

Strategic Evaluation on Innovation and the Knowledge Based Economy in relation to the Structural and Cohesion Funds, for the programming period 2007-2013

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Executive Summary

The economic growth of Estonia has shown one of the fastest paths relative to other EU countries during the previous decade. Estonia stands in high positions in international competitiveness reports. High ICT diffusion rate is specific to the Estonian society as a whole. The overall innovativeness assessed via Community Innovation Survey has resulted in 47% of manufacturing and 51% of service sector firms in Estonia. However, much of the economic growth is based on a low value added work (subcontracting) for northern European companies. Estonia lacks significantly in number of researchers and engineers, science and engineering graduates, as well as in lifelong learning, business R&D as critical success factors for the further economic progress.

The economic growth has been supported by a moderate growth of productivity achieving the level of 25% of the EU25 average in 2002. The fastest growth is in the fields of manufacturing industry, construction, hotels and restaurants, and financial intermediation. The Estonian national innovation system tends to be still too weak, also lagging behind in the sense of R&D and innovation (RTDI) resources, for a transition from an investment-driven stage of development to an innovation-based one. To increase value added of industrial products and productivity, it is extremely important to show greater efforts on R&D and innovation by any single individual stakeholder of the national innovation system. Most of the innovative activity in Estonia is related to machinery, followed by training and intramural R&D. There is limited amount of strategic innovations present in the Estonian private sector. Estonia needs to invest substantially more in developing more advanced innovative capabilities. In order to catch up, moving towards the world technology frontier, it needs to increase the share of strategic innovators in Estonia. This all shows that a greater emphasis needs to be given to innovation awareness and capabilities of enterprises, R&D institutions, as well as human resource development and technology transfer into the Estonian economy.

Due to the small size of Estonia, policy-makers have not presented regional priorities of RTDI. RTDI is predominantly focused at national level. Instead, cooperation between R&D institutions and firms over regions and horizontally across various public support programmes is strongly prioritised. The creation of critical mass of R&D competence in certain fields of technology is determined to be the main factor of showing the way to R&D and innovation in Estonia. The gain received from the integration into international production, R&D and other networks is dependent on strengths present and specific resources provided by the local R&D institutions and firms. The dominant regions in terms of innovation, research and business activity of Estonia are Northern Estonia (*Põhja-Eesti*), Southern Estonia (*Lõuna-Eesti*) and Northeast Estonia (*Kirde-Eesti*). Most of the R&D intense businesses are located in Tallinn and in its surroundings. Also, the economic value of the total R&D and other activities in Tallinn tend to be higher than in other areas of Estonia. The main universities, as well as most of innovation support structures have been and are presently being developed in Tallinn and Tartu, where they constitute important intermediary links in the commercialisation of knowledge, and support the foundation and development of new, research-intensive companies.

Besides institutions responsible for RTDI at the national level and mainly hosted by the capital city – Tallinn, there are also established regional offices of the Enterprise Estonia (the major RTDI public funding agency). In addition, Enterprise Estonia is given support from the Counties Development Centres. Several regional initiatives have been launched through and pushed by the EU pre-structural, as well as structural funds. The main local activities in the field of innovation in the Southern Estonia are the Regional Innovation Strategy (TRIS) project¹ and the Innovation Relay Centre. Eastern, Northern and Western Estonia are jointly developing a regional innovation strategy through the ERIS project².

Overall in terms of the RTDI institutional system, difficulties have been seen in an effective cooperation between the Ministries: Economic Affairs and Communications, Education and Research, Finance, Agriculture, particularly in developing and implementing the R&D Strategy “Knowledge-based Estonia” for 2002-2006, as well as EU Structural Funds. The Research and Development Council was supposed to act as negotiator in RTDI strategic questions, but it has not performed this role sufficiently. By means of the policy implementation Enterprise Estonia as the main RTDI funding body in the Estonian national innovation system has assessed by independent experts to being overemphasised with the bureaucracy machinery, which significantly impedes the communication with clients (firms, R&D institutions). Finally, the outcome of the innovation support structures like science/technology parks and incubation centres should be facilitated either at national and regional level to improve the science/business linkages.

As of September 2005, for the majority of programmes within the measure, efforts were still focused on completing the initial operational stages in terms of the process of selection and then launching of projects. At this stage of the programming cycle, it is relatively early to analyse the results of the RTDI measure in any meaningful way. The state of play implementation RTDI measure was assessed by Technopolis Consulting Group Belgium SPRL in 2005, and the results of the evaluation across RTDI schemes, as well as the principal difficulties of the management aspects are highlighted in subsection 4.2. It has to be mentioned that the situation assessed was almost nine month ago and significant changes have taken place in terms of the programmes` stages and financing since September last year. All RTDI programmes have been launched and financing decisions made by the Enterprise Estonia. Although, the difficulties in administrating the EU Structural Funds have been certainly detected.

In terms of the future priorities for Structural Fund support for innovation and knowledge in Estonia, one of the major concerns relates to the innovation awareness and capabilities of firms and R&D institutions across different regions in Estonia. The main bottleneck of the present innovation policy approach might be argued to be its emphasised focus on R&D and high-tech sectors. Although, the strong R&D floor (incl. infrastructure, researchers and engineers) is required to be sufficiently (internationally competitively) present in each innovation system, innovation is not only consisting of R&D. Innovation activities should be facilitated in each sector (also medium low-tech, low-tech) and various types of firms, in each region, etc. The

¹ See <http://tris.tartu.ee/>

² See http://www.eesti-ris.info/component/option,com_docman/task,cat_view/gid,73/Itemid,58/

notion of innovation must be promoted more broadly, in addition to technological also organisational innovation. Factors influencing regional innovation potential in Estonia are exhibited in subsection 5.

The challenges for Structural Fund investments predominantly relate to human resource development for RTDI, the establishment of appropriate technology transfer support mechanisms, RTDI co-operation between firms themselves, as well as firms and R&D institutions. The international dimension of the initiatives is proposed to be the requirement for Estonia to experience long-term economic growth. Key conclusions and recommendations for the EU interventions are finally presented regarding the situation of the RTDI, the RTDI institutional framework and policymaking in Estonia.

1 Introduction

In March 2000, the EU Heads of State and government launched an ambitious political initiative for the European Union to become “the most competitive, dynamic, knowledge-based economy by year 2010”. The agenda, which has become known as the ‘Lisbon Strategy’, has included a broad range of policies and regulatory measures to achieve this goal.

At the 2005 Spring Council of European Union, Heads of State and government concluded that all appropriate national and Community resources, including those of Cohesion Policy, should be mobilised in order to renew the basis of Europe’s competitiveness, increase its growth potential and its productivity and strengthen social cohesion, placing the main emphasis on knowledge, innovation and the optimisation of human capital. In short, the Council recognised that while some progress has been made since 2000 in moving towards the goals enshrined in the Lisbon Strategy there remains a need to create “a new partnership for growth and jobs”³

In launching the discussion on the priorities for the new generation of cohesion policy programmes, the Commission published on 6 July 2005 draft Community Strategic Guidelines entitled “Cohesion Policy in Support of Growth and Jobs: Community Strategic Guidelines, 2007-2013”. One of the specific guidelines is to improve the knowledge and innovation for growth. More specific areas of interventions, which are proposed by the Commission, include: improve and increase investment in research and development and innovation (RTDI), facilitate innovation and promote entrepreneurship, promote the information society for all, and improve access to finance.⁴

Innovation is an important factor in realising the potential of the Lisbon agenda. The knowledge captured in new technologies and processes can drive growth and competitiveness and create new jobs. But knowledge must be treated as part of a wider framework in which businesses grow and operate. Developing knowledge-based economy requires adequate levels of investment in R&D, education, and ICT as well as creating a favourable environment for innovation.

Less developed areas of the Union are also confronted with this new competitiveness challenge. Increasing cohesion leads to improvements in living standards and the reduction of economic and social disparities, which depend to an important extent on increases in productivity. Increasing competitiveness implies economic change through the introduction of new technologies and new methods of production as well as the development of new skills. Innovation is at the heart of this process. Technological and organisational change and new demands generated by rising

³ Communication to the Spring European Council (2005) “Working together for growth and jobs: A new start for the Lisbon Strategy”, COM(2005) 141. Available at: http://www.europa.eu.int/growthandjobs/key/index_en.htm.

⁴ Communication from the Commission (2005) “Cohesion Policy in Support of Growth and Jobs: Community Strategic Guidelines, 2007-2013”, COM(2005) 0299. Available at: http://www.europa.eu.int/comm/regional_policy/sources/docoffic/2007/osc/index_en.htm.

income levels and factors which create new economic opportunities and therefore, contribute to the growth potential of these countries.

Structural Funds are the main Community instruments to promote economic and social cohesion. In the past and current programmes, they have contributed to enhance the research potential and innovation in businesses and to develop the information society, particularly in the less developed areas. Cohesion policy has also promoted the development of regional innovation strategies and other similar initiatives in the field of the information society.

The overall objective of the strategic evaluation study, as set out in the terms of reference, is that the study should provide conclusions and recommendations for the future of Structural Fund and Cohesion policy. In particular, the Strategic Evaluation will be used to prepare the negotiations with the Member States for 2007-13, to prepare the next operational programmes and to provide input into the 4th Economic and Social Cohesion Report.

In line with the tender specifications, this country report addresses the following issues:

- An analysis of the current situation in the field of innovation and the knowledge-based economy at national and regional level. For the national level, performance is compared to the average performance for the EU25 Member States plus Romania and Bulgaria; and at regional level, where possible given available statistics, compared to a typology of EU regions;
- Lessons from the past and current experience of implementing innovation and knowledge economy measures in the Structural Funds, both in terms of priorities and strategic approaches; as well as in terms of operational implementation;
- Main needs and potential for innovation in the eligible regions drawing on available studies, strategy development and future and foresight studies; and
- Recommendations on main investment priorities for Structural Funds over the programming period 2007-2013 and their implications for regional development.

2 Investing in innovation and knowledge: a comparative overview of regional performance

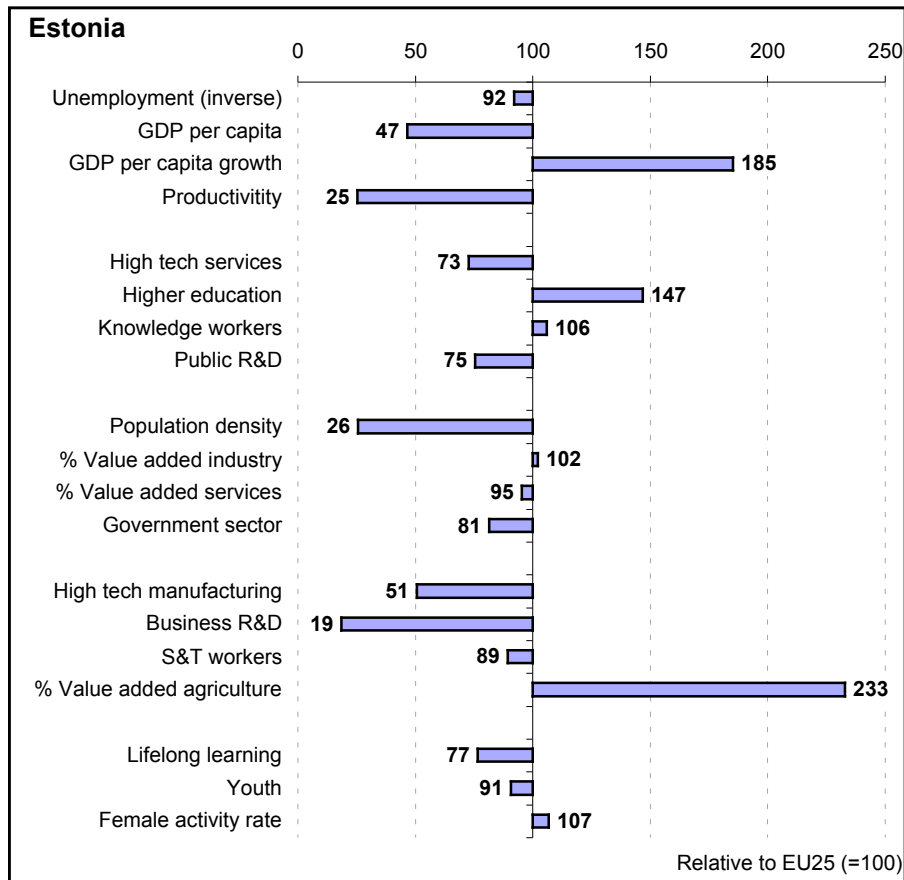
This section provides a synthetic overview of the relative performance of the country and, where relevant, main regions with respect to the EU25 average for a number of selected key structural indicators of innovation and knowledge. The analysis aims to identify **main disparities and needs** at national, and wherever possible, at regional level with a view to support the definition of priorities for future Structural Funds interventions (see sections 5 and 6 of this report).

2.1 Country overview: innovation and the knowledge economy

A catching-up process has been clearly seen to occur in Estonia during the 1990s. The Estonian growth model is based on its completely liberalised trade and openness to foreign investments, as well as an export focus on the manufacturing sector and a liberal economic regime in terms of business regulation. Multinational corporations have driven much of the growth of Estonia, as well as other CEE countries. Estonia and Hungary had the highest share of foreign investment to GDP by 2003 (accordingly 77.6% and 51.8% which is far above the CEE average), although Estonia was a country of only modest foreign direct investments (FDI) inflows at the beginning of the 1990s. Estonia is largely related to the economies in the Northern Europe with investing partners mostly originating from Sweden and Finland. Industrial integration via multinational corporations has supported technology upgrading of Estonia. This has resulted in a strong growth in the Estonian economy in terms of GDP and exports during the second half of the 1990s and since 2000.

The average economic growth during the last 10 years has been 6.1%. Estonia has one of the highest growth rates amongst the EU25, in comparison only Ireland has achieved more (7.8%). Economic growth in Estonia reached 9.8% by 2005. However, Estonia has followed a difficult path to reach the highest economic growth among other Central and Eastern European (CEE) countries. Experiencing changes of GDP growth between 0.3% and 11.1% during the years of the 1990s, it entered a more stable period after 2000. Since the average economic growth for the EU25 during the same period was 2.3%, the Estonian GDP per capita, taking into account the purchasing power parity, has increased from initially one-third to almost one-half (47%) of the EU average. See Exhibit 1, which provides a snapshot picture of the relative position of Estonia compared to the EU25 average for a series of key knowledge economy indicators (mainly on the basis of the data from 2001-2003). GDP per capita growth - 85% more than the EU25 during the years of 1996-2002 refers to a highly dynamic economic environment in Estonia. The economic growth potential of the new EU member states has been estimated by Eurostat to continue being significantly higher (keeping around the 5–7% level) than the EU average. Estonia and Slovakia seem to show greater dynamics in terms of economic development relative to the others.

Exhibit 1: Relative country performance for key knowledge economy indicators



Source: calculations of MERIT based on available Eurostat and national data from 2002-2003 depending on the indicator. Detailed definitions and data for each indicator are provided in Appendix B.

The economic growth has been supported by a moderate growth of productivity achieving the level of 25% of the EU25 average in 2002. While, in the meantime, the unemployment rate was 10% in 2003 (8% higher compared to the EU25 average). In recent years, the economic growth has been mostly caused by the growth of exports, as well as by domestic demand. The increase in the volume of exports has been induced by an increase in the external demand largely due to the formal integration to the EU in 2003. The fastest growth is in the fields of manufacturing industry, construction, hotels and restaurants, and financial intermediation. However, only 3,500 companies operate in external markets and 30 leading companies generate 50% of all the export revenues.

The World Economic Forum gives to Estonia the 20th position in the Global Competitiveness Report for 2004 - 2005. Estonia has become one of the most successful countries in Central and Eastern Europe. The relatively high result of the competitiveness score is remarkably enhanced by a surplus state budget and an access to loan resources, as well as technology indicators. In the Global Information Technology Report, Estonia is ranked 25th out of the 102 countries selected by the World Economic Forum in 2003-2004. Again, Estonia was defined to be the most

successful Central and Eastern Europe country in terms of the ICT development, in comparison Latvia achieved the 35th and Lithuania the 42nd position. ICT expenditures in Estonia resulted in 85% higher contribution relative to EU15 in 2003. Despite these high ratings in the international comparable reports, however, much of the growth is based on low value added work (subcontracting) for northern European companies.

Technology in the modern era is knowledge-based and the Estonian national innovation system seems to be still too weak for a transition from an investment-based stage of development to an innovation-based one. In the above-presented figure, it is shown that Estonia is performing below the EU25 average on a majority of key knowledge economy indicators. In total, besides the general economic indicators there are only five indicators in which Estonia exceeds the EU25 average, namely: higher education employment (47%), knowledge workers (6%), industry value-added (2%), agricultural value-added (133%), and female activity rate (7%). The three following indicators are all 10% below the EU25 average: services' value-added (5%), youth (9%) and also S&T workers (11%). The indicators with the lowest performance were business R&D (19% of the EU25 average), population density (26%) as well as productivity.

Analysis of the value-added structure of manufacturing industries of Estonia shows that the role of high-tech industries in producing manufacturing value-added is only 1.8% (2001) while in the meantime the low-tech sector give 58% of it⁵. Hence, most of the manufacturing value added comes from the medium- and low-technology sectors in Estonia. Not high-tech but rather medium high- and medium low-tech industries are those today contributing most significantly to the economic growth of Estonia.

To increase value added of industrial products and productivity, it is very important to place a greater emphasis on research and development and innovation (RTDI). The Estonian economy is characterised by a comparatively low level of R&D investments in comparison with other EU countries. In 2004, the total R&D expenditures in Estonia amounted to 0.91% of GDP (0.58% in 1998), in nominal terms to ca 83 MEUR (ca 29 MEUR in 1998). Company investments into R&D form only ca 40% of total R&D expenditures in Estonia, as opposed to a EU average of 55%. Public expenditures on R&D approach the EU25 average presently capturing about 75% of it. Every year, the government has increased the volume of investments in R&D. According to the draft of the State budget for 2006, the nominal increase in R&D investments compared to 2005 is 17%. The private sector's R&D expenditures have likewise increased by over 10% annually. Estonia has been relatively successful in using foreign financing for R&D owing to the successful participation of Estonian researchers in international programmes. In 2003, the proportion of foreign investments was almost 15% of R&D expenditures of the public sector. From the point of view of patenting as one of R&D outputs, the situation for Estonia looks very modest. Patenting activity is almost non-existent in Estonia (EPO high-tech patents 8%, USPTO high-tech patents 10%, EPO patents 6%, USPTO patents 4% of the EU15 average in 2002).

⁵ See Männik 2006.

Only 13.3% of manufacturing enterprises are active in high or medium-high technology sectors (2002)⁶. The respective employment is 16.4%. Furthermore, only 25.9% of overall business R&D personnel are active in high-tech and medium high-tech industries. To develop a knowledge-based society and economy, Estonia needs a significantly larger number of researchers and engineers. While the relative importance of researchers and engineers in the total working-age population has increased to some extent during 1999-2003 (shifting from 4.3 in 1999 to 4.6 researchers and engineers per 1000 people), the EU average is 5.8. In the sense of education, and which is a positive sign, Estonia performs 47% above the EU average in population with tertiary education. But in contrast to the overall high educational level, the number of new science and engineering graduates in Estonia is relatively low (64% of the EU average). Estonia also lacks in lifelong learning.

