ERAWATCH COUNTRY REPORTS 2012: Lithuania

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The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the 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 2012 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Gerard Carat from JRC-IPTS. The contributions and comments from Jovita Surdokiene, of Ministry of Economy of the Republic of Lithuania, Innovation and Knowledge society department are also gratefully acknowledged.

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

Lithuania with a population of approximately 3m is the seventh smallest country in the EU. The country experienced the second worst recession in the EU in 2009, when GDP dropped by almost 15%. The economy showed signs of recovery in 2010-2012; the estimated increase in the real GDP in 2012 is 3.6%. The main knowledge producers in the Lithuanian R&I system are universities along with a few government research institutes. The universities performed 54% of total R&D, or €153.3m in 2011. The R&D intensity measured as the GERD percentage of GDP increased by 0.12 percentage points to 0.92% of the total GDP in 2011. The business enterprise R&D expenditure (BERD) as a percentage of total GDP increased from 0.20% in 2009 to 0.24% in 2011 (an increase of 35% in absolute figures). The contrast in terms of the EU average is still sharp: Lithuania's BERD as a percentage of total GDP was only 19% of the EU27 average.

Strategic objectives and funding for the Lithuanian research and innovation (R&I) policies have gained weight over 2007-2012. The R&I policy mix has improved significantly in the context of the National Strategic Reference Framework (NSRF) 2007-2013, the Lithuanian Innovation Strategy 2014-2020 and the public research and education system reform that took place in 2009-2012. The authorities have set a national R&D target of 1.9% of the national GDP/R&D intensity in 2020, of which at least half should be contributed by business investments. The availability of high quality research infrastructure has been addressed in the policy actions focusing on the development of five science 'valleys'. The quality of human resources in research has been addressed by funding research mobility and research grants. R&D grants and tax incentives for R&D are available for business. Several actors, such as the Agency for Science, Innovation and Technology, the Lithuanian Research Council, the European Social Fund Agency, the Lithuanian Business Support Agency and the Central Project Management Agency, provide R&D funding. The process of preparation for the 2014-2020 period has started and many of the new and continued policy routes are framed by the National Progress Programme for 2014-2020.

Lithuania has not approved the Regional and/or National Research and Innovation Strategy (RIS3) or the specific priorities for smart specialisation by the time when this Report was prepared[1]. The process of defining the priorities has been launched in the second part of 2012. It is expected that priorities for smart specialisation will be defined and a 'joint projects' pipeline within the priority areas will be launched by the end of 2013.

The investments undertaken in enhancing R&D capabilities have not led so far to a significant change in how companies compete in international markets. According to the Innovation Union Scoreboard (IUS) 2011, Lithuania is assigned to the group of 'modest innovators', being the third least innovative in the group of 27 EU countries. Lithuania scores low in almost all R&I performance indicators, except for the R&D expenditure in the public sector and the numbers of tertiary graduates. Moreover, with the average annual 'rate of improvement' in the IUS indicators at 1.5% Lithuania is among the 'slow growers'. Given this, the gap is too wide for this growth pace to be sufficient to catch up within the short or medium term. The five *structural challenges* need to be addressed:

1. International research excellence and commercialisation of public research results have to be improved. The key obstacles are low quality and quantity of human resources in research, unattractiveness of research as a career, internationalisation of science and lack of entrepreneurial culture in the public research system. Most of Lithuania's universities only

[1] December 2012 – January 2013.

have very limited experiences with, capacities and motivation for patenting, licensing, start-up companies and other commercialisation efforts.

2. Lithuania suffers from the very low R&I intensity in business. The certain barriers to private R&D investments may explain this: a shortage of capital, especially for innovative start-ups and spin-offs, the risk-averse entrepreneurial tradition and a lack of markets for innovation. The Lithuanian innovation system relies mainly on supply side instruments and neglects possibilities to link innovation demand with technology producing capacities. Venture capital measures for innovation (especially seed and pre-seed capital) were mainly missing until 2012.
3. Collaboration between public science and the business sector needs to be improved. The limited purchase of R&D results from universities is an indication for this weakness. The science 'valleys' were expected to strengthen the links between universities, PROs and businesses, however most of funds are invested in buildings and laboratories, while the scale of support for professional innovation services, IPR rights and joint research projects is very low. An innovation culture and skills in universities and institutes need to be urgently developed.
4. The absorptive capacities of the indigenous enterprise sector are insufficient. The barriers relate to the limited inflow of highly skilled graduates for growth in high-tech sectors, the immigration policy reducing the inflow of foreign researchers, the high unemployment endangering skills renewal in the enterprise sector, and quality of formal education. It is necessary to further develop the skills and capacity of enterprises in order to adapt and exploit technologies developed in Lithuania or internationally.
5. R&I policy design, coordination and approach to the policy implementation require improvement. Lithuania needs to shift the national R&I system from the current system traditionally focused on basic science to the more inclusive of innovation. Despite the progress over 2010-2012, a coherent policy has not been achieved so far - the links between R&I programmes and even between actors in 'joint' projects have been rather formal. The current policy approach mainly follows the 'linear' perspective of innovation. Other issues concern the weak involvement of various stakeholders in the process of designing R&I policy, the limited employment of strategic intelligence systems and the overly bureaucratic approach to the implementation of the measures.

The pressure towards structural reforms and efficiency has amplified under the harsh financial and economic conditions the country is presently facing. Therefore, the rationale of R&I policies needs to be critically assessed, using the 'window of opportunity' opened by the need to develop policies for research and innovation for the 2014-2020 period. The current policy mix is focused on promoting R&D investments in the public sector. Direct support grants dominate types of support funding, but some new trends in the mode of RTDI funding are becoming apparent. Next to the introduction of the tax incentives for R&D in 2008, the *financial engineering instruments* (risk capital, loans, etc.) become more important. To achieve a more significant breakthrough *in business R&I investments*, these policy directions need to be addressed on short and medium term:

- Creating strong demand for new products and services through a better use of innovative public procurement and pre-commercial procurement; creating necessary regulations and standards for innovative markets; using financial and tax incentives if necessary.
- Creating good framework conditions (venture capital and professional services) for private R&I investment, especially focusing on young innovative companies and start-ups;
- Encouragement to SMEs cooperation for innovation and internationalisation (focus on the culture for going global);
- Attraction of new knowledge-based companies from abroad.

Better results in *commercialising public research* can be achieved if the priority R&I areas where Lithuania is strong and capable of competing internationally were identified in a consensus

building process, with a clear focus on collaboration and commercialisation potential; efforts by different institutions and R&I funds could then be focused on these areas to achieve economic outcomes. Moreover, a networking culture has to be supported at all levels – from (i) innovation clusters and knowledge transfer platforms to (ii) innovation culture and skills in universities, and (iii) society's social capital (education innovations tackling group work and trust issues).

Next to the increased attention to R&I markets, framework conditions and commercialisation of research, other supplementing actions are necessary:

- Policies affecting R&I processes and performance need to be orchestrated, and it would require both strengthened policy coordination and informed policy learning processes. R&I monitoring and analysis of innovation performance, ex ante and ex post policy evaluation capacity, foresight capacity need to be increased and assisted by consultations with the main stakeholders and actors in the innovation system. The fragmentation in the policy objectives needs to be reduced, e.g. by developing an effective Smart specialisation strategy (RIS3) based on existing documents.
- Policy implementation weaknesses need to be addressed, with a focus on simplification, reducing administrative load, abandoning the risk-averse and process-oriented approach, strengthening the implementation capacity in the agencies, and overall making programmes closer to the needs of companies and researchers.

