised. The innovation policy design has been under significant influence of the good practices seen in the EU. Both, the challenges, identified by the policy papers as well as the measures proposed, can be assessed as the 'right' ones. But policy documents are representing only the broad framework; it is the implementation which reflects the efficacy of innovation policy. Here Slovenia has experienced several problems: from insufficient coordination of the measures to slow and complex administrative system in delivery of support to business R&D and innovation.

To achieve an efficient R&D and innovation policy mix, a more thorough analysis of various measures and instruments and their results needs to be undertaken, having in mind the existing scientific and technological potentials of the Slovenian science

community, the production and competitive capabilities of business sector and the ambition and opportunities, opening to Slovenian R&D in European Research Area. For a small country, finding an optimal combination of various national and international resources to fund its scientific and technological development is essential, especially if R&D and innovation are to contribute to its economic and social development. So far, the public R&D policy, support for business R&D and innovation and S&T internationalisation policy have not been sufficiently integrated to bring synergy in the results.

Table 11: Effectiveness of knowledge triangle policies

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	Preparation of a new National Research and Innovation Strategy 2011-2020	<p>Strength: A comprehensive framework for broad institutional change in R&D and innovation system, focusing on key deficiencies of the current NIS is proposed by the government.</p> <p>Weakness: some of the novelties suggested by the government face strong opposition in publicly financed R&D (both government and HEI sector), which will make the implementation very difficult.</p>
Innovation policy	see above	<p>Strength: clearly integrated innovation with R&D strategy</p> <p>Weakness: opposition to changes in R&D may hinder also the changes in innovation policy</p>
Education policy	Preparation of the new National Higher Education Programme	<p>Strength: Harmonisation of Bologna process in HEI and planned stronger internationalisation of HEI</p> <p>Weakness: Financial sustainability of the planned reform</p>
Other policies	Economic crisis exit strategy	<p>Strength: measures to promote economic growth</p> <p>Weakness: lack of social dialogue, including the public sector employees, where social contract has been cancelled by the government.</p>

4.2 ERA 2020 objectives - a summary

Table 12: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard the specific ERA objective
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers	Proposed change in legal documents, opening the R&D area to non-EU researchers; change the legislation for HEI to allow programmes in English language at all levels of HE	Relatively closed and unfriendly labour market, compensation limitations which limits the attractiveness for inflow of R&D staff
2	Increase public support for research	Commitment of the government to 1%	Strict budget policy to curtail deficit

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard the specific ERA objective
3	Increase European coordination and integration of research funding	Introduce more open calls for research funding in the future (new legislation being proposed)	
4	Enhance research capacity across Europe	No change: continuation of the Young researchers programme and various mobility schemes	Good annual increase in number of young people entering both Young researchers programmes
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	Introduction of the centres of excellence and centres of competence: both measures will contribute significantly to the research infrastructure in Slovenia	Up to now restricted possibility to finance larger R&D investments, with the Structural funds the measures have significantly more financial resources
6	Strengthen research institutions, including notably universities	With the new National HE programme, funding for Universities is to include larger share of grant funding for research	Fragmented research in small groups at the University
7	Improve framework conditions for private investment in R&D	Continuation of tax subsidy and further synchronisation of support network	Lack of coordination and transparency of the support institutions
8	Promote public-private cooperation and knowledge transfer	New system of financing of public research institutes proposed in the National Research and Innovation Strategy, requiring the PRO to increase a share of business funding	PRO had little incentive to seek cooperation, since evaluation criteria for projects was mostly citation/publication based.
9	Enhance knowledge circulation across Europe and beyond	Continue with support for mobility schemes, support the participation of R&D staff in EU projects/ programmes.	High level of participation in EU schemes by HEI.
10	Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world	No special measure	Sufficient support already available
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	Joint design of policies is increasingly practiced by MHEST and ME: the draft of new National Research and Innovation Strategy was prepared in cooperation of the two and involvement of the Chamber of Industry	Up to now, business sector was less involved in national policy design
12	Develop and sustain excellence and overall quality of European research	The financing will be related to the achieved scientific quality	Already in the current NRDP, evaluation criteria contributed to the increased quality of research
13	Promote structural change and specialisation towards a more knowledge - intensive economy	In principle, the new draft of NRIS addresses this	Promotion was there in all strategic documents, the implementation was weaker