Nevertheless, in terms of innovation performance measured yearly by the European Commission, in general, Estonian as well as Slovenian indicators are estimated to be relatively strong. Estonia is determined to be a mid-ranking country on the 2005 European Innovation Scoreboard (EIS), coming 13th out of the 25 EU countries. The Summary Innovation Index (SII) presented yearly in the European Scoreboard shows some advantages in innovation activities for Slovenia and Estonia relative to other CEE countries⁷. While Sweden and Finland remain the innovative leaders within the EU, Estonia and Slovenia lead the EU10 group of the new Member States. They approach the EU25 average and rank above a number of EU15 countries. Following the pattern of innovation potential, Estonia exceeds the EU average in terms of five indicators and occupies the first position within the EU-15 in ICT expenditures (84%), in innovation cooperation in SMEs (59%) and in tertiary sector working population (44%)⁸. Again, the cluster analysis rank Estonia among the group of poor performing countries because Estonia's strengths are highly skewed with very good performance on innovation and entrepreneurship and good performance on innovation drivers (due to high levels of tertiary education), but poor performance on IPR, applications and knowledge creation (low level of new science and engineering graduates, lifelong learning, insufficient business R&D, etc).

Compared with other EU countries, the overall share of innovative enterprises (36%, based on CIS III) in Estonia is a relatively good result⁹. The CIS IV showed that innovative activities are performed in 47% of manufacturing and 51% of service sector enterprises in Estonia (38% and 33% in 2000). The firms belonging to foreign owners/partners are more innovative. But as in other transition countries, most of the innovative activity in Estonia is related to the acquisition of machinery, followed by training and intramural R&D. There is a limited amount of strategic innovations present in the Estonian private sector.

The results above suggest that Estonia needs to invest substantially more in developing more advanced innovative capabilities. In order to catch up, moving towards the world technology frontier, it needs to increase the share of strategic

⁶ See Pärna 2004.

⁷ For the methodology of SII, see the methodology report of the 2004 European Innovation Scoreboard (2005).

⁸ See 2004 European Innovation Scoreboard (2005).

⁹ See CIS III, also preliminary results from CIS IV published by the Statistical Office of Estonia (February 2006).

innovators, and to improve seriously the supply of science and engineering graduates. This all shows that a greater emphasis needs to be given to innovation awareness and capabilities of enterprises and R&D institutions as well as human resource development in specific fields of technologies in Estonia. Significantly stronger emphasis is needed to be given on the upgrading of knowledge infrastructure, particularly which supports knowledge and technology transfer between the public and private sector.

More intense upgrading of traditional and interactions with high-tech sectors as well as services are to be needed. Key issues of indigenous technology development in Estonia might not be associated with only a very high involvement of foreign firms in the economy nor just resources directed towards high-tech sectors. The major challenges for Estonia lie with its own capabilities to absorb foreign knowledge over a variety of industry and technology sectors.

2.2 Regional disparities and recent trends

In order to analyse and describe the knowledge economies at regional level in the EU, the approach adopted was to reduce and condense all relevant statistical information available for a majority of regions. The approach involved firstly reducing the information from a list of selected variables into a small number of factors by means of factor analysis. These factors are:

- Public Knowledge (F1): human resources in science and technology combined with public R&D expenditures and employment in knowledge intensive services is the most important or common variables in this factor. Regions with large universities will rank high on this factor.
- Urban Services (F2): The most important variables for this factor are value-added share of services, employment in government administrations and population density. A key observation is that academic centres do not necessarily co-locate with administration centres.
- Private Technology (F3) This factor is most strongly influenced by business R&D, occupation in S&T activities, and employment in high- and medium-high-tech manufacturing industries.
- Learning Families (F4). The most important variable in this factor is the share of the population below the age of 10. The Learning Families factor could also be interpreted as an institutional factor indicating a child-, learning- and participation- friendly environment, or even a 'knowledge-society-life-style' based on behavioural norms and values that are beneficial to a knowledge economy.

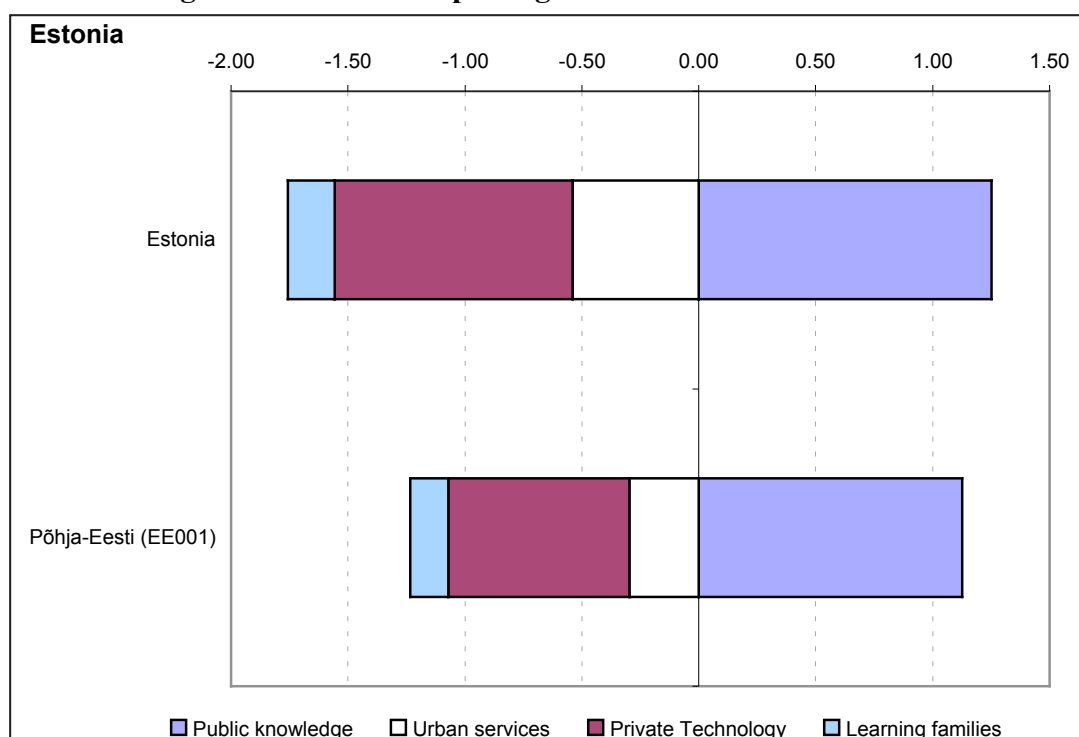
In the second step, the 200 plus EU27 regions were grouped into 11 types of regions (see appendix A) displaying similar characteristics by means of a cluster analysis. For small countries like Estonia, it was not possible to disaggregate all regions due to the lack of data. As a result, the whole of Estonia and *Põhja-Eesti* (EE001, Northern Estonia) are presented as the main regions in terms of the regional clusters. Subsequently complementary national level data will follow aiming to result with the more diversified and complete picture of the regional distinctions in Estonia. Not all

of the regions in Estonia could be approached as “Rural Industries”. The situation is much more diversified.

In accordance to the general classification the whole of Estonia stands as a member of the cluster called “**Rural Industries**”. Besides regions in Bulgaria, Romania and Greece, there is also a more Nordic sub-group consisting of Estonia, Lithuania and Itä-Suomi (Eastern Finland). Besides a low per capita GDP, Rural Industries regions have in common a low score on both the factors of Urban services and Private Technology. Population density is very low in Estonia reaching only up to the level of 26% of the EU25 average (see Exhibit 1 and also Exhibit 2). The service sector is often very small in this cluster, although for Estonia the share of value added services lags the EU25 by only 5%. Especially agriculture but also manufacturing industries are relatively large sectors. The share of industrial value added exceeds the EU25 by 2%. In the sense of the factor Private Technology, the biggest drawbacks result from a very low level of business R&D as well as high and medium high-tech manufacturing employment. The share of agricultural value added is extremely high varying from the EU25 average by 133%. A positive side of characterising Estonia as “Rural Industries”, relates to its relatively high level of higher education` (47% more than the EU25), as well as knowledge workers` contribution to the factor Public Knowledge. Going into the internal structure of the cluster (see Annex B), the components of the factor Public Knowledge are all above the cluster average, particularly public R&D with more than 200%. The factor Learning Families has a surprisingly higher than average cluster level especially lifelong learning. However, in the comparisons it amounts to only 77% of the EU25 average. It is considered to be one of the real drawbacks of the Estonian RTDI in a longer-term perspective.

Põhja-Eesti is classified as an “**Aging Academia**”. This group of regions is mostly located in Eastern Germany and Spain and also includes the capital regions of Bulgaria and Romania but also Estonia. *Põhja-Eesti* includes the capital of Estonia – Tallinn and its surrounding areas. The strengths in the Public Knowledge factor is mostly due to the high proportion of people with tertiary education. The same results were received for Estonia and for *Põhja-Eesti*. In general, the low score on the Learning Family factor is due to a lack of life-long-learning and a relatively low number of school-age children. In the region of *Põhja-Eesti* and entirely in Estonia those indicators tend to be quite similar, lagging behind the EU average with the gap of 23% and 9% accordingly. The main differences from the country average lie on the size of GDP per capita (53% higher in *Põhja-Eesti*), population density (four times higher) and agricultural value added, which is almost three times less in *Põhja-Eesti*.

Exhibit 2: Regional factor scores per region



Source: MERIT. The bars are stapled factor-scores showing the deviation ($1=$ standard deviation) per factor from the average of 215 EU regions (0.00). The longer the bar, the bigger is deviation. Detailed regional scorecards can be found in Appendix B.

Considering the recent (during 1996-2002/2003) country level trends, the following Exhibit 3 shows the improvements in unemployment (40%), GDP per capita (8.83 times), as well as tertiary education (6%). Estonia has reported with a lower share of agricultural (2.87%), likewise industrial value added (27%).

Exhibit 3: Recent trends of Estonia in key indicators

Region		Unemployment	Per capita GDP	Industry share	Agriculture share	Population density	Tertiary education	R&D intensity
		1996-2003	1996-2002	1996-2002	1996-2002	1996-2002	1999-2002	1996-2002
		%-pnt ch.	% growth	%-pnt ch.	%-pnt ch.	% growth	%-pnt ch.	%-pnt ch.
EU25		--	--	--	--	--	--	--
Estonia		0.40	8.83	-0.27	-2.87	-4.15	0.06	--
Estonia	EE	0.40	8.83	-0.27	-2.87	-4.15	0.06	--

Source: MERIT based on Eurostat data for period indicated.

Using further national level data specific regional disparities in terms of innovation and knowledge economy potential are highlighted. The dominant towns in terms of innovation and research activity of Estonia are Tallinn (located in *Põhja-Eesti*, Northern Estonia) and Tartu (in *Lõuna-Eesti*, Southern Estonia). Approximately 40% of the Estonian population (398,000 in 2002) live in Tallinn and within its sphere of influence (Harju County). Tallinn and the surrounding Harju County is the political and economic centre of Estonia. The total population of the North Estonia is almost 600,000 inhabitants. 60% of active firms (which gives 22 393 units) in Estonia perform in Northern Estonia while 52% in Tallinn¹⁰. The second largest town – Tartu (101,000 inhabitants) – is the regional centre for six counties. Both these towns are important science, business and service centres. The largest towns of *Ida-Virumaa* – Narva (68,000 inhabitants) and Kohtla-Järve (47,000 inhabitants) – are industrial towns providing rather weak central functions for the surrounding area. Pärnu (45,000 inhabitants) is an important resort town.

The remaining 35 towns, some of which also perform the tasks and functions of a county centre, are relatively small (1,000 – 20,000 inhabitants). Population density is the highest in *Põhja-Eesti* (120.7 in 2002), followed by North-Eastern Estonia (52.6) and Southern Estonia (22.6). See Exhibit 4, which shows the regional disparities based on various selected development indicators by major regions in Estonia. An economically more active population is located in *Põhja-Eesti* (283.3 thousand in 2004) and in *Lõuna-Eesti* (155.1 thousand).

Exhibit 4. Regional disparities by major regions in Estonia

Region	Population density	Economically active popul. In thousands	GDP, millions of Purchasing Power Parities	GDP in current prices, % (Total=100)	Unemployment rate	Value added, MEEK	GERD, KEEK	BERD, KEEK
	2002	2004	2002	2003	2003	2003	2004	2004
Põhja-Eesti	120.7	283.3	7921.2	153.2	9	66588.2	735665	389673
Kirde-Eesti	52.6	82.2	1025.6	59.4	17.4	8683.0	62492	56470
Lääne-Eesti	14.8	73.9	1182.3	70.0	8.4	9553.9	1412	1352
Kesk-Eesti	15.8	64.6	991.9	68.5	9	1152.2	2230	2230
Lõuna-Eesti	22.6	155.1	2315.3	68.0	9.2	19816.3	492205	54515
Estonia	31.3	659.1	13436.4	100	10	112763.2	1294004	504240

Source: urban, city&NUTS III data, February 2006; Regional Development Database, Statistical Office of Estonia, February, 2006.

During the transition, a re-orientation of foreign trade towards the West and an increasing inflow of foreign investments have been positive, above all, for Tallinn and its surroundings and for Western Estonia. Approximately 80% of foreign investments have been made in Tallinn. Problems with access to the eastern market have had the most negative impact in South-Eastern Estonia and in *Ida-Virumaa*. Private business has been more active in Tallinn and other larger towns (Pärnu, Tartu) and Western Estonia. In these towns, the levels of income and entrepreneurship are higher and unemployment rates lower than in other regions. More than a half of the Estonian GDP (7921.2 millions of Purchasing Power Parities in 2002) is provided by the area of *Põhja-Eesti*, thereby exceeding the average GDP per capita by 53.2% in Estonia.

¹⁰ See Ettevõtluse areng Eestis aastal 2003 (2005). Majandus- ja Kommunikatsiooniministeerium.

North Estonia represents almost 50% of the country's total industrial production. Most traditional sectors such as textile, foodstuff, wood processing, furniture and building materials are represented in the area. In addition, the importance of machinery and electronics, e.g. production of computers, has increased considerably during the last years. Industry employs 35% of the workforce. The restructuring of the Estonian economy has brought about a rapid development of the service sector, which employs almost two thirds of the regional workforce. The agriculture sector is smaller relative to other regions in Estonia and represents 5% of employment.

The second largest contributor in terms of GDP is considered to be *Lõuna-Eesti* where the city of Tartu locates. Although in relative terms, GDP in current prices is 30% less the Estonian average (likewise in other areas of Estonia). 27% of the workforce is employed in industry and 65% in the service sector, the remaining 8% work in agriculture. Wood and furniture, food processing and machinery are the most important industrial sectors in the region. The sectors of biotechnology and information and communications technologies are emerging.

Large industrial towns in Ida-Viru County (Narva and Kohtla-Järve) show a considerable development gap in comparison with the centres mentioned above (unemployment rate 17.4%). East Estonia as a whole is mainly focused on heavy industry, 60% of the labour force work in industry. Mining, manufacturing, power engineering, machinery and construction sectors are all important to the region's economy as well as do the food processing industry and the production of textiles, leather, wood, building materials and furniture. Agriculture employs 10% while service sector only 30% of the workforce. Emerging sectors include transport and logistics, the service industry and tourism. In general, the shrinking of agriculture has had a negative impact on the development of rural settlements and the smaller towns that serve rural areas. The development of the service sector in small towns is restricted by the low purchase power of the rural population.

West Estonia consists of four counties (Pärnu, Lääne, Hiiu, Saare). 10% of the labour force works in agriculture, 34% in industry and the remaining 56% in the service sector. The region has a well-developed tourism and health resort sector. Major industrial sectors include wood and furniture, food processing and plastics. The absolute number of value added is higher than in Ida-Viru County but R&D investments still show much lower performance compared to other leading regions.

The main universities of Estonia (the University of Tartu, Tallinn University of Technology, University of Tallinn, the Estonian Agriculture University, the Academy of Arts, the Estonian Business School, the IT College) as well as various innovation support structures (e.g. Tallinn Technology Park, Tartu Science Park, Estonian Biocentre) have been and are presently being developed in Tallinn and Tartu, where they constitute important intermediary links in the commercialisation of knowledge, and support the foundation and development of new, research-intensive companies. As the capital city, Tallinn also hosts the national R&D support institutions, such as the Academy of Sciences, the R&D Council, the Science Foundation and the Enterprise Estonia. The main universities in East Estonia are the Virumaa College of Tallinn Technical University, the Narva College of Tartu University, the Sillamäe Institute of Management and Economics, the Oil-Shale Research Institute of Tallinn Technical University, etc. The Ida-Viru Business Incubation Centre and the Ida-Viru

Innovation Centre are two of the leading innovation support institutions that are supported by the technical universities of the region. West Estonia hosts three major research and higher education establishments: University of Tartu Pärnu College, Tallinna Pedagogical University Haapsalu College and Tallinn University of Technology Kuressaare College. All these institutions have been established in the course of the last ten years and their role in regional scientific research activities tend to increase.

56% of total gross R&D expenditure (GERD from the exhibit) are made by the institutions in *Põhja-Eesti*, and 38% in *Lõuna-Eesti*. Furthermore, 77% of business R&D expenditure (BERD), is spent in *Põhja-Eesti*, and only 11% in *Lõuna-Eesti* and the same percentage in *Kirde-Eesti*. Finally, 60% of the total value added is received from *Põhja-Eesti*, only 18% from *Lõuna-Eesti*, followed by 8% from *Lääne-Eesti* (Western Estonia).

As seen from the preceding data and also according to CIS III, the more innovative enterprises are concentrated in Tallinn and Tartu regions as well as *Kirde-Eesti* where the entrepreneurial and research activities are most active and where every second enterprise invested in innovation. The number of innovative firms in *Põhja-Eesti* amounts to 52.3%, and even more 54.7% in *Lõuna-Eesti* and 53.3% in *Kirde-Eesti* in 2004 (38.4%, 37.6% and 29.8% in 2002)¹¹. However, regarding research and development intensity among enterprises then the most R&D intense businesses are still located in Tallinn and in its surroundings (*Põhja-Eesti*). Also, the economic value of total R&D and other activities in Tallinn tend to be higher than in other areas.

2.3 Conclusions: innovation and knowledge performance

Due to the small size of Estonia, regional priorities of RTDI have not been presented by policy-makers. RTDI is predominantly focused at the national level. Instead, cooperation between R&D institutions and enterprises across different regions is strongly prioritised. Since only three regions of Estonia (*Põhja-Eesti*, *Lõuna-Eesti*, *Kirde-Eesti*) are seriously involved in innovation and R&D activities, key weaknesses and needs are shown in the following exhibit. Only the regional disparities in Estonia are pointed out in the section 2.3. In principle, international comparisons are not considered presently.

¹¹ See also Ettevõtete innovatsiooniuringu tulemuste esialgne analüüs (aastad 2002-2004). Eesti Statistikaamet 2006; Innovation in Estonian Enterprises 1998-2000 by Kurik *et al.* 2002.

Exhibit 5: Summary of key disparities and needs per region

Region / group of regions	Key factors explaining disparity of performance (weaknesses)	Key needs in terms of innovation and the knowledge economy
<p><i>Põhja-Eesti</i> as a leading capital region with the highest concentration of business, science and service sectors (particularly the latter one)</p>	<ul style="list-style-type: none"> • Low level of economic value of business R&D 	<ul style="list-style-type: none"> • To increase innovation awareness and capabilities of enterprises • To develop basic innovation support structures (e.g. science/technology parks) for technology transfer • To facilitate an access to finance for innovative start-ups • To increase the quantity and quality of human capital for R&D • To facilitate clustering of businesses nationally and internationally
<p><i>Lõuna-Eesti</i> as one of the central university, science as well as business (manufacturing, agriculture) centres</p>	<ul style="list-style-type: none"> • Very low density of population • Low level of economically active population • Low level of GDP in relative terms • Low level of business R&D (compared to GERD) 	<ul style="list-style-type: none"> • To motivate young people (e.g. graduates) to stay in the region and R&D institutions • To stimulate entrepreneurship, increase innovation awareness and capabilities of enterprises • To develop basic innovation support structures (e.g. science/technology parks) for technology transfer • To facilitate an access to finance for innovative start-ups • To increase the quantity and quality of human capital for R&D • To facilitate clustering of businesses nationally and internationally
<p><i>Kirde-Eesti</i> as one of the biggest industrial (mining, electricity, manufacturing) areas</p>	<ul style="list-style-type: none"> • Low density of population • Low level of economically active population • Very low level of GDP in relative terms • Very high unemployment rate 	<ul style="list-style-type: none"> • To motivate young people (e.g. graduates) to stay in the region • To stimulate entrepreneurship, innovation awareness and capabilities of enterprises • To develop basic innovation support structures (e.g. innovation incubation centres) for technology transfer • To facilitate an access to finance for innovative start-ups • To facilitate co-operation with the R&D organisations and businesses in <i>Põhja-</i> and <i>Lõuna-Eesti</i>

3 Innovation and knowledge: institutional context and policy mix at national and regional levels

Structural Fund support for innovation and knowledge is contingent on and seeks to strengthen the existing national (and/or regional) innovation system¹² in each Member State. In particular, institutional, legal and financial factors in the innovation system can limit the potential for certain types of intervention. Moreover, within the framework of the EU's "Lisbon objectives", Structural Fund interventions are expected to complement and provide added value to national (or regional) policy framework. In some Member States, Structural Fund interventions in favour of innovation and knowledge are marginal with respect to the national investment and policy effort, in others Structural Funds provide a main source of funding for such interventions. In both cases, there is a need to identify relevant national and EU policies which can have an impact on decisions on funding priorities.

3.1 Institutional and legal framework for innovation and the knowledge economy

This section of the report appraises two broad factors that condition the potential for coordinated intervention of EU and national (regional) policies in favour of innovation and knowledge:

- The first concerns the organisational structures of public and semi-public bodies responsible for the design, implementation and monitoring of innovation and knowledge economy policies. In particular, the analysis considers the responsibilities for funding or managing specific types of measures liable to be considered for support under the Structural Funds;
- The second concerns the institutional, legal and financial frameworks, which condition the linkage of national (regional) financing with EU financing.

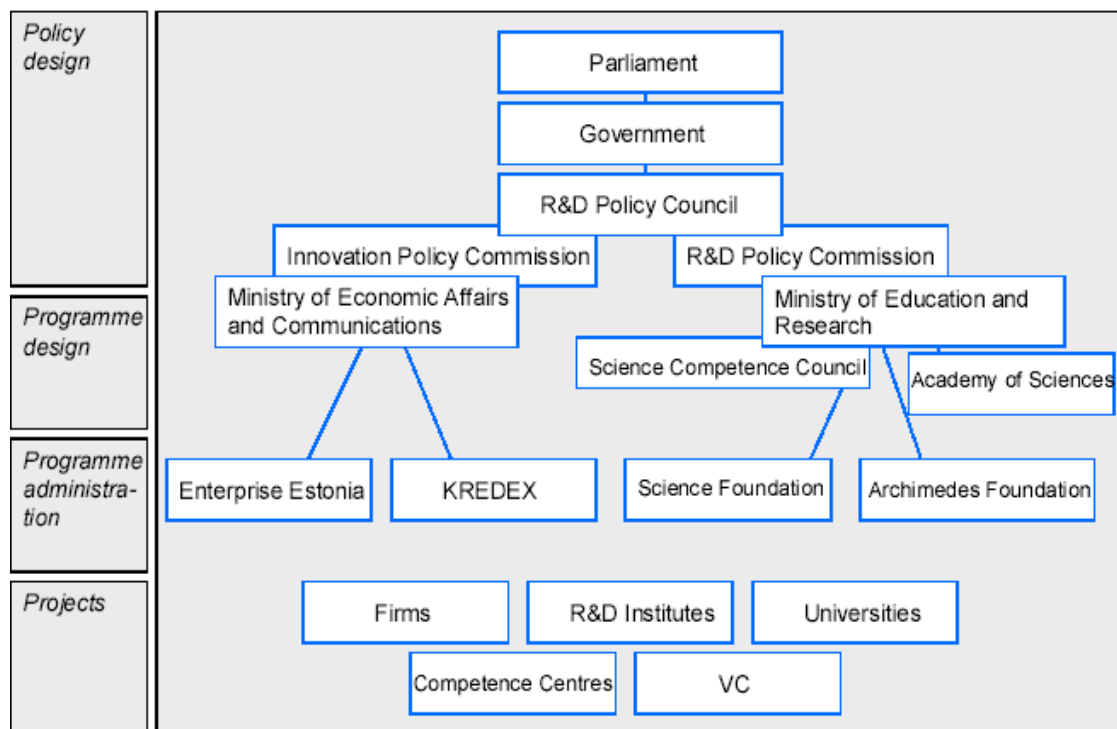
The Organisation of Research and Development Act (since 1997, later amended) provides the bases for the structure, organisation and financing of the research and development system, as well as for state surveillance in Estonia. In Exhibit 6 the institutional RTDI system of Estonia is illustrated showing the relationship between the different bodies and levels and the functional organisations. Exhibit 7 includes main organisations for each policy area defined in Appendix C. The highest responsibility for the RTDI policy in Estonia lies with the Government and the Parliament – *Riigikogu*. The Parliament's role in the RTDI policy is mainly related to the approval of the national budget for the RTDI activities as well as the Estonian R&D Strategy (updated in every three years).

In practise, two ministries are carrying the core role of Estonian RTDI policy system

¹² The network of organisations, individuals and institutions, located within or active within national or regional boundaries, that determine and shape the generation, diffusion and use of technology and other knowledge, which, in turn, explain the pattern, pace and rate of innovation and the economic success of innovation.

– the Ministry of Education and Research, and the Ministry of Economic Affairs and Communications. The ministries, as well as the Government have advisory bodies for RTDI policy – the Research and Development Council for the Cabinet itself, and two subcommittees for each ministry – Research policy subcommittee for the Ministry of Education and Research and Innovation policy subcommittee for the Ministry of Economic Affairs and Communications. In addition to that, both ministries have implementing agencies or advisory bodies for the implementation of specific policy instruments – Enterprise Estonia and KREDEX under the Ministry of Economic Affairs and Communications, and Estonian Science Foundation, Scientific Competence Council and Foundation Innove by the Ministry of Education and Research. Archimedes Foundation is created with the aim by the Government for the implementation of the European Union research instruments like Framework Programmes.

Exhibit 6: Institutional Framework



Source: European Trend Chart on Innovation. Annual Innovation Policy Trends and Appraisal Report. Estonia, 2004-2005, p. 9.

In addition to governmental bodies in the system some non-profit institutions such as the Estonian Chamber of Commerce and Industry, the Association of Estonian Information Technology and Telecommunications Companies, the Estonian Employers' Confederation are more active attempting to influence the RTDI policy path in Estonia.

Enterprise Estonia is one of the largest institutions within the national support system for entrepreneurship and RTDI in Estonia providing financing products, advice, partnership opportunities and training for entrepreneurs, research and development institutions and the public and third sectors. Enterprise Estonia is also one of the main institutions responsible for the implementation of EU structural funds in Estonia.

Activities of Enterprise Estonia are mostly financed by the national budget and EU structural funds through the budget of the Ministry of Economic Affairs and Communications. Enterprise Estonia was founded in 2000 by the Ministry of Economic Affairs with the aim of promoting the competitiveness of the Estonian entrepreneurial environment and Estonian businesses. The restructured Enterprise Estonia started to operate in full on 1 October 2003.

Exhibit 7: Main organisations per policy area.

	Type of organisation	
Policy objectives	National (&/or regional) public authorities and agencies	Key private or non-profit organisations
Improving governance of innovation and knowledge policies	<ul style="list-style-type: none"> R&D Policy Council, Ministry of Economic Affairs and Communications, Ministry of Education and Research, Academy of Sciences 	<ul style="list-style-type: none"> Estonian Chamber of Commerce and Industry, Estonian Employers' Confederation, Estonian Business Association, Estonian SME Entrepreneurs Association
Innovation friendly environment	<ul style="list-style-type: none"> Ministry of Economic Affairs and Communications, Ministry of Education and Research, Ministry of Environment, Ministry of Agriculture 	<ul style="list-style-type: none"> Estonian Chamber of Commerce and Industry, Association of Estonian Information Technology and Telecommunications Companies, Estonian Biotechnology Association, Estonian Employers' Confederation, Estonian Business Association, Estonian SME Entrepreneurs Association
Knowledge transfer and technology diffusion to enterprises	<ul style="list-style-type: none"> Enterprise Estonia 	<ul style="list-style-type: none"> Innovation support structures in Tallinn (e.g. Tallinn Technology Park), Tartu (Tartu Science Park, Tartu Biotechnology Park), Jõhvi (a regional innovation centre)
Innovation poles and clusters	<ul style="list-style-type: none"> Enterprise Estonia, counties development centres (CDCs) 	<ul style="list-style-type: none"> Estonian Chamber of Commerce and Industry, Association of Estonian Information Technology and Telecommunications Companies, Estonian Biotechnology Association, Estonian Business Association, Estonian SME Entrepreneurs Association
Support creation to and growth of innovative enterprises	<ul style="list-style-type: none"> Enterprise Estonia, KREDEX, counties development centres 	<ul style="list-style-type: none"> Innovation support structures in Tallinn (e.g. Tallinn Technology Park), Tartu (Tartu Science Park, Tartu Biotechnology Park), Jõhvi (a regional innovation centre)
Boosting applied research and product development	<ul style="list-style-type: none"> Enterprise Estonia, Estonian Science Foundation, Ministry of Education and Research, Ministry of Economic Affairs and Communications, Science Competence Council 	<ul style="list-style-type: none"> Association of Estonian Information Technology and Telecommunications Companies, Estonian Biotechnology Association

Source: study team based on national/regional policy documents, TrendChart reports, OECD reports, etc. See appendix C for a detailed definition of the policy categories.

From the institutional side, two bigger changes have been implemented in the Estonian RTDI system recently. After several discussions and the evaluation of the innovation system, the Ministry of Economic Affairs was given the authority to reorganise the former Innovation Foundation in 1998. Supported by the strategy team of TEKES, the Finnish Technology Agency, and the Estonian Technology Agency (ESTAG) was established. After the reform of enterprise support structure by the Ministry of Economic Affairs and Communications, in 2001, ESTAG was integrated to the Enterprise Estonia. Two foundations were created – Enterprise Estonia and Credit and Export Guarantee Fund Kredex. The first one was established as a merger of five different agencies - Trade Promotion Agency, Regional development Agency, Investments Agency, Estonian Tourism Board, and the Technology Agency. The second important institutional development was the reorganisation of the Research and Development Council of the Government, which was divided into sub-committees – the Innovation Policy Sub-Committee led by the Minister of Economic Affairs and Communications, and the Science Policy Sub-Committee led by the Minister of Education and Research.

Due to the size of Estonia, policy-making and coordination of RDTI generally takes place at the national level. However, Enterprise Estonia has two regional offices, one located in Tartu (Southern Estonia) and the other one in Jõhvi (North-Eastern Estonia). In addition, Enterprise Estonia is given support from the Counties Development Centres by introducing the information about its services to any interested institution in the different regions of Estonia. Several regional initiatives have been launched through and pushed by the EU prestructural as well as structural funds. For example, in the North Eastern part of Estonia and the South-Eastern Estonia, the “Special Preparatory Programme for EU SFs” (1999-2001) provided support for establishing an innovation centre, business incubator, start-up funds, and incubation centre. The main activities in the field of innovation in Southern Estonia are the Regional Innovation Strategy (TRIS) project¹³ and the Innovation Relay Centre. The City of Tartu and the Tartu Science Parks are leading a TRIS project. In addition to Shannon (Ireland) and Uppsala (Sweden), which are the partners of Tartu and South Estonia in the TRIS Project, the region also co-operates with Tampere (Finland) and Alborg (Denmark).

East, North and West Estonia are jointly developing a regional innovation strategy through the ERIS project¹⁴. The City of Tallinn is giving a strong policy support for the promotion of entrepreneurship and innovation. A business support programme for the years 2002-2004 includes the launching of three business incubators: one for the technology-oriented companies, one meant for engineering firms and one for other start-up enterprises. The City is directly funding the technology-oriented incubator and finances the development of the Tallinn Technology Park. Therefore, science and technology parks have an extremely important role in terms of RTDI at regional level. The EU (pre-structural, structural) funds have been crucial for developing regional business support systems, developing and upgrading innovation infrastructure and strengthening administrative capacities.

¹³ See <http://tris.tartu.ee/>

¹⁴ See http://www.eesti-ris.info/component/option,com_docman/task,cat_view/gid,73/Itemid,58/

Overall, there have seen difficulties in the effective cooperation between the Ministries: Economic Affairs and Communications, Education and Research, Finance, Agriculture, particularly in developing and implementing the R&D Strategy (see ch. 3.2) as well as EU Structural Funds. The Research and Development Council was supposed to act as negotiator in RTDI strategic questions, but it has not performed this role sufficiently. By means of the policy implementation Enterprise Estonia as the main RTDI funding body in the Estonian national innovation system has assessed by independent experts to being overemphasised with the bureaucracy machinery which significantly impedes the communication with clients (firms, R&D institutions). Finally, the outcome of the innovation support structures like science/technology parks and incubation centres should be facilitated either at national and regional level to improve the science/business linkages.

3.2 Policy mix assessment

This section provides a summary overview and analysis of the national and regional policy mix in favour of innovation and knowledge in which the Structural Fund interventions take place. The analysis is conducted with respect to seven broad categories of objectives of innovation and knowledge policies (see appendix C for an explanation of each category).

Measures identified per category of the policy objectives are then further sub-divided in terms of the direct beneficiaries of funding (or legislative) action. To simplify, the report adopts three broad types of organisation as targets of policy intervention:

- Policies supporting academic and non-profit knowledge creating institutions;
- Policies supporting intermediary/bridging organisations involved in innovation support, technology transfer, innovation finance, etc.;
- Policies supporting directly innovation activities in private sector.

The matrix below summarises the current policy mix in at national level. A simplified coding system is used with intensity of support (financial or political priority) for different policy areas and targets indicated by a colour coding system.

Exhibit 8: Policy mix for innovation and knowledge

Policy objectives	Target of policy action		
	Academic /non-profit knowledge institutions	Intermediaries/bridging organisations	Private enterprises
Improving governance of innovation and knowledge policies			
Innovation friendly environment			
Knowledge transfer and technology diffusion to enterprises			
Innovation poles and clusters			
Support to creation and growth of innovative enterprises			
Boosting applied research and product development			

Legend

Top policy priority
Secondary priority
Low priority

Source: calculations of study team based on national/regional policy documents, TrendChart reports, OECD reports, etc.

Awareness of innovation started to grow among policy-makers since the end of the 1990s after the first economic transition period. A more formalised process started with the creation of a Technology and Innovation Division under the Ministry of Economic Affairs at the beginning of 1999. Since then, the division has been responsible for planning technology and innovation policy, managing technological development, and supervising the main funding agency (formerly the Innovation Foundation, the Technology Agency, now integrated into Enterprise Estonia). During this period, the whole innovation policy, including the policy documents, the policy-making and implementation bodies, and the new programmes have been created and launched.

The quality of the governance of innovation and knowledge policies in Estonia has been the main concern of the Ministry of Economic Affairs and Communications. The specific activities relate to the various types of evaluations¹⁵, the training for key stakeholders in the National Innovation System¹⁶, the development of national/regional policy documents, the institutional developments, etc. The first

¹⁵ See Hernesniemi 2000, Romanainen 2001, de Jager *et al.* 2002, Reid 2002, Monck 2002, Nedeva, Georghiou 2003, etc.

¹⁶ E.g. The FEU training cycle “Guidelines for the National Execution of Innovation and Technology Policies in View of EU Accession” for public and private sector representatives in Estonia organised by the Ministry of Economic Affairs in 2000-2001.

international evaluation of the Estonian Innovation System (Hernesniemi 2000) showed several weaknesses (and also some strengths) in the system and made some significant suggestions for improvements, which also strongly emphasised the need to achieve a consensus of technology and innovation policy in Estonia. The Ministry of Education and Research has commissioned an assessment of the Estonian RTDI funding system in 2003¹⁷.

The guidelines and the financing plan of the Estonian innovation policy were formulated in the strategy paper “Knowledge-based Estonia” for 2002-2006 in 2001. The revision and development of the new strategy for 2007-2011 started in 2005. The most immediate legal act the document is meant to be linked to is the Organisation of Research and Development Act (since 1997, later amended), which provides the basis for the structure, organisation and financing of the research and development system, as well as for state surveillance. The first strategy document was prepared by a working group with participation of experts from the Ministry of Education, the Ministry of Economic Affairs, and the Estonian Academy of Sciences. The superior aim of the strategy is to increase the participation and the financing contribution of enterprises to the Estonian RTDI base in line with public RTDI measures in 2002-2006. Within the framework of the Lisbon Strategy, the Heads of State and Government agreed that the level of R&D investments must increase to reach 3% of the GDP. The Estonian Government aims to achieve this objective by 2014. Based on the assessment of the Estonian R&D strategy for 2002-2006 the public financing plan included in the document has not achieved¹⁸. By means of the activities the main gaps relate to the low capacity to develop the technology programmes in key technology areas.

Another key strategic document forming the backbone of the RTDI in Estonia is the Estonian National Development Plan, which considers innovation and R&D as a development engine of the Estonian economy. The NDP constitutes an essential operational programming document for support to RTDI in Estonia during the period 2004-2006, with the co-financing support of the EU Structural Funds. In a broader sense, the Estonian NDP includes public activities targeted towards human resource development, competitiveness of enterprises, infrastructure and local development, etc. Some other complementary area-specific or more general documents have supported the RTDI activities in Estonia (the Estonian Enterprise Policy “Enterprising Estonia”, Agricultural Applied Research and Development, the Transport Sector Development Plan; Estonia’s Success 2014, “The Sustainable Development – 21”, Social Agreement on Estonian Development 2003-2015, Action Plan for Growth and Jobs 2005-2007 for Implementation of the Lisbon Strategy). Due to the size of Estonia, the policy-making and coordination of RTDI generally takes place at the national level. However, several initiatives have been launched through pre-structural and structural funds (e.g. TRIS Tartu Regional Innovation Strategy). From the institutional side, two major reforms have taken place: the reform of Enterprise Estonia and Research and Development Council (see section 3.1).

¹⁷ See Nedeva, M., Georghiou, L. Assessment of the Estonian Research Development Technology and Innovation Funding System. Final Report, 2003.

¹⁸ See “Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning (2005). Final Report.” Technopolis Consulting Group Belgium SPRL.

The development of a business environment favourable to enterprise, entrepreneurship and innovation has predominantly aimed to enhance private enterprise in Estonia. The public awareness of enterprise and innovation is insufficient. In order to develop an environment favourable to entrepreneurship and innovation, it is necessary to increase people's interest in entrepreneurship, to provide adequate information on different aspects of entrepreneurship and innovation, to disseminate best practices. The Estonian Enterprise Policy for 2007-2013 addresses the area of enterprise culture and entrepreneurship more than in the previous policy terms. The efforts planned in the field of enterprise culture are to be supported by those institutions responsible for establishing better regulation. The Transport Sector Development Plan for 2006-2013 and the Public Transport Programme for 2006-2013 provide a new vision for the regulation and development of the transport system. The functioning of international transport connections is one of the factors that influence competitiveness. Today, one of the most important preconditions for improving competitiveness is the existence of IT infrastructure, information society services whilst the broad distribution of fast communications is the basis of increasing productivity, of implementing new flexible forms of work, and the creation of new jobs. Creating a well-functioning information society is the long-term goal of the Information technology action plan 2006-2013. Supporting the development of environmental infrastructure, the development of the Estonian Environmental Technology Development Plan is to be planned. Vocational training reform (presently implemented) is intended to provide a qualified labour force and reduce structural unemployment in Estonia (incl. programmes of training for assessing the need for skilled specialists in IT and the telecommunication industry).

By running RTDI programmes in Enterprise Estonia, the Innovation Awareness Programme (launched in 2001) aims to increase the awareness of innovation as an important factor of economic growth and to reinforce knowledge and know-how of innovation methods and tools (among policy-makers, opinion leaders, entrepreneurs, investors and top management of the enterprises, technical staff, students, professors and academics, pupils and teachers, public). Other related programmes link to the Innovation Audit Programme, Training Programme, Consulting Programme, Business Infrastructure Development Programme, Regional Competitiveness Improvement Programme and Development Programme for Local Physical Living Environment managed by the Enterprise Estonia. Some previous actions stimulating the entrepreneurial culture and innovation in Estonia are presented as follows: the establishment of the IT College (2000), Single Access Point to Government Information Resources on the Internet (1998), ICT diffusion campaign in education institution (Tiger Leap National Programme, Tiger's Leap Plus, 2001), Estonian ID-Card Programme (1998), X-Route (2001), Public Internet Access Points (1997), *KülaTee* (Village Road) project for developing data communication services in rural areas on the first level of government (1998), *Peatee* (EEBone), Backbone Network for Estonian Government Institutions (1998), Estonian Genome Project (2000), Estonian Language Technology Programme (1997). The PHARE Funds have been used for developing regional business support systems, developing and upgrading innovation infrastructure and strengthening administrative capacities for challenging the EU Structural Funds.

In the sense of knowledge transfer and technology diffusion to enterprises, not only enterprises are prioritised as the target group of the policy. It is extremely important to facilitate academic institutions to become more entrepreneurial in thinking and to encourage more intense cooperation with enterprises. The specific objective of the SPINNO Programme (managed by Enterprise Estonia, launched in 2001) is to create a favourable entrepreneurial environment within the R&D institutions and applied higher educational establishments in Estonia. National and public institutions of R&D and applied higher educational establishments specialising in engineering and technology are eligible to apply within the framework of the programme, provided they are involved in the conducting of research and/or are able to provide development-related services to enterprises. The R&D Financing Programme (the longest RTDI programme in Estonia, launched in 2001) provides opportunities to launch new or improved products and services. The programme consists of feasibility study grants, applied research grants both to R&D institutions and enterprises (including joint applications), product development grants only for enterprises. The third major action the Competence Centre Programme (since 2003) supports strategic cooperation between science and industry sectors in Estonia. Enterprise Estonia co-finances the establishment of small R&D institutions – the competence centres. The centres are established and operated jointly by a number of companies and universities, the strong focus lies on applied research. Today, 5 competence centres have been established in Estonia.

Direct or indirect support for the creation of innovation poles and clusters of companies (e.g. funding for enterprise level cluster activities) has not been directly (or intentionally) targeted by innovation or other related policies in Estonia. Through the Competence Centre Programme, the establishment of knowledge clusters (or competence centres) in cooperation with science and industry partners is one of these few activities. The Competence Centre Programme promotes clustering but clear-cut cluster development policy is missing in Estonia. Based on the Estonian R&D Strategy two sector-cluster development policies: IT and biotechnology began to develop but were not implemented.

Public support for the creation and growth of innovative enterprises is mainly implemented through financing of innovation intermediary structures like incubators and technology/science parks in Tallinn and Tartu. The aim of the Business Incubation Programme (launched in 2004) is to support the development and supply of incubation services in the Estonian business incubations, which predominantly concentrate on the needs of innovative start-ups. The institutions eligible for the programme are legal persons governed by public law whose main area of activity concerns minimising risk for entrepreneurs in the start-up phase by offering incubation services in vocational and higher education institutions. The SPINNO Programme emphasis is placed upon building up and strengthening the ability of universities to manage spin-off processes. As a new activity, the development of the State Venture Capital Fund is on-going (planned to launch in 2006). The objective of the venture capital fund tends to cover the gap in financial resources (in the form of equity investments) in the seed/early stage phase of firms in innovation/R&D intensive sectors, i.e. after the phase covered by available grants and before the coming in operation of existing private investors.

Boosting applied research and product development is highly prioritised in the Estonian R&D strategy by updating the pool of knowledge through raising the quality and level of scientific research in Estonia. A main pre-condition is improving the numbers and quality of highly qualified specialists. Development of human capital has been targeted by supporting the creation of in-service training system for engineers and specialists, increasing funding for Masters and Doctoral studies, improving funding for R&D infrastructure, developing science and excellences and competence centres, supporting applied research through R&D Financing Programme, etc. These activities are mainly implemented by the Ministry of Education and Research but also jointly with the Ministry of Economic Affairs and Communications. The aim of the Centres of Excellence Programme is to support research clusters in cooperation with various R&D institutions in certain technology areas (formerly implemented by the Ministry of Education and Research, now by the Enterprise Estonia, launched in 2005). Research and Development Institutions' Infrastructure Development Programme is the newest initiative in the package of the Estonian RTDI policy. An internationally competitive RTDI infrastructure system providing comprehensive support to higher education, R&D activities and innovation in strong and strategically important areas of R&D is developed through this public action. Enterprise Estonia also supports preparations for and the conducting of international applied research and product development projects. Enterprise Estonia assists in locating appropriate cooperative partners for the implementation of projects and for technology transfer through the following networks: the EU 7th R&D Framework Programme, the Estonian Innovation Relay Centre, the Pan-European Cooperation Network EUREKA.

3.3 Conclusions: the national innovation system and policy mix

One of the main obstacles, which might impede the policy mix activities in Estonia, starts from the lack of coordination between various significant public institutions linked to the R&D activities. In innovation policy-making and implementation only two ministries – the Ministry of Economic Affairs and Communications and the Ministry of Education and Research have been involved. There is lack of coordination found with other policy areas such as environment, agriculture, defence etc Following the modern thinking of the innovation policy the co-operation with other ministries and institutions has to be considered as compulsory issue to succeed in longer-term.

From the perspective of policy planning and implementation there is seen a threat to overemphasise the significance of the high-tech industry as a target group of policy instruments in Estonia considering the specific geographical, economic and social features of Estonia. The question is most critically related to the policy-planning phase where one could not copy automatically the measures from the most developed economies. Foresight studies are to be supportive tools to decide on the present and future technology needs. Technology programmes from another side would give an opportunity for more effective co-operation between government institutions in Estonia. The following exhibit gives a detailed overview of opportunities and constraints for Community intervention for the next programming period.

Exhibit 9: Key opportunities and constraints for investment by the Structural Funds

Policy objectives	Opportunities for Community funding (national priorities)	Constraints or bottlenecks (factors limiting Community funding)
Improving governance of innovation and knowledge policies	<ul style="list-style-type: none"> • Evaluation of the RTDI governance system • Systematic appraisal of the institutions themselves • Foresight exercises • Technical assistance in implementing EU Structural Funds 	<ul style="list-style-type: none"> • Lack of coordination and cooperation between the different ministries and other organisations as well as between central and regional institutions • Insufficient power of Research and Development Council to ensure the effective intermediary role for different ministries • Lack of practice and capabilities for conducting technology foresight
Innovation friendly environment	<ul style="list-style-type: none"> • Raising awareness of innovation and entrepreneurship targeting policy-makers, top managers, firms, students, academics, pupils and teachers, publicity, etc. • Ensuring general infrastructure (transport, IT, environment) • Increasing R&D human resources (researchers and engineers, technicians) 	<ul style="list-style-type: none"> • Lack of policy coordination to ensuring a horizontal view on innovation across different ministries and other organisations • Opposition from academia to more demand-oriented innovation policy developments • Poor entrepreneurial mindset in universities, lack of relevant courses and Master programmes • The notion of innovation is confusing and not perceived as essential among the target groups • Lack of commitment of entrepreneurial associations in policy-making
Knowledge transfer and technology diffusion to enterprises	<ul style="list-style-type: none"> • Raising entrepreneurial culture in R&D institutions (supporting university liaison and transfer units etc.) • Supporting directly applied research • Supporting competence centres • Supporting science and technology parks 	<ul style="list-style-type: none"> • Opposition from academia to more demand-oriented innovation policy developments • Poor entrepreneurial mindset in universities, lack of relevant courses and Master programmes • Difficulties to find a common language between science and industry partners • Low R&D capability of firms
Innovation poles and clusters	<ul style="list-style-type: none"> • Assisting to regionalise the cluster accessibility for SMEs • Assisting to emphasise on inter-regional cooperation (with Nordic countries) 	<ul style="list-style-type: none"> • Low level of knowledge infrastructure and resources • Low R&D capability of firms in Estonia • Inability to attract more strategic-oriented foreign direct investments
Support to creation and growth of innovative enterprises	<ul style="list-style-type: none"> • Supporting SMEs, start-ups and spin-offs • Supporting science and technology parks, business incubations • Supporting venture capital implementation 	<ul style="list-style-type: none"> • Bulk of public financing is targeted towards high-tech companies, lack of integration with medium and low-technology companies • Lack of cooperation between science and industry partners • Low rate of commercialisation of research results through spin-offs
Boosting applied research and product development	<ul style="list-style-type: none"> • Developing qualified specialists for R&D • Supporting directly R&D projects • Supporting R&D infrastructure • Facilitating international cooperation 	<ul style="list-style-type: none"> • Linear approach to innovation mostly in R&D institutions • Opposition from academia to more demand-oriented innovation policy developments • Low R&D capability of firms and innovation management capacity both in universities and firms

4 Structural Funds interventions to boost innovation and create a knowledge economy: 2000-2006

This section of the report provides an analysis of the patterns of Structural Fund expenditures in the fields of innovation and knowledge-based economy during the current programming period (2000-2006 for EU-15 or 2004-2006 for the new Member States). It examines the patterns from both a strategic point of view (the policy mix pursued by the Structural Funds programmes) and at an operational level (consumption of funds, management of innovation measures, indications of relative effectiveness of measures, case studies of 'good' practice).

4.1 Strategic framework for Structural Fund support to innovation and knowledge

4.1.1 Strategic approach to innovation & knowledge in Structural Fund programmes

The National Development Plan for the Implementation of the EU Structural Funds/Single Programming Document constitutes the operational programming document for support to RTDI in Estonia during the period 2004-2006, with the co-financing support of the EU Structural Funds. The majority of support for RTDI is channelled through a single measure (or sub-programme) entitled "Promotion of Research, Technology Development and Innovation" (measure 2.3 under priority 2 "Competitiveness of enterprises"). Structural Fund interventions complement and provide significant added value to national policy framework of RTDI in Estonia. Structural Funds offer is a main source of funding for public RTDI initiatives.

Based on the thorough analysis of the RTDI situation in Estonia the overall objective of the measure was defined as follows: *"to increase the RTDI capacity in existing businesses and stimulate the creation and growth of new technology-based businesses"*. A number of specific objectives were also defined:

- To create a critical mass of research potential in a number of technological fields vital for both existing industrial or service sector firms and the creation of new sectors of activity with higher technology content.
- To increase co-operation between the science and business sectors in applied research of strategic importance for the Estonian economy and to reinforce the capacities of R&D institutions to co-operate with businesses and to manage the innovation process;
- To stimulate an increased involvement of Estonian enterprises in funding and undertaking, on a regular basis, research and development, technology transfer and development and innovation;
- To establish financially sustainable technology and innovation infrastructures and respective support services able to support Estonian enterprises in their innovation activities;
- To generate a wide awareness of innovation as a key driver of economic growth and to strengthen the RTDI capacity and competence of businesses and research institutions.

Actions to be funded under the RTDI measure were then grouped under four broad objectives: 1) strengthening the knowledge base, 2) financing RTDI, 3) strengthening the innovation system, 4) developing knowledge and skills about innovation. In more detail, the May 2003 Programme Complement proposed the following programmes per action line of the measure:

Strengthening the knowledge base:

- Establishing and reinforcing a network of Research Centres of Excellence relevant to the Estonian enterprise sector (investments in R&D)
- Modernising research equipment and providing specialized facilities tailored to new technologies – exclusively in designated Research Centres of Excellence

Financing R&D and innovation:

- Support scheme for market oriented R&D projects
- Advanced technology programmes in key areas
- Pre-seed, seed and venture capital scheme for favouring technology intensive and/or innovative new entrepreneurship

Strengthening the innovation system:

- Creation and development of innovation and technology infrastructures (single large scale investment projects incl. buildings, machinery and equipment)
- Support scheme for technology transfer and high-tech incubation services
- Competence Centres Programme (funding of staff and investments in machinery and equipment for industrially relevant R&D projects)
- SPINNO program for creating Spin-of companies

Developing knowledge and skills about innovation:

- Innovation Awareness & Competence Programme
- Support scheme for science-industry human resource mobility

Public funding allocated to the RTDI measures for the period 2004-2006 (of which 75% from the European Regional Development Fund, ERDF)¹⁹ amounts to 51.68 MEUR or 65.7% of the total (public expenditure) for RTDI plus business support measures (measures 2.1, 2.2 in the SPD/NDP) and 17 % of the total ERDF budget (see also Exhibit 10 below).

The calculations presented below in the exhibit are based on the allocation of Structural Fund budgets based on the intervention code classification. For practical purposes, the calculation of financial resources allocated to innovation and knowledge has been limited to the RTDI and some selected codes for SMEs (following the logic of the programme complement of the Estonian SPD/NDP):

- 163 Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology) (only for SMEs)
- 164 Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs) (only for SMEs)
- 165 Financial engineering (only for SMEs)

¹⁹ According to the management principles of the Structural Funds, funding committed until 31 December 2006 is eligible for co-financing by the ERDF if it is disbursed before end 2008 (the so-called N+2 principle).

- 181 Research projects based in universities and research institutes,
- 182 Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes,
- 183 RTDI Infrastructure,
- 184 Training for researchers.

Exhibit 10: Overall allocation of resources at an objective 1 and 2 level (planned figures in Euro – current prices)

Objective	Total cost	SF			NF	
		Total	ERDF	ESF	Public	Private
RTDI INTERVENTIONS						
Objective 1	62 028 504	38 760 561	38 760 561	0	12 920 187	10 347 756
TOTAL COHESION POLICY						
Objective 1	621 136 415	371 363 452	225 975 652	76 120 100	124 066 063	125 706 900

Source: Estonian National Development Plan for the Implementation of the EU Structural Funds. Single Programming Document 2004-2006. Programme Complement.

Additional calculations based on broader definitions of innovation are presented in Appendix D (tables provided by ISMERI). RTDI and all business (innovation technology) support measures jointly amount to 69.0 MEUR²⁰ (13% of total SPD budget) and more broad innovation and knowledge economy (additionally including ICT, services and applications for SMEs) funding to 71.9 MEUR (14% of total SPD budget).

4.1.2 Specific measures in favour of innovation and knowledge

The Structural Funds are the main instrument for supporting innovation and knowledge in Estonia at national level. Due to its small size regional priorities of RTDI have not been discussed. However, a separate measure called “Local socio-economic development” is aiming to contribute to Estonia’s general viable and balanced economic development through elimination of bottlenecks in local infrastructures and enhancing local attractiveness. Likewise, the regionality is taken into account and more active participation in entrepreneurship and innovation is facilitated in all business-oriented schemes (e.g. grants to R&D, business development) by offering bigger public support shares in the projects to be applied in the areas different from Northern Estonia.

In financial terms the RTDI measure 2.3 independently has amounted to 22.8% out of all considered direct and indirect RTDI activities of the NDP/SPD for 2004-2006 (see Exhibit 11). It includes four intervention areas: boosting applied research and product development, knowledge transfer and technology diffusion to enterprises, support to creation and growth of innovative enterprises, innovation friendly environment as presented in Appendix D.2. Based on the programme complement of the NDP/SPD single amounts of funding for each area cannot be presented. This core element of the Estonian RTDI policy has been directly focusing on all major policy areas during the first programming period of EU Structural Funds. SME support programmes to a great extent enhance the creation and growth of innovative enterprises in Estonia. As mentioned earlier, there is no measure, which would target the development of

²⁰ Private sector funds are not included in tables provided by ISMERI which is different approach compared to the Estonian SPD/NDP for 2004-2006.

innovative clusters. The technology and science parks could play a role in such initiatives in the near future.

Exhibit 11: Key innovation & knowledge measures²¹

Policy area	Number of identified measures (all programmes)	Approximate share of total funding for innovation & knowledge measures	Types of measures funded (possibly indicating importance)
Improving governance of innovation and knowledge policies	1 (measure 1.4)	0.90%	Training targeted to raise the capacity of public administration, surveys, foreign internships
Innovation friendly environment	5 (measures 1.1, 1.2, 4.3, 4.5, 4.6)	62%	Strengthening of educational system, modernisation of infrastructure for vocational and higher education, human resource development increasing the competitiveness of enterprises, development of information society and local socio-economic development
Knowledge transfer and technology diffusion to enterprises	1 (measure 2.3)	22.8%	Development of R&D infrastructure, competence centres; entrepreneurial environment of universities and creation of spin-offs; R&D grants to market-oriented projects
Innovation poles and clusters	0	0%	N/a
Support to creation and growth of innovative enterprises	3 (measures, 2.1, 2.2, 2.3)	37.6%	Development of science and technology parks, incubation services, entrepreneurial environment of universities and creation of spin-offs, business development, business infrastructure development
Boosting applied research and product development	1 (measure 2.3)	22.8%	Reinforcing the Centres of Science Excellence, R&D grants to market-oriented projects, R&D infrastructure development

Nb: this table is a summary of the table in appendix D.2. The total of the percentage share per policy area may sum to more than 100 since certain measures fall into several categories.

Source: Estonian National Development Plan for the Implementation of the EU Structural Funds. Single Programming Document 2004-2006. Programme Complement.

²¹ In the table RTDI measure 2.3 as well as human resource development' measures 1.1, 1.2, business development measures 2.1, 2.2, infrastructure development' measures 4.3, 4.5 and 4.6, administrative capacity' measure 1.4 are added. See also Appendix D.2.

The creation of an environment conducive to innovation is horizontally focused in various areas of policies across the NDP/SPD (amounted to 62% of total included funding). It might even be proposed that most of the key innovation and knowledge measures are assumed to target innovation friendly environment. All public instruments strengthening the educational system, vocational and higher education, human resources for R&D, business infrastructure as well as developing an information society gives positive stimuli for more active entrepreneurship and innovation activities in Estonia. Knowledge infrastructure is directly focused through supporting the R&D infrastructure (laboratories, equipment, machinery) development by R&D institutions, science and technology parks and incubation services in Tallinn and Tartu. The situation of knowledge and general infrastructure of Estonia is a critical determining factor for attracting more strategic foreign investors into Estonia during the coming years. The integration of firms in Estonia into international production and other networks is to a great extent limited by their capabilities. The low level of knowledge infrastructure and resources as well as low R&D capacity of firms in Estonia could be considered to be the most critical constraints in attracting strategic investors to the Estonian economy.

Improving the governance of innovation and knowledge policies is directly targeted in the measure 1.4 called as “Enhancing administrative capacity”. It includes conducting training needs assessment and surveys, preparing training programmes, systematic further training of civil servants, short term internship in foreign administrations, implementing management capacity building projects, etc. Through Inno Awareness Programme (Good Estonian Idea) the awareness of innovation is also enhanced among different stakeholders of the National Innovation System e.g. policy-makers, opinion leaders, students, academicians, etc.

4.2 Learning from experience: the Structural Funds and innovation since 2000

4.2.1 Management and coordination of innovation & knowledge measures

This section reviews the overall management of Structural Fund interventions in favour of innovation and knowledge (intentional focus is given on the RTDI measure 2.3, though SME measures are taken into a game at some points) during the current period. It examines the coherence of the role of key organisations or partnerships in implementing Structural Funds measures for innovation and knowledge, the linkages between Structural Fund interventions and other Community policies (e.g. the RTD Framework Programme) and the financial absorption and additionality of the funds allocated to innovation and knowledge.

The agency responsible for administering funding from the Structural Funds for the RTDI measure 2.3 as well as for the measures 2.1 and 2.2 (SME measures) is the Enterprise Estonia foundation as presented earlier. Following a restructuring, which took place in 2003, EAS is organised as a “matrix format” with the RTDI measure programmes falling under the competence of the Active Enterprises division. The Exports and Technology Development Unit pools experts in different fields for consulting and project assessment including the RTDI programmes.

In Estonia the implementation of Structural Funds is based on Structural Assistance Act (SAA). Most of the questions concerning implementation of the RTDI measures have been regulated in secondary legislation. In practice, for each measure, the Ministry responsible is obliged to prepare ministerial decrees for implementation. A survey of Structural Fund implementation in Estonia has acknowledged that these procedures have led to some delays in implementation²². Moreover, according to the SAA, the managing authority (the Ministry of Finance) has to approve all conditions laid out in the decrees of ministers implementing specific programmes within each measure.

As of September 2005, for the majority of programmes within the RTDI measure, efforts were still focused on completing the initial operational stages in terms of the process of selection and then launching of projects. The state of play implementation RTDI measure was assessed by Technopolis Consulting Group Belgium SPRL in 2005 and the results of the evaluation across RTDI schemes are given in Appendix E. It has to be mentioned that the situation assessed was almost eight month ago and significant changes have taken place in terms of the programmes` stages and financing since September last year. All RTDI programmes have been launched and financing decisions made by the Enterprise Estonia. The following table 12 below gives the picture of the expenditure capacity for RTDI and SME programmes by the Enterprise Estonia in the beginning of 2006 (hence, the evaluation results of the study are updated). Based on the feedback received from the Enterprise Estonia, most of the SF funding were planned to be used by June 2006. The financing has almost finished for the R&D financing scheme and the Centres of Excellence programme. The low expenditure capacity figured out for R&D infrastructure programme (1.8%) is due to its recent launch at the end of 2005. Today, financing decisions are done by the Enterprise Estonia as well as the same applies to the development of technology parks and incubations. Hence, the overall expenditure absorption capacity of the Enterprise Estonia is quite promising for 2006²³.

²² See the overall evaluation report of the Estonian R&D Strategy 2002-2006 by Technopolis Consulting Group Belgium SPRL in 2005.

²³ The tables provided by ISMERI in Appendix D originate from 2005 detecting the financing situation of RTDI measures in 2004/the beginning of 2005. The financing capacity of the Enterprise Estonia shows a significantly different picture today as introduced in Exhibit 12.

Exhibit 12: Expenditure capacity of RTDI and SME interventions (measures 2.1, 2.2, 2.3 in the SPD/NDP) by programmes (expressed as value of contracts, in EEK²⁴.)

Programme	Budget²⁵	Expenditure capacity (% of the budget)
R&D financing programme	127 813 285	99.8%
SPINNO programme	322 000	78.9%
Innovation awareness programme	11 781 300	84.7%
R&D infrastructure development programme	230 780 000	1.8%
Centres of Excellence programme	100 640 000	99.6%
Competence Centre Programme	100 560 000	59.4%
Technology parks and incubations	13 430 000	19.0%
Innovation audit programme	2 550 000	53.6%
Development of international co-operation	1 000 000	94.5%
Start-up programme	26 531 144	67.0%
Mentor programme	1 198 000	50.0%
Export planning programme	51 650 025	79.0%
Business infrastructure development programme	66 280 223	46.9%
Consulting programme	13 874 732	88.7%
Training programme	36 657 455	74.4%
Quality management development	4 060 000	16.8%

Source: Ettevõtluse Arendamise Sihtasutuse 2005 aasta aruanne. 2006 (Annual Report 2005 of the Enterprise Estonia).

Although, in the sense of administration the principal difficulties highlighted in the above-mentioned RTDI measures` assessment are worth to list also in 2006, which are presented to impede the appropriate communication with the clients (enterprises, R&D institutions, etc.):

- Micro-management of planning and implementation of projects by Enterprise Estonia staff allied to insufficient technical expertise in-house on project contents;
- Use of experts with insufficient knowledge of field of technology or sector, or with conflict of interest to select projects;
- General risk aversion culture which limits additionality of public funding;
- Design of application forms which respond more to control requirements of Enterprise Estonia than to the needs of applicants;
- Non-transparent and subjective criteria for project selection (e.g. avoidance of giving funding to certain sectors);
- Lack of understanding of EAS staff about other support schemes within EAS;
- Heavy financial control and audit requirements (e.g. six-monthly audit of competence centres).

²⁴ The budget is shown for the year of 2005 when the EU SFs` were mostly started to use; 1 EURO = 15.6466 Estonian kroons (EEK)

²⁵ The budget also includes the application costs of the programme e.g. launching, evaluation, etc.

4.2.2 Effects and added value of Structural Fund support for innovation and knowledge

This section of the report analyses the effects and added value of the Structural Fund interventions in favour of innovation and knowledge during the current programming period. The analysis is based on two main sources, namely: a) available evaluation reports or studies concerning Structural Fund interventions; b) interviews and additional research carried out for this study. Accordingly, this section does not pretend to provide an exhaustive overview of the effects or added value²⁶ of Structural Fund interventions but rather is based on the examination of a limited number of cases of good practice. These good practice cases may concern the influence of the Structural Funds on innovation and knowledge economy policies (introduction of new approaches, influence on policy development, etc.), integration of Structural Funds with national policy priorities, promoting innovative approaches to delivery (partnerships), or measures which have had a particularly important impact in terms of boosting innovation potential, jobs and growth.

A first conclusion would be that at this stage of the programming cycle it is still relatively early to analyse the results of the RTDI measure in any meaningful way. See Exhibit 13, which draws the picture of the effectiveness of RTDI measures from 2000.

Exhibit 13 Synthesis appraisal of effectiveness of RTDI measure (2.3 in the SPD/NDP)

Programme	Synthesis appraisal of effectiveness of measures	Results identifiable
R&D financing programme	<ul style="list-style-type: none"> - Significant leap in demand for financing from enterprises and universities - Programme could probably absorb funds. 	<ul style="list-style-type: none"> - Enterprise Estonia considers it too early to judge results since most projects are not completed - State Audit Office report found limited evidence of results in review carried out in 2004 - The programme is to be evaluated in 2006
SPINNO programme	<ul style="list-style-type: none"> - Projects launched and apparently functioning correctly 	<ul style="list-style-type: none"> - Positive evaluation of previous round (non-Structural Fund supported) - Second round of funding appears to be leading to greater sophistication in terms of services provided - The programme is to be evaluated by September 2006

²⁶ A good definition is “The economic and non-economic benefit derived from conducting interventions at the Community level rather than at the regional and/or national level”. See Evaluation of the Added Value and Costs of the European Structural Funds in the UK. December 2003. (Available at: www.dti.gov.uk/europe/structural.html)

Programme	Synthesis appraisal of effectiveness of measures	Results identifiable
Innovation awareness programme (Good Estonian Idea)	<ul style="list-style-type: none"> - Good response to first calls from range of beneficiaries 	<ul style="list-style-type: none"> - Projects in process of being launched only
R&D infrastructure development programme	<ul style="list-style-type: none"> - Programme appears to be over-subscribed in terms of funding applications - Difficulties over financial issues such as VAT reimbursement 	<ul style="list-style-type: none"> - Financing decisions made but projects not yet launched
Centres of Excellence programme	<ul style="list-style-type: none"> - As for R&D infrastructure development likely to be oversubscribed 	<ul style="list-style-type: none"> - Projects in process of being launched only
Competence Centres programme	<ul style="list-style-type: none"> - 2004 essentially used to launch and establish legal structures and for initial strategy building by selected centres - Difficulties with bureaucracy and financial rules act as a brake on development 	<ul style="list-style-type: none"> - Initial series of research actions being launched within established centres - Still need to clarify strategies for end of initial funding period and for IP management and self-financing - Despite of the administrative difficulties the programme is expected to give significant influences in the Estonian NIS
Business incubation programme	<ul style="list-style-type: none"> - Relatively sub-critical investments made at this stage, some difficulty to self-finance private share - Need to link more effectively with Science & Technology Park development 	<ul style="list-style-type: none"> - Initial projects in start-up phase
Infrastructure development programme for Science and technology parks	<ul style="list-style-type: none"> - No funding yet committed within SPD - Small amounts allocated under SPD seem to make significant additional infrastructure investment problematic 	<ul style="list-style-type: none"> - Gradual development of services within S&T parks in part due to PHARE funding, but also through use of INTERREG, etc. funded projects
Innovation programme audit	<ul style="list-style-type: none"> - The pilot project performed during the 2nd and 3rd quartile in 2005 	<ul style="list-style-type: none"> - 11 consulting firms and 60 innovation audits were performed - Decided to continue with the PERA methodology and software (some proposals for specific changes in the methodology)

Source: Updated table from "Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning", December 2005. Technopolis Consulting Group Belgium SPRL.

The SPINNO Programme

The Estonian innovation policy practise is not very long one but since 2000 significant initiatives have been launched and implemented year by year. The SPINNO Programme is one of these early birds in the policy package, it was launched in 2001. The programme aims to support the establishment of the commercialisation tools and manners in the R&D and higher education organisations in Estonia.

The programme could be regarded as a good practise in the policy history for both the applicant institutions and policy-makers. Through the SPINNO Programme intellectual property regulations and technology transfer units have developed as well as technology transfer trainings performed. The work will continue with the support on intellectual property rights and more intense commercialisation of the research results. For policy-makers the programme has given a good possibility to see the programme evolution during its implementation period.

As can be seen from above, it is essentially the R&D financing and SPINNO programme which have been running since prior to the Structural Fund programmes where initial impacts could be expected to be identified in near future. The mid-term evaluation of the SPINNO Programme has carried out by the foreign experts in 2003. The second evaluation of the SPINNO programme as well as R&D financing programme are ongoing. The box below gives some hints to the SPINNO programme as a good policy practise in the Estonian innovation policy. In Appendix F a more comprehensive overview on the SPINNO Programme is included.

Despite of the fact the programmes are relatively new and impact assessments are not yet available there are still some circumstances could be presented to give an attention on some positive outcomes accompanying the programmes. The R&D financing scheme has been a supportive tool to map the R&D potential firms as well as higher education and research organisations in Estonia. Second, it has to a great extent helped to define the short-term joint R&D projects between R&D organisations and firms. The share of firms in the programme portfolio has increased year by year which shows the growing interest and capabilities of firms to invest on R&D. The competence centre programme has given an opportunity to determine and implement the mid-term R&D programmes jointly with research and industry partners in specific technology questions. The programme is expected to contribute to more systematic and strategic thinking on R&D questions as well as competence building. The first years' progress of competence centres shows their success in terms of interested researchers and available financing on longer-term R&D plans. If preceding the programmes have been primarily focused on R&D, the Spinno programme has aimed to support the establishment of technology transfer mechanisms and rules in R&D institutions in Estonia (see Appendix F). Technology and science parks have also received a public support (investments, services) but mostly via single projects to date.

One can see that the first policy instruments were opened for the institutions and firms capable for single or joint R&D projects. The schemes have given a challenge for policy-makers to map the competencies in R&D field in Estonia. But the Estonian society needs a broader RTDI policy approach to being responsive to the needs and opportunities of firms and R&D organisations. The Inno Awareness programme already complements the policy-package to introducing innovation as a wider topic and management subject for different groups of society. See also exhibit 14.

4.3 Conclusions: Structural Funds interventions in favour of innovation and knowledge

Exhibit 14: main outcomes of innovation and knowledge programmes (the NDP/SPD measure 2.3)

Programme or measure	Capability	Added value
R&D financing programme	Relatively good financial absorption capacity (see also Exhibits 12, 15, 16)	Financing RTDI
SPINNO programme	Relatively good financial absorption capacity (positive evaluation results of first round)	Increasing of entrepreneurship in universities and other R&D institutions
Innovation awareness programme (Good Estonian Idea)	Recently launched, good response to first calls	N/a
R&D infrastructure development programme	Recently launched, over-subscribed in terms of funding applications	N/a
Centres of Excellence programme	Recently launched, over-subscribed in terms of funding applications	N/a
Competence Centres programme	Relatively good financial absorption capacity, 5 competence centres established	Strengthening the strategic cooperation between science and industry sectors
Business incubation programme	Middle financial absorption capacity	Enhancing the creation and growth of innovative enterprises
Infrastructure development programme for science and technology parks	Low financial absorption capacity	N/a
Innovation audit programme	Recently launched, 11 consulting firms selected, 60 first innovation audits carried out	N/a

Effectiveness → significant results achieved; good absorption and management performance, etc.

Added value of measures → reinforcement of national priorities, innovative approaches and solutions, institution building, etc.

Source: Updated table from “Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning”, December 2005. Technopolis Consulting Group Belgium SPRL.

Considering the SFs’ support for innovation as a wider term (incl. also SME, human resource schemes) and following the interview phase at the Ministry of Economic Affairs, the Ministry of Education and Research and Enterprise Estonia, no suspicion to have been absorbing the SFs’ resources for certain programmes was found at first. In terms of human resource development (measures 1.1, 1.2), higher education institutions have been relatively more capable to apply and absorb public funds compared to vocational education institutions²⁷. The establishment of doctoral schools, as well as supporting foreign professorships in Estonia, are expected to be the most promising SFs’ activities during the first programming period of the EU intervention.

²⁷ See also the internal evaluation of the measure 1.1 from www.hm.ee.

Based on the interviews, the start-up support for SMEs has achieved its mature stage where the scheme is completely ready for the applicants in practise. The expenditure absorption by Enterprise Estonia was relatively high (67%) in 2005 (see also Exhibit 12). Approximately 90% of the applications for the Start-up scheme are defined to be successful. Most active regions in applying the start-up support from the Enterprise Estonia come from Järva, Jõgeva, Valga, Võru, Põlva and Ida-Viru²⁸ - hence, from Southeastern and North-Eastern part of Estonia. Regional limits have been applied for the start-up and infrastructure schemes. The enterprises in the capital city Tallinn have not been eligible for these two schemes; the rules will be changed for the next programming period, at least for the Start-up programme. Training and consultancy programmes have achieved the highest absorption rates - 74.4% and 88.7% accordingly. The Entrepreneurs' infrastructure programme (46.9%) has met relatively poorer performance in 2005. But again, by June 2006, all the SFs' funding for SMEs is also estimated to be outpaid by the Enterprise Estonia. A very important role in delivering the support for SMEs has been given to Regional Development Centres by the Enterprise Estonia. These regional centres carry out preliminary applicability of the Enterprise Estonia' clients as their competence building must be considered as a very significant factor in simplifying the general bureaucracy of administrating the EU SFs.

Among the RTDI programmes (under the measure 2.3 of the SPD/NDP), the R&D financing scheme, as well as launching the Competence Centre Programme and R&D infrastructure programme, have presently become the most supportive public support activities appreciated by various interest groups. Although, during the preparations of three years' R&D programmes, the competence centres found it to be a difficult task. But in accordance with the programme documentation, it was the main of it strategic thinking to be enhanced in co-operation with enterprises and R&D institutions in certain technology fields in Estonia. According to the expert opinion of the Enterprise Estonia, the Competence Centre programme has experienced to be problematic to administrate whilst to be expected to give the most promising and immediate value added contribution to the Estonian NIS during the following years. The R&D infrastructure programme is presently waiting for an additional funding (received less than initially planned, 230 MEEK instead of 400 MEEK) due to an oversubscription of good quality projects. The role of Inno Awareness programme is seen to be highly supportive for all other RTDI and SME development activities.

From the management point of view the tight bureaucracy in administrating the applications (by the Enterprise Estonia, the Ministry of Finance) was confirmed to impede the speed of the overall process of the EU SFs. Enterprise Estonia is gradually going to leave a more decision-making power to the lower level of the management within the organisation. However, the final financing decisions of the EU SFs will be still made by the Ministry of Finance. Another concern relates to the bureaucracy written into the programmes, which is going to be decreased for the new EU SFs. By means of the activities the new public tools such as to supporting sectoral clusters, firm audits, innovation scouts in Estonian enterprises etc. are to be introduced by the relevant ministries. The amendments into the present programmes are foreseen.

²⁸ See Eesti Ettevõtluspoliitika 2007-2013. Majandus- ja Kommunikatsiooniministerium.

5 Regional potential for innovation: a prospective analysis

This section of the report seeks to summarise and draw conclusions from the analysis of the preceding sections, available studies and interviews and focus groups carried out for this study in order to provide an analysis of the regional innovation potential. In doing so, the aim is to provide a framework for orientations in terms of future Structural Fund investments in innovation and knowledge.

5.1 Factors influencing regional innovation potential

RTDI competencies have been primarily concentrated on the three regions of Estonia: *Põhja-Eesti* (Northern Estonia), *Lõuna-Eesti* (Southern Estonia) and *Kirde-Eesti* (North-East Estonia). However, one could not underestimate the role of other regions such as Western Estonia in innovation activities, particularly in the tourism and health resort sector. The research community is mainly located in the capital city Tallinn and Tartu. Regarding the nature of the research, R&D organisations are more industry oriented in Tallinn. On the other hand, the region of Tartu could be characterised with the tradition of more fundamental research.

From the demand side Northern Estonia significantly leads other regions representing 60% of active firms, 80% of foreign investments, 77% of business R&D and 60% of the total value added in the country. More than half of the Estonian GDP comes from Northern Estonia as well as almost half of the country's total industrial production is provided by the businesses in the region. Complementary to the traditional industry sectors (textile, food and beverages, wood, furniture, building materials, plastics), the significance of machinery and electronics has rapidly increased in parallel with the entrance of foreign investors primarily in the region of Tallinn. The new sectors are emerging, information and communication technology in the dominant cities of innovation and research activity. The driving forces of biotechnology sector in Estonia originate from Tartu. North-East Estonia lags significantly other dominant regions with the economic development. But the area is crucial for Estonia in terms of natural resources. Mining, manufacturing, power engineering, machinery and construction sectors in the region are important to the Estonian economy.

The main challenge for Northern Estonia stands on the innovation capabilities of firms both in terms of human capital and financing (see also Exhibit 15). Regarding its regional advantages in terms of the business sector the innovation potential tends to be the highest in North Estonia. But the area shows some weaknesses, which might limit its growth already in near future. In general terms, one could expect the higher economic value of R&D in Northern Estonia. The share of value added is much lower compared to relatively high share of business R&D or foreign involvement in the business sector. Today, manufacturing is to a great extent related to the production of intermediary goods instead of providing final products, especially in machinery and electronics' sector in Northern Estonia. From the policy perspective international partnerships should be more systematically taken into account throughout the policy portfolio focusing the instruments for enhancing human resource mobility, knowledge

and technology transfer etc Innovation support organisations are intended to collaborate with foreign partners but on a basis of more strategic plans as performed to date.

The major factors influencing the future innovation potential in Southern Estonia are primarily associated with the region' ability to grow the quantity and quality of human capital related to business and research performance. Both the regional and national initiatives are about to provide with the stimuli of young graduates to come and stay in the region for contributing to the creation of critical mass of people around certain technology fields. Despite of the positive developments e.g. in the ICT as well as biotech sectors in Tartu the advantage in terms of the quantity of people is much lower in Tartu relative to Tallinn and its surroundings. The second critical success factor determining the attractiveness of the region (also for foreign investors) is associated with the quality of knowledge infrastructure and services provided both by R&D organisations and innovation support structures (e.g. Tartu Science Park, Tartu Biotechnology Park). The latter issue is of great importance to the creation and growth of new businesses in the region. Tartu has a very good floor for spin-offs to flourish.

The role of North-East Estonia is much smaller compared to Southern and Northern Estonia in determining the innovation potential in Estonia. However, the natural resources provided in the region offer opportunities for systematic research performance and innovation activities. The question of attractiveness of the region is the most critical in terms of young people. R&D competence building in the region will be mainly dependent on the nature of collaboration both with the local and foreign R&D organisations and businesses.

Exhibit 15: factors influencing innovation potential by type of region

Region / type of region	Main factors influencing future innovation potential
<i>Põhja-Eesti</i> (Northern Estonia)	<ul style="list-style-type: none"> • The level of entrepreneurship, innovation awareness and capabilities of firms (particularly SMEs) • The access to complementary financing resources • The quality of relations between science and industry sector • The availability of highly qualified skilled workers, researchers and engineers • The motivation and orientation of foreign investors • The success of innovation support structures (e.g. incubators, science parks)
<i>Lõuna-Eesti</i> (Southern Estonia)	<ul style="list-style-type: none"> • The stimuli of young people (e.g. graduates) to come and stay in the region • The level of entrepreneurship, innovation awareness and capabilities of firms (particularly SMEs) • The access to complementary financing resources • The quality of relations between science and industry sector • The availability of highly qualified skilled workers, researchers and engineers • The success of innovation support structures (e.g. incubators, science parks)
<i>Kirde-Eesti</i> (North-East Estonia)	<ul style="list-style-type: none"> • The stimuli of young people (e.g. graduates) to come and stay in the region • The level of entrepreneurship, innovation awareness and capabilities of firms (particularly SMEs) • The access to complementary financing resources • The quality of relations between science and industry sector • The quality of relations with R&D institutions and firms as well as innovation support structures in other regions of Estonia, particularly in Northern and Southern Estonia • The availability of highly qualified skilled workers, researchers and engineers

5.2 A prospective SWOT appraisal of regional RTDI potential

To conclude the discussion on the innovation potential of Estonia the regionality should not be overemphasised. The Estonian economy is export-oriented, sensible to the developments in the neighbouring and other foreign countries' markets. The Estonian society and economy has to be able to compete internationally and to react appropriately to foreign influences. A strong RTDI base will ensure the position for Estonia in the international production networks. In regional terms Northern Estonia with the capital city Tallinn has the closest foreign links relative to other Estonian regions. The positions in the international networks are to a great extent determined by the innovation capabilities of firms in Tallinn and within its sphere of influence. The regional innovation potential might be impeded by insufficient science-industry co-operation and lack of highly qualified R&D personnel (see also Exhibit 16). The main threat for Southern Estonia as well as for North-East part of Estonia remains to be related to the creation of critical mass of people on more applied research questions.

Exhibit 16: Innovation and Knowledge SWOT

Põhja-Eesti as a leading capital region	Opportunities	Threats
Strengths	<ul style="list-style-type: none"> ▪ High level of concentration of firms, business R&D expenditure and value added 	<ul style="list-style-type: none"> ▪ Low level of strategic innovators and asset-seeking foreign investors
Weaknesses	<ul style="list-style-type: none"> ▪ Lack of highly qualified R&D personnel 	<ul style="list-style-type: none"> ▪ Low level of R&D co-operation between firms, local R&D institutions and firms

Lõuna-Eesti as one of the central university, science as well as business centres	Opportunities	Threats
Strengths	<ul style="list-style-type: none"> ▪ Relatively high level of concentration of firms and science resources (particularly in biotech, ICT) 	<ul style="list-style-type: none"> ▪ Low level of population density and economically active population
Weaknesses	<ul style="list-style-type: none"> ▪ Lack of highly qualified R&D personnel 	<ul style="list-style-type: none"> ▪ Low level of R&D co-operation between firms, local R&D institutions and firms

Kirde-Eesti as one of the biggest industrial areas	Opportunities	Threats
Strengths	<ul style="list-style-type: none"> ▪ High level of concentration of industrial capacity 	<ul style="list-style-type: none"> ▪ Low level of population density and economically active population
Weaknesses	<ul style="list-style-type: none"> ▪ Lack of highly qualified R&D personnel and other resources 	<ul style="list-style-type: none"> ▪ Low level of R&D co-operation between firms, local R&D institutions and firms

5.3 Conclusions: regional innovation potential

Presenting the policy headlines for Estonia there is no reason to make distinctions between the three dominant regions in terms of RTDI. Due to the small size, the Estonian government has not presented any particular regional limits for RTDI measures. The level of RTDI is relatively similar in the regions with their particular specific contexts, weaknesses and strengths. From the policy perspective the differences between these three and other regions of Estonia are rather emphasised.

Policy headline 1: The Structural Funds interventions promoting RTDI must be predominantly targeted at regions with high RTDI and business concentration (Northern Estonia, Southern Estonia, North-East Estonia)

Considering the various competence levels of the firms' RTDI measures such as R&D financing, the Competence Centre, the Centres of Science Excellence programmes, etc., are predominantly focused on the regions in Northern Estonia, Southern Estonia and North-East Estonia. The vast majority of the science and respective business resources have been concentrated on these three regions of Estonia. Since Estonia is small by its size, the accumulation of competence in certain areas is defined to be an extremely important issue. Whilst, the co-operation between the institutions in these and with other regions is highly appreciated to occur. Innovation activities are to be supported across various industry and service sectors.

Policy headline 2: Innovation in wider terms must be also enhanced in all other regions and sectors of the economy in Estonia

Innovation is not only based on poor R&D activities. It is a part of the innovation performance. Aiming to increase the amount of firms capable for systematic innovation management, other public support measures such as targeted towards SMEs (start-up, business infrastructure development, training support, mentoring etc) have to be planned and implemented properly. Significant public efforts are required to give to enhancing entrepreneurship and innovation across different sectors in all regions of Estonia (not only turning attention on the high-tech). Inno Awareness programme managed by the Enterprise Estonia is to be aimed to carry a special attention to the latter issues during the next programming period of the EU SFs.

Policy headline 3: The development of entrepreneurial and innovation support structures have to be considered with the utmost importance in all regions of Estonia

Innovation support structures such as technology and science parks, as well as incubators, play a central role in stimulating innovation activities in *Põhja-Eesti*, *Lõuna-Eesti* and *Kirde-Eesti*. From the international perspective and considering the location and size of Estonia, the linkages with innovation support structures in neighbouring countries (other Baltic countries, Finland, Sweden) should be prioritised. The role of county development centres is proposed to give a particular attention (competence building) to introducing the services of Enterprise Estonia, as well as being more intensively involved in the decision-making process of public programmes.

6 Future priorities for Structural Fund support for innovation and knowledge: options for intervention

6.1 Strategic orientations for Structural Fund investments in innovation and knowledge

The role of EU Structural Funds in supporting RTDI in Estonia is extremely significant. A major part of programmes stated in the Estonian R&D strategy (the preparations for the new RTDI strategy ongoing) are co-financed by the EU Structural Funds. The EU SFs are to be the main public funding sources for RTDI in Estonia during 2007-2013. RTDI development has included as one of the priority areas in the operational programme on the development of business, information society, transport and energy infrastructure, which is prepared by the Ministry of Economic Affairs and Communications.

Future priorities for Structural Fund support for innovation and knowledge link to the aims and principles inserted into the new R&D strategy. One of the main value added of the new strategy could be linked to the technology programmes, which are planned to be developed and launched during 2007-2013. The R&D strategy in its turn is in compliance with the “Action Plan for Growth and Jobs for 2005 –2007” (for implementation of the Lisbon Strategy). The success of the public RTDI activities stated in the new strategy document will be strongly influenced by the implementation of the “Estonian Higher Education Strategy for 2006-2015”, the “Estonian Enterprise Policy for 2007-2013”, the “Lifelong Learning Strategy for 2005-2008” as well as the “Development Plan for Information Society until 2010”. Hence, the future opportunities of the Estonian RTDI are not only depending on the implementation of the RTDI policy. Innovation has to be taken as wider concept than conventionally approached. The need for more intense co-operation between different ministries in the sense of public innovation support is only increasing.

Today, the economic growth of Estonia tends to be too much investment rather than innovation-driven. The main focus of RTDI policy has to continuously concentrate on the businesses. The key issue from the viewpoint of businesses lies within their capabilities while being to a great extent influenced by the general knowledge and production infrastructure in the economy. If the production outcome finally appears at the business level, the assumptions for less or more value-added production are created at the country level. The firm is involved in local as well as foreign networks of production, technology, etc. Just as businesses have to promote dynamic capabilities in production and suppliers in technology, so policy-makers at regional or national level have to promote dynamic capabilities in respect of the institutional and economic environment in which the firms can best emerge.

Second, government policy needs to focus on network failures in the national innovation system by attempting to encourage the generation of appropriate knowledge of various kinds, as well as diffusion of this knowledge between defined

sectors of economy and a society. Effective interactions are the main success factor of the Estonian Innovation System in a longer perspective. The national and county governments must continuously support activities aiming to enhance science and business cooperation, knowledge transfer between key stakeholders of the innovation system. Increasing absorption capacity may require primarily the promotion of greater mobility of the personnel involved, particularly to absorb the more tacit aspects of the new products, processes, policies, etc.

Considering low- and high-tech industries of manufacturing sector the coupling of both of them is foreseen as a critical success factor of economic development of Estonia. Also, more intense interactions between manufacturing and service sector bodies can be forced by the government. Therefore, key issues of indigenous technology development in Estonia might not be associated with only a very high involvement of foreign firms in the economy nor just resources directed towards high-tech sectors. The major challenges for Estonia lie within the quality of human resources and capabilities to absorb foreign knowledge (mainly from Northern Europe) over a variety of sectors. The preconditions for attracting more strategic foreign investments and highly specialised and skilled people lie on the quality of knowledge infrastructure (basic research, innovation support infrastructure, such as science/technology parks) provided by the Estonian society.

The following policy challenges in relation to the EU SFs are listed below regarding the situation in the Estonian RTDI.

Key conclusion 1: One of the main concerns of the Estonian RTDI opportunities lies in the human resource to be appropriate and sufficient in approaching the world technology frontier

Recommendation 1: The human resource development has to be started with a systematic innovation-oriented thinking, training and education in vocational, applied and higher education institutions, continuing with more active entrepreneurial and innovation activities performed by firms and R&D institutions and a society as a whole

Public funding on the human resource development has to be considered as a systematic and complex sector and/or technology based process. Foresight studies and key technology programmes could be foreseen as very helpful tools to support this aim. More serious attention has also to be paid to the mobility of researchers between firms and R&D institutions, as well as to increasing the innovation management knowledge and skills in firms. Complementary to RTDI measures presented in the operational programme of the Ministry of Economic Affairs and Communications SME support is to be systematically implemented to increase the RTDI potential of Estonia. In terms of increasing innovation managements skills in businesses and enhancing the researchers' mobility between science and industry sectors Estonia could learn from the good practise examples in the UK (e.g. the Q-Share@ scheme), in France (the CIFRE) or in the Netherlands (the Casimir). The programmes such as the SPINNO, Inno awareness, Innovation audit should be continued in the next programming period.

Key conclusion 2: The accumulation of the R&D competence relates to the quality of the knowledge infrastructure, which is weakly developed in Estonia

Recommendation 2: Knowledge infrastructure including the R&D infrastructure in the R&D institutions, centres of science excellence and R&D competence centres, as well as innovation support structures (technology and science parks, incubation centres, etc.) need to be given a long-term public focus in certain regions (*Põhja-Eesti, Lõuna-Eesti* and *Kirde-Eesti*) and business support structures (incubation centres, industrial parks, etc.) in all regions of Estonia

The EU intervention by means of knowledge infrastructure is recommended to be primarily focused on the knowledge and technology transfer and R&D co-operation between firms and R&D institutions. The first is linked to the universities' knowledge transfer functions, as well as all relevant regional business and innovation support structures such as technology and science parks, incubation centres, etc. The RTDI situation today in Estonia, particularly the wide gap of attitudes and needs in the business and science sector will require stronger emphasis to be given on building innovation support infrastructure. The share of businesses linked to R&D activities and the share of R&D institutions involved in the joint projects with the industry is very modest. However, the research infrastructure of the R&D organisations related to the applied research must be given a priority status as well. The competence centres carry the role of creating strategic R&D co-operation between firms and R&D institutions in certain technology fields. These activities intentionally aim to support the international competitiveness of the firms in Estonia. Public support through, Competence centres programme, SPINNO programme, Business incubation programme, infrastructure development of science and technology parks, R&D infrastructure development programme, SME programmes (Start-up, Business infrastructure development programme, etc) should be continued but adapted in accordance to the future needs.

Key conclusion 3: Industrial foresight and clustering is not systematically supported by the public measures

Recommendation 3: Systematic industrial foresight exercise and supporting industrial clusters attempts to attract more strategic asset seeking foreign investments into Estonia

Industrial foresight studies attempt to serve horizontally the various types of RTDI and human resources development measures in Estonia. Whilst stimulating the creation of clusters, the integration between high- and low-tech sectors locally, regionally or internationally must be foreseen. By its character the Estonian economy is strongly linked to the Scandinavian economy via foreign investors mainly from Finland and Sweden. Industrial foresight studies are recommended to foresee the clustering potential of firms at international scale (the practise should be learnt from the Northern Europe).

Key conclusion 4: Technology foresight has not been systematically exercised neither the key technology programmes developed

Recommendation 4: Technology foresight exercises must be launched in parallel with industrial foresights to serve all RTDI, SME and human resource development measures with necessary information about the mismatch between the local opportunities and the world technology frontier

Technology foresight exercises also attempt serving horizontally various types of RTDI public measures, as well as giving a considerable input into technology programmes to be developed in key technology areas (defined in the RTDI strategy of Estonia). Foresight exercises are to be complemented by various types of innovation studies to keep eye on the governance issues of the RTDI institutional system and policy tools (the practice should be learnt from Ireland, the UK, Finland).

6.2 Operational guidelines to maximise the effectiveness of Structural Fund interventions for innovation and knowledge

Key conclusion 5: The low co-operation between the government institutions impedes the application of the modern innovation approach - horizontally carried over all areas of the society - in the Estonian RTDI policy

Recommendation 5: A more intense dialogue is required between the ministries responsible for various sectors of the society

The function of playing a negotiator role for the relevant ministries is to be more seriously taken by the R&D Council. Each ministry is responsible on its own field and is carrying the ideas into policy documents and state budget. Without any strong co-ordinating body of RTDI in Estonia it will be a particularly difficult process to develop technology programmes presented in the R&D strategy.

Key conclusion 6: The regional initiatives of RTDI are not coherent with the policy planning at national level

Recommendation 6: Initiatives taken by individual regions must be considered more systematically by the central government

The results of regional initiatives on RTDI should be more systematically focused by central government institutions. For example, taking the regional innovation strategies (TRIS, RIS) under consideration, a question could rise concerning the value for these strategies to be implemented without having the government eye on them in the Estonian context? The more intense involvement of the national representatives in the strategic-oriented regional initiatives is to be foreseen.

Key conclusion 7: The administration of the EU SFs' measures is detected to be too bureaucratic

Recommendation 7: The bureaucracy of the implementing agency, as well as the programmes, must be significantly decreased

The task could be implemented through decentralisation of the decision-making power within the implementing agency (Enterprise Estonia), as well as "softening" the internal programme's implementation rules (e.g. for the SPINNO Programme). More risk tolerant practices in the implementation (application, reporting, etc) of the SF' activities is expected. Increasing the capacity of county development centres would be necessary to carrying more sophisticated tasks in terms of the public RTDI and SME programmes thereby reducing the administrative obligations of Enterprise Estonia as well as shortening the time to be consumed for the application procedure.

Key conclusion 8: Within the limits of bureaucracy, the financing of too many small-size (by terms of funds and applicants) should be avoided

Recommendation 8: It is more efficient to support a less ambitious amount of programmes with sufficient critical size

Due to the extensive bureaucracy developed in the organisation of Enterprise Estonia and written into the programmes, it is recommended to co-finance a "reasonable" package of RTDI, SME and human resource development activities. The preparation of the operational programmes by various ministries needs an intense co-operation to avoiding the inclusion of small but often necessary instruments. The joint programmes based on common interests of different fields might be produced then.

In summary, Exhibit 17 includes the indication of strategic focus, responsive priority measures and financial resources devoted to RTDI for Estonia through EU Structural Funds in 2007-2013. There are not only RTDI submeasures but also SME and selected human resources development measures (strengthening doctoral studies, supporting basic R&D infrastructure) based on the information from the two operational programmes (the one prepared by the Ministry of Economic Affairs and Communications and another by the Ministry of Education and Research) inserted into the table. In total, eight submeasures from the two operational programmes were used to figure out the indicative division of financing for 2007-2013. These submeasures are to amount to around 20% of the overall EU cohesion policy in Estonia. If we also included other measures such as information society, transport infrastructure development, long-life learning etc (which could be seen as indirect innovation support measures), the percentage would be much higher then. In the last column the internal division of funding is proposed for innovation support in Estonia for the next programming period of the EU SFs. The indication is based on the absorptive capacity and the foreseen opportunities of the Estonian Innovation System.

Exhibit 17: Summary of recommendations on investment priorities for innovation activities 2007-2013

Region or group of regions	Strategic focus	Priority measures	Indicative financial resources (internal structure of innovation funding from the EU SFs)
Estonia	Improving governance of innovation and knowledge policies	Foresight, innovation studies, policy evaluation, training and innovation public sector administration	4%
	Innovation friendly environment	Human capital development e.g. doctoral schools, innovation awareness activities, innovation management skills	15%
	Knowledge transfer and technology diffusion to enterprises, innovation poles and clusters	Competence centres, researchers' mobility between private and public sectors, industrial cluster development	12%
	Support to creation and growth of innovative enterprises	Incubators and related services, the commercialisation of R&D results, spin-offs, science and technology parks; SME support schemes e.g. innovation audit, business development infrastructure, mentoring, start-up, training, export planning	24%
	Boosting applied research and product development	R&D projects, R&D institutions' infrastructure, centres of science excellence	45%

Appendix A Methodological annex

A.1 Quantitative analysis of key knowledge economy indicators

A 1.1 Factor analysis

In order to analyse and describe the knowledge economies at regional level in the EU, the approach adopted was to reduce and condense all relevant statistical information available for a majority of regions. The approach involved firstly reducing the information from a list of selected variables (Table 1) into a small number of factors by means of factor analysis.

Table 1. Reduction of the dataset (215 EU-27 regions) into four factors by means of factor analysis

	The 4 factors			
	F1 'Public Knowledge'	F2 'Urban Services'	F3 'Private Technology'	F4 'Learning Families'
Higher education (HRSTE), 2003	.839	.151	.190	.184
Knowledge workers (HRSTC, core), 2003	.831	.164	.267	.327
High-tech services employment, 2003	.575	.367	.428	.323
Public R&D expenditures (HERD+GOVERD), 2002	.543	.431	.275	-.195
Value-added share services, 2002	.323	.869	.002	.121
Value-added share industry, 2002	-.265	-.814	.386	-.061
Employment government administration, 2003	-.217	.745	.124	-.175
Population density, 2002	.380	.402	.043	.038
High and Medium/high-tech manufacturing employment, 2003	-.073	-.331	.873	-.089
Value-added share agriculture, 2002	-.222	-.350	-.672	-.198
Business R&D expenditures, 2002	.335	-.050	.664	.267
S&T workers (HRSTO, occupation), 2003	.560	.178	.589	.382
Population share under 10 years of age, 2001	-.237	.060	-.015	.868
Life-long learning, 2003	.472	-.009	.165	.703
Activity rate females, 2003	.418	-.227	.281	.620

Note: Principal Component Analysis. Rotation Method: Equamax with Kaiser Normalization, a Rotation converged in 9 iterations. Main factor loadings are highlighted in bold. Source: MERIT, based on Eurostat data, mostly referring to 2002 or 2003

Based on the variable with the highest factor loadings we can characterise and interpret the four factors and give them a short symbolic name:

Public Knowledge (F1)

Human resources in Science and Technology (education as well as core) combined with public R&D expenditures and employment in knowledge intensive services is the most important or common factor hidden in the dataset. The most important variables in Public Knowledge are the education and human resource variables (HR S&T education and core). Cities with large universities will rank high on this factor.

One interesting conclusion is that public and private knowledge are two different factors (F1 and F3 respectively), which for instance has implications for policy issues regarding Science-Industry linkages. Public R&D and higher education seems especially related to high-tech services, whereas Business R&D especially serves high- and medium-high-tech manufacturing.

Urban Services (F2)

This second factor contains information on the structure of the economy. It is well known that industrial economies are quite different from services based economies. It is not a matter of development per se, because in the European regions the variety of economic structure is very large and for a large part based on endowments and path dependent developments like the extent to which government administration is located in a region or not. This factor takes into account the differences between an industrial area and a service based area including the public administration services of the government. Another observation is that there are two different 'urban' factors, indicating that academic centres not necessary co-locate with administration centres. What may not be surprising is that the Urban Services factor is not associated with R&D, since R&D is more relevant for innovation in manufacturing than for service industries.

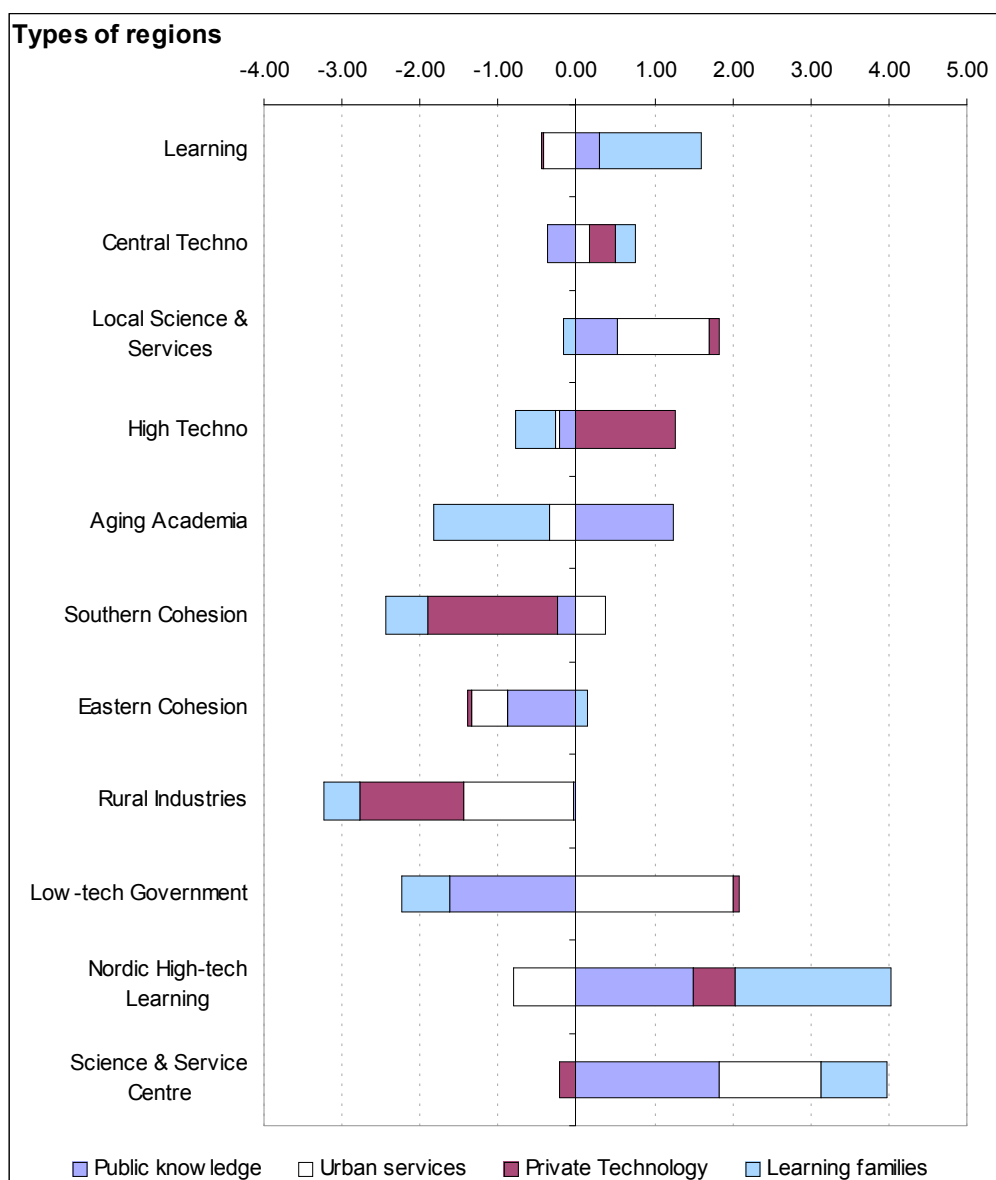
Private Technology (F3)

This factor contains business R&D, occupation in S&T activities, and employment in high- and medium-high-tech manufacturing industries. A countervailing power is the existence of agriculture in the region. One interpretation could be that agricultural land-use goes at the cost of possibilities of production sites. Another interpretation is that agriculture is not an R&D intensive sector.

Learning Families (F4)

The most important variable in this factor is the share of the population below the age of 10. Locations with relatively large shares of children are places that are attractive to start a family. Possibilities for Life Long Learning in a region seems associated with the lively labour participation of the mothers of these youngsters. The Learning Families factor could also be interpreted as an institutional factor indicating a child-, learning- and participation- friendly environment, or even a 'knowledge-society-life-style' based on behavioural norms and values that are beneficial to a knowledge economy.

A 1.2 Description of the 11 types of EU regions



1 Learning

The Learning regions are first of all characterised by the high score on the factor 'Learning Families', and the three main components of this factor: life-long-learning, youth and female activity rate. On the other factors the regions are close to the regional average. Unemployment is on average the lowest compared to the other EU regions. Employment in the government sector is limited. GDP per capita is rather high. The regions are located in Austria, Ireland, the Netherlands, Sweden and the UK. There are many similarities with the Nordic High-tech Learning regions, but the business sector in the Nordic version invest more in R&D.

2 Central Techno

This is a rather large group of regions located mostly in Germany and France with close to average characteristic, but the share of High-tech manufacturing is rather

high. The factor-scores as well as GDP-per head is slightly above the regional average, except for the Public Knowledge factor which is slightly lower.

3 Local Science & Services

This group of regions with diverse nationality consist mainly of capital cities, such as Madrid, Warsaw, Lisbon, Budapest and Athens. These urban area's serve as national centres for business services, government administration, public research institutes and universities. Urban Services and Public knowledge are therefore the strongest factors for this type of region. GDP per capita is on average slightly below the EU25 average, but growing. The low score on life-long-learning is a weakness in most Local Science & Services regions, especially compared to the more wealthy and advanced Science & Service Centres.

4 High Techno

The High Techno regions host many high-tech manufacturing industries. They are mostly located in Germany (e.g. Bayern and Baden-Wurtemberg), some in Italy (e.g. Lombardia and Veneto) and two French regions. This type is very strong in Private Technology and has a high level of GDP per capita. The factors Public Knowledge and especially the Learning Family factor shows a relative weakness, e.g. in life-long-learning. Growth in terms of GDP per capita has been low and unemployment didn't improve much in the previous years.

5 Aging Academia

This group of regions is mostly located in East-Germany and Spain and also includes the capital regions of Bulgaria and Romania. The strength in the Public Knowledge factor is mostly based on the high share of people with tertiary education. The low score on the Learning Family factor is due to little life-long-learning and hosting relatively few children. The unemployment situation has improved, but is still very high.

6 Southern Cohesion

Southern cohesion regions are located in Southern Europe, consisting of many Greek, some Spanish and two Portuguese regions. The low score on the Private Technology factor is striking. There is hardly any high-tech manufacturing nor business R&D. Services is the most important sector, but also agriculture is still a rather large sector. The share of manufacturing industry in value added is very limited. Population density is low, but on average it has been increasing.

7 Eastern Cohesion

Manufacturing industries is the dominant sector, whereas services and agriculture are rather small sectors. This type of region is mostly located in Poland, Czech Republic, Hungary and Slovak Republic. Two Portuguese regions are also included. The Public Knowledge factor is the main weakness of this type of regions. However, the score on the Private Technology factor is close to average, which means that it is much stronger in this respect than the Southern Cohesion regions. Unemployment is high, even compared to Rural Industries and Southern Cohesion regions.

8 Rural Industries

Besides a low per capita GDP, Rural Industries regions have in common a low score on both the factors Urban Services and Private Technology. Population density is

very low. The service sector is often very small. Especially agriculture but also manufacturing industries are relatively large sectors. Besides regions in Bulgaria and Romania and Greece, there is also a more nordic sub-group consisting of Estonia, Lithuania and Itä-Suomi

9 Low-tech Government

This type of region, mostly located in southern Italy is characterised by a very low score on Public Knowledge combined with a high share of employment in the Government sector. Unemployment is severe, on average comparable to Eastern Cohesion regions. GDP per capita is however close to the regional average.

10 Nordic High-tech Learning

The Nordic version of the learning regions are typically strong in the Learning Family factor, but this type also has by far the highest business R&D intensity. In contrast with the popular characterisation of Nordic societies, the size of the government administration is the lowest of all the types. The low score on Urban Services is also due to the low population density. A rather unique feature of this type of regional knowledge economy is the combined strength in both the Public Knowledge and the Private Technology factor.

11 Science & Service Centre

The main characteristics of this urban group of regions are the high scores on the Public Knowledge and Urban Services factors. Population density is very high. This type also has the highest GDP per capita and productivity. The variables that are captured by the factor Learning Families also show a score above the regional average, but disappointing is the relatively low presence of high and medium-high-tech manufacturing and the business R&D intensity.

A.2 Qualitative analysis and preparation of country reports

In summary, the country reports were prepared in the following stages:

A first country document was prepared by the core study team in the form of a **template country report**. It contained overall guidance to the country experts and included a number of pre-filled tables, graphs and analysis sections based on information available at EU level.

Next, the core team members and the national experts who were involved in the pilot phase of the project commented completed elements of the templates. Drafted elements and templates were completed and compiled into **first country briefings (draft pilot reports)** by the national experts involved in the pilot phase of the project. These pilot country reports were prepared by experts for Belgium, Greece, Italy, France, and Poland.

Once the five first country briefings were completed, a **final set of guidelines** was prepared by the core team. These guidelines were agreed with the Commission services responsible for this evaluation. Prior to this, all first country briefings were reviewed during the January 2006 and presented to a first meeting of the scientific committee.

The work during the **country analysis phase** included:

- Undertaking a series of key interviews (KI) with policy decision makers;
- Organising a focus group (FG) with key national or regional RDTI stakeholders;
- Collecting additional information and finalising short case studies; and
- Preparing the synthesis notes of these various activities.

The above-mentioned work served as qualitative data and allowed the national experts to compile the draft **country reports**. All reports were subsequently reviewed, checked and finalised by the core team and the consortium members. Once this first check was completed, the core team organised a final peer reading of the document to verify its overall consistency and to ensure a final English language editing of the document. The core team then completed the final editing and layout of the document with a view to publication.

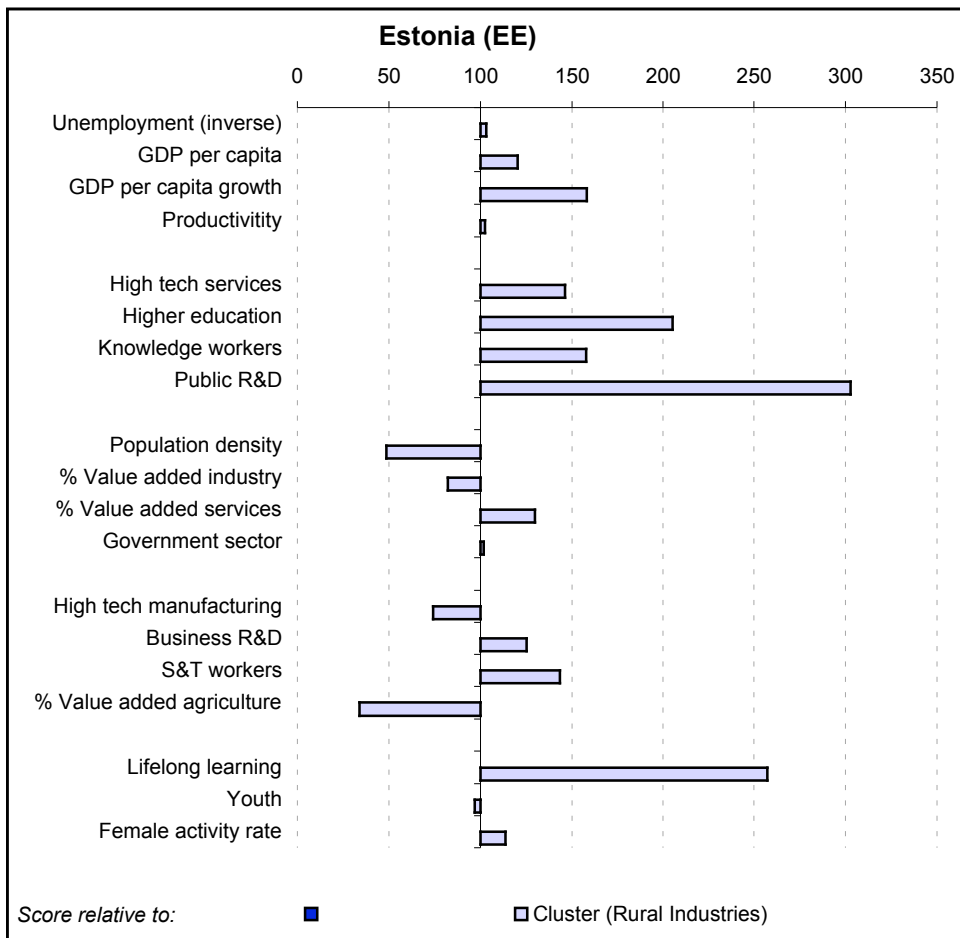
An overall synthesis report of all has been prepared and will be published by the European Commission providing an overview of the issues addressed in each of the 27 country reports produced by the evaluation team.

Appendix B Statistical tables and regional scorecards

B.1 Overall quantitative analysis per region

	Economic performance			Public knowledge			Urban services			Private technology			Learning families				
	Unempl er oyment	GDP per capita growth 1996- 2002	Product ivity	High tech service	Higher educati ons	Knowle dge on workers	Public R&D	Populat ion density	Value added service s	% Value added service s	High tech manufa cturing	Busines s R&D workers	S&T workers	Value added agricult ure	Lifelong learning	Youth	Female activity rate
EU25	9.2	21170	4.8	4556	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002	2002
Regional average	9.4	18882	4.8	3914	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
Estonia	10.0	9871	8.8	1148	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
Relative to EU25	92	47	185	25	73	147	106	75	102	51	19	89	233	77	91	107	107
Estonia	10.0	9871.0	8.8	1148	2.3	30.4	12.3	0.5	30.0	27.6	0.2	18.5	4.9	6.7	9.8	51.6	51.6
Põhja-Eesti (EE001)	9	15120	4.7	4900	2.3	30.4	12.3	0.52	120.7	27.8	0.23	18.5	1.7	6.7	9.8	51.6	51.6
Learning	4.3	23139	4.7	4900	3.2	22.1	12.5	0.40	216	30.5	6.2	1.12	2.4	15.1	12.2	53.8	53.8
Central Techno	7.5	20700	4.0	4884	2.9	18.7	10.6	0.42	182	30.0	7.5	0.84	3.1	6.7	11.2	47.6	47.6
Local Science & Services	9.2	19852	6.0	3780	4.3	23.6	13.7	0.88	389	22.0	4.6	0.79	1.8	5.9	10.4	46.9	46.9
High Techno	6.1	25202	3.6	5591	3.1	17.5	10.3	0.58	288	31.7	11.9	1.31	1.6	5.6	9.7	46.4	46.4
Aging Academia	13.3	17508	5.3	3649	2.5	27.4	13.2	0.67	185	30.1	6.7	0.57	3.0	4.8	7.4	46.0	46.0
Southern Cohesion	10.7	16213	6.3	3082	1.2	14.7	8.2	0.37	66	19.9	1.5	0.11	10.2	3.1	10.0	38.2	38.2
Eastern Cohesion	14.2	9776	5.3	1230	1.9	12.0	7.2	0.26	113	34.2	6.6	0.33	4.5	4.1	11.0	48.4	48.4
Rural Industries	10.3	8204	5.6	1120	1.6	14.8	7.8	0.17	62	33.6	4.5	0.18	14.5	2.6	10.1	45.3	45.3
Low-tech Government	14.1	18553	4.1	4848	2.3	10.0	6.2	0.55	161	21.2	4.2	0.28	3.7	4.6	10.1	32.4	32.4
Nordic High-tech Learning	6.4	23323	4.7	5202	4.5	28.5	18.7	0.41	67	29.9	7.6	3.05	2.3	25.0	11.9	58.2	58.2
Science & Service Centre	6.1	34489	5.3	6663	5.6	28.5	16.8	0.98	2118	16.8	3.8	1.00	0.8	12.8	11.4	55.5	55.5

B.2 Regional Scorecards



Appendix C Categories used for policy-mix analysis

C.1 Classification of policy areas

Policy area	Short description
Improving governance capacities for innovation and knowledge policies	Technical assistance type funding used by public authorities, regional agencies and public-private partnerships in developing and improving policies and strategies in support of innovation and knowledge. This could include past ERDF innovative action programmes as well as support for instance for regional foresight, etc.
Innovation friendly environment;	This category covers a range of actions which seek to improve the overall environment in which enterprises innovate, and notably three sub groups: innovation financing (in terms of establishing financial engineering schemes, etc.); regulatory improvements and innovative approaches to public services and procurement (this category could notably capture certain e-government investments related to provision of services to enterprises) ; Developing human capital for the knowledge economy. This category will be limited to projects in higher education aimed at developing industry orientated courses and post-graduate courses; training of researchers in enterprises or research centres ²⁹ ;
Knowledge transfer and technology diffusion to enterprises	Direct or indirect support for knowledge and technology transfer: direct support: aid scheme for utilising technology-related services or for implementing technology transfer projects, notably environmentally friendly technologies and ITC; indirect support: delivered through funding of infrastructure and services of technology parks, innovation centres, university liaison and transfer offices, etc.
Innovation poles and clusters	Direct or indirect support for creation of poles (involving public and non-profit organisations as well as enterprises) and clusters of companies direct support: funding for enterprise level cluster activities, etc. indirect support through funding for regrouping R&D infrastructure in poles, infrastructure for clusters, etc.
Support to creation and growth of innovative enterprises	Direct or indirect support for creation and growth of innovative firms: direct support: specific financial schemes for spin-offs and innovative start-ups, grants to SMEs related to improving innovation management, marketing, industrial design, etc.; indirect support through funding of incubators, training related to entrepreneurship, etc.
Boosting applied research and product development	Funding of “Pre-competitive development” and “Industrial research” projects and related infrastructure. Policy instruments include: aid schemes for single beneficiary or groups of beneficiaries (including IPR protection and exploitation); research infrastructures for non-profit/public organisations and higher education sector directly related to universities.

²⁹ This is part of the wider area of in-house training, but in the present study only the interventions targeted to researchers or research functions will be analysed.

C.2 Classification of Beneficiaries:

Beneficiaries	Short description
<i>Public sectors</i>	Universities National research institutions and other national and local public bodies (innovation agencies, BIC, Chambers of Commerce, etc.) Public companies
<i>Private sectors</i>	Enterprises Private research centres
<i>Networks</i>	cooperation between research, universities and businesses cooperation between businesses (<i>clusters of SMEs</i>) other forms of cooperation among different actors

C.3 Classification of instruments:

Instruments	Short description
<i>Infrastructures and facilities</i>	Building and equipment for laboratories or facilities for university or research centres, Telecommunication infrastructures, Building and equipment for incubators and parks for innovative enterprises
<i>Aid schemes</i>	Grants and loans for RTDI projects Innovative finance (venture capital, equity finance, special bonds, etc.) for innovative enterprises
<i>Education and training</i>	Graduate and post-graduate University courses Training of researchers

Appendix D Financial and policy measure tables

D.1 Additional financial tables

D 1.1 RTDI plus business (innovation technology) support

Objective	Total cost	SF			NF	
		Total	ERDF	ESF	Public	Private
RTDI INTERVENTIONS						
Objective 1	69,036,785.88	51,783,010.20	51,696,275.50	0.00	17,253,775.68	0.00
TOTAL COHESION POLICY						
Objective 1	495,429,515.00	371,363,452.00	225,975,652.00	76,120,100.00	124,066,063.00	0.00

OBJECTIVES	ALLOCATED	DISBURSED TOTAL SF	EXPENDITURE CAPACITY
Objective 1	51,783,010.20	3,429,840.93	6.6%

CODES	ALLOCATED	DISBURSED	EXPENDITURE CAPACITY
OBJECTIVE 1			
153 - Business advisory services (including internationalisation, exporting and environmental management, purchase of technology) (only for large enterprises)	2,629,175.00	535,834.43	20.4%
162 - Environment-friendly technologies, clean and economical energy technologies (only for SMEs)	1,296,241.95	292,553.40	22.6%
163 - Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology) (only for SMEs)	8,168,059.17	636,063.98	7.8%
164 - Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs) (only for SMEs)	9,377,566.42	928,617.37	9.9%
165 - Financial engineering (only for SMEs)	8,168,059.17	636,063.98	7.8%
181 - Research projects based in universities and research institutes	5,538,884.17	100,229.55	1.8%
182 - Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes	5,535,008.11	100,159.41	1.8%
183 - RTDI infrastructure	5,535,008.11	100,159.41	1.8%
184 - Training for researchers	5,535,008.11	100,159.41	1.8%
TOTAL OBJ. 1	51,783,010.20	3,429,840.93	6.6%

Categories 181 to 184 plus :

- 152 Environment-friendly technologies, clean and economical energy technologies
- 153 Business organisation advisory service (including internationalisation, exporting and environmental management, purchase of technology)
- 155 Financial engineering
- 162 Environment-friendly technologies, clean and economical energy technologies
- 163 Enterprise advisory service (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology)
- 164 Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs)

165 Financial engineering

D 1.2 Broad innovation and knowledge economy funding

c	Total cost	SF			NF	
		Total	ERDF	ESF	Public	Private
RTDI INTERVENTIONS						
Objective 1	71,897,715.33	53,928,707.35	53,841,972.65	0.00	17,969,007.98	0.00
TOTAL COHESION POLICY						
Objective 1	495,429,515.00	371,363,452.00	225,975,652.00	76,120,100.00	124,066,063.00	0.00

OBJECTIVES	ALLOCATED	DISBURSED TOTAL SF	EXPENDITURE CAPACITY
Objective 1	53,928,707.35	3,732,740.97	6.9%

CODES	ALLOCATED	DISBURSED	EXPENDITURE CAPACITY
OBJECTIVE 1			
153 - Business advisory services (including internationalisation, exporting and environmental management, purchase of technology) (only for large enterprises)	2,629,175.00	535,834.43	20.4%
162 - Environment-friendly technologies, clean and economical energy technologies (only for SMEs)	1,296,241.95	292,553.40	22.6%
163 - Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology) (only for SMEs)	8,168,059.17	636,063.98	7.8%
164 - Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs) (only for SMEs)	9,377,566.42	928,617.37	9.9%
165 - Financial engineering (only for SMEs)	8,168,059.17	636,063.98	7.8%
181 - Research projects based in universities and research institutes	5,538,884.17	100,229.55	1.8%
182 - Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes	5,535,008.11	100,159.41	1.8%
183 - RTDI infrastructure	5,535,008.11	100,159.41	1.8%
184 - Training for researchers	5,535,008.11	100,159.41	1.8%
322 - Information and Communication Technology (including security and safe transmission measures)	1,521,570.55	296,002.28	19.5%
324 - Services and applications for SMEs (electronic commerce and transactions, education and training, networking)	624,126.60	6,897.77	1.1%
TOTAL OBJ. 1	53,928,707.35	3,732,740.97	6.9%

This third calculation adds RTDI plus business (innovation & technology) support plus information society. As D.1.1 plus:

322 Information and Communication Technology (including security and safe transmission measures)

324 Services and applications for SMEs (electronic commerce and transactions, education and training, networking)

D.2 Summary of key policy measures per programme

D.2.1 Main measures in favour of innovation and knowledge

Identified RTDI measure or major project*	Focus of intervention (policy areas classification)**	Main Instruments***	Main beneficiaries****
Measure 1.1 Educational system supporting the Flexibility and employability of the labour force and providing opportunities of lifelong learning for all (ESF)	Innovation friendly environment	Schemes supporting vocational education, higher education, lifelong learning (e.g. developing an accreditation system for vocational education institutions, training of students, lecturers, further developing a professional qualifications system)	Public and private sectors
Measure 1.2 Human resource development increasing the competitiveness of enterprises (ESF)	Innovation friendly environment	Grants to retraining and continuing training, Training Programme (e.g. provision of entrepreneurial training for potential entrepreneurs, training activities to increase the awareness and skills of managers and specialists about business management, export and marketing, R&D, innovation, quality management)	Public and private sectors
Measure 1.4 Enhancing administrative capacity (ESF)	Improving governance capacities for innovation and knowledge policies	Conducting training needs assessment and surveys, preparing training programmes, systematic further training of civil servants, short term internship in foreign administrations, implementing management capacity building projects, etc	Public sector
Measure 2.1 Business development (ERDF)	Support to creation and growth of innovative enterprises	Schemes supporting access to finance for enterprises in start-up phase, use of consultancy services, entrance to new markets, awareness of, and access to, business support services	Private sector
Measure 2.2 Business infrastructure development (ERDF)	Support to creation and growth of innovative enterprises	Development of physical infrastructure, support to establishment of business incubators	Public and private sectors
Measure 2.3 Promotion of research, technology development and innovation (ERDF) I Creation of New Knowledge II Financing RTD and Innovation III Strengthening the Innovation	I Boosting applied research and product development II Knowledge transfer and	I Reinforcing the Centres of Science Excellence II Support scheme for market oriented R&D projects, advanced technology programmes in key areas	Public and private sectors, networks

System IV Increasing Awareness and Knowledge about Innovation	technology diffus. to enterprises III Knowledge transfer and technology diffus. to enterprises, support to creation and growth of innovative enterpr. IV Innovation friendly environment	III Development of R&D infrastructure, science and technology parks, incubation services, competence centres, Spinno Programme IV Inno Awareness Programme	
Measure 4.3 Modernisation of infrastructure for vocational and higher education (ERDF)	Innovation friendly environment	Constructing and renovating buildings and research-bases of vocational and higher education institutions, procuring contemporary equipment, inventory and work devices necessary for learning and research in vocational schools, establishing youth information and career counselling centres and public youth centres.	Public sector
Measure 4.5 Information society development (ERDF)	Innovation friendly environment	Development of one-stop channel for citizens and ensuring the interoperability of information systems, further development of public sector e-services, development of digital content and easier Internet access for the population	Public sector
Measure 4.6 Local socio-economic development	Innovation friendly environment	Comprehensive schools, kindergartens, local infrastructure necessary for employment stimulating social services; developing attractions, exhibiting and opening of sites and objects of natural and cultural value; preparing re-use of old military and industrial estates and sites; bridges, viaducts, etc; street lightening systems, etc.	Public sector

* There are additional measures detected in the NDP/SPD to influence RTDI in Estonia but their role is assessed to be the minor one compared to other direct or indirect RTDI measures. Those measures include: Measure 3.2 Investment support for improving processing and marketing of agricultural products (EAGGF), Measure 3.11.1 Investment support for processing of fish and agriculture products (FIFG), Measure 3.11.2 Investment support for agriculture ports (FIFG), Measure 3.11.4 Investment support for inland fisheries (FIFG)

** Classification of RTDI interventions: Improving governance capacities for innovation and knowledge policies; Innovation friendly environment; Knowledge transfer and technology diffusion enterprises; Innovation poles and clusters; Support to creation and growth of innovative enterprises; Boosting applied research and product development (see appendix C).

*** Classification of instruments: Infrastructures and facilities; Aid schemes; Education and training.

**** Classification of Beneficiaries: Public sectors; Private sectors; Networks

Appendix E State of play implementation RTDI measure as of mid-2005

• Programme	• Selection and application process	• State of play of implementation
• R&D financing programme	• Application rounds opened on annual basis and closed once sufficient applications received.	• Upwards of 135 MEEK of projects selected from 1 January 2004 to mid-2005, representing roughly 50% commitment of allocation through SPD • Little or no actual expenditure incurred during 2004.
• SPINNO programme	• Deadline for preliminary applications was 15 June 2004; and 15 September 2004 for full applications.	• Seven projects selected for a total funding of 60.37 MEEK, representing full commitment • Little or no payments made. • Implementation period 15 June 2004-30 June 2007.
• Innovation awareness programme (Good Estonian Idea)	• Two rounds for submitting applications in 2005 for projects aimed at: • students and teachers, and • policy makers and opinion leaders and entrepreneurs.	• In process of selecting first projects
• R&D infrastructure development programme	• Deadline for preliminary application was 1 August 2005.	• In process of selecting first projects
• Centres of Excellence programme	• Deadline for call was 16 September 2005	• In process of selecting first projects
• Competence Centres programme	• First call in February 2003 for short proposals. Fourteen short proposals submitted. • Full proposal negotiations with six applicants as of February 2004.	• Five projects currently underway for a total funding of 42.66 MEEK in first year (from EAS reserves). Further support totalling 100 MEEK to be disbursed via SPD; • Implementation period: 2004-2007 (2-3 years from date of signature of contract)
• Business incubation programme	• First round finished on the 24 th of January 2005. • Second round is intended to take place during Autumn 2005.	• 3 projects selected in 2004 for a total funding of 1.64 MEEK.
• Infrastructure development programme for Science and technology parks	• At this stage no call for proposals have been launched.	• Tartu Science Park still implementing projects under Phare pre-Structural Fund support; • Development of strategic partnership by Tallinn Technology Park with Finnish investor • Need to clarify how planned Structural Fund support can be most effectively used – for developing services or infrastructure.
• Innovation audit programme	• Programme was launched as Pilot project in April 2005 with the aim to map innovation potential and needs at least in 60 enterprises and accordingly design activities to raise their competitiveness.	• Audits currently being carried out by Estonian consultants on the basis of a methodology proposed by a UK consultancy.

Source: Updated table from "Evaluation of the design and implementation of Estonian RTDI policy: implications for policy planning", December 2005. Technopolis Consulting Group Belgium SPRL

Appendix F Case study – the SPINNO Programme

The SPINNO Programme
<p>Title of measure/project: the SPINNO Programme, SPINNO programm (in Estonian)</p> <p>Description: The SPINNO Programme attempts to create a favourable entrepreneurial environment within the R&D institutions and applied higher educational establishments in Estonia through a more intensive application of the knowledge available and results obtained from research.</p> <p>Zone: Objective 1</p> <p>Policy framework: The programme is a part of the R&D Strategy “Knowledge-based Estonia” for 2002-2006 and of measure 2.3 “Promotion of Research and Development Activities and Innovation” in the Estonian National Development Plan/Single Programming Document for 2004-2006. The programme was supported with non-Structural Fund support until 2004.</p>
Brief history and main features
<p>Policy area: The programme predominantly supports the creation and growth of innovative enterprises in Estonia.</p> <p>The main instruments:</p> <p>Five main activity groups are included in the programme:</p> <ul style="list-style-type: none">• The creation of a favourable and motivated environment for the transfer of knowledge and successful implementation of R&D activity findings in the applicant institution (necessary administrative rules, motivational systems, competence, structures and networks, etc.);• The nurturing and development of the representatives’ entrepreneurial and business skills within the applicant institution (training, conferences/seminars, distributing general information, etc.);• The provision of knowledge and transfer of technological support services for the members of the applicant institution (advice on identifying and assessing ideas, preparing project plans and financing applications, preparing business plans of spin-off businesses, finding partners, etc.);• The active introduction of the applicant’s services, opportunities for co-operation and intellectual property (determining the co-operation opportunities, visiting enterprises, publishing informative and promotional materials, etc);• The co-operation between the applicant institution and local and foreign partners for the acquisition and exchange of information and technology (participating in international networks or initiating new ones, practising in other similar organisations that support knowledge and technology transfer). <p>The main beneficiaries: National and public institutions of research and development and applied higher educational establishments specialising in engineering and technology are eligible for the programme funding.</p>

The structure of the initiative (operational phases, lengths...): Based on the latest application round, the programme has two-stage application process. During the first stage, the applicants were required to submit their preliminary application and then to submit the full application. Only those applicants whose preliminary application had been approved submitted a full application. The preliminary application was reviewed by Enterprise Estonia within two months and the full application within three months of their respective dates of receipt. Those applicants, who received support funding within the programme during the previous period of 2001-2003, submitted an overview of results achieved, together with cause for further support funding for the next period. The programme funding for applicants is decided for longer than one year in accordance with the individual project plans but the real financing is based on semiannual and annual reporting.

Crucial milestones and criticalities: The programme was launched in 2001, since then it has passed two main application rounds. The implementation period for the second application round is 2004-2007. The Ministry of Economic Affairs and Communications commissioned the mid-term evaluation of the programme in 2003. The next assessment is going to be carried out in 2006. The programme is going to be a part of the next EU intervention period for 2007-2013.

The degree of novelty: The programme was introduced as a new measure by the Ministry of Economic Affairs and Communications. The feasibility study of the programme³⁰ strongly criticised the level of commercialisation of R&D results in the Estonian R&D organisations. A strong bias in Estonian research and development favouring academic fundamental research was used as a main indicator showing the situation in comparison with EU member states in 2000. The prior study also confirmed that, although in Estonian universities, the “maturity” of support structures that stimulate knowledge intensive entrepreneurial activity was different, all universities and R&D institutions lacked support structures, which would have covered all relevant aspects.

Main results

The main outcomes (financial and physical):

- In terms of the financing share of the total RTDI budget administrated by the Ministry of Economic Affairs and Communications, the SPINNO Programme has received 13.5% in 2002, 14% in 2003, 23% in 2004. In 2005, the complementary funding for the programme clients was not delivered. In total, the programme funding has amounted to 6.2 MEUR since 2001.
- As a result of the first round in 2001, only two projects were initially financed: 1) Tallinn SPINNO (managed by Tallinn Technical University) and 2) Tartu SPINNO (managed by the Tartu University Technology Institute). Later, the third project entitled BioSPINNO (managed by the Estonian Biotechnology Association) was launched in 2003. The funding of the second round was delivered between seven projects as follows: 1) University of Tartu *et al.* (22% of funding), 2) Estonian Biocentre *et al.* (22%), 3) Tallinn University of Technology (20%), 4) Tallinn Pedagogical University (14%), 5) Estonian Academy of Arts (12%), 6) Tallinn College of Engineering (4.5%), 7) Estonian Maritime Academy (5.5%). The funding has concentrated on the HE

³⁰ Performed by Technopolis BV and KU Leuven R&D in 2001.

institutions in Tallinn and Tartu.

The main evaluation results: Based on the results of an external midterm evaluation in 2003, the programme was following its main goal to support the set of activities for establishing the knowledge and technology transfer tools at the universities and research institutes in Estonia. The objective of the midterm evaluation was rather forward-looking than assessing the outputs of the programme. The study emphasised the importance of the programme in opening up a new innovation support infrastructure dedicated to spin-off promotion and support in Tallinn Technical University and the Tartu University Technology Institute. Without SPINNO funding, the institutions could not have initiated these specific activities or reached the current stage of development. A major emphasis of SPINNO activities for the BioSPINNO was to market the Estonian biotechnology sector internationally. The BioSPINNO consortium of partners included all the main university departments, research institutes and companies actively involved in the biotechnology sector in Estonia. Considering recommendations of the midterm evaluation, the second round of the programme funding is more sophisticated in terms of activities, participants, monitoring targets and performance indicators of the projects. The programme was also opened for applied higher education institutions. The next external assessment of the programme is to be carried out this year. Widening the SPINNO Programme for applied higher education institutions in Estonia is expected to result in significant additional outcomes.

Reasons of success and conditions for repeatability

The SPINNO Programme could be regarded as the good practise case in the Estonian RTDI policy. It is still too early to refer to the outcomes but the institutional coverage (all relevant universities and applied higher education institutions) of the programme but the activities supported are quite promising in the Estonian situation. In 2004, the programme financing amounted to almost 1/4 of the RTDI funding administered by the Ministry of Economic Affairs and Communications. The main lessons learnt during the first programming period (since 2001) are linked to the scale and scope of the activities performed by the applicant institutions and the administration of the programme. The midterm evaluation concerned about the resources devoted to some projects to being overgenerous given the likely levels of activities. From another perspective, activities themselves might be too general (difficult to measure) to reach the programme aims. Finally, the annual report of the Enterprise Estonia presents the bureaucracy of the programme to have become very hardly manageable both for the applicants and the implementing agency. The programme is also going to be financed during the next programming period of the EU SFs but with apparent amendments into the conception and activities of the programme. For the Estonian policy-makers the programme has given a possibility to see the programme development process: which rules and aims the programme included when it was launched first time, continued in the second round and will be implemented in the following round. The programme might be implemented for the years but the financing conditions are changing due to the developments and needs within the applicant institutions and in the business and R&D environment.

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List of useful websites at national or regional level:

Ministry of Finance, Structural Funds in Estonia
<http://www.struktuurifondid.ee/?lang=en>

Ministry of Economic Affairs and Communications
<http://www.mkm.ee/index.php?keel=en>

Ministry of Education and Research
<http://www.hm.ee/>

Enterprise Estonia
<http://www.eas.ee/?lang=eng&PHPSESSID=ba92b9f1c3a5cc6643faaf802a0b6a1b>

The Estonian Science Foundation
<http://www.etf.ee/index.php?setlang=eng>

Research and Development Council
<http://www.riigikantselei.ee/?id=3706&&langchange=1>

Regional Development Database. Economy. Statistical Office of Estonia.
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Regional Innovation Strategies
[http://www.eesti-ris.info/component/option.com_docman/task.cat_view/gid.73/Itemid.58/;](http://www.eesti-ris.info/component/option.com_docman/task.cat_view/gid.73/Itemid.58/)
<http://www.tris.ee>

Appendix H Stakeholders consulted

Name	Position	Organisation
Mr Silver Tammik	Executive Officer of Economic Policy Division	Economic Development Department, Ministry of Economic Affairs and Communications
Mr Pirko Konsa	Head of Enterprise Division	Economic Development Department, Ministry of Economic Affairs and Communications
Mrs Tea Danilov	Head of Technology and Innovation Division	Economic Development Department, Ministry of Economic Affairs and Communications
Ms Marika Popp	Executive Officer of Technology and Innovation Division	Economic Development Department, Ministry of Economic Affairs and Communications
Mr Lauri Tammiste	Executive Officer of Technology and Innovation Division	Economic Development Department, Ministry of Economic Affairs and Communications
Prof. Rein Vaikmäe	Vice Rector	Tallinn University of Technology, formerly the Ministry of Education and Research and R&D Council (Policy Advisor)
Dr Meelis Sirendi	Member of the Board	Estonian Science Foundation
Dr Luule Mizera	Member of the Board	Estonian Science Foundation
Mr Ilmar Pralla	Deputy Director in Technology Development	Business Development Division, Enterprise Estonia
Dr Kristjan Haller	Deputy Secretary General of Higher Education and Research	Ministry of Education and Research