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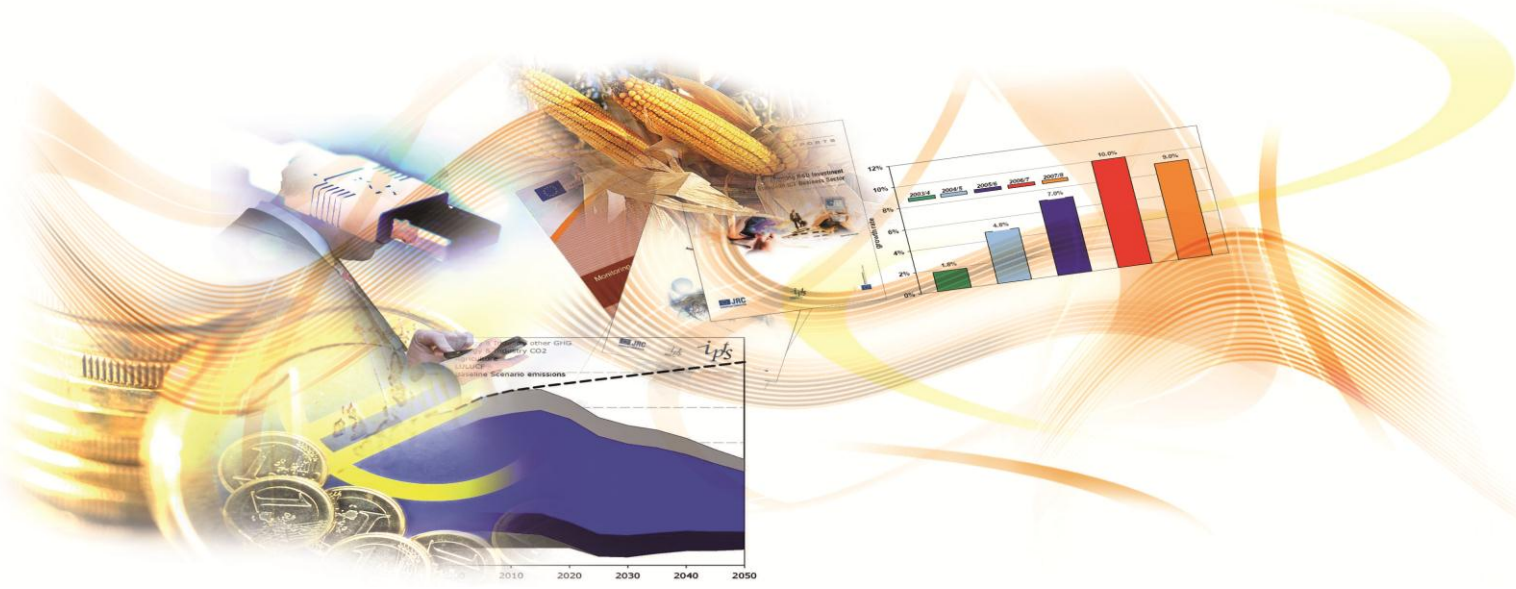

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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

The Country Report (CR) 2013 follows the same basic approach as the Country Report 2012 and is partly based on the 2012 Report as on information available in reports from previous years. Therefore the author is grateful to colleagues for the excellent work done for these earlier editions.

In particular, the CR 2013 has benefited from comments and suggestions of Mariana Chioncel from JRC-IPTS. The contributions and comments from DG-RTD are also gratefully acknowledged.

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments which took place in the previous twelve months.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

Latvia is a small country with a population of 2.003m (March 2014, Central Statistics Bureau - CSB of LV). The GDP per capita in PPS in 2009-2011 was only 51% of the EU-27 average (€ 9,700 in 2011). While the annual GDP growth rate was +12.2% in 2006, it fell during the economic recession to -17.7% in 2009 and to -0.3% in 2010. Recovery in 2011 resulted in positive growth of +5.5%. For 2012, the CSB indicated +5.5% growth, while in 2013 someslowdown to *4.1%* was reported. According to the forecast of the European Commission *(May 2014*) 3.8% is foreseen for 2014, with a subsequent return back up to 4.1% in 2015. The Commission's 2013 country specific recommendations for moving Europe beyond the crises, indicates that Latvia is among the last in terms of investment in research and innovation.

Five RTD domains: materials, health, nano-sciences, environment and energy were highlighted until 2011. More recently, work in photonics, and quantum sciences and technologies has also received particular attention. Involvement in the bottom-up Baltic initiative towards regional *(Latvia together with Lithuania and Estonia)* smart specialisation focused on these domains is also anticipated. An inventory of 7669 publications in global data bases for 2004-2013 reveals that 32% are related to this trend emerging from the abovementioned domains.

Smart specialisation also provided the context for the setting of new national research priorities in 2013, particularly the ex-ante conditionality of defining a smart specialisation strategy in order to access structural funds for 2014-2020. This and the requirements for responding to forthcoming HORIZON 2020 calls were taken on board step-by-step in public debate organised by the Ministry of Higher Education and Science in late 2013. The proposed domains for smart specialisation in Latvia (December 2013) are rather broad: knowledge based bioeconomy, biomedicine, medicine technologies, bio-pharmacy and biotechnologies, smart materials and smart engineering system technologies; smart energetic, information and communication technologies. An Action Plan of final drafting, implementation and monitoring the national RIS3 strategy until December 31, 2014 was reported by the Ministry to the President of Ministers on April l4, 2014.

In terms of the performance of the National Research and Innovation system: the ratio of GERD to GDP fell from 0.61% in 2008 to 0.46% in 2009, equivalent to 30% of the EU-27 average. Some increase in of GERD over the period 2010 - 2012 is linked to European Union allocations (EU SFs + FP7 etc. constitute 50.7% in 2012). Latvia no longer adheres to the research intensity target of 3% GERD/GDP by 2020. The National Reform Programme of Latvia (2011) and the National Development Plan (adopted 20.12.2012) have halved this target to 1.5%. However, this is unlikely to be reached soon. The state budget has remained constant from 2011 till 2013 and, according to national three year budget planning, this will not change before 2016. This, together with observed stagnation or even decrease in industry contributions, means only 1.0% will be reached in 2020.

There is no reason to expect significant input from the private sector, which is dominated by service SMEs and a few large state monopolies. Not a single company from Latvia is listed among first 1000 mentioned in EU Innovation Scoreboard. The contribution to science from the national budget in absolute figures declined from €67m in 2008 to €40m in 2012. BERD in 2012 constituted €35m and was smaller than in 2010. GERD for Latvia in 2012 was 0.35% when purely domestic investments are counted and 0.66% when investments attracted from abroad are included. The budgets of research organisations are dominated by project based funding and the expectations for 2013-2014 are pessimistic, with no increase from the state budget and a sharp

decrease of Structural Funds and EU Framework Programme projects, as one planning period ends and the next starts, when a lot of relevant political decisions are late or still pending. At 90%, Latvia has the highest proportion of funding from competitive sources in Europe. This situation looks set to continue until 2020.

Static and low levels of RTD financing in the country since 2010 have resulted in extremely low and still decreasing regional competitiveness indicators for Latvia, according to the recently published figures (Paola Annoni, Lewis Dijkstra EU Regional Competitiveness Index - RCI 2013: DG JRC&DG REGIO). With RCI (-0.840) Latvia in 2013 is ranked 237 among 271 EU regions (decreasing by 18 places in the regional ranking since 2010) and is in the 25th place in EU member state ranking. While many such indicators show a decrease since 2010, this needs explanation in relation to the above mentioned impressive GDP growth indicators in this period. According to EUROSTAT and the European Commission Innovation Union 2013 progress report, the percentage of the national workforce employed in high and medium high-tech manufacturing was only 3% in year 2008 and decreased to 2.5% in 2012. The high- & medium-tech contribution in the trade balance decreased by - 5.42% in 2011. Excellence in S&T had a negative (-0.15) growth rate in the years (2005-2010). There is no reason to expect any significant change in the trends of the indicators, given the static RTD financing in the country in the years 2012-2013.

The main research performers in Latvia are about 40 large and medium sized and a few small research institutes or researchers groups which have had a tradition of doing good science for decades and have participated in at least three EU Framework programme projects and are well recognised and sought after as partners in the European Research Area since 1999. The best 15 participated in more than 8 financed projects, but the best ones accounted for more than 20. In total, more than 80 various research institutions were invited to be partners of FP project proposal consortia. The major share of publications in journals with high impact factors comes from this group of institutes. These well known facts were confirmed in the outcomes of the international evaluation of science in Latvia (published late in January 2014) by a team of experts commissioned by the Nordic Council and performed by TECHNOPOLIS[1].

The capital city, Riga was a dominant actor for many years, but during the past decade regional universities in Daugavpils and Ventspils have also developed their own research capacities, followed, more recently, by the successes of university researchers in Liepaja and Valmiera.

Latvian Research and Development (R&D) and Innovation policy is mainly the responsibility of the Ministry of Education and Science. The Ministry of Economics also has influence on the research domain through its responsibility for selected innovation policy measures. The role of the Science Council of Latvia and, in particular, advice from Academy of Sciences of Latvia has been reduced over recent years.

The current report identifies the following key structural challenges of the national research, development and innovation (R&D&I) system of Latvia:

- Slow decision making process at the political level;
- Need to increase substantially R&D&I funding from the national budget[2];

[1]TECHNOPOLIS, 20 January 2014 Latvia Innovation System Review, http://izm.izm.gov.lv/upload_file/2014/Latvia-systems-review_2014.pdf

2 The too-low level of institutional funding for research encourages fragmentation, makes it hard to recruit, plan or develop sustainable partnerships with other research groups abroad and with industry Institutional funding should be more like 50% than the current 17% of university research income It should be influenced by performance, via

- Need to improve the quality of research and increase substantially number of publications in international peer-reviewed academic journals, and, the number of patent applications to the European Patent Office;
- Emerging knowledge society and the need for a future knowledge based economy and manufacturing systems in the context of sustainable development;
- Limited (in quantity and quality) innovative capacity and competitiveness of the enterprise sector including SMEs in "high-tech" industry domains;
- Insufficient (in quality and in quantity) and decreasing supply of high-quality skilled labour force.

The allocation of state budget for R&D&I in both relative and absolute terms is too low to achieve substantial progress in innovation. In addition, there is little evidence of financial prioritisation for R&D and innovation[3]. There is insufficient awareness of the importance of Key Enabling Technologies and the Regional Smart Specialisation as a key for the success oriented investments of Structural funds and HORIZON 2020 resources. Science and universities are not always considered as stairways towards excellence of national "high-tech" industry and R&D&I system as such. In recent years public funding for R&D has become rather dependent on EU Structural Funds (EU SFs) and Framework programme funding (about 50% in years 2011 and 2012).

Small and medium-sized enterprises dominate business, but only about 50 SMEs and few existing large scale industrial enterprises prove to be internationally competitive in the high-tech domain in the global market. The problem with the supply of a qualified labour force for R&D and the innovation sector has become particularly acute due inter-sectoral and international "brain drain".

The national policy mix is, to varying degrees, aligned with the ERA pillars. Most of the ERA objectives are addressed, though with variable rates of success, and with support of the EU Structural Funds and FP7 project financing.

Considering possible directions for the evolution of the current policy mix, up until 2020 national R&D&I policy measures in Latvia are largely likely to remain focused on R&D&I specific financial policy, based on EU Structural Funds in particular, and will retain the *modus operandi*, similar to previous EU SFs planning periods which have not so far resulted in notable changes in performance of the knowledge-based economy of Latvia.

periodic reviews of quality and relevance (in the style of the current research assessment exercise or a variant of it). Citation from page 44 in the report: TEHNOPOLIS, 20 January 2014 Latvia Innovation System Review.

3 The system and institutions of governance. In principle, government (through the Parliament) sets state policy for the development of science and technology, decides what fields and themes should be prioritised and sets criteria for evaluating the efficiency of research institutions and allocated budget to science and technology policy.

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1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

Latvia has a total population of 2.003m (March 2014, Central Statistics Bureau - CSB of LV), which has been decreasing since 1990. The decrease during 2013 was 17 000. Latvia accounts for only 0.44% of the EU-27 population. Latvia's gross domestic product (GDP) per capita in purchasing power standards (PPS) is 51% of the EU-27 average. Real GDP growth rate was (-3.3) in 2008, (-17.7) in 2009 and (-0.3) in 2010. The CSB data for 2012 and 2013 reflect recovery, showing GDP increase of + 5.5% and + 4,1% respectively. The forecasts of the European Commission *(May 2014*) for 2014 and 2015 are 3.8% and 4.1% respectively. The unemployment rate was 11.9 % in 2013. The workforce employment rate is still low, and according to CSB, stood at 68.6% in 2008, falling to 59.3% in 2010 and to 58.25 in 2013 (compared with the EU-27 average of 64.1%).

The national budget contribution to science in absolute figures declined from €67m in 2008 to €34.7m in 2012, staying at around the same value in 2013. BERD in 2012 was €35m, smaller than in 2010 (€42.50m). GERD for Latvia in 2012 was 0.35% of GDP, when purely domestic investments are counted and 0.66% when investments attracted from abroad are included. The expectations for 2013-2014 are: no increase from national state budget and a decrease in contributions from Structural Funds and EU Framework Programmes, mainly as a consequence of the change in planning cycles.