The assessment of alignment between the national policy mix and the ERA priorities shows that the national policy is broadly aligned with the ERA priorities, but the objectives of trans-national collaboration and open market for researchers need urgent policy attention.

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1. INTRODUCTION

In 2012 Lithuania had a population of approximately 3m, and was thus the seventh smallest country in the EU. The country experienced the second worst recession in the EU in 2009, when its GDP dropped by almost 15%. The economy showed signs of recovery in the next three years: in 2010 the real GDP grew by 1.5%, in 2011 – by 5.9%, and in 2012 the forecasted increase is 2.9%. Due to high levels of emigration, the GDP per capita in PPS increased from 55% of EU27 average in 2009 to 66% in 2011. The intensity of R&D funding in Lithuania measured as the GERD percentage of GDP in 2011 increased by 0.12 percentage points from 0.80% in 2010 to 0.92% of the GDP in 2011. According to Eurostat's data, the total GERD in Lithuania increased by almost €60m over 2009 - 2011. The Business enterprise R&D expenditure (BERD) as a percentage of GDP increased from 0.20% in 2009 to 0.24% in 2011 (an increase of 35% in absolute figures). The contrast in terms of EU average is still sharp: Lithuania's BERD as a percentage of total GDP was only 19% of the EU27 average, which comprised 1.26% of the GDP.

Public higher education institutions (HEIs) perform the major part of R&D in Lithuania (54% of the total R&D, or €153.3m in 2011). Another major performer of R&D was Government institutions (about 20% of all R&D, or €55.34m in 2011). Private business carried out 26% of all the R&D in Lithuania in 2011, or €73.59m.

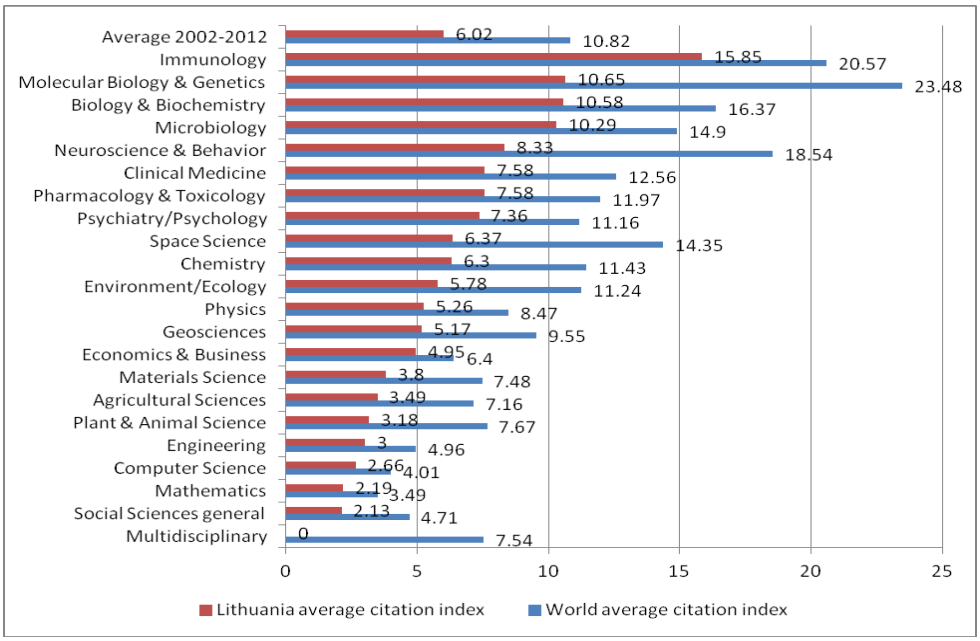
Lithuania suffers from relatively low research outputs compared to the existing inputs. The number of publications increased from 3504 in 2010 to 3698 in 2011 (or by 3%) and the proportion of publications among 10 % of the most cited publications in 2011 remained slightly below 5% (source: Scopus). In 2010 Lithuania applied for 6.49 patents per million habitants to the EPO, what was 18 times lower than the EU27 average (118.59 patent applications per million inhabitants). Similarly, the Lithuanian high technology patenting rates per million inhabitants were 16 times lower than the EU27 average. Thus, despite being extensive in its scale, the efficiency of the Lithuanian research sector is relatively low and requires major modifications.

The quantity and quality of human resources for R&D needs to be considered as well. While the number of researchers in Lithuania has been growing during the last decade, the number of total R&D personnel decreased by almost 10% to 11,173 in 2011 (compared to 12,316 in 2010). The number of new doctoral graduates also decreased by 13 % in 2011, i.e. from 406 in 2010 to 353 in 2011. In 2009 Lithuania had 0.8 new doctoral graduates per thousand population aged 25-34, whereas EU27 average was 1.8.

In terms of scientific specialisation of R&D, the dominant scientific fields in Lithuania in 2011 (with the most public expenditures in the higher education and government sectors) were technological sciences (roughly 23% of total public R&D funding in 2011), biomedical sciences (about 22%), and physical sciences (20%). In terms of international publications, the most productive are the biomedicine and medicine science fields (especially, deontology, healthcare, immunology and microbiology, biochemistry, genetics and molecular biology fields) as well as physics, astronomy and material sciences, followed by economics, econometrics and finance. 60% of all international co-publications published by Lithuanian authors during 1996-2010 were produced in the science fields listed above[2]. The most frequently cited scientific publications, an indicator of scientific impact, are concentrated in the following fields: medicine, physics, biochemistry, genetics and molecular biology, chemistry and engineering sciences (see Figure 1).

[2] Bumelis V. et. al. (2012): Review of Lithuanian R&D, higher education and innovation. Not published

Figure 1. Citation index of World and Lithuanian publications in Thomson Reuters, 2002-2012