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard the specific ERA objective
14	Mobilise research to address major societal challenges and contribute to sustainable development	Not much discussion or policy change in this area.	Lack of discussion on societal challenges and the role of science
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	The draft NRIS devoted some space to promotion of R&D and science	Various attempts made, but little media attention received so far

References

- Bučar, M. et al. (2010): National Innovation System of Slovenia, Ljubljana: Faculty of Social Sciences.
- Bučar, M. and Rojec, M. (2009): Cases of science-industry cooperation in Slovenian food and chemical industries, Ljubljana: Faculty of Social Sciences.
- Bučar, M. (2009): ERAWATCH Country Report 2008, An assessment of research system and policies: Slovenia, JRC Scientific and Technical Reports, Luxembourg: Office for Official Publications of the European Communities.
- Bučar, M. (2009): ERAWATCH Country Report 2009: Analysis of policy mixes to foster R&D investment and to contribute to the ERA: Slovenia, JRC Scientific and Technical Reports, Luxembourg: Office for Official Publications of the European Communities.
- Eurostat (2010): Data available on the webpage of the Eurostat. <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home>
- IMAD (2005): Slovenian Development Strategy, Ljubljana, IMAD.
- IMAD (2010): Development report 2010. http://www.umar.gov.si/en/publications/?no_cache=1
- INNO-Policy TrendChart - Policy Trends and Appraisal Report, Slovenia 2008. http://www.proinno-Europe.eu/extranet/upload/countryreports/Country_Report_Slovenia_2008.pdf
- Kozmus, D. and R. Verčko (2010): Pregled človeškega potenciala v raziskovalno razvojni dejavnosti v Sloveniji, Mimeo and MVZT.
- NSRF (2007): National Strategic Reference Framework. http://www.svlr.gov.si/fileadmin/svlsrp.gov.si/pageuploads/KOHEZIJA/Programs_ki_dokumenti/NSRF_Slovenia_18_06_07_Unoff_eng_trasl.pdf
- Sorčan, S. et al. (2008): Znanstveno raziskovanje v Sloveniji [Science&Research in Slovenia], Ljubljana: ARRS.
- SORS (2010): Data available on the webpage of the Statistical Office of the Republic of Slovenia. <http://www.stat.si/eng/index.asp>
- SORS (2009): Research and Development Activity, Slovenia, 2008 – final data. http://www.stat.si/eng/novica_prikazi.aspx?id=2742
- SORS (2009): Research and Development Activity, Slovenia, 2007. http://www.stat.si/eng/novica_prikazi.aspx?id=2179
- SVR (2005): National reform programme for achieving Lisbon Strategy Goals, Ljubljana: SVR.
- SVR (2007): National Development Programme 2007-2013, Ljubljana: SVLR.

List of Abbreviations

BERD	Business Expenditures for Research and Development
CF	Cohesion Funds
CIS	Community Innovation System
CMEPIUS	Centre for Mobility and European Educational and Training Programmes
EMUNI	EUROMediterranean University

EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU MS	European Union Member States
EUREKA	
FP	European Framework Programme for Research and Technology Development
FTE	Full-time equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
HE	Higher education
HEI	Higher education institutions
ibid	Latin , short for <i>ibidem</i> , meaning <i>the same place</i>
IMAD	Institute for Macroeconomic Analysis and Development
ISI	International Science Index
IZUM	Institut informacijskih znanosti
MD	Ministry of Defence
ME	Ministry of Economy
MHEST	Ministry of Higher Education, Science and Technology
NIS	National Innovation System
NRDP	National Research and Development Programme
NRIS	National Research and Innovation Strategy
NRP	National Reform Programme
NSRF	National Strategic Reference Framework
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Development and Cooperation
OP	Operational Programme
OP SRDP	Operational Programme for Strengthening Regional Development Potential
PAEFI	Public Agency for Enterprises and Foreign Direct Investments
PhD	Doctorate
PRO	Public Research Organisations
R&D	Research and development
RS	Republic of Slovenia
S&T	Science and technology
SEF	Slovene Enterprise Fund
SICRIS	Informacijski sistem o raziskovalni dejavnosti v Sloveniji (Slovenian information system on research)
SME	Small and Medium Sized Enterprise

SORS	Statistical Office of Republic of Slovenia
SRA	Slovenian Research Agency
SVLR	Služba vlade za lokalno samoupravo in regionalni razvoj (Government Office for Local Self-Government and Regional Policy)
SVR	Služba vlade za razvoj (Government Office for Development)
TIA	Slovenian Technology Agency