GERD as a proportion of GDP fell from 0.61% in 2008 to 0.46% in 2009, thus standing at 30% of the EU-27 average. Recovery of GERD in 2010 - 2011 is linked to allocations from abroad (EU SFs + FP7 etc. constitute 50.7%). It will thus be difficult to achieve the GERD target of 3% of GDP by 2020. The National Reform Programme of Latvia (2011) and the National development Plan (adopted on 20.12.2012) has lowered this target to 1.5%. The static level of state budget financing from 2011 till 2013 (€32-34m) likely not to change before 2016 as foreseen in the three year state budget plan means that even 1.5% will be difficult to reach by 2020. Also the input from the private sector, which is dominated by SMEs in the service sector and a few large state monopolies, may be low.

According to the CSB, in 2011 and in 2012, total GBAORD as a percentage of total general Government expenditure was 0.50%, compared to the EU-27 average of 1.5%.

The governance of the national research and innovation system can be characterised by a group of main actors at the political, operational and performance levels (see Figure 1). Latvian Research and Development and innovation policy (R&D&I) is governed by the Ministry of Education and Science. The Ministry of Economics also has some influence on the research domain through its responsibility for selected innovation policy measures. At the top level, a new national authority, the Prime Minister's Cross-sectoral Coordination Centre, was set up in 2011 to coordinate national development planning. The role of the Science Council of Latvia and, in particular, the advisory role of the Academy of Sciences of Latvia has been reduced to some extent over recent years. Sometimes, the political decisions have come late and therefore effective strategic planning is delayed. For example, the adoption of regional smart specialisation strategy is foreseen to be finalised only in December 2014. An Action Plan of final drafting,

implementation and monitoring of national RIS3 strategy till December 31, 2014 was reported by the Ministry of Education and Science to the President of Ministers on April l4, 2014.

Research and innovation policy in Latvia is predominantly developed, funded and implemented at national level. Therefore the institutional role of the regions in research governance is comparatively limited. The country as a whole is categorised as a single region at NUTS I level. The existing five planning regions have neither the level of responsibility nor the funding capacity to develop their own explicit R&D policies.

According to the CSB of Latvia, 3904 FTE researchers were active in 2012, a decrease from 3947 in 2011. This figure includes 2078 fully employed staff and 5917 employed part-time. Of these, 66.7% were affiliated to the Higher Education sector, 15.2% to the business sector and 18.0% to the Government sector.

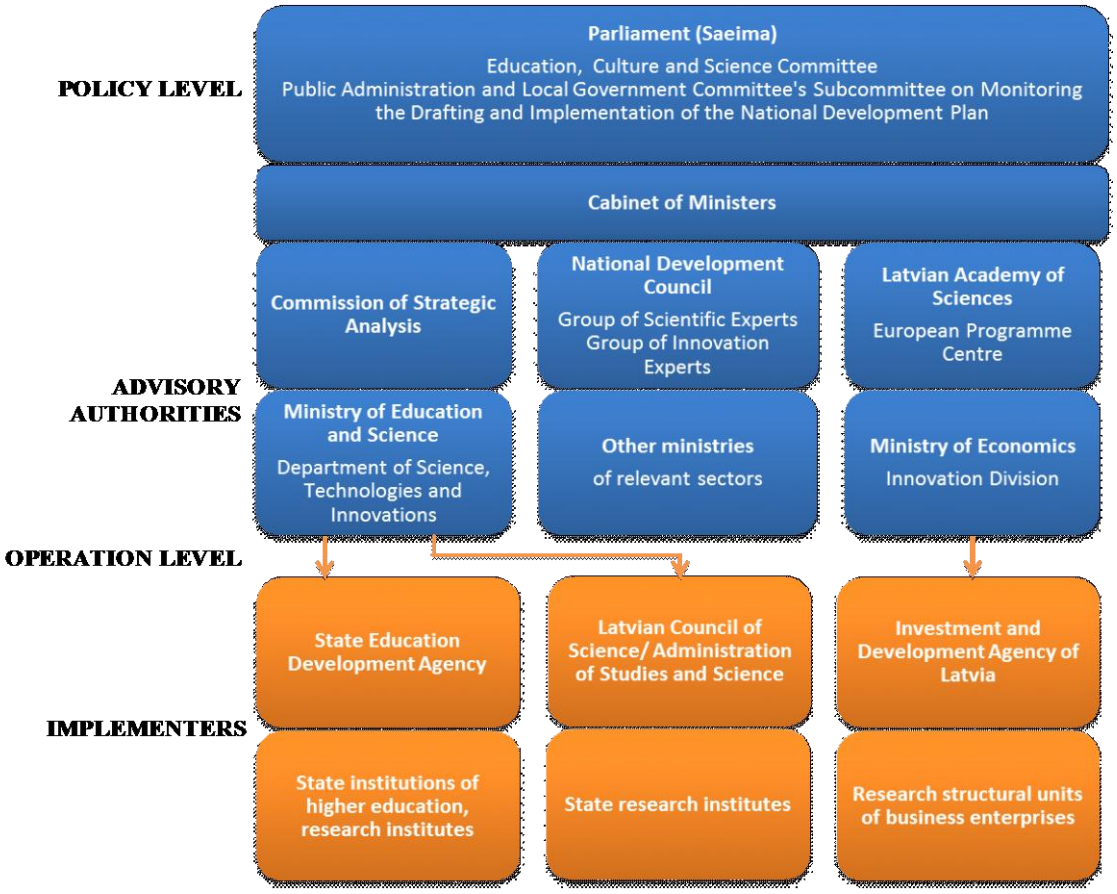

Figure 1. (Source: Adapted in English from the version of the Ministry of Education and Science)

In 2013, the setting of new national priorities was on the political agenda, driven largely by the need to determine priorities for regional smart specialisation, and to meet the ex-ante conditionality of EU Cohesion policy for the years 2014-2020, and in anticipation of HORIZON

2020 calls. Public debate was organised by the Ministry of Higher Education and Science only in late 2013. The following officially proposed domains for smart specialisation (see page 96 in the

Decree Nr.685 of the Cabinet of Ministers on RTD & Innovation guidelines for 2014-2020, December 28, 2013) in Latvia are rather broad: knowledge based bioeconomy, biomedicine, medicine technologies, biopharmacy and biotechnologies, smart materials and smart engineering system technologies; smart energetic, information and communication technologies. As already mentioned on page 10 an Action Plan is drafted to finalise the process till December 31, 2014[4].

It should be mentioned increasing role and significance of Photonics, Quantum Sciences and technologies[5] over the period in 2011-2013, including a proposed bottom-up Pan Baltic initiative towards smart specialisation in the domain.

According to various documents (as of December 2013) Latvia may not be able to achieve the EU target to invest 44% of ERDF investments in research and innovation and in SME competitiveness.

[4] An Action Plan of final drafting, implementation and monitoring of national RIS3 strategy till December 31, 2014 was reported by the Ministry of Education and Science to the President of Ministers on April l4, 2014

[5] 15 FP7 projects in this scientific domain bring to Latvia about 7 m euro. There is growing involvement of 50 SMEs in the Photonics domain in the Baltic Countries in 2013, to the value of more than € 120 m.

2. RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

In 2009, the Cabinet of Ministers adopted a nation-wide strategic document on the Guidelines for Development of Science and Technology for 2009-2013. This was drafted by the Ministry of Education and Science in collaboration with the Ministry of Economics. The document highlighted the goal of establishing science and technology as a basis for the enduring development of civil society, long-term economic growth and cultural progress, thereby securing the evolution of the knowledge-based economy and sustainable development. Gradual growth in total R&D expenditure was planned. On 26 April 2011, the Cabinet approved the National Reform Programme of Latvia for the implementation of the "Europe 2020" strategy (NRP) setting the following targets: 1.0% of GDP by 2015 and 1.5% by 2020.

The availability of EU Structural Funds for RTD since 2004, in addition to increased research funding from the national budget in 2005-2007 improved the situation and opened new opportunities for researchers for the development of the national research system. The Innovation Union Scoreboard 2013 shows that the Summary Innovation Index has slightly improved for Latvia from 0.195 in 2009 (2006 – 0.163) to 0.225 in the years 2011 and 2012. However, the country is still listed among the poorest performing innovators with its innovation performance strongly below the EU-27 average of 0.544 in 2012[6]. Latvia contributes an extremely low number of publications in international peer-reviewed academic journals[7], and, like other CEE countries, it also produces low levels of applications to the European Patent Office. According to both these indices, Latvia reaches only around 25% of the EU average.

BERD experienced an upward trend in 2010 when it made up 37% of all R&D funding in Latvia, but then fell back in 2011 to 24.7% and to 23,8% in 2012 (CSB Latvia). This decrease is likely to continue in 2013 and 2014. According to the Innovation Union Competitiveness Report 2011, the economy of Latvia is characterised by limited knowledge capacity and intensity, positioning it among countries of "medium-low knowledge capacity with a strong role of agriculture and low knowledge-intensive services"[8]. Static, low levels of national RTD funding since 2010 may be one of the reasons for low regional competitiveness indicators (RCI) for Latvia according to the 2013 European Commission report.[9] The 2013 RCI-innovation index for Latvia stands at -0.716, placing the country in 237th place among 271 EU regions (decreasing by 18 places in regional ranking since 2010) and in 25th place among the EU member states., An RCI of technological readiness of -1.10 places Latvia 231st in the regional ranking and 23rd in the member state ranking. RCI for labour market efficiency (-0.76) ranks Latvia as 218 among the regions. All indicators show a decrease since 2010 in contrast to the impressive GDP growth in

[6] The Innovation Union's scoreboard for Research and Innovation 2013, http://ec.europa.eu/enterprise/policies/innovation/files/ius-2013_en.pdf

[7] It should also be noted that related costs of Latvian publications are much lower!

[8] Innovation Union Competitiveness Report 2011,

[9] Paola Annoni, Lewis Dijkstra EU Regional Competitiveness Index - RCI 2013: DG JRC&DG REGIO)

this period. According to EUROSTAT and the 2013 Innovation Union progress report, the percentage of the national workforce employed in high and medium high-tech manufacturing was only 3% in year 2008 and decreased to 2.5% in year 2012. The contributions of high-and medium-tech to the balance of trade decreased by 5.42% in 2011. Excellence in S&T has a negative (-0.15) growth rate over the period 2005 to 2010. There is little reason to expect change in the recent trends in the above-mentioned indicators.

New Guidelines for the Development of Science, Technology and Innovation for 2014-2020 were drafted late in 2013 and submitted to Cabinet of Ministers on December 19, 2013 (approved by Decree Nr 685 of the Cabinet on December 28, 2013), but debate resumed when the new Government came into power in January 2014, following the resignation of the previous one early in December 2013.

The GDP of Latvia in 2012 is, in current prices, €22.1b, of which only 14% was provided by the industrial manufacturing sector (CSB, 2013). The major share of Latvia's GDP (70%) currently derives from the service sector, which is dominated by SMEs, with a significant role being played by local market oriented food trade/communications/transport/transit services where only a few companies have a turnover above €100m. Those sectors, however, do not include significant contributions in terms of innovation.

The current business structure of Latvia is composed mainly of small- and medium-sized enterprises (SMEs) (99.5%), of which 82.5% are micro-enterprises.[10] Their low and actually decreasing capacity to invest in R&D and innovation is demonstrated by the fact that, according to Innovation Union Scoreboard 2010, only 17% of SMEs introduced product or process innovations in Latvia, while the EU-27 average was 34%. The 2013 Scoreboard shows a decrease to 15.78% for Latvian SMEs and an increase to 38.44% in the EU average. As summarised by the Global Competitiveness index, Latvia is still in the transition from an "Efficiency driven" to an "Innovation driven" economy[11]. A deeper analysis revealed that only about 20 of the existing industrial enterprises (SMEs with annual turnaround above € 0.5m) prove to be unique, research driven and feel strong in worldwide competition in the high-tech field[12] and the situation is the same in 2013.

Latvia joined the Eurozone on January 1, 2014. Among other benefits, gains for research community are evident, such as simpler financial management in EU projects and stronger obligations to decision makers to move the country towards knowledge based economy.

[10] Economic Development of Latvia, Report, June, 2011

[11] Global Competitiviness report 2012-2013: http://reports.weforum.org/global-competitiveness-report-2012-2013/

[12] Kalviņš, I. Ūbelis, A. et al. (2010): Informative report on the necessary support for the development of new exportable products in cooperation with Latvian scientists [Informatīvais ziņojums „Par nepieciešamo atbalstu jaunu eksportspējīgu produktu radīšanai sadarbībā ar Latvijas zinātniekiem]. Riga: Ministry of Education and Science, (In Latvian)

2.2 Funding trends

2.2.1 Funding flows and funding mechanisms

GERD as a percentage % of GDP in Latvia reached a historical maximum of 0.70% in 2011 but then started to decrease, going down to 0.66% in 2012, with further a decrease expected in 2013 (see Table below). Under conditions of stagnating R&D funding from the state budget – the situation in 2011 and 2012 was improved by the inflow of EU Structural Funds and FP7 project investments. In absolute figures, total government budget outlays on R&D (GBAORD) have decreased from €53m in 2008 to €33-34m which has remained relatively static over the period 2010-2013. According to the three year state budget forecast, this is unlikely to change before 2016. Its overall trend in GERD positions Latvia still far behind the EU-27 average of 2.1% ranking it among the most lagging EU MS since early 1990s.

Following accession to the EU in 2004, a national target of 3% of GDP was set for GERD. However, the provision stipulated by the Law on Research Activity (2005 and still in force), which envisages an annual increase of GBAORD by 0.15% of GDP until it reaches 1%, has not been enforced because of the economic crisis. This is not expected to change in the coming years. It will be difficult for Latvia to reach the revised GERD target of 1.5% of GDP by 2020 as referred in above mentioned NRP (2011) and in NAP (2012). However, in line with financial trends (see table below) the growth scenario sees under 1% as a more realistic in 2020.

2.2.1.1 Competitive vs. institutional public funding

The most recent trends in R&D funding demonstrate that in 2011-2013 the budget funding for R&D in absolute figures face minor changes. This is also the case for the years up to 2016 according to the national budget Law. In 2012-2013, the national budget was split between institutional funding (40%) and competitive (project-based) (60%) funding. However, when including financing from abroad, the research community in Latvia receives only 10% of its funding in the form of institutional funding.

By definition, the increasing share of competitive funding is considered to be conductive to yielding higher returns in terms of knowledge creation, research output and making research organisations more responsive to socio-economic needs[13], whereas the level of institutional funding is ensuring long-term stability for research as a basis for creative research activities towards various future demands[14].

The available data on budget allocation suggests that the competitive funding will continue to dominate in Latvia for the years 2014-2020.

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[13] OECD (2011a): Issue brief: Public sector research funding, OECD Innovation policy platform, http://www.oecd.org/dataoecd/34/16/48136600.pdf.

[14] "The too-low level of institutional funding for research encourages fragmentation, makes it hard to recruit, plan or develop sustainable partnerships with other research groups abroad and with industry. Institutional funding should be more like 50% than the current 17% of university research income. It should be influenced by performance, via periodic reviews of quality and relevance (in the style of the current research assessment exercise or a variant of it)." Citation from page 44 in the report: TECHNOPOLIS, 20 January 2014 Latvia Innovation System Review.

2.2.1.2 Government direct vs indirect R&D funding

As noted above, the last 10 years have witnessed considerable growth in the share of EU SFs (ERDF/ESF)[15] in total R&D funding in Latvia, reaching 50.99% in 2011 (EU SFs and FP7 contribution together) and 50.45% in 2012. The same dominance was present in 2013 with a gradually decreasing trend in late 2013 and in 2014 due to a decrease in the money available from Structural Funds and EU Framework programme projects due to the transition period between programme and planning cycles.

As for the contribution made by the business enterprise sector to GERD, so far it has been rather low in relative and absolute terms and has been seen as one of the main critical issues in Latvia. Yet, between 2008 and 2010 it has increased slightly (from roughly €35m to €40m) decreasing again to €34.6m in 2012. In 2010 BERD had increased to 37% of all R&D funding in Latvia (25% in 2008), decreasing once more to 23.8% in 2012.

Thematic funding in Latvia is mainly allocated from the budgetary sub-programme covering funding for five national research programmes.

It should be also mentioned that, so far, there are no Government indirect R&D funding incentives in place to promote R&D&I in Latvia, such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital. On the contrary, the Government is taxing VAT in case of FP7 project implementation costs and does not support the amortisation costs of equipment purchased in such projects.

Table 1. Basic indicators for R&D investments* http://www.csb.gov.lv)

	2009	2010	2011	2012	2013 estimate	EU27 (2012)*
GDP growth rate	-17.7	-0.3	5.5	5.5	3.8	-0.4
GERD (% of GDP)	0.46	0.60	0.7	0.66	About 0.6	2.06
GERD (€ million)	84.88	109.6	141.4	145.4	Expected decrease	
GERD (euro per capita)	39.0	52.94	69.15	71.84	Expected decrease	525.8
GBAORD – Total R&D appropriations (€ million)	37.997	28.9	31.9	34.7	32.0	17086309
GBAORD – Total R&D appropriations (% of GDP)		28.37	22.56	23.86		
R&D funded by Business Enterprise Sector(€ million)	30.89	42.50	35.1	34.6	Expected decrease	
R&D funded by Business Enterprise Sector (% of GDP)		38.77	24.82	23.79	Expected decrease	
R&D funded by HEI financing (€ million)		1.6	2.3	2.9	N/A	
R&D funded by HEI financing (% of GDP)		1.46	1.63	1.99	N/A	
Financing attracted from abroad (€ million)		36.6	72.1	73.3	Expected decrease	
Financing attracted from abroad (% of GDP)		33.39	50.99	50.41		
R&D performed by HEIs (€ mill)	33.1	43.8	69.2	73.1	N/A	

[15] Since Latvia is categorised as a single region at NUTS I level, funding, co-financed by the ERDF/ESF pertains to the country as a whole.

R&D performed by HEIs (% of GERD)	39.0	39.96	50.21	50.27	N/A	24
R&D performed by Government Sector (€ million)	21.0	25.2	33.0	39.4	Expected decrease	
R&D performed by Government Sector (% of GERD)	25.0	22.99	23.39	27.15		12
R&D performed by Business Enterprise Sector (€ million)		40.5	39.3	32.9	Expected decrease	
R&D performed by Business Enterprise Sector (% of GERD)		36.95	27.79	22.63		63
Share of competitive vs. institutional public funding for R&D	83.0	83.0	89.6	89.7		
Venture Capital as % of GDP (Eurostat table code tin00141)	0.0	0.0	0.0	0.0		0.021
Employment in high- and medium-high-technology manufacturing sectors as share of total employment (Eurostat table code tin00141)	2.5	2.5	2.5			9.7 in (2011)
Employment in knowledge-intensive service sectors as share of total employment (Eurostat table code tsc00012)	45.8	45.6	45.6			40.0 (2011)
Turnover from Innovation as % of total turnover (Eurostat table code tsdec340)	8.9 (2008)					17.4 (2008)

2.2.2. Innovation Funding

Support for innovation in Latvia is overseen by two ministries: the Ministry of Economy and the Ministry of Education and Science. The primary resource available is the EU European Regional Development Fund – ERDF). The Ministry of Economy in its webpage[16] includes a chapter entitled "Support for innovation," which includes seven support measures:

- Support to Technology Transfer Contact points 2008-2013 (ERDF, launched on 26.02.2008): established seven TTOs in the main universities. Total funding € 2.7m;
- Competence Centre Programme 2011-2015 (ERDF, launched on 13.04.2010): competence centres established in six sectors:
    1. Chemistry and Pharmaceuticals;
    2. Forestry and Wood Products;
    3. Environment, Biotechnology, Bioenergy;
    4. Electronics;
    5. IT;
    6. Mechanical Engineering. Total funding € 53.2m;
- Support for the Development of New Products and Technologies (ERDF, launched on 07.10.2008): Total funding € 7.2m;
- Support for the Introduction of New Products and Technologies in Manufacturing (ERDF, launched on 12.08.2008): Total funding € 38.7m;
- Support to high added value investments (ERDF, launched on 24.02.2009): Total funding € 198,7m;
- Support to industry intellectual property rights in the design of new projects and technologies (ERDF, launched on 07.10.2008): Total budget € 102,2m;

[16] http://www.em.gov.lv/em/2nd/?cat=30255

- The programme for the support of the development of new products and technologies (ERDF, launched on 11.10.2011): Total funding € 2.8m.

According to the Ministry of Economy, the first instruments were launched in 2008 and, in a few cases, more than one call for proposals has been announced. The main beneficiaries were SMEs in targeted sectors of the economy. Quite significant resources have been allocated, which was mainly foreseen for the purchase of advanced (latest) technologies, instruments and licences. Fewer resources were targeted to the direct support of innovation activities. The last programme on the list (launched in 2011) is more directly targeted to national scale innovation. Up to now no impact assessment is available and it is hard to say how effective these instruments have been.

The Ministry of Education and Science is responsible for the implementation of three programmes targeted to innovation. The ideas behind the instruments listed below are quite advanced and are using Structural Funds money (ERDF) to strengthen the innovation capacity of the research community. Unfortunately, the low level of funding from the national state budget for R&D&I creates a lot of problems. In many cases research institutes are using projects financed by ERDF to keep researchers in the labs. In most cases ERDF projects and EU Funding projects are the only sources for institutes' budgets. Absence of projects due to their ending is a disaster for the institute.[17]

There is only one innovation orientated programme financed by the state budget but its total annual amount is rather small. The programme "Market Oriented Research Projects" (in the 2012 state budget allocation for this programme was €157 654 and in 2013 it was planned to allocate €215 991) is the oldest one in Latvia. It was introduced in 1994, and is possibly the oldest innovation support programme in Europe.

- Development of 1) Research Base Infrastructure and 2) Commercial Research Infrastructure 2011-2013 (ERDF): total funding for the 1 stage projects €59,7m. The call for the second stage projects is open in the course of 2013;
- Practical Application Research Projects 2011-2013 (ERDF): 122 are being implemented under this programme with the total budget of €59.73m;
- Business Incubator Programme 2009-2014 (ERDF): total budget €28.5m;
- Market Oriented Research Projects (state budget): Funding for this programme is decided on an annual basis. In 2012 state budget allocation for this programme was €157 654 and in 2013 it was planned to allocate €215 991.

[17] The acute lack of money in recent years has had a number of undesirable effects on the research and innovation system. An obvious one is that the principle of increasing state expenditure on R&D by 0.15% of GDP per year until it reached 1% was effectively abandoned after the first year. A second is that it has diluted thematic priorities, for example in the state research programmes. Given a reasonable budget, it would have been possible to focus the effort by growing certain activities, without effectively leaving other parts of the research system unfunded. Given the acute shortage of money, the practice has been to broaden the priorities *so* that almost everyone can get a little funding. This has not produced the desired focusing of the research and innovation system. Quotation from page 30 in the report: Technopolis, 20 January 2014 Latvia Innovation System Review.

2.3 Research and Innovation system changes

Significant reorganisation of the Ministry of Education and Science has been underway since 2011[18]. The main objective has been to achieve a smaller, more efficient, motivated and results-oriented state administration in the domains falling under the responsibility of the Ministry (including education, science, youth, sports and language). However, the Ministry is still facing delays in preparation for the planning period 2014-2020[19] as well as in the implementation of several key plans, e.g. international evaluation[20].

New competitiveness-driven procedure for the distribution of state-funded research grants in Latvia. The 2012 call under the state-budget funded programme for basic and applied research projects envisaged conceptually new elements in the submission and evaluation procedure of grant applications. Most of these were geared towards boosting international competitiveness and the overall quality of national research proposals submitted by Latvian researchers. The response to the call from the research community was impressive in both quantity (346 applications) and quality. In independent international evaluations, 217 projects (63%) received marks above the quality threshold[21]. The outcome of this competition was clear additional international peer review evidence of the quality of research community in Latvia. In total, research teams from Latvia were invited to become partners of consortia in more than 3000 projects and participated in the implementation of about 650 EU Framework programme projects.

Continued governmental support for international science and research collaboration. On 19 June 2012, the Cabinet of Ministers accepted new "Rules of procedure for the provision of State aid for participation in international cooperation programmes in research and technology". Since 2008 Latvia has joined many new international programmes and new legislative acts have been adopted by the European Parliament and Council. The new Rules of procedure stipulated that support is provided for participation in FP7 projects, including coordination and support actions ERA-NET and ERA-NET+ and the related projects, COST actions, GEANT, EURATOM, largest EU infrastructure undertakings - ITER and European Spallation Source, projects in the frames of BONUS and EUROSTARS programmes, as well as ARTEMIS and IMI Joint Undertakings. The Ministry budget for both 2013 and 2014 has rather small financial resources to provide such aid. Even the €0.8m allocated in previous years to ensure the continued association of Latvia to the European Space Agency programmes was not included in the budget plans for 2013 or 2014.

[18] http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/lv/highlights/highlight_0003

[19] Smart specialization

[20] The evaluations and decisions related to outcomes of evaluation were scheduled to be completed in 2013, but in praxis outcomes were available in January 2014 and relevant decisions are scheduled for implementation in the second part of 2014

[21] Money was available only for 65 projects(less than 6%) having marks above 85 from the possible 90. It was supposed that financing of successful teams would begin from January 1, 2013, but this was delayed till April 2013. 152 excellent projects remain without finance.

2.4 Recent Policy developments

In addition to the Council Country Specific Recommendations for Latvia (discussed below in 2.8) two documents released in 2012 highlighted the need for urgent policy measures:

- On 07.03.2012 the State Audit Office released the Audit report "The Efficiency and Compliance with the Requirements of Regulatory Enactments of the Activities of the Ministry of Education and Science in Developing and Organising the Implementation of the National Science Policy" which scrutinised the policy of the Ministry and Cabinet. Inconsistencies and contradictions between policy statements and implementation activities in national RTD policy over the last two decades were highlighted. The concluding statement of the report is: "The national science policy implemented by the MES as the leading State administration institution during the audited period did not facilitate the attainment of main objective of the RTD policy – to shape science and technology as the basis for the long-term growth of public society, economy and culture, ensuring the implementation of a knowledge-based economy and a sustainable growth."
- Insight into the Latvian society provided by the annual Human Development Report The most recent annual Human Development Report of Latvia for 2010/2011 prepared by the Advanced Social and Political Research Institute of the University of Latvia addresses topical issues related to national identity, mobility and capability in Latvian society. The 2010/2011 report particularly focuses on emigration issues (about 200 000 people have left the country during the last 10 years). Human development is weakened by the reduction in the country's population and evidently the human capacity of the RTD sector of Latvia has also been weakened.
- Until now there have been no large increases in researcher emigration. Two ESF programmes, Attraction of Human Resources to Science (activity 1.1.1.2 – 2010-2014 - 35 projects were financed till the end of 2013[22]) and Support to the implementation of doctoral programmes (activity 1.1.1.1 - 2009 – 2015) – close 2000 PhD students were supported till the end of 2013 contributed substantially to human resource development; Additional input was made by the ERDF programme – Support to Science and Research started in 2011 (activity 2.1.1.1) – 122 financed projects for 2011-2013). The goal has been to maintain sustainable growth in human resources engaged in the research sector, to promote the return of Latvian researchers currently working abroad and to attract foreign researchers to work in Latvia. The aim of the programme was to attract and finance an additional 1,000 researchers (as FTE), but data from CSB[23] show that the total number of researchers in Latvia is slightly below 4000 and has barely changed over the period 2011-2013. Knowledge based industries are not strong enough and the number of research driven SMEs in Latvia is fewer than 100. Calls and eventual financed projects from Structural Funds and HORIZON 2020 are pending. Crises management measures are needed to prevent an increase in the "brain-drain" and the best ones may be among the first who will leave.[24]
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[22] Offer from research community was impressive. Altogether 154 project proposals were submitted – only 35 financed and a lot of excellent proposals left unfinanced.

[23] http://www.csb.gov.lv/statistikas-temas/zinatne-galvenie-raditaji-30423.html

[24] Kancs, D., Kielyte, J. 2010."Education in the East, Emigrating to the West?," European Review, 18(02), 133-154.

- Latvia has benefitted from being able to use EU Structural Funds to solve the above mentioned problems. Policy instruments (launched in 2012) managed by the Latvian Investment and Development Agency and geared towards the industrial sector should also be mentioned: support for development of new products and technologies; support for establishing industrial property rights; support for introduction of new products and technologies into production;
- Specific note should be taken about the activities aimed at enhancing motivation for innovation and business start-ups. The proposed instrument is theoretically acceptable, but is not sufficiently well adjusted to the realities faced by a research community, where the employment position of researchers is extremely insecure. When employed full-time on one or two projects; a researcher has no time to think about start-up projects. Furthermore, their institutions have little institutional funds to retain researchers for creative work on new scientific or applied project ideas. Together with the above-mentioned shortage of RTD personnel, such instruments face a risk of ineffective implementation.

2.5 National Reform Programme 2013 and R&I

The implementation of this R&D&I strategy has been further specified in the Strategic Development Plan of Latvia for 2010-2013, and subsequently in the National Reform Programme of Latvia (NRP) for the Implementation of the "Europe 2020" strategy. These latter documents demonstrate an attempt to reconsider the priorities of the national R&D&I strategy in the light of the current economic situation since the Guidelines were elaborated in 2006-2008 prior to the crisis. The government is not sufficiently proactive in response to dynamics (since 2010) of EU R&D&I policy towards promoting innovation by enhancement of applied research, pilot production lines and by support to Key Enabling Technologies[25] through Smart Specialisation[26] where Cohesion policy should work in tandem with research and innovation policy sustained by Horizon 2020[27]. Only in the middle of 2013 was the task force mobilised to elaborate the Guidelines for Development of S&T&I for 2014-2020 and efforts made in order to design Regional Smart Specialisation Strategy.[28] The Cabinet of Ministers of the former Government had a hearing of the report "The design of smart specialisation strategy" on December 17, 2013[29]. It is foreseen, that the newly formed Government (in January 2014) will continue this process until December 2014.

Thus, at the time of writing, the NRP remains the most recent strategy document. The NRP sets the following priorities with regard to the R&D domain:

- advancement of the potential of scientific activity;
- development of a long-term cooperation platform for enterprises and scientists; and
- support for the development of innovative enterprises.

[25] A European strategy for Key Enabling Technologies – A bridge to growth and jobs' Brussels, 26.6.2012 , COM(2012) 341 final".
[26] http://ec.europa.eu/regional_policy/what/future/index_en.cfm
[27] http://www.ris3.lv/documentshttp://ec.europa.eu/research/horizon2020/index_en.cfm
[28] Innovation and Research Strategy. for Smart Specialization. THE INITIAL POSITION OF LATVIA. 27 March 2013.
[29] http://mk.gov.lv/lv/mk/tap/?pid=40291636&mode=mk&date=2013-12-17

These priorities have been selected mainly on the basis of the low share of R&D in GDP, which is explained by the rather small amount of state budget funding, and an insufficient contribution of the private sector to research. More specifically, the key underlying challenges to be addressed by the listed priorities have been attributed to:

(1) the small numbers of personnel employed in science and research and by industry[30];

(2) underdeveloped scientific and research infrastructure[31];

(3) weak commercialisation potential of research results[32];

(4) poor cooperation between scientists and the industrial sector , and

(5) low share of high-tech products in export; weak high-tech sector;

(6) limited capacity of research driven SMEs needed to be dominant component moving Latvia towards a knowledge based economy and high added value production.

The government in power from March 2009 until October 2011, declared the development of manufacturing companies and increase in export volumes as a basis for economic recovery.[33] The Ministry of Science and Education applied this approach when distributing the rather small amount of available funds. In the light of this policy orientation (unfortunately not supported by financial flows accordingly) specific business sectors were identified as high-priority sectors[34]: Information and communication technologies; production of electric devices and optical appliances; chemical and pharmaceutical industry; mechanical engineering and metal working; transport and logistics; forest industry; and food industry. A similar approach has since been used in several other governmental decisions, including the NRP which was adopted by the subsequent Government, which has since resigned (December 2013). Comparison of rather ambitious statements in documents with the real funding flows highlighted before, leads to the conclusion that – insufficient actions have been foreseen to fulfil these obligations in Latvia.

2.6 Recent evaluations, consultations, foresight exercises

At the end of 2009, the national research and innovation policy was comprehensively evaluated by the CREST Policy Mix Peer Review[35]. Latvia needs significant reform in order to promote the recovery and development of the innovation system. The recommendations of the Review included the following:

(1) to establish the importance of innovation (broadly defined) as an issue through debate at both political and public levels;

(2) to establish a strategic innovation policy and governance system, and a national arena, involving key ministers and stakeholders, to discuss and agree the elements of such a policy;

[30] 2-3 times less than EU average "per capita" indicators, but successful in international quality tests, see 2.3 above.. Ageing of scientists. Insufficient number of doctoral candidates.
[31] Insufficient number of up-to-date equipped laboratories for implementing technology-oriented projects.
[32] Acute lack of well-trained science managers having natural science or engineering background,
[33] An improvement could be observed in 2010 with import volume only by 21% (41% in 2008) exceeding the export volume, both having increased by 20-23% since 2009.
[34] Informative Report on the Mid-term Economic recovery Plan, (In Latvian)
[35] CREST (2010): Policy mix peer review: Latvia. Peer Review Outcome Report (Final), May 2010. Prepared by Erik Arnold et al.

(3) to move endogenous company innovation to the centre of research and innovation policy;

(4) to set thematic priorities based on the actual and potential strength of the economy and to align research and innovation policy with these priorities;

(5) to reform the PhD education system through internationalisation of Latvian research;

(6) to alter science-funding rules and give priority to research relating to the thematic priorities;

(7) to establish programmes that develop contacts and networking with the Latvian industrial and research diaspora; and

(8) link to instruments providing incentives for successful entrepreneurs and researchers to move home.

While this review has been generally well accepted by the research community and its recommendations have been considered by policy-makers, there has been little official Government response.

Due to the reorganisation of CREST, the review was not officially submitted to the Cabinet of Ministers of Latvia. Reference to this evaluation, however, was provided in the report prepared by the Ministry of Education and Science[36] and submitted to the Government. The Cabinet of Ministers adopted a decision (Protocol No 27, §29, April 26, 2011) on the need to conduct an external assessment of the implementation of the science and innovation policy in Latvia during 2011/2012, in order to perform the necessary measures for the implementation of structural reforms in science and to ensure well-founded strategic planning of the future cohesion policy of the European Union. The outcome of the Nordic Council's subsequent evaluation undertaken by Technopolis was published late in January 2014[37] [38] and decisions about increasing support to excellent institutes will only come in the second half of 2014. Besides the main report, five discipline-related reports comprising evaluation of institutes were also submitted [39]

The CREST reports highlighted the main problems of the capacity and competitiveness of the RTD system in Latvia in the ERA, which have been under examination since 1999, when Latvia became an associate member of FP5. The Latvian National Contact Point System for EU Framework Programmes has a full record of the country's participation (success and failures) and provides some analysis of Latvian research entities in Framework Programmes and

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[36] Informative report on the evaluation of science and innovation policy, Riga. (In Latvian)

[37] www.technopolis group.com 20 January 2014 Latvia Innovation System Review, and Research Assessment Exercise: Draft Final Report. http://izm.izm.gov.lv/upload_file/2014/Latvia-systems-review_2014.pdf

[38] It assessed top 150 research institutions in Latvia according to five internationally recognised criteria (this assessment criteria is widely used in the EU): (i) Quality of research; (ii) Impact on science in the particular field; (iii) Economic and social impact; (iv) Research Environment and infrastructure; and (v) Potential for development. A key result is that 15 institutes (out of 150) received a score 4 or higher (1-very poor; 5-excellent) and are recognised as strong international players 33 institutes with average score 3 are recognized as strong local players and need to be strengthened; 77 institutes are average local players and to be strengthen via thematic integration. Experts conclude that the largest problems are acute lack of funding and even more important lack of human resources. The formation of large science centres and world level research activities should be stimulated.

[39] http://izm.izm.gov.lv/upload.../1843_Final_Report_Panel_M_140115.2-84.pdf..Panel M: Natural Sciences and Mathematics; http://izm.izm.gov.lv/upload.../1843_Final_Report_Panel_E_140115.2-100.pd.. Panel Report: Engineering and Computer Science: http://izzm.gov.lv/upload.../1843_Final_Report_Panel_L_140115.2-58.pdf Panel Report: Life Sciences and Medicine (http://izm.izm.gov.lv/upload.../1843_Final_Report_Panel_S_ Panel Report: Social sciences: http//izm.gov.lv/upload.../1843_Final_Report_Panel_H_140115.2-56.pdf. Panel Report: Humanities.

structured ranking among different groups of players. This ranking complements the results of participation in national level calls (including competition for SFs projects) and in other EU programmes and provides a clear picture of the strong and weak points of each institution. The latter have also been specifically highlighted in the recent Technopolis reports.

The research and innovation system in Latvia faces vital structural and quality problems[40] and its changes should be directly linked to the "critical mass" in laboratories (per capita 2-4 times less than in advanced MS) to be able to compete for new projects under various sources of public funding (on national and EU levels and to react to the requirements of the national scale or the EU level industry for applied research efforts).

There is a need for improved strategic intelligence activities, such as technology foresight or roadmaps, industrial research and innovation surveys, studies related to research and innovation policies that provide international analysis of strengths and weaknesses at national and regional levels as well as analyses of emerging opportunities (smart specialisation) and market developments.

Such exercises are needed to improve the allocation of the state science budget in a systematic way by increasing the amount of money and by giving priority to research relating to the thematic priorities, such as EU key enabling technologies, as well as to traditionally strong research institutes well recognised in the European Research Area (ERA). In addition, concrete efforts are to be made in Latvia to ensure further rejuvenation and expansion of the research and academic staff (including resuming the careers a of lot of unemployed or those working in non-relevant professions) as well as enhanced contacts and networking with Latvian industry and the research diaspora inter alia to facilitate the return of expatriates. This could be particularly encouraging if the 15-20 traditionally scientifically strong and internationally recognised national research institutes or their associations could be advanced towards becoming world class centres of excellence in terms of research infrastructure, staff competencies and remuneration. Foresight exercises are now in strong demand to sustain success and to participate in the calls of HORIZON 2020 under the programme "Spreading excellence and widening participation, specifically targeted to Convergence regions.

2.7 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

Research policy in Latvia is developed, funded and implemented at the national level. Formally it is not regionally organised. Latvia is treated as one NUTS region. In practice some aspects of regionalisation are present from historical heritage and are also promoted by EU structural

[40] See Chapter 7.4 Policy implications on page 41 of Technopolis report: The biggest question is, as earlier indicated, the absolute lack of money. This is completely understandable in the current economic context. However, the plain fact is that you cannot build and sustain a modern economy without making a significant expenditure on research and higher education. If you fail to make this investment, the supply of high-quality human resources to society and industry is too small and those people who could be driving socio-economic development and growth tend to drift abroad. The production of knowledge is of course one very important reason for funding research; but the production of human capital is probably an even more important reason for doing so. Lack of human capital means not only that the country has difficulties in exploiting its own knowledge production but also, crucially, that it is hard to exploit the more than 99% of new knowledge that is generated abroad. Without these capabilities, the country will enter a declining spiral that infects the performance of the economy as a whole.

funds. In particular, to promote balanced development of all territories, five planning regions of Latvia (Riga, Kurzeme, Latgale, Vidzeme and Zemgale) have been created. With its population slightly above 2 million, Latvia has six NUTS 3 regions – they are the same as the planning regions.

At the level of regional planning, the main bodies are the Planning Region Development Councils, which are elected by the municipalities of the respective planning region. They are responsible for setting the main principles, objectives and priorities of long-term development, drafting the regional development programme and undertaking territorial planning in compliance with the national development strategy.

Most research activities in Latvia are concentrated in the capital city of Riga where the majority of higher education institutions (HEIs) and public research organisations are located. Outside Riga, research activities are undertaken in some of the largest cities. In fact, each of the planning regions hosts at least one HEI – Kurzeme has HEIs in Liepaja and Ventspils; Latgale has HEIs in Daugavpils and Rezekne, Vidzeme hosts Vidzeme University of Applied Sciences in Valmiera and Zemgale hosts a National Agriculture University in Jelgava. Regional HEIs see themselves as potential centres for research and technology development. These universities or university colleges can emerge as engines of development in the regions and can make research and economic development across the country more balanced. Development of the Eastern part of Latvia also means contribution to strengthening of distant border regions of EU.

In conditions when the entire research system in the country faces a shortage of financial and human resources, regional HEIs are behind their capital city partners in levels of support despite having excellent research capacities[41].

The formal setting of new national research priorities was placed on the agenda in the 2013, by the need to determine the list of regional innovation smart specialisations, in line with the ex-ante conditionality to be able to accessing Structural Funds over the period 2014-2020, as well responding to certain HORIZON 2020 calls. In late 2013, stakeholder consultation on selecting these priorities took place, involving both entrepreneurs and research communities. The domains eventually proposed for smart specialisation (December 2013) are rather broad: knowledge based bioeconomy, biomedicine, medicine technologies, biopharmacy and biotechnologies, smart materials and smart engineering system technologies; smart energetic, information and communication technologies. As a consequence it will be difficult to achieve the EU target of investing 44% of ERDF investments in research and innovation and in competitiveness of SMEs. That was said and relevant documents cited already in previous sections, the final decision on regional smart specializations in Latvia is delayed until December 31.2014.

In the determining areas for Regional Smart specialisation, bottom-up initiatives are very valuable and should also be considered. Several bottom-up initiatives have already brought € millions of investments to the country in the R&D system.

A recent example is the emergence of a strong team in quantum computing. A talented young researcher returned to Latvia with a prestigious FP7 Marie Curie return grant after building an excellent early carrier in the Massachusetts Institute of Technology and in several other universities in North America. Together with colleagues in his home lab he subsequently won three FP7 FET-OPEN projects and in 2013 was the first in Latvia who succeeded winning the European Research Council Advanced Grant for 5 years in the domain of quantum computing

[41] Excellence of research centers in Daugavpils and in Ventspils was confirmed by already cited Technopolis reports of peer review evaluation of science in Latvia.

(success rate 7% for both cases). A similar situation can be seen in the domain of photonics in Latvia, which had not been a priority.

Bottom-up initiatives in those two domains introduced real structural changes in the Latvian R&D system mobilising national intellectual capital worth € millions, bringing investments from outside totalling close to €10m at the end of 2012. This is comparable with the annual state budget contributions to R&D in Latvia. It also signals to investors that Latvia has internationally approved capacities. The above-mentioned teams have been developing the initiative "Photonics, Quantum Sciences and Technologies" a specific domain for smart specialisation in Latvia. Together with colleagues in Lithuania and Estonia a possibility for a pan-Baltic regional smart specialisations is also being discussed.

An inventory of 7669 scientific publications from for the period 2004-2013 reveals that 32% are related to this emerging domain. 37% of these appear in journals with an impact factor higher than 2, of which some 250 are in journals with impact factors from 4 to 35. Besides excellence in the public sector there are up to 20 research-driven SMEs competing in the photonics world market.

As already mentioned, decisions were taken by the outgoing government in December 2013. The new government, formed in January 2014, is working on the design of an improved governance structure to define, implement and refine the RIS3 and to set a clear link between the RIS3 and the programming documents for the 2014-2020 EU funding cycle.

2.8 Policy developments related to Council Country Specific Recommendations

In May 29, 2013, the European Commission published its Council Recommendations for Latvia's National programme[42] followed by the Commission Staff working document[43].

The Council recommendations document states (page 4) the following:

"Latvia has proposed an ambitious reform that can be expected to have a significant positive impact on the quality of its higher education system. However, the plans are still at an early stage and needs to be properly implemented to ensure that the foreseen positive impacts materialise. Moreover, in 2013, an evaluation will be carried out of the effectiveness of scientific institutions and their development strategies. This important assessment should help underpin future reform and funding of scientific institutions, in support of increased innovation activity in Latvia"

The Commission Staff working document in the overview assessment (page 27) includes the warning already discussed above about Latvia's R&D target: 1.5% of GDP in 2020: "The R&D target is very ambitious. In order to reach it, Latvia needs an average annual growth rate of 9% for R&D expenditure".

[42] Brussels, 29.5.2013, COM (2013) 364 Final. Recommendation for a COUNCIL RECOMMENDATION on Latvia's 2013 national reform programme and delivering a Council opinion on Latvia's convergence programme, 2012-2016.

[43] The Brussels, 29.5.2013 SWD (2013) 364 final COMMISSION STAFF WORKING DOCUMENT Assessment of the 2013 national reform programme and convergence programme for LATVIA

In June 13, 2013 Permanent Representatives Committee of the Council issued an Annex to Council recommendations which points the following (page 9): … "*Take further steps to modernise research institutions based on the ongoing independent assessment"*

The portal " Europe 2020 in Latvia contains the following statement: "Latvia has proposed ambitious reforms to its higher education system, which if properly implemented, should have a positive impact on quality. This should be carefully monitored and further modernisation of research institutions should also be pursued."

These points show that the Council Country Specific Recommendations towards RDI policy developments provided in the middle of 2013 reflect that Latvia faces serious problems and that urgent actions are needed.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

The analysis and references to independent evaluations provided above repeatedly highlights that the allocation of state budget funding for R&D&I in relative and absolute terms has been rather low for the past years. In addition, there has been insufficient financial prioritisation of R&D and innovation in annual budgets of Latvia. This has contributed to low performance competitiveness indicators for the knowledge based economy (Council Recommendations point Nr.4 says …. "Tackle high rates of poverty"… "A high proportion of the Latvian population is at risk of poverty or social exclusion (40%)".

In recent years, public funding for R&D has become more and more dependent on EU SFs and Framework programme funding (about 50% in year 2011 and the same share in years 2012 and 2013). The low R&D intensity in Latvia has also been noted also by the Innovation Union Competitiveness Report of 2011 and Innovation Union Scoreboard of 2014 and the TECHNOPOLIS report documents this situation.[44]

While in 2011 GERD reached 0.70% of GDP it fell down to 0.66% in 2012 and is expected fall to 0.6% in 2013. 2013 marks the end of the current planning cycle of SFs. Based on previous experience, it is unlikely that the flows of new funding will not begin in earnest until two years after the launch of the new cycle. The same relates to the decreased contribution from FP7 in its final phase. Practically no concrete contribution from HORIZON 2020 is likely during the Year 2014. This implies that Latvia may have one of the lowest levels of GERD (in relative and in absolute numbers) among EU Member States for the years to come.

[44] But the most powerful reason behind these issues of implementation seems to be a lack of political commitment to the idea that research and innovation are important drivers of development and growth. This problem is likely to have two elements: first, a lack of experience and exposure at political level to success examples, especially in the specifically Latvian context; second, the problem of ' dynamic inconsistency', by which we mean the incompatibility of the short time constants relevant to political life and the rather long ones that apply in research and innovation. Underpinning these patterns is a series of problems, the most fundamental of which is the absolutely low level of research funding in the system as a whole. Ultimately, any developed country must be financing its own research on a permanent basis. Temporary funds are useful for supporting transitions but cannot sustainably fund 'business as usual… Citation from page 40 in the report: Technopolis, 20 January 2014 Latvia Innovation System Review.

Table 2.

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1,0 (Y2011, IUS-2014)
Percentage population aged 25-64 having completed tertiary education	37 (Y2012, IUS-2014)
Percentage population aged 25-64 having completed tertiary education	Below 20%
Open, excellent and attractive research systems	
International scientific co-publications per million population	195,8 (Y2012, IUS-2014)
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	3,03 (Y2009, IUS-2014)
Finance and support	
R&D expenditure in the public sector as % of GDP	0.23
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	0.24
Linkages & entrepreneurship	
Public-private co-publications per million population	2,23 (Y2011, IUS-2014)
Intellectual assets	
PCT patents applications per billion GDP (in PPS€)	0,49 (Y2010, IUS-2014)
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0,13 (Y2010, IUS-2014)
OUTPUTS	
Economic effects	
Medium and high-tech product exports as % total product exports	High-Tech - 8,2 (Y2011, UN)
Knowledge-intensive services exports as % total service exports	32,82 (Y2011, IUS-2014)
License and patent revenues from abroad as % of GDP	0,03 (Y2012, IUS-2014)

3.2 Structural challenges of the national R&I system

Latvia has been listed among the EU countries having one of the lowest levels of innovation performance. The analysis provided by the Innovation Union Scoreboard 2013 notes that Latvia has weak funding and participation of industry in R&D. While there has been an upward trend with regard to BERD, in 2010, when it made up only 37% of all R&D funding in Latvia, a decrease occurred with only 26% in 2012. Latvia lagged well behind the EU average of above 60% in 2012.

The current business structure of Latvia is composed mainly of small- and medium-sized enterprises (SMEs) (99.5%), with the strong domination of micro-enterprises (82.5% of all enterprises)[45] . Their low capacity to invest in R&D and innovation is demonstrated by the fact that SMEs introducing product or process innovations in Latvia make up only 17% of all SMEs, while the respective share in the EU-27 on average is 34%.

The GDP of Latvia in 2013 in current prices made up €22.1 b, of which only 14% were provided by the industrial sector (CSB, 2013). The industrial sector suffers from the overall weakness of R&D system, is undersized to make a significant contribution in terms of the overall innovation performance and to increase the share of exports of "High-Tech" products

While SMEs dominate the landscape, only about 50 SMEs and few of the existing large scale industrial enterprises prove to be internationally competitive in the high-tech domain of the global market. The problem with the supply of a qualified labour force for the R&D and innovation sector has become particularly acute due to local and foreign "brain drain" from Latvia, and as a result of not having the capacity to stimulate the emergence of high added value production. Whereas there has been entrepreneurial success, the owners are hesitating to invest in up-to-date equipment[46] According to EUROSTAT data, the percentage of employed in high and medium high-tech manufacturing was only 3% in 2008 which decreased to 2.5% in 2012.

The main structural challenges of the national R&I system are:

- Need to increase R&D&I funding from national budget[47]
- Need to improve the quality of research and to increase substantially number of publications in international peer-reviewed academic journals, and, number of applications to the European Patent Office;
- Emerging knowledge society and the need for future knowledge based economy and future manufacturing systems in the context of sustainable development;
- Limited (in quantity and quality) innovative capacity and competitiveness of the enterprise sector including SMEs in "high-tech" industry domains;
- Insufficient in quality and in quantity and continually decreasing supply of a skilled labour force.

Industry in particular, faces lacks the following:

- Effective support instruments and systems to the community of worldwide competitive "high-tech" and research driven SMEs;
- Specific advice, consultations and targeted support to SMEs having significant experience in participation in Framework Programme projects;
- Industry related MSc and PhD programmes in leading research institutes;
- Smart future manufacturing fund for "high-tech" SMEs (see ref.51 above);

[45] Economic Development of Latvia, Report, December, (In Latvian)

[46] Kalviņš, I. Ūbelis et al. (2010): Informative report on the necessary support for the development of new exportable products in cooperation with Latvian scientists [Informatīvais ziņojums „Par nepieciešamo atbalstu jaunu eksportspējīgu produktu radīšanai sadarbībā ar Latvijas zinātniekiem]. Riga: Ministry of Education and Science, (In Latvian)

[47] Citation from TEHNOPOLIS panels

- Increased RTD community in the country.
- Attraction of foreign large scale industry investments in R&T&D

3.3 Meeting structural challenges

Up to now the ability of the implemented policies to effectively and efficiently tackle (over time) the structural challenges faced by the research and innovation system is not sufficient. Actions from new interim Government formed in January 2014 are needed now not waiting for elections of Saeima foreseen in October 2014. There are several measures from the previous policy mix which are particularly worth continuing.

The "critical mass" of the research community as such in the country and in many research institutes could be lost.

Such problems are highlighted also in the Technopolis reports cited above. The reports also provide recommendations for the management of situations (see some highlighted recommendations cited from chapter 7.4 of Technopolis review report listed below), but action plans need to be designed by the decision makers and policy designers in Latvia.

The major policy needs identified are the following:

- Allocation of permanent national funding to research, using Structural Funds as far as possible only to pay for the costs of reforming and transitioning the system to higher levels of performance;
- Defragmenting and strengthening the research system by consolidating research units primarily around the 'cores' provided by the existing well performing units and proving incentives for quality and international reach;
- Use of an institutional funding system that is based on a balance of prospective planning, international peer review and performance indicators, so as to combine strategic development, incentives related to measurement and embedding in the international research system.

According to the Global Competitiveness Report Latvia is ranked 96th (Lithuania – 57th, Estonia – 62nd) in terms of the availability of scientists and engineers[48] (GCR, 2011). A substantial part of the existing staff (in 2012, there were 3904 researchers in FTE counting 2078 full time employed and 5917 on part-time duty - CSB, 2013) are over 60 years of age and the overall number of researchers per thousand labour force is 3.6 compared to the EU-27 average of 6.3. The number of new doctoral graduates (EURODICI2011[49]) per thousand population aged 25-34 is 1,0 in Latvia compared to the average of 1.7 in the EU-27 (2012)[50]. While a national target has been set to award at least 425 new PhDs annually[51], so far this target has not been reached (2009 – 133; 2010 – 176, 2011 – 287, 2012 – 267, 2013 - 315). The main shortage of researchers can be observed in the business enterprise sector where only about 550 of all researchers are employed

[48] The Global Competitiveness Report 2011-2012, World Economic Forum,
[49] Eurydice (2011): Science education in Europe: National Policies, Practices and Research, Education, Audiovisual and Culture Executive Agency
[50] Innovation Union Scoreboard 2014
[51] Guidelines for Development of Science and Technology for 2009-2013, Riga, Ministry of Education and Science of the Republic of Latvia, (In Latvian)

(CSB, 2013), The current set-up of the research and academic staff available in Latvia (including estimated 4000-5000 unemployed or working in not relevant fields) is in need of a qualification upgrade or rejuvenation in terms of both quantity and quality. The last is directly linked to lack of research activities.

This, together with a significant number of researchers returning from abroad could constitute an essential strategic reserve of human resources in Latvia and the general policy should address

changes to facilitate it. No attention is paid or efforts have been made to the training of highly qualified science managers in technology-intensive branches having natural science or engineering background.

Table 3

Challenges	**Policy measures/actions addressing the challenge** [52]	**Assessment in terms of appropriateness, efficiency and effectiveness**
1. Effective support instruments and system to the community of worldwide competitive "high-tech" SMEs in the country;	Only general measures to provide support to innovative SMEs	Bureaucratic, robust and time consuming
2. Specific advice, consultations and targeted support to SMEs having significant experience in participation in Framework Programme projects and have been frequently requested (invited) to become members of consortia of project proposals;	Only nominated NCPs are in service, but they are not always able to serve for this community of SMEs. A specific consultants network should be created to work specifically with a small target group of SMEs	Effective in quality of consultations, but do not always satisfy demand due to insufficient funding
3. Industry related MSc and PhD programs in leading research institutes;	Insufficient incentives from ministries or universities. Largest research institutes are making indirect voluntary steps	There are success stories where institutes were very helpful
4. Smart future manufacturing fund for "high-tech" SMEs;	Specific Cabinet approval is on place since 2011, see ref 27	No further actions from ministries
5. Increased in numbers RTD community in the country.	New Guidelines for R&D&I foresee to double number of researchers till 2020	Shortage of qualified staff is an issue for industry

[52]Changes in the legislation and other initiatives not necessarily related with funding are also included.

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1 Strengthening the knowledge base and reducing fragmentation

The number of personnel employed R&D in Latvia has witnessed a decrease from about 30 000 in 1990 to about 5000-6000 by the turn of the century. Further stagnation of the formerly strong RTD system and "high-tech" industry (Danish Council Of Science, 1992) and the years of crisis has reduced the number of FTE to 3904 in 2012. This figure includes 2078 full-time and 5917 part-time staff. With such researchers ready to resume full time employment, the number of researchers could be raised to 8000. This could provide a resource in Latvia to increase quality and quantity of scientific activities when relevant resources become available. The EU policy framework concerning Cohesion Policy, usage of structural funds in synergy with HORIZON 2020 in 2014-2020 has seen a radical inflow of resources in R&T&I sectors.

The quality of the small research community has been discussed above and is also highlighted in the Technopolis reports. There could be an opportunity to repatriate up to 2000 researchers that have left Latvia since 1990 if relevant policy measures will be put in place. To reach the EU average per capita number of researchers in Latvia, 2000 more are needed. The inflow of both young and experienced researchers from abroad in the national labs can help to solve this problem.

On one side the low national state budget and accordingly low levels of remuneration of researchers do not act as a strong attraction factor for a career in science. The solution may lie in the various pathways through which researchers especially trained in labs are effectively employed in industry while simultaneously bringing new ideas to market based on applied research exercises to stimulate growth of turnover of SMEs. Universities also face a lack of experienced researchers – as a result there is poor competition for academic chairs, further diminishing the quality of education.

Generally speaking, the problem with the supply of a qualified labour force has become particularly acute under the conditions of major emigration of the Latvian population during the last 6 years. The R&D and innovation system, which has been underfinanced for years, has a low demand for highly skilled workers and is therefore a weak contributor to the nation's economic development.

Recent research-based estimates show that during the last 11 years (2000-2011) more than 200,000 people have left the country, the majority of which are educated and skilled individuals[53]. As already mentioned above, in addition, more than 60 thousand people have emigrated in just over a two year period (2011-2013). The dynamics of emigration shows the direct effects of economic crisis.

[53] Kancs, D., Kielyte, J. (2010). European Integration and Labour Migration, European Integration online Papers, European Community Studies Association Austria, 14:(01), 1-24.

Several policy measures have been launched to increase the number of researchers in Latvia. Already mentioned the EU SF co-funded programme "Attraction of human resources to science" launched in 2009 has attracted an additional R&D staff of 623 persons (FTE) that make up almost 10% of all R&D staff[54]. Likewise, largely due to the notable scholarships for PhD students and candidates (ca. €1,000 per month) funded from EU SFs since 2009 (Support to the implementation of doctoral programmes), the number of newly awarded PhDs has been increasing quite substantially – while during 2000-2004 the annual number was below 100, it reached 315 in year 2013. However, it is still far below the annual target of 425 new PhDs[55] .

The measures mentioned were, generally speaking, valuable indeed but appropriate policy steps are needed to provide long-term sustainable growth of investments in the RTD sector in the country. Both measures provided opportunities to increase the current total number of researchers by up to 50% already by 2013. The substantial decrease in, and subsequent stagnation of, national public RTD funding since 2008 do not support this. Furthermore, knowledge based industries are rather weak and research driven SMEs number fewer than 100 in the country. This is a suboptimal situation for the 1000 or more experienced (recruited or repatriated) and young researchers mentioned.

There are insufficient sustainable and clear mid- and long-term programmes for the recruitment or return of researchers. There are no comprehensive studies available on the short-term or long-term inward or outward flow of researchers. An indication of mobility flows of researchers-to-be is provided also by the share of foreign exchange students at Latvian HEIs, which has increased substantially in years 2003-2013 (from 1,269 to 4,228 students) and in 2013 making up 5.5% of all students[56]. In turn, the number of students from Latvian HEIs undertaking studies abroad in the years 2003-2011 has grown by 60% (from 673 to 1,684). However, in comparison with the EU level, Latvian mobility levels are still very low.

Research Infrastructures

One of the officially approved medium-term tasks of national research policy for 2009-2013 (though little money has so far been foreseen) is to foster integration in the ERA, by supporting participation in technological platforms and other international initiatives as well as developing RIs of interest for the European and international research communities. Up to now Latvia has no EU level large-scale research infrastructure, but there are a few sites which are attractive to the ERA research community and are already positioned in various EU infrastructure access projects which are financed via various Framework Programme projects.

In 2007-2013, €146m structural funds have been earmarked to co-fund the national programme "Development of research infrastructure.". A significant part of this money has been allocated to top-down positioned virtual National Status Research centres incorporating fragments of 30 scientifically strong research institutes. Participating groups of the institutes mentioned are expected to purchase actually needed research instrumentation starting from 2012 but most of purchases have been postponed to year 2013 or later. In the current situation with financing those centres may not have sufficient money for management and salaries to personnel obliged to maintain and intensively operate large scale, complicated and costly instrumentation which is foreseen to be used by several groups or provided to other interested parties for the market price of the relevant service. The risk exists that due to the acute shortage of human resources in R&D in the country, the equipment will remain unused. A certain positive outcome of such

[54] Public report of the Ministry of Education and Science on 2010, Riga, (In Latvian)
[55] Guidelines for Development of Science and Technology for 2009-2013, Riga, Ministry of Education and Science of the Republic of Latvia, iIn Latvian)
[56] 2013 - Annual statistics on higher education in Latvia Riga 2014, (in Latvian)

investments is the increased capacity to perform research in cooperative projects expected to be won in the coming HORIZON 2020 by involved groups from historically stable institutes recognised in the ERA.

The ESFRI (European Strategy Forum on Research Infrastructures) annual report of 2009 lsted Latvia among the five (of 33) countries not having initiated the process of drafting their national ESFRI roadmaps[57]. However, to date, Latvia is not presented on roadmap portal.[58]. The 2010-2011 action plan for the implementation of the Guidelines for Development of S&T for 2009-2013 stipulates that the national plan of Latvia for the development of research infrastructures (RIs) of European importance should be elaborated by mid-2011 and the ESFRI-class RIs are to be identified by the end of 2011 but as of early 2014 such a plan is still pending. The above-mentioned action plan also envisages funding to be allocated for the establishment of four to five ESFRI-class infrastructures. No real steps made towards implementations up to no in year 2014.

So far Latvia has formally confirmed its participation in such ESFRI roadmap projects as the Common Language Resources and Technology Infrastructure (CLARIN), the European Spallation Source (ESS), the European Social Survey and the Bio-banking and Biomolecular Resources RI (BBMRI). Yet, this participation does not involve financial liabilities. Certain interest has been demonstrated also with regard to the Council of European Social Science Data Archives (CESSDA), European Life Sciences Infrastructure for Biological Information (ELIXIR), Pan-European RI for Nano-Structures (PRINS), and the Partnership for Advanced Computing in Europe. The above-mentioned action plan envisages some funding for ensuring the national participation in the CLARIN project and providing access to the services of the European Spallation Source. The Institute of Physics having world-wide recognition in magneto-hydrodynamics is very much a demanded partner in the core group of ESS developers.

As for national participation in inter-governmental European RIs, Latvian researchers have been involved in the European Fusion Development Agreement (EFDA). As of June 2011, Latvia has been granted observer status at the European Space Agency. While Latvia is not an official member of the European Organisation for Nuclear Research (CERN), Latvian researchers have contributed to selected research activities (e.g., CMS, EGEE, BalticGrid, WLCG). Negotiations have taken place on the possibility of Latvia joining the European Synchrotron Radiation Facility.

In conclusion it should be reiterated that the Latvian research community is already involved in this area and has the potential to become an important contributor to two mega projects of European research infrastructure: European Spallation Source and in ITER - International Thermonuclear Experimental Reactor to explore the potential of fusion as an energy source. Latvia has a school of magneto-hydrodynamics which has been recognised worldwide for more than 50 years. Research groups of the Institute of Physics - experienced in the manipulation of liquid metals in magnetic fields have experience in contributing to the needs of various existing installations of spallation sources in the world. Several Latvian research groups have been strongly involved in the EUROATOM programme since 1999 and now are valuable contributors to the EFDA ITER Physics Work Programme 2012/2013. They combine expertise and knowledge which is valuable heritage of intellectual capital of Latvian science which could be used as a cornerstone to start the recovery of Latvia's previous position in top level physics research having a trans-disciplinary context.

[57] ESFRI (2010): Annual report 2009, European Commission,
[58] http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-national-roadmaps

4.2 Getting good ideas to market

Facilitation of public-private partnership in the field of R&D and innovation has been set among the four goals of the national S&T development strategy embodied in the Guidelines for Development of S&T for 2009-2013. The action plan of the guidelines for 2010-2011 envisaged the establishment of research management units at HEIs and PROs along with state aid programmes for technology transfer and innovation/product development as well as measures aimed at efficient protection of intellectual property, etc. [59].

While the action plan of the Guidelines envisaged the passing of amendments to the Law on Research Activity on the delegation of rights to use the intellectual property resulting from state-funded research already in 2010, there is a delay in the implementation of the listed measures.

The EU SF co-funded programme "Support for science and research" and Competence centre programme, launched in 2009-2010 with the aim of facilitating academia-industry integration and collaboration [60] , has also been continuing. In 2010, in the framework of the former programme, 114 applied research projects (of 177 submitted proposals) were approved for funding with the eligible costs amounting to € 1m. In turn, in the beginning of 2011 within the latter programme, 6 major contracts (involving 72 enterprises and 17 scientific institutions) have been concluded for the total contractual sum of € 53.2m that are expected to attract additional co-funding of € 31m from the private sector by 2015.

In conclusion, it is not easy to highlight well-targeted, clearly differentiated, and easy to access support schemes for research infrastructure development and in particular specifically tailored to the needs of companies e.g. high-tech SMEs. In the existing ones, bureaucracy and public procurement slow down the processes. Funding schemes are not regularly evaluated and benchmarked against comparable schemes in other countries.

4.3 Working in partnership to address societal challenges

As of April 2014, there has been limited funding targeted to contribute to the openness of research organisations and national programmes to foreign researchers in Latvia. National programmes are generally designed for local researchers with a common condition for beneficiaries to be registered in the national register of scientific institutions automatically excluding foreign institutional and individual participants not residing and registered in Latvia. The Law on Research Activity also specifies that state budget funding for research activities can be allocated only to those institutions listed in the register. Besides, in most cases the terms of reference are provided only in the national language thereby limiting the possibilities for foreign applicants.

Foreign researchers can be involved in the execution of national R&D programmes only if being employed as individual researchers by a local scientific institution.

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[59] Action plan for the implementation of the Guidelines for Development of S&T for 2009-2013 in 2010-2011, http://polsis.mk.gov.lv/LoadAtt/file55565.docx (in Latvian)

[60] Six centres: 1) Chemistry and Pharmaceuticals; 2) Forestry and Wood Products; 3) Environment, Biotechnology, Bioenergy; 4) Electronics; 5) IT; 6) Mechanical Engineering. Total budget LVL 59.39m.

The general rationale of national authorities for limiting the access of non-domestic researchers or research teams that might be willing to conduct work in their home countries to funding made available for national R&D programmes is largely based on the scarcity of national R&D budget funding that is already being strongly competed for by nationals. Such a strategy also implies a certain degree of protectionism of national research centres, which do not always meet the international standards that would guarantee their position in an equal competition with foreign peers.

On other hand, it should be noticed, that the research community of Latvia has been associated with the EU Framework programmes since 1999. This has resulted in participation of close to 3000 multinational consortium project proposals being prepared and participation in the implementation about 700 financed projects. It has resulted in thousands of trans-border contacts and cooperation between experienced scientists, young scientists as well as intergeneration and trans-border knowledge transfer. Due to scarce national funding and no targeted support researchers are eager participants of FP projects to sustain their scientific interests. Success allows them to stay in science at least 2-3 years longer.

Nevertheless there are persistent bottom-up initiatives emerging from the research community. Among others Latvian researchers were among the initiators of BONUSS ERA-NET project early during the FP6. Now BONUS 2010-2016 programme (Article 185) - is treated as an example of future pooling of national research budgets for the benefit of all Member States in the EU.

Therefore Framework programmes up to now are dominant facilitators of multinational cooperation and integration in the ERA, and in 2014 - 2015 the research community is looking forward to HORIZON 2020 and new EU Cohesion Policy demanding from MS to ensure synergy between two sources and to allocate more SFs resources to R&T&I issues.

A range of other activities are being undertaken in Latvia for the facilitation of cross-border cooperation with regard to coordination of research. Mention can be made of the EU Baltic Sea Region (BSR) Programme 2007-2013, as well as bilateral cross-border cooperation programmes with Lithuania, Estonia, and the Central Baltic Programme which facilitates implementation of projects also dealing with research and innovation.

4.4 Maximising social and territorial cohesion

In chapter 2.7 the problems with delayed top-down actions concerning smart specialisation in the context of IU commitments 24 and 25 has been discussed as has the insufficient adoption of bottom-up initiatives. Draft documents submitted to the Cabinet late in December 2013 reveal similar definition of national priority areas and accordingly implementation of Cohesion policy and usage of SFs money for the next planning period. There appears insufficient knowledge in ministries and government structures of the Innovation Union concept and the Europe 2020 strategy objectives of smart, sustainable and inclusive growth. Regional smart specialisation is an instrument for mobilisation of the Cohesion Policy to build a Stairway to Excellence.

The regional smart specialisation process should build on the various bottom-up initiatives that have already brought to the country €millions of investments in the R&D system (see chapter 2.7).

4.5 International Scientific Cooperation

On the whole, the knowledge circulation between Latvia and other European and non-European countries in the field of higher education and research can be seen as steadily increasing over the last decade. The 2010/11 progress report on the action plan for necessary reforms in higher education and science for 2010-2012 notes an increase in the export volume of Latvian higher education, which is characterised by the increasing number and share of foreign students (from 1,416 or 1.1% in 2005/2006 to 4475 or 5,5% in 2013/2014 academic year) (report of MoES, 2014). In September 2011, draft regulations on granting scholarships to foreign students (based on the existing intergovernmental and interdepartmental agreements) have been elaborated by the Ministry of Education and Science.

Latvian partners have been involved in 195 approved projects under FP5 (1999-2002), 218 - under FP6 (2002-2006). By June 2014, partners from Latvia have been involved in the submission of 1253 project applications under FP7 (2007-2013), of which 263 have been retained for funding. The amount of contracted sums by Latvian participants has increased from € 14.6m in FP5 to € 21.6m in FP6, reaching the expected value of €50 m for FP7 in 2014. In spite of the current conditions of national funding, limited support from national authorities and the relatively small research community, Latvia has the capacity to compete and still has prospects for recovery in all domains of the RTD system covered by the FP7 and coming HORIZON 2020.

Besides Framework programmes, COST and EUREKA are contribution to international contribution across EU borders. At the end of 2013, there were over 78 running COST projects with the involvement of Latvian partners (Latvia altogether had been involved in over 170 COST actions). Up till July 2012, Latvian researchers and entrepreneurs had been involved in 57 EUREKA projects (44 finished and 13 running, including two EUROSTARSs projects). Latvia at the end of 2013 participated in 16 ERA-NET projects and 5 ERA-NET+ networks under the ERA-Net scheme: BONUS+, MATERA+, WoodWisdomNet-2 and BIOPHOTONICS+. Specifically important is the participation of Latvia in the new ERA-NET RUS Plus promoting cooperation with Russia in material sciences, environment, health and social sciences.

Cooperation in the domain of S&T with non-ERA countries is rather intensively pursued by Latvia with a range of intergovernmental agreements signed with such countries as Uzbekistan, Ukraine, China, Vietnam, India and Egypt. Particularly intensive cooperation is taking place in the framework of the Latvian-Byelorussian cooperation programme in S&T as well as the Mutual Funds for Science Cooperation between Lithuania, Latvia and Taiwan. While most of the bilateral cooperation agreements signed by LAS cover European countries, there are also many signed with the former socialist countries outside ERA, e.g. Russia, Belarus and the Ukraine, as well as countries such as Canada. All these initiatives still are waiting to be intensified with relevant financial resources allocated from the Latvian side.

5. NATIONAL PROGRESS TOWARDS REALISATION OF THE ERA

5.1 More effective national research systems

Latvia according to the National Development Plan (adopted at 20.12.2012) is unlikely to attain the EU target to invest on average 3% of GDP in research by 2020. The Government plan is 1.5% comprising investments from national sources and financing attracted from abroad.

GERD/GDP witnessed a drop from 0.61% in 2008 to 0.46% in 2009, thereby reaching 30% of the EU-27 average. The recovery of GERD levels in 2010 - 2012 is linked to allocations from abroad (EU SFs + FP7 etc. constitutes 50.4% in 2012). The contribution to science from the national budget declined in absolute figures from €67m in 2008 to €32m in 2011, rising again to €34,7m in 2012. BERD in 2011 constituted €32.9m and was lower than in 2010 and is foreseen to remain unchanged in 2013. Financing attracted from abroad increased by 97%. GERD for Latvia in years 2011 - 2012 was about 0.35% when purely domestic investments are counted

Public R&D funds are provided via a mix of institutional and project based competitive funding. The share of competitive versus institutional funding is very roughly 50:50. The proportion and absolute numbers in various budget lines remain unchanged since 2010 till the actual budget in 2013 where budget amount of the state funding €23.5m is the same size one can see in 2010, which means no positive changes during the last 4 years.

After regaining independence in 1990, all public research funding was allocated in project based competition with evaluation by relevant experts. International peer review practice has been in place since late 2012.

The NRP as the most recent strategy document sets the following priorities with regard to the R&D domain: advancement of the potential of scientific activity; development of a long-term cooperation platform for enterprises and scientists; and support for development of innovative enterprises.

The following business sectors were identified as high-priority sectors[61]: information and communication technologies, Production of electric devices and optical appliances, Chemical and pharmaceutical industry, Mechanical engineering and metal working, Transport and logistics, Forest industry, and Food industry. A similar approach has been used in several other governmental decisions, including the NRP.

As already mentioned in previous chapters the promotion of research and innovation has not been identified as a key contributing factor to enhance competitiveness, job creation and improve the quality of life in Latvia. The lack of progress with regard to improving research and innovation in Latvia can also been attributed to the planning of the EU SFs and the low quality of the evaluation studies on the absorption of these funds. These features are crucial especially given the heavy reliance of Latvia on the SFs in the domain of R&D and innovation. The same applies to the scarce budgetary resources.

[61] Informative Report on the Mid-term Economic recovery Plan, (in Latvian)

With regard to support measures for R&D and innovation, little distinction can be made between those directly fostering innovative performance and the ones shaping and affecting the broader economic framework conditions that are relevant for innovative performance as part of the overall R&D and innovation policy mix[62].

5.2 Optimal transnational co-operation and competition

There are few attempts from decision makers to design national scale joint and open research programmes in general and concerning grand challenges in particular. Even in particular cases where such a need is unavoidable, like BONUS, ERA NET+, EUREKA or bilateral (Belarus and trilateral – Latvia, Lithuania, Taiwan) projects and programmes Latvian researchers suffer from insufficient national contributions and lack of a supportive attitude from the ministries and Government.

No attempts have been made to accept mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions.

Up to now few actions have been taken to reduce legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions and none are foreseen for the nearest future. The exception is a small scale joint Latvia-Belarus research cooperation programme. But still only separate national scale evaluations occur in the selection of bilateral projects.

Few attempts were made to promote bilateral cooperation with old MS like Germany and France, but due to the small scale Latvian contribution and oversized bureaucracy the scope of projects is very limited. The bilateral programme with Germany was cancelled several years ago.

A small but significant success story is the trilateral cooperation Latvia-Lithuania-Taiwan. Thanks to the Taiwanese colleagues in their intention to sustain active research partnerships with the EU. The programme has been active for 9 years in spite of the small scale budget and is expected to be continued in 2014.

Little planning has been done or any resources allocated to benefit from the accessibility of intergovernmental European infrastructures. There are few signs for progress in the coming years. Incidental actions have been performed due to initiatives raised by several Framework Programme projects, but no areas of specialisations have been selected.

It was already mentioned that Latvian research teams are cooperating in ESS and ITER (European Spallation Source in Lund and ITER project in Cadarache) – RIs projects. The basic financing comes from the involvement of research groups from Latvia via FP7 and EURATOM financing.

The use of EU Structural funds, which may well be a preferred option during the planning period 2014-2020, due to the allowed synergy between SFs and HORIZON 202o financing.

Due to the availability of EU Structural fund money, leading research groups and research institutes succeeded in upgrading their RI and few of them are members of FP7 RI infrastructure

[62] OECD (2011b): Science, Technology and Industry Outlook, 2010, OECD, Paris

network projects. However, due to the lack of human resources, the acquired instrumentation is not intensively used and is available for transnational usage on a case-by-case basis.

Unfortunately only few comprehensive measures are designed to benefit from enhanced research effectiveness from the availability of upgraded infrastructure via EU SF funding.

So far due to weak interest from the Ministry, Latvia has demonstrated limited activity under Joint Programming Initiatives.

5.3 An open labour market for researchers

Up to now there are no active policies reducing the barriers to research mobility, training and attractive careers for inside and outside flows. Brain drain is high due to unfavourable conditions in Latvia and no measures are present to benefit from "brain gain".

While the gross average monthly salary by individuals falling under the category of "Scientific research and development" (NACE 72) witnessed a notable increase of 66% between 2005 (€ 407) and 2008, it dropped by 16% in 2009 and climbed back only by 11% in 2010 (€ 871) (CSB, 2011). According to the data provided by the State Revenue Service, in 2011 it has decreased again by 12% down to €768 (for comparison the overall average salary in the country € 670). It is far from competitive on a European scale. In particular, in the business sector EUROSTAT statistics in an article[63] on Key indicators, professional, scientific and technical activities (NACE Section M) in 2009 reveals the following annual per capita numbers

	Apparent per head labour productivity, €	**Average per head personnel costs, €**	**Wage adjusted labour productivity**
EU 27	47 000	40 500	117.0
Latvia	14 800	8 600	172,5
Estonia	18 900	13 300	141.3
Finland	51 900	46 500	116.0

The employment of foreign researchers in Latvia is governed by legislation on immigration and research activity. The Law on Research Activity, last amended in 2010, and the Cabinet Regulations in 2008[64] incorporates legal norms arising from Council Directive 2005/71/EC of 12 October 2005 on a specific procedure for admitting third-country nationals for the purposes of scientific research. It means that accredited scientific institutions are entitled to recruit third-country nationals to participate in scientific research projects. A foreign national visiting Latvia for employment, irrespective of the duration of the stay in Latvia, is required to have a temporary residence permit. An EU researcher and a third country national, having a permanent residence permit and/or the status of a long term EU resident, may apply for any research position in Latvia. In case an academic or professional qualification is obtained in a country

[63] Http://epp.€ostat.ec.€opa.eu/statistics_explained/index.php/Professional,_scientific_and_technical_activity_statistics_-_NACE_Rev._2

[64] Regulations of the Cabinet of Ministers of 21.07.2008. No 568 on the procedure to be followed by scientific institutions at signing and ending employment contracts with foreign researchers, (In Latvian)

other than Latvia, its official recognition is a prerequisite for both Latvian and foreign researchers to be able to apply for academic positions in Latvia. Latvia participates in the European diploma recognition networks ENIC/NARIC and in the international cooperation of the EURPASS framework.

Academic position vacancies in scientific institutions are announced in the official newspaper Latvijas Vēstnesis, which is available only in Latvian, and, in individual cases also in English on the websites of the respective HEI/PRO. The use made of announcements placed in the EU-wide database of the EUROAXESS portal in Latvia so far has been very limited. Furthermore remuneration offered is usually far below average in EU and even in neighbouring countries. While research grants awarded in Latvia are portable to another national research institution, the current law doesn't regulate their portability to another country. So far only one Latvian HEI – the Riga Technical University[65] – has been listed among the institutions having signed the declaration of endorsement of the 'Charter for Researchers', which provides recommendations to the EU MSs on the career management of researchers.

Few actions or policy measures are taken from national authorities to enable the implementation of the HR Strategy for Researchers incorporating the Charter & Code. The research community is facing pressure for quality from one side and insufficient financial resources to sustain the research environment, physical infrastructure and the frequency of remuneration at the basic level on the other side.

5.4 Gender equality and gender mainstreaming in research

Latvia has a rather balanced representation of women and men in the field of research. In 2009, the share of women researchers (FTE) in Latvia was 50.3% of all researchers, whereby the respective share in the EU on average reached only 30.2% (EUROSTAT, 2011). At the same time, the percentage of females in human resources in S&T as a share of labour force of Latvia in 2010 made up 46.4%. This correlates with the fact that, in 2010/11, 71% of all graduates from Latvian HEIs were female[66] . This predominance of women, however, does not translate directly into the patterns of the academic staff – while the share of females in the academic staff (main work) makes up 71.8% at colleges, the respective share at HEIs is only 55.4% (ibid.: 60-61). Furthermore, the share of female full professors at HEIs in 2010/11 reached only 32% (29% in 2007/08), gradually increasing only at lower ranks – 47% among associate professors and 58% among assistant professors (ibid.). The same can be attributed to the representation of women in high-ranked positions in decision-making and representative bodies.

There are also gender disproportions in selected branches of science. In 2010/11, a predominance of women among the students of HEIs and colleges could be observed in the thematic groups of education (88%), health and welfare (85%), Humanities and arts (76%) as well as social sciences, business and law (67%) (CSB, 2011). Male students however, strongly dominate the fields of engineering, manufacturing and construction (79%) and natural sciences, mathematics and information technologies (69%) (ibid.).

[65] http://ec.europa.eu/euroaxess/index.cfm/rights/charterAndCode#L (accessed on 11.12.2011)
[66] Annual statistics on higher education in Latvia, (in Latvian)

Formally, the Labour Law provides equal opportunities for females and males and restricts discrimination against women in employment. The Law stipulates that a woman who makes use of maternity leave shall have ensured her previous job or, if not possible, a similar or equivalent position with not less favourable conditions and employment provisions. At the same time, the qualitative study on women in sciences and high technology in the Baltic States reveals that despite some recent changes, support to traditional gender roles in family in Latvia appears dominant.[67]

In reality, the situation for female researchers is not as good as for male researchers. Short-term project based contracts are dominating. A limited number of permanent positions and the large probability of termination of contracts with the end of the project are disadvantages for family life and remuneration during maternity leave. Also preference is given to an early return from a maternity leave in order to retain and to maintain the former position and status in science (ibid).

Given the comparatively limited articulation of science-related gender issues in the public discourse, so far no specific policy measures have been undertaken on a national level to promote the role of women in science.

In conclusion it should be mentioned that gender balance is a complex problem, involving issues of historical heritage, deeply rooted across generations in Latvia. Among other issues was the obligatory 2-3 year military service in the USSR army for young men at the age of 19-23 years, often far away from their home. That slowed up many male tertiary education careers in Latvia during the Soviet period. It influenced the mentality and family life and strongly resulted in female dominance in a lot of professions based on higher education. This influence is still the case in Latvia at the family and societal level.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

In general the situation in Latvia with guaranteed access to knowledge by all is favourable due to one of the fastest internet lines in the EU. The research community benefits from intensive international networking and personal contacts allowing the solution of problems due to emergence of ERA and various actions in other Member states. In particular, free access granted to scientific research publications and data for specific sectors (e.g. academic sector), and for the results of publicly funded research is the result of implementation of FP6 and FP7 projects.

No specific actions for SMEs have been implemented in Latvia. The interaction between research institutions and the private sector is promoted via at least eight functioning technology transfer units. Stronger influence has FP7 initiated technology transfer projects including relevant efforts from National Contact Point system fostering interactions between research institutions and the private sector in order to raise project proposals with higher quality.

[67] Women in sciences and high technology in the Baltic States: problems and solutions, FP6 BASNET project results

ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	**Assessment**	**Latest developments**
1. Importance of the research and innovation policy	(-) Policy governance had been fragmented, with lack of coordination in policy design and in implementation. (-) Only few specific programmes are designed and devoted to major societal challenges.	Few signs from decision makers about progress in future. Insignificant increase of R&D budgets devoted to R&D on grand challenges
2. Design and implementation of research and innovation policies	(-) Absence of stable and qualified centre-of-government structure, defining broad policy orientations on a multi-annual basis and ensures sustained and properly coordinated implementation (-) No multi-annual strategy focused on a limited number of priorities, preceded by an international analysis of strengths and weaknesses at national and regional level and of emerging opportunities ('smart specialisation') and market developments (-)No relevant strategy in resonance with EU priorities, (-)Absence of professional and timely effective monitoring and review system is in place, which makes full use of output indicators, international benchmarking and ex-post evaluation tools.	Only badly drafted and late for the period 2013-2020 multi-annual STI framework is in place providing a long-term policy context to prioritise expenditure on STI. Shortage of resources for R&D&I evidently will continue. No evidences about move towards strong taskforce for strategy design.
3. Innovation policy	(-)Few targeted and qualitative actions to promote innovation concept (a lot of bureaucracy rooted instruments)	Few realistic actions
4. Intensity and predictability of the public investment in research and innovation	(-) Public investments in education, research and innovation never were prioritised and budgeted in the framework of multi-annual plans to ensure predictability and long term impact (-) Public funding being extremely low fail to motivator for private investments due to acute	There are no clear messages that public investments in education, research and innovation will become priority of state budget in next years.

	lack of human capital (-) Absence of public-private partnerships) and the use of tax incentives for years	No progress foreseen Absence of any serious debate to change situation in future
5. Excellence as a key criterion for research and education policy	(+) (-) The situation is controversial: 90% of the research funding is allocated on a competitive basis and imbalance with institutional funding devastating (+)(-)The institutes and projects are evaluated on the basis of internationally recognised criteria during the last 2-3 years. (+)(-)Funding is not portable across borders and institutes? (+)(-)Due to insufficient funding the autonomy to organise activities in the areas of education, research, and innovation is rather declarative. (+)(-)Absence of significant alternative sources of funding such as philanthropy. (+)(-)The legal, financial and social frameworks for research careers, including doctoral studies, offer sufficiently attractive conditions to both men and women in comparison to international standards, especially those in the US - yes, but in the conditions of lack of funding	There are some doubts, that logical balance between institutional and project-based funding of research will be introduced and internationally recognised excellence will become basic criteria.
6. Education and training systems	(-) Absence of policies and incentives are in place to ensure a sufficient supply of (post)graduates in science, technology, engineering and mathematics and an appropriate mix of skills among the population (including through strong vocational and education and training systems) in the medium-to-longer term. (+) Education and training curricula mainly focus on equipping people with the capacity to learn and to develop transversal competences such as critical thinking, problem solving, creativity, teamwork, and intercultural and communication skills. (-) No special attention is paid to address innovation skills gaps.	Up to now no comprehensive policies and incentives are drafted for future to ensure a sufficient supply of (post)graduates in science, technology, engineering and mathematics. However little training of an appropriate mix of skills for innovation and creativity is foreseen
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(-) Where possible, research efforts are accompanied by instruments to support the commercialisation of innovative ideas. Policies and instruments such as innovation/knowledge clusters, knowledge transfer platforms, and voucher systems, are in place to encourage co-operation and knowledge sharing and at creating a more favourable business environment for SMEs. (-) Move of researchers and innovators between public and private institutes is rather complicated.	A proposals for the set of complex measures are pending but strong political motivation is needed

	(-)Absence of clear rules on the ownership of intellectual property rights and no clear and attractive rules of creation of university spin-offs. (+) (-) There are no obstacles to setting up and operating transnational partnerships and collaborations, besides acute lack of funding	
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(-) Policies to promote innovation, entrepreneurship and enhance the quality of the business environment are weakly interconnected. (-)Absence of favourable conditions to foster a growing and robust venture capital market, especially for early stage investments. (-) (+)The rules for starting up and running a business are acceptable but not simple from an SME perspective. (-)Small local markets. (-) Absence of an efficient, affordable and effective system for the protection of intellectual property rights, which fosters innovation and preserves investment incentives.	Policies to promote innovation, entrepreneurship and enhance the quality of the business environment will continue to be insufficient
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(-) Several complicated, instruments to obtain access to EU Structural funds. (-) In spite of large number of funding support tailored to the needs of companies, particularly SMEs the outcomes are insignificant. (+) During the last years the national funding is allocated through international evaluation procedures Absence of clear rules, procedures and time-tables in order to facilitate participation in EU programmes and co-operation with other Member States. (-) Specific support is insufficiently available to young innovative companies to help them commercialise ideas rapidly and promote internationalisation	No comprehensive measures are foreseen to change current crises situation
10. The public sector itself is a driver of innovation	(-)The public sector is trying to do it's best to stimulate innovation within its organisations and in the delivery of public services (-)Public procurement of innovative solutions in order to improve public services is bureaucratic (-) Absence of the system and relevant data bases to use government-owned data freely as a resource for innovation	Public sector faces shortage of human capital and financial resources to recruit highly qualified workers

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

	IU commitment for MS	Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	Little changes or any relevant actions	
4	**ERA Framework**		
5	**Priority European Research Infrastructures**	Little changes or any relevant and financially significant actions	
7	**SME Involvement**	Little changes	(-)Limited partnerships
/11	**Venture Capital Funds**	Some progress	(+)Instruments Stimulating Venture Capital inflow Introduced via SF availability
13	**Review of the State Aid Framework**	Very good progress	(+)Promotion of cluster formation via SF financing instruments
14	**EU Patent**	Discussions Started	(+)Discussions Started
15	**Screening of Regulatory Framework**	Little progress	(-)Comprehensive and professional analysis is needed
17	**Public Procurement**	Some progress	(-)Changes in legislation in favour or research activities introduced, but implementation is still to formal
20	**Open Access**	Very good progress	(+)A set of needed measures introduced
21	**Knowledge Transfer**	Few changes	(+)SF financial instruments used in support of R&D co-operation projects (including KT) between public/academic/non-profit sector research institutions and enterprises (including specific schemes to encourage the business sector to fund research in research institutions). (+)SF financing instruments used to support schemes directed to enterprises or for services aimed at encouraging technology acquisition (licensing, joint ventures, testing, etc.) and knowledge transfer and other cooperation schemes between enterprises that aims to develop or introduce innovations.
22	**No new measures**		
23	**Safeguarding Intellectual Property**		

	Rights		
24	**Structural Funds and Smart Specialisation**	Late changes	Discussions with the society started only in the mid of 2013
25	**Post 2013 Structural Fund Programmes**	Late progress	Discussions with the society started only in the mid of 2013
26	**European Social Innovation pilot**	Good progress	Now progress or remarkable measures
27	**Public Sector Innovation**	Few changes	(+)Some new Prizes and awards introduced (+)More comprehensive publication of government-owned data to be made available and that can be used as a resource for information
29	**European Innovation Partnerships**	Little progress	
30	**Integrated Policies to Attract the Best Researchers**	Little progress	(-)Little progress (-)Few financial instruments directly target to repatriation and recruitment ensuring statistically significant influence
31	**Scientific Cooperation with Third Countries**	Good progress	(+)RTD International cooperation agreements with Belaruss, Ukraine, Taiwan.
32	**Global Research Infrastructures**	2 examples	Latvian researchers are members of various consortium contributing to the ITER and ESS (lagerst EU infrastructure projects)
33	**National Reform Programmes**	Some progress	Relevant wording about main R&I aspects is incorporated in NRP

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	**ERA Action**	**Recent changes**
1. More effective national research systems	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	Substantial, but slow in implementation progress in last 3 years
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	Not in place up to now
2. Optimal transnational co-operation and competition	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	Few actions and little progress expected
	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	Little progress foreseen in nearest future
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	Few attempts to make progress
	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	Little financial resources from national budget are planned
	Action 5: Remove legal and other barriers to cross-border access to RIs	Little progress
ERA priority 3: An open labour market for researchers	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	Little progress foreseen
	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national	Little progress foreseen

	grants	
	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	
	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	Little progress and any plans for future
	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	Little actions towards recognition of Charter & Code
ERA priority 4: Gender equality and gender mainstreaming in research	Action 1: Create a legal and policy environment and provide incentives	Little progress
	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	Little progress
	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	Little progress
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	Action 1: Define and coordinate their policies on access to and preservation of scientific information	Acceptable situation
	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	There are competence centres, clusters and knowledge transfer points
	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	Good progress
	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	Little progress

LIST OF ABBREVIATIONS

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
CSB	Central Statistical Bureau of Latvia
EC	European Commission
ERA	European Research Area
CEE	Central and Eastern Europe
CoM	Cabinet of Ministers of the Republic of Latvia
COST	European Cooperation in Science and Technology
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ESA	European Space Agency
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
FTE	Full-time equivalent
GBAORD	Government Budget Appropriations or Outlays on R&D
GCR	The Global Competitiveness Report
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
HEI	Higher education institutions
HES	Higher education sector
IPR	Intellectual Property rights
IUS	Innovation Union Scoreboard
LAS	Latvian Academy of Sciences
MoE	Ministry of Economics
MoF	Ministry of Finance
MoES	Ministry of Education and Science

NACE	Nomenclature Générale des Activités Économiques dans les Communautés € opéennes (French, EU classification system)
NUTS	Nomenclature of territorial units for statistics
PPS	Purchasing power standards
PRO	Public Research Organisations
R&D	Research and development
RI	Research Infrastructures
RCI	regional competitiveness indicators
RTDI	Research Technological Development and Innovation
SF	Structural Funds
SME	Small and Medium Sized Enterprise
S&T	Science and technology

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