Source: Thomson Reuters database, 2012

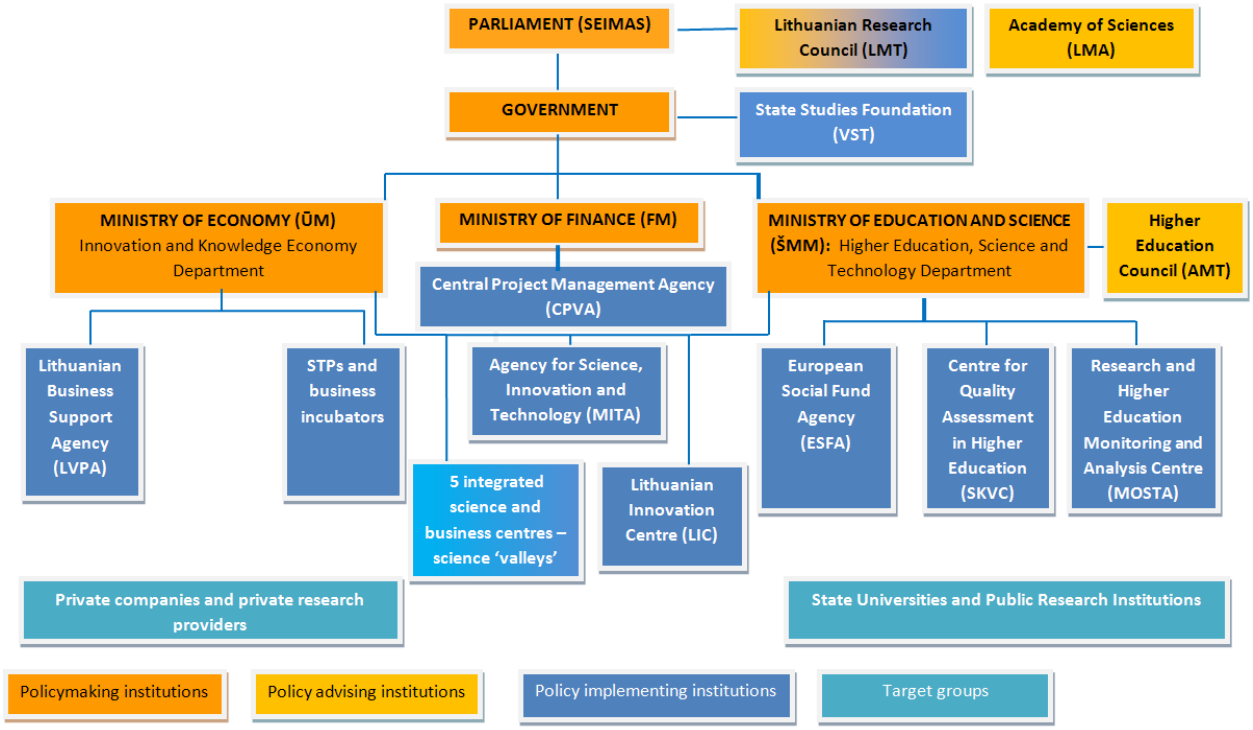
In terms of economic specialisation, Lithuania remains a country of predominantly traditional economic sectors (transport and logistics, food and beverages, textile, wood and furniture), that so far have not exhibited high investments in R&D. Medium and high-tech industry and knowledge intensive services are the principal R&D investment sectors. The biggest share of private R&D investments in Lithuania in 2011 were made by telecommunication services (25% of total business R&D investments), the atypical scientific development and R&D sector (10%), financial and insurance activities (7%), human health and social work activities (8%), and computer programming, consultancy and related activities (8%), and food and beverages (7%). Overall, ICT emerges as one of the most innovative sectors in Lithuania, accounting for 35% of total private R&D investments. In terms of R&D intensity (R&D expenditure divided by output), the most innovative sectors (if the atypical scientific research and development sector is excluded) were electricity, gas, steam and air conditioning supply; manufacturing of basic pharmaceutical products and pharmaceutical preparations.

The two *principal governing bodies,* shaping research and innovation policy in Lithuania, are the Ministry of Economy (ŪM), which is responsible for innovation policy, and the Ministry of Education and Science (ŠMM), responsible for higher education and science policy. For a small country as Lithuania the institutional system for the implementation of research and innovation policy is rather fragmented. The five main agencies (MITA, LVPA, ESFA, LMT, CPVA; see Figure 2 below) are responsible for funding of research and innovation, and several other institutions are responsible for regulating the field and/or providing specific services.

Since 2010 the Agency for Science, Innovation and Technology (MITA) is the main institution responsible for the implementation of innovation policy in Lithuania. Currently, MITA administers a number of measures and programmes aimed at innovation and especially R&D collaboration. The Lithuanian Business Support Agency (LVPA) administers the rest of business support programmes, including innovation and R&D in the business sector. The Lithuanian Research Council (LMT) is the central funding agency for fundamental research and researchers' mobility, complementing institutional funding for basic research with project-type funding. The Lithuanian Centre for Quality Assessment in Higher Education (SKVC) deals with quality assurance and higher education standards. The European Social Fund Agency (ESFA) administers EU SF aid and implements measures assigned to ŠMM in the development of human resources for science, technology and industry. Moreover, the administration of high

scale investments into the development of research infrastructures is the responsibility of the Central Project Management Agency (CPVA) under the Ministry of Finance.

Figure 2: Overview of Lithuania's research and innovation system governance structure



Source: Paliokaite and Caturianas, 2011

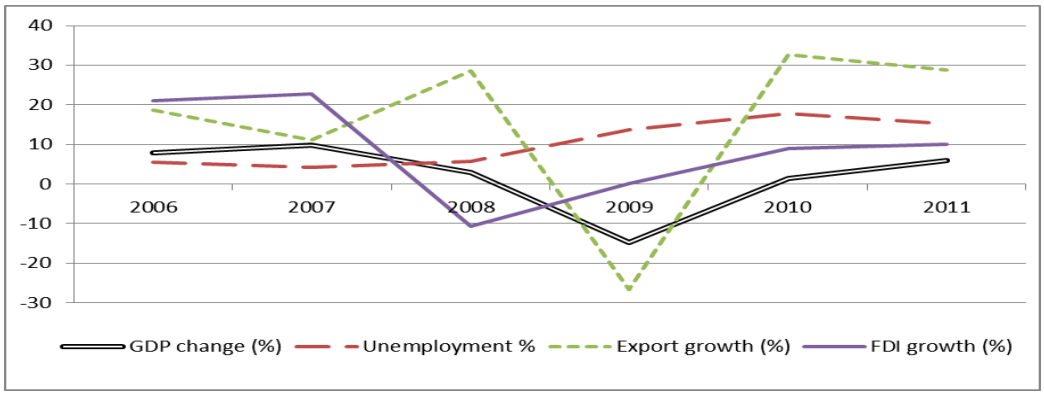
Lithuanian *regions and municipalities* do not play any role in research governance.

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

2.1. National economic and political context

Lithuania was heavily hit by the recession in 2009, when its GDP declined by nearly 15%, but has shown signs of a steady recovery. In 2011 the GDP grew by 5.9% and the forecast for 2012 is 3.5%. The economic recovery is largely fuelled by steady exports, which grew by 32% and 29% in 2010 and 2011 respectively (see Figure 3). The economic recovery, however, is not sufficiently large to spur job creation and the level of unemployment remains over 15%.

Figure 3. Key economic indicators.



Source: Statistics Lithuania, 2012.

The parliament elections in October 2012 led to the change in Lithuania's government. On the economic front, the previous center – right Government focused on fiscal consolidation and attracting FDI to knowledge intensive services sectors. It also carried out wide ranging reforms in higher education, which led to the introduction of voucher based funding and changes in the composition of Universities' Councils. Reforms in public R&D sector led to the merger of research institutes and the launch of competitive research funding. The new centre-left Government was formed in December 2012. The announced economic policy aims to foster job-creation and simulate further economic recovery. The new Government launched discussions on reversing higher education reforms that were initiated by the previous Government. Lithuania will hold the Presidency of the Council of the European Union in the second half of 2013. Lithuania will be the first of the three Baltic States to hold the Presidency since joining the European Union in the spring of 2004.

2.2. Funding trends

The National Reform Programme of Lithuania (adopted in 2012) has set the national R&D target of 1.9% of GDP by 2020. At least half (i.e. 0.9%) should be contributed by private (business) investment in R&D. The Lithuanian Progress Strategy 2030 foresees that Lithuania should be 15th in the EU27 according to BERD/GDP figures by 2020, and 10th – by 2030 (Lithuania was 23rd in 2011, according to provisional Eurostat data; the BERD/GDP was lower only in four EU27 countries: Poland, Romania, Latvia and Cyprus).

R&I funding indicators demonstrated positive trends during the last three years. The intensity of R&D funding in Lithuania measured as the GERD percentage of GDP in 2011 increased by 0.12 percentage points from 0.80% in 2010 to 0.92% of total GDP in 2011. According to

Eurostat data, total GERD in Lithuania increased by almost €60m over 2009 - 2011. The Business enterprise R&D expenditure (BERD) as a percentage of total GDP increased from 0.20% in 2009 to 0.24% in 2011 (an increase of 35% in absolute figures). The total intramural Government R&D expenditure (GOVERD) fell from 0.2% in 2009 to 0.18% of the total GDP in 2011 (however, it increased by almost 44% in absolute terms in 2011 compared to 2010). If the GDP, GERD and BERD growth rates remain at the level of 2010-2011 (e.g. the private R&D investments grew by 16%), Lithuania would be able to bridge the gap and meet the 2020 R&D targets.

In 2011, GOVERD as a percentage of GDP in Lithuania (0.18% or €55.34m in total) was below the EU27 average (0.26%). The contrast in terms of BERD was much sharper: Lithuania's BERD as a percentage of total GDP was only 19% of the EU27 average (1.26% of the total GDP). Moreover, in terms of GOVERD per capita, Lithuania with €17.1 was sharply below the EU27 average (the Eurostat's estimate is €64.7 per inhabitant in 2011). The respective figure for BERD was even more pronounced: €22.7 per inhabitant in Lithuania compared to €318.3 per inhabitant on average in the EU27. In terms of GERD per capita, Lithuania (with €87 per inhabitant) is only above Latvia (€63.1), Poland (€74.2) and Slovakia (€86.2), and differs significantly from the EU27 average (€510.5).

Table 1: Main R&D indicators

	2009	**2010**	**2011**	**2012**	**2020 national target**	**EU average 2011**
GDP growth rate	-14.8	1.5	5.9	3.6	-	1.5
Real GDP per capita growth rate	-14	3.6	8.1 (b)	-	-	1.4
GERD as % of GDP	0.84	0.8	0.92 (p)	-	1.9*	2.03 (s)
GBAORD (€ million)	69.86	46.98	49.61	-	-	92,308 (s)
GBAORD as % of GDP	0.26	0.17	0.16	-	-	0.73 (s)
BERD (€ million)	54.507	64.556	73.592	-		159,976 (s)
BERD as % of GDP	0.2	0.23	0.24 (p)	-	0.9*	1.26 (s)
GERD financed by abroad as % of total GERD	13	19.9	28.5 (p)	-	-	8.9 (s)
HERD as % of GERD (R&D performed by HEIs as % of GERD)	52.20	53.06	54.31 (p)	-	-	23.99 (s)
GOVERD as % of GERD (R&D performed by PROs as % of GERD)	23.41	17.54	19.61 (p)	-	-	12.68 (s)
BERD as % of GERD (R&D performed by Business sector as % of GERD)	24.39	29.40	26.08 (p)	-	-	62.35 (s)

(p) – provisional; (s) –Eurostat estimate; (f) – forecast.

* - as per National Reform Programme, 2012

Source: Eurostat, December 2012

Overall, the economic crisis has not had a major impact on public R&I funding in Lithuania. Because RTDI measures are mainly funded by the EU structural funds based on multiannual planning, the research and innovation budgets were 'secured' in 2010–2012. Moreover, the implementation of most RTDI measures introduced during 2009-2011 gained acceleration,

influencing the real expenditures in policy priorities. The real expenditures on innovation policy priorities *have increased by more than €50m* in 2011 compared to 2010[3].

Due to the Economic Recovery Plan launched in late 2008 by the Government, about €143m were re-allocated from the science 'valleys' measures and other R&D measures to the venture capital funds in order to restore market stability and provide greater access to the capital for business. In addition, the capacity of the State to launch the large scale State funded measures remains limited due to the public budget restrictions.

After the heavy public research and education funding and the governance reforms carried out in 2008-2011 (see Erawatch country reports for 2010 and 2011), the competitive funding of research was about 50% of the total funding; the rest of the funding is results-based. Most of the funding for R&D still comes from the Government and is targeted at public HEIs. However, the amount of funding from private business and international bodies grows slowly.

The current RTDI policy mix in Lithuania is mainly funded by the European Regional Development Fund (ERDF)/ European Social Fund (ESF) – this funding stream constitutes up to 80-90% of the total R&D funding (about €200m per year). Only few programmes are funded solely from the national budget, e.g. the national research programmes (total annual budget is €1.9m). One of the most important novelties was the introduction of the corporate profit tax incentives for R&D and the corporate profit tax incentives for investments into new technologies in 2008-2009. The introduction of the tax incentives has put more emphasis on the innovation friendly environment. The available data suggests that tax incentives had become an alternative to the grants schemes, although the interest in tax incentives for R&D has slightly decreased over 2010-2011 (in 2009, 212 companies applied the tax incentive, in 2010 – 186, in 2011 – 160 companies, according to the State Tax Inspectorate).

Trans-national/trans-regional funding is applied to a relatively limited extent. For example the Eurostars programme and five bilateral/multilateral research programmes are implemented (the annual budget of bilateral/multilateral programmes was €0.56m in 2010).

Direct support grants dominate these types of support funding. Public-private partnerships are relatively unimportant in leveraging additional funding. On the contrary, considerable legal obstacles to private-public partnership in research still prevail in Lithuania. Although the grants remain the predominant form of support to research and innovation, a shift in the mode of RTDI funding is becoming apparent. Next to the introduction of the tax incentives, two important trends can be noticed: (a) a shift towards the *financial engineering instruments (*risk capital, loans, etc.), and (b) increasing significance of the *demand-side policy measures* (namely, innovative and pre-commercial public procurement).

Firstly, the Ministry of Economy is determined to move towards greater emphasis on risk capital and seed capital funding to innovative SMEs and especially start-ups and 'gazelles' compared to grants and subsidies. It is projected that the financial engineering instruments (seed, pre-seed, risk capital funds, loans, and guarantees) will become the dominant funding instruments in the forthcoming period of 2014-2020. A lack of seed/pre-seed capital funds available to innovative entrepreneurs and SMEs was often emphasized as one of the main market failures in the Lithuanian market. Several seed/risk capital funding schemes were launched in 2012 to bridge this gap, e.g. new seed and pre-seed capital schemes under a framework of the ERDF-funded 'Creative Innovation Development' measure launched by ŪM and INVEGA, or the 'Practica Seed Capital Fund' and the 'Practica Venture Capital Fund' implemented by the European Investment Fund under the local JEREMIE initiative.

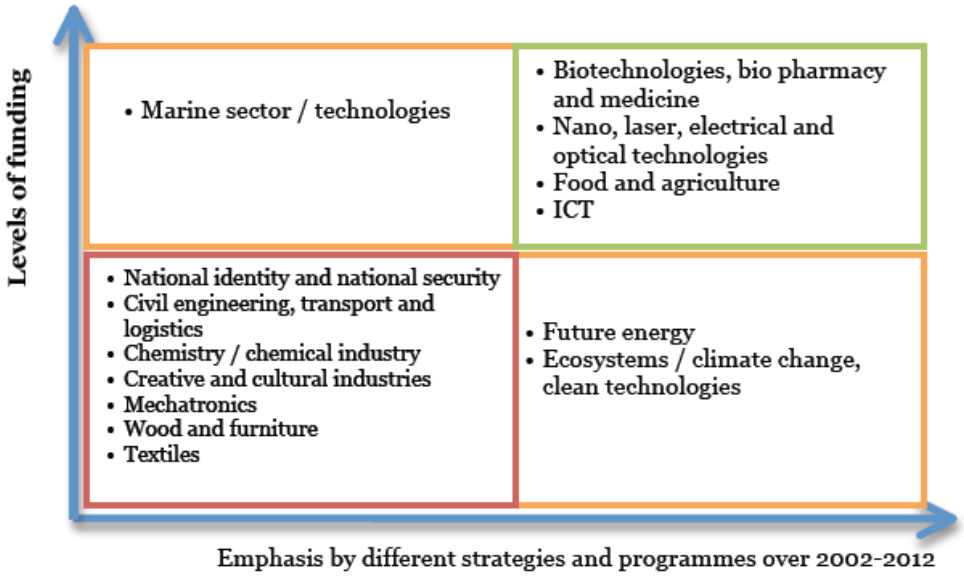
Secondly, the policy debate shifts towards the demand-side oriented measures. Although no new measures were launched yet, the Ministry of Economy is leading the debate on how to increase

3 Source: InnoPolicy Trendchart country report 2011 produced by Agnė Paliokaitė in September 2012

the implementation of the innovative public procurement and the pre-commercial procurement instruments. The Public Procurement Office together with the Ministry of Economy intends to publish the recommendations aimed at other institutions on application of the innovative public procurement. The Ministry of Economy also intends to implement pilot actions of the innovative public procurement, and, with the help of MITA, to conduct a survey of other ministries on the demand for the innovative public procurement as well as for the pre-commercial procurement. The National Progress Programme for Lithuania for the period 2014-2020 (approved on 28 November 2012) contains a set of demand-side innovation policy measures, e.g. innovative and pre-commercial procurement, regulation, financial and tax incentives for innovation consumers.

Lithuania does not have a single document outlining current R&D priorities. Rather, different strategic documents emphasise different priority areas for investments into research, education and innovation. The scope of incrementally developed list of priority fields is rather broad for a small country - about 20 R&D and innovation fields have been identified in the strategies and programmes adopted over the 2002 to 2012 period[4] (for a more detailed overview see Paliokaite and Caturianas, 2011, p. 14-16). Clearly defined thematic R&D funding comprises about 10% of the total funding. This ratio could be 50/50 if the EU SF support granted for the development of research infrastructures in thematic fields (science 'valleys') and the 12 national complex programmes is considered. Figure 4 highlights the fields that received or will receive the largest share of funding for R&D from 2008-2015 and summarises trends in setting the thematic priorities for investments into R&D and innovation.

Figure 4. Lithuania's investments into current R&D priorities



Source: Reid. A. et. al., 2012

The four R&D fields that receive the highest amount of funding have been repeatedly prioritised by strategic documents between 2002 and 2012 (in order of priority): Biotechnologies, bio

[4] Sources:
1. National research priorities set in Lithuanian legislation by the Government of Lithuania from 2002 to 2010;
2. The Lithuanian Innovation Strategy 2010-2020;
3. The Concept and five programmes of the integrated science, studies and business centres - 'valleys';
4. Twelve national integrated research programmes (NIRPs);
5. Six national research programmes (NRPs);
6. Thematic industrial programmes: the Industrial Biotechnology Development Programme for Lithuania and the High Technology Development Programme;
7. Measures for the promotion of cluster development (Inocluster LT and Inocluster LT+).

pharmacy and medicine; Nano, laser, electrical and optical technologies; Food and agriculture; ICT.

2.3. New policy measures

Despite the limited freedom of manoeuvre and the fiscal constraints of the State budget, the ministries of Economy and Education and Science have launched a number of new measures during 2010-2012. These measures are tackling the existing gaps in the innovation system:

(a) Lack of collaboration between industry and academia and limited commercialisation of research results:

- The pilot innovation vouchers scheme[5] was launched in 2010 and after the confirmed success in 2011 was upgraded to the Ino-vouchers LT scheme in 2012 (the pilot measure started with the annual budget of €0.29m; now the measure is co-funded by the EU structural funds, the annual budget of €1.5m was approved till 2015).
- In 2011-2012 MITA started the implementation of the joint scheme introduced by the Ministry of Economy and Ministry of Education and Science and aimed at promoting R&D collaboration between business and universities and research institutes. The scheme supports joint research and business projects under the framework of the Joint Research Programmes and the National Integrated Programmes. The Ministry of Economy and the Lithuanian Business Support Agency finance the business part of the project (measure Intellect LT); the Ministry of Education and Science and MITA finance the part of the project where universities and research institutes are involved (they can get support up to €0.9m from the measure 'R&D implementation in the National Integrated Programmes').

(b) Lack of pre-seed, seed and venture capital as well as business acceleration services for new innovative companies (including spin-offs):

- A new initiative of the commercialization of R&D results was launched under the High Technology Development Programme by the Agency for Science, Innovation and Technology (MITA) in 2012. The main goal of the initiative is to encourage scientists, researchers and students to establish start-up or spin-off companies in Lithuania. After applying the two-steps selection process, 13 new enterprises were established and received public funding (up to €20,273) from MITA in mid-2012.
- The Ministry of Economy and INVEGA are currently launching a new start-up/pre-seed capital fund aimed at innovative micro, small and medium companies operating in the high technologies manufacturing sector. The new ERDF-funded measure, called 'Creative Innovation Development' and containing two seed/pre-seed capital funds ('Start-up' and 'Seed'), will be launched by 2013. Companies will be supported with funds and mentors' help in developing commercially viable innovative ideas.
- The Practica Seed Capital Fund (€6m), co-funded by the European Investment Fund, was launched in summer 2012 under the local JEREMIE initiative. This fund will support prospective business ideas at the pre-seed and seed stages. A business accelerator 'Startup.lt' will provide vital services such as business advice, office space, networks and other services including bookkeeping, legal and intellectual property advice. In parallel, the Practica Venture Capital Fund (€15.7m) will provide follow-on investments for the

5 A more detailed description can be found at: Paliokaitė A., Caturianas D. (2012): ERAWATCH Country Report Lithuania 2011, p. 13

ideas developed under the Seed Fund, but will also invest into existing high-growth companies.

Several previous studies (see for example Paliokaite and Caturianas, 2011, p. 22) claimed that the R&I policy mix neglects young innovative firms and lacks support for collaborative research. It is expected that the newly launched measures will actively support the establishment and the growth process of new companies throughout their early life cycle, thereby filling the policy gap.

2.4. Recent policy documents

The four key longterm and midterm policy documents were introduced or revised in 2012:

- The Seimas of the Republic of Lithuania (the Parliament) approved the **National Progress Strategy 'Lithuania 2030'** in May 2012. The National Progress Strategy 'Lithuania 2030' indicates the long-term vision for Lithuania and lists priorities for change in three key areas named Smart Economy, Smart Society and Smart Governance. The document also names main indicators for 2020 and 2030.
- Based on 'Lithuania 2030', on 28 November 2012 the Government approved the **National Progress Programme for Lithuania for the period 2014-2020** (NPP). This Programme will provide a basis for the European Structural Funds support for the next programming period. The investment priorities concerning research and innovation policy are discussed in the priority fields of 'Smart Economy' and 'Smart Society'. It is projected that at least 11.44% of all NPP (national and EU SF) funds will be invested into development of the networked economy, oriented towards the creation of higher value added. The policy focus is on innovation networks and research collaboration, joining global networks and entering global value chains as well as fostering innovation in business and demand for innovation. Another 14.23% of funds will be invested in education, culture and basic research (e.g. mobility, research infrastructures, competitive research funding, etc.).
- On 5 December 2012 the Lithuanian Government approved the **State Studies and R&D Programme for 2013-2020** that set the long-term R&D policy targets, e.g. the R&D intensity should reach 1.9% of GDP by 2020 (0.92% in 2011), annual international patent applications should reach 150 (39 in 2011), and at least two Lithuanian universities should be among 500 World's best academic institutions by 2020.
- The Lithuanian Government also approved the updated **Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys)** on 24 October 2012. The new Concept provides the basis for continuation of investments into five science 'valleys', but also defines steps on setting the priorities for investments into research and innovation in the context of smart specialisation. The Concept provides that the Government based on the analysis performed by an international expert group will approve priorities. In addition, it is intended to launch a specific programme for funding the 'joint projects' (i.e. projects implemented by networks or consortiums of various academic, business and other organisations) in the defined priority areas. MITA receives a mandate to coordinate the implementation of 'joint projects' and develop a projects pipeline. Moreover, the Concept provides the basis for the establishment of a new coordinating body – the Strategic Council for Research, Development and Innovation under the Prime Minister's Office. Overall, the new Concept sets the policy mix for fostering research collaboration and bridges between academia and industry for the forthcoming period.

Overall, it is expected that the above-mentioned policy developments will contribute to further modernisation of Lithuania's R&D policy. Nevertheless, some stakeholders feel that the newly adapted documents are somewhat fragmented as the drive of the Government to adopt all the documents before December 2012 impeded more intensive coordination and wider discussions.

The policy stability and its implementation pose the major risks for the future, as the new Government could be reluctant to implement the priorities set by its predecessor.

2.5. Research and innovation system changes

The reform of the R&I policy implementation and coordination system is ongoing since 2010. The main change in the structure was related to the establishment of **MITA** in early 2010. The administration of several applied R&D and innovation funding programmes, especially the ones related to research collaboration and knowledge transfer, as well as some innovation policy functions (e.g. the coordination and implementation of the clusters development, the R&D collaboration and research commercialisation policy) were gradually transferred to MITA over 2010-2012. The Board of MITA is comprised of both ministries responsible for innovation and research.

The Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) approved in late 2012 provided basis for the establishment of the new R&I policy coordinating body – the **Strategic Council for Research, Development and Innovation**. This Council (not yet approved at the time of drafting the report) will consist of representatives of the main stakeholders (governmental ministries and agencies), research institutions, associated business structures and independent experts. The predecessor of this Council – the Valleys Monitoring Council – will be subsequently dismantled. The Strategic Council for Research, Development and Innovation has a mandate to discuss and approve main decisions and to provide recommendations for the R&I policy development at the national level.

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

Lithuania has not approved the Regional and/or National Research and Innovation Strategy (RIS3) or the specific priorities for smart specialisation by the time when this Report was prepared[6]. Nevertheless, the Ministry of Education and Science has launched the process of defining the priorities in August 2012 and it is still ongoing. It is expected that the priority areas for smart specialisation will be defined by April 2013, and then the specific priorities will be defined and a 'joint projects' pipeline within these areas will be launched by the end of 2013.

The Research and Higher Education Monitoring and Analysis Centre (MOSTA) under the Ministry of Education and Science has a mandate for coordinating the process of defining the priorities for smart specialisation. An international expert group was formed in September 2012 to provide conclusions on the current research and innovation potential in Lithuania and recommendations on the priorities for smart specialisation. After the initial analysis the experts group suggested that the process of defining the priorities needs to be based on a national foresight type exercise involving strong consensus building elements as well as deep analysis of current R&I strengths, key emerging trends and drivers and critical technologies and processes in the main priority areas. At the time when this Report was prepared, the process of defining the national priorities for R&D and innovation was being launched.

No final decisions on RIS3 were made by January 2013. It can be expected that Lithuania will have a national (not regional) level strategy on smart specialisation. The set of strategic R&I policy documents is already very fragmented - at least several medium term documents are functional, e.g. the National Progress Programme for Lithuania for the period 2014-2020, the Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys), the Lithuanian Innovation Strategy for 2010-2020, the State Studies and R&D Programme for 2013-2020. Yet another policy document is hardly justified. Therefore RIS3 will

[6] December 2012 – January 2013.

probably be approved on the basis of already existing documents. The ministries of Economy and Education and Science formed a work group on the issues related to smart specialisation, and the International Independent Experts Group has been set up to define the 'smart priorities'.

2.7. Evaluations, consultations

A number of policy evaluations were conducted and policy reports published during 2011-2012. In 2011 the National Audit Office published a 'State audit report on the support for science/business interaction'. The same year the Ministry of Economy contracted an 'Evaluation of the Effectiveness Business-Science Collaboration and Financing Mix' and the Ministry of Foreign Affairs published the 'Evaluation of the effectiveness of Lithuania's participation in European Research Area: a study on the potential private sector investments into R&D and relevant support measures'. The results of these evaluations are summarised in Paliokaite and Caturianas, 2011, p. 16-17. In 2012 the Prime Minister's Office and Ministry of Education and Science contracted an 'Assessment of opportunities for Lithuania to participate in the international research infrastructures'. The recommendations of the evaluation suggested the ESFRI infrastructures that need to be prioritised when considering Lithuania's participation.

A number of thematic analysis reports related to the monitoring and evaluation of research and higher education sector in general and the Valleys as well as the Joint Research Programmes in particular were contracted by MOSTA[7]. MOSTA is an analytical and advisory body to the Ministry of Education and Science, which performs and contracts out various studies on research and higher education. In 2011, MOSTA completed the Research and Higher Education Foresight exercise for developing a longterm vision for the research and higher education sector in Lithuania. The main product of this exercise is the Research and Higher Education Vision 2030: 'Science and education in Lithuania in 2030 are at the core of the learning society. Research and education is supposed to facilitate development of integral, enterprising and creative individuals with a broad cultural orientation, attitudes of partnership and a healthy lifestyle. The universally accessible higher education combined with the integral and purposefully formed research system represent the major driving force of the society's cultural, social and technological progress, and the basis for the attractiveness of the country and the welfare of its citizens'[8].

Since August 2012, MOSTA coordinates an analysis aimed at establish a list of national research priorities. This exercise is carried out in the context of 'smart specialisation' priorities and the need to update the existing R&I policy documents. As of March 2013, an International Independent Experts Group was formed and started a national foresight type exercise involving strong consensus building elements as well as deep analysis of current R&I strengths, key emerging trends and drivers and critical technologies and processes in the main priority areas. The analysis of existing strengths and weaknesses has already provided some initial results. After additional analysis including the analysis of social and economic challenges, trends and drivers, it is expected to discuss and establish the list of priority areas for smart specialisation by April 2013. Lastly a series of foresight studies involving panel discussions and consensus building and aimed at analysing and discussing the future prospects and development scenarios in each of the priority area will follow (to our knowledge, results are expected by the end of 2013).

[7] Reports available at (only in Lithuanian): http://www.mosta.lt/analize/tyrimai-ir-ataskaitos.
[8] More information on the Research and Higher Education Foresight can be found at: http://www.moksliojilietuva.lt/en/.

3. STRUCTURAL CHALLENGES FACED BY THE NATIONAL SYSTEM

According to the assessment of the Innovation Union Scoreboard (IUS) 2011, the Lithuania's aggregate innovation index stands at 0.255 (0.227 in 2010), considerably below the EU-27 average (0.539 in 2011). Lithuania is assigned to the group of modest innovators, being the third least innovative in the group of 27 EU countries, right after Bulgaria and Latvia. Lithuania scores low in almost all R&I performance indicators. except for the R&D expenditure in the public sector (which is dependent upon the EU structural support) and the numbers of tertiary graduates (see Table 2 for the main IUS indicators for Lithuania and EU27). Moreover, with the annual rate of improvement at 1.5% Lithuania is among the 'slow growers' (as compared to 4.4% of the average growth rate in the modest innovators group). Hence, it is unlikely at this pace Lithuania will bridge the innovation gap in the short or medium term.

Table 2: Main Innovation Union indicators

	Current performance, Lithuania	**Current performance, EU-27**	**Growth performance, Lithuania**
HUMAN RESOURCES			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.8 (2011)*	1.5 (2010)	-11.1%
Percentage population aged 25-64 having completed tertiary education	45.4 (2011)	33.6 (2010)	3.7%
Open, excellent and attractive research systems			
International scientific co-publications per million population	214 (2010)	301	5.5%
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	5.82 (2007)	10.73	16.7%
Finance and support			
R&D expenditure in the public sector as % of GDP	0.68 (2011)	0.75	21.4%
FIRM ACTIVITIES			
R&D expenditure in the business sector as % of GDP	0.24 (2011, provisional)	1.26	4.4%
Linkages & entrepreneurship			
Public-private co-publications per million population	3.0 (2008)	36.2	9.4%
Intellectual assets			
PCT patents applications per billion GDP (in PPS€)	0.54 (2008)	3.78	9.1%
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.02 (2008)	0.64	-11.3%
OUTPUTS			
Economic effects			
Medium and high-tech product exports as % total product exports	31.82 (2010)	48.23	-1.0%
Knowledge-intensive services exports as % total service exports	17.25 (2009)	48.13	2.3%
License and patent revenues from abroad as % of GDP	0.00 (2010)	0.51	-12.5%

* - same source and year is applied for corresponding EU27 current performance and growth performance indicators, unless indicated otherwise

Sources: Innovation Union Scoreboard 2011, Annex A; Eurostat, December 2012

Lithuania suffers from a set of interrelated structural challenges that hinder the transformation of increasing levels of investment in R&D into higher competitiveness. These challenges are discussed below.

International excellence and capacity to commercialise public research

The ability of the Lithuanian research system to produce high-level research is low due to the weak, fragmented and uncompetitive public science base. Lithuania lags behind even the catching up group of the EU countries in terms of the capacity to produce knowledge. The number of publications increased by 3% in 2011. However the proportion of publications among 10% of the most cited publications is twice below the EU27 average. Moreover, the Lithuanian science base is still relatively closed with the lowest rates of overall co-publications per million of population (10 times below the EU27 average). Lithuanian universities in general do not fare well in international comparisons. None of Lithuanian universities is listed in the top-500 of the Shanghai ranking. The only Lithuanian university currently ranked 501-550 among the World top universities by 2012/13 QS World University Rankings is Vilnius University. This indicates that universities fall short in international excellence and the fragmented science base does not allow achieving critical mass.

Existing policy documents list the out-dated research infrastructures, the low quality and quantity of human resources and the unattractiveness of research as a career (due to low salaries, poor access to world-class equipment) as the principal obstacles to research quality. The public research sector recently faced organisational mergers (two universities merged and research institutes were integrated into universities). However, the progress in the changes of organisational strategies towards excellence, collaboration and internationalisation has been slow. A problem in the management of research groups is still prevailing, as the groups tend to be very small, locked into existing research trajectories and lacking inter-disciplinarity because of weak bottom-up incentives, lack of internationalisation strategies and disproportional administrative load when managing research. The degree of internationalisation of science is one of the least addressed key weaknesses. Lithuania lags behind most of the EU Members in terms of the percentage of foreign researchers and students involved in the research system. For example, Lithuania faces 'brain drain' as more researchers and doctorate students leave than arrive. The bilateral and multilateral research funding constitutes a relatively small share of research. This suggests that the country is not benefiting from the international scientific knowledge flows and in general fails to attract foreign talent.

The weak capacity to commercialise and exploit public research for economic benefits becomes more evident after heavier investments in research production. In 2010 Lithuania applied for 6.49 patents per million habitants to the EPO, 18 times lower than the EU27 average. The entrepreneurial culture is not developed in Lithuanian universities and thus requires a change of the mindset at the universities via incentive systems, e.g. modifications to the research funding and researchers career criteria, university IPR policies, development of the knowledge transfer offices, and entrepreneurial training.

R&D and innovation intensity in business

The share of business enterprise expenditure on R&D as a percentage of GDP, as well as the innovative activities of enterprises, have increased over 2002-2012 and even during the economic slowdown. However, its level remains five times below the EU27 average. The knowledge and technology intensive sectors remain small and the extent of their development does not provide any grounds for speaking about convergence. One explanation of the lower share of BERD is a shortage of capital. Utilisation of venture capital to support innovative businesses, start up and spin-off firms trying to commercialize research outcomes remains one of the lowest among the European countries. The venture capital (especially seed and pre-seed capital) measures in this field were mainly missing until 2012. Another explanation is in the risk-averse entrepreneurial tradition and a lack of markets for innovation. The Lithuanian innovation system relies mainly

on supply side instruments and neglects possibilities to link innovation demand with technology producing capacities. It is especially important for (i) supporting those research fields and industry sectors that are new, on the rise and outside the scope of policies, as well as (ii) using the existing research potential for tackling main social-economic challenges (e.g. in the field of energy transmission, generation and efficiency, which are the key national long-term challenges).

Despite several instruments addressing innovative enterprises, more effective support for entrepreneurial culture and especially the culture for going global is lacking. The majority of the new policy documents (e.g. the National Progress Programme for 2014-2020) intend to address these issues more extensively in 2014-2020.

Public-private research collaboration

Given the historical separation of science and industry and the prevailing differences in culture, a lack of productive collaboration between those two sectors is nowadays one of the most challenging Lithuanian R&I policy issues. In spite of the current effort to strengthen science-industry links, deficiencies are present on both sides – poor commercialisation endeavour and a lack of commercially-valuable results in academy, on the one hand, and low ability to look outside the short term company's horizon, identify and exploit external knowledge, on the other hand. Information asymmetry, a lack of motivation from both sides and sometimes too rigid setting of support measures only reinforce the weaknesses mentioned above, as noted by Paliokaite et. al. (2011). An innovation culture and skills in universities and public research institutes need to be developed in a short time. They have to become better at marketing their research to the business sector. Additionally, the public support needs to be targeted to the (co-) financing of development phases that follow the R&D phases in firms, e.g. prototypes, feasibility tests, market research and coaching activities (Paliokaite et. al, 2011; Paliokaite and Caturianas, 2011). The strengthening of innovation markets and of overall innovation culture is linked to these issues.

Additionally, Lithuania, unlike other EU Member States, lacks a network of specialised application-oriented research institutes (like Fraunhofer Institute in Germany) whose mission is to provide technological services to SMEs for industrial research and product development. R&D services are provided by universities and their research institutes which are mainly dedicated to the roles of teaching and basic research. This gap was approached by constructing several 'open access' research centres at the universities, but the long-term vision of these centres and availability of access to industry remains unclear. Technology transfer offices in the universities are missing or not functioning.

Absorptive capacity of indigenous SMEs

Low absorptive capacities in Lithuanian SMEs are seen as one of the factors hampering innovation. Here the gap is dual. Firstly, the challenge relates to the quality and renewal of labour market skills. The shortage of highly skilled labour is critical, especially for the growth in high and medium technology sectors. The growth and share of PhD graduates, especially in the technological research fields, in comparison to those of social sciences and humanities, and the overall quality of studies goes hand in hand with poor results in technological advancement. Moreover, barriers to immigration may also endanger the attraction of foreign researchers. The low share of non-EU doctorate students compared to the EU-27 confirms this assessment (0.61% of total doctorate holders in 2009 compared to 19.19% on average in the EU27, according to IUS 2011). High unemployment in Lithuania may have a negative impact on the investments into skills renewal and life-long learning in indigenous enterprises. Secondly, IUS 2011 indicated that indigenous enterprises have the low-medium levels of co-operation arrangements, while innovative SMEs' collaboration with others declined by 14%. The skills and absorptive capacity of enterprises needs to be developed to adapt and exploit technologies and other external knowledge, whether developed in Lithuania or internationally.

R&I policy design, coordination and approach to implementation

The divide between science and enterprise policies has historically been a major obstruction to the productivity of the R&I system (Martinaitis et. al, 2009; Paliokaite et. al, 2011; Whitelegg et. al, 2008; World Bank, 2009). The Lithuanian Innovation Strategy 2010-2020 called for a 'systemic approach to innovation'. Despite the progress in communication between the main ministries over 2010-2012, a coherent policy has not been achieved so far. The current policy approach mainly follows the 'linear' perspective of innovation. The current innovation terminology reflected in the policy documents, measures, projects and monitoring systems focuses on the supply side of knowledge and particularly on basic research. As a result, the critical parts of the innovation process related to the experimental and technological development as well as the incremental development of products and processes, and the systemic nature of innovation in general, is not captured by the laws, policy documents and even statistics. To achieve better results of innovation performance, Lithuania needs to shift the national R&I system from the current system traditionally focused on the basic science to the one more inclusive of innovation.

An increasing concern is how to deal with the difficulties in funding public research as an opportunity to strengthen the linkages with company capabilities and needs. This demands measures that might facilitate the circulation of people and ideas between companies and academy. The current priorities for research and innovation are too broad, too general, and are of dual nature - based on economic sectors (the Ministry of Economy) and science fields (the Ministry of Education and Science). A related issue concerns the weak involvement of various stakeholders in the process of designing R&I policy. Consequently, the links between R&I programmes and even between actors in 'joint' projects have been of rather formal character. It is important to activate stakeholders' consultations, to stimulate a closer dialogue and interaction between research and business activities. The re-launched Strategic Research and Innovation Council and the consensus building activities around the research priorities and the smart specialisation strategy for 2014-2020 would highly contribute towards the improved coordination between science and enterprise policies.

4. ASSESSMENT OF THE NATIONAL INNOVATION STRATEGY

4.1. National research and innovation priorities

The Lithuania's current multiannual R&I strategy document is the Lithuanian Innovation Strategy for 2010-2020 (LIS) published in 2010. LIS demonstrates a shift towards a 'broad-based' (horizontal) innovation strategy. As well, it extends the definition of innovation, by including social, customer-oriented, non-technological, demand-oriented, and public innovation; and puts much stronger emphasis on policy internationalisation, entrepreneurship and creativity. The four objectives emphasised in the strategy are: (1) to accelerate Lithuania's integration into the global market ('Lithuania without borders'); (2) to educate a creative and innovative society; (3) to develop broad-based innovation; (4) to implement a systematic approach to innovation.

The LIS Action Plan 2010-2013 has a large focus on the continued development of the science base and in principal echoes the Lithuanian Strategy for the use of European Union Structural Assistance for 2007-2013 (NSRF) approved by the European Commission in 2007, and its operational programmes. The NSRF 2007-2013 combines the EU and national funds to address structural weaknesses in the economy as well as the R&I system, and is currently the main source of funding research and innovation activities. The main R&I related NSRF objectives are to upgrade the research infrastructure and capacities of researchers as well as to increase public and private R&D collaboration and to attract more private R&D investments. In terms of funding, most of funds are streamlined towards building five so called 'integrated science, studies and business centres – valleys', especially towards upgrading the research and education infrastructure.

LIS also incorporated new objectives introduced by the centre-right wing Government that took office in late 2008 and immediately launched the large-scale public research and education reform. First of all, the focus was on consolidation and internal optimisation in academic and research institutions, enhancing their R&D potential, placing more emphasis on results-based and competitive funding, evaluation of institutions, increasing academic autonomy, etc. Secondly, much stronger emphasis was put on the internationalisation of research and innovation: integration of the business actors and Public Research Organisations (PROs) into the international innovation networks; direct foreign investments into knowledge intensive services and manufacturing, and internationalisation of local businesses. Over 2010-2012 Lithuania joined various international collaboration programmes (e.g. BSR Stars, Enterprise Europe Network). Thirdly, the greater emphasis is put on creativity and entrepreneurship, especially on the establishment and growth of the young innovative companies, start-ups, spin-offs, and 'gazelles'. This translated into launching a number of new measures for young companies and entrepreneurs over 2010-2012 (see Chapter 2.3).

The publication of the long and medium term economic framework documents, the National Progress Strategy 'Lithuania 2030' in May 2012 and the National Progress Programme 2020 (NPP) in November 2012, was the Government's attempt to set the long-term policy directions. NPP in general accepted the ideas introduced by the Lithuanian Innovation Strategy, especially the emphasis on global markets, creativity and entrepreneurship. This document highlights the role of research and innovation and especially the innovation networks in restructuring the whole economy towards greater value added, and provides the basis for financial proportions of the national and EU funds over 2014-2020. According to the NPP, 14.23% of the total funds will be invested into education, research and culture, and 11.44% of all funds will be invested into the development of the networked economy, oriented towards the creation of higher value added.

The former priority focuses on further strengthening of the public education and science base, as well as researchers' careers. The latter priority emphasises issues related to collaborative research and innovation, whereas the main focus is on innovation networks and research collaboration, joining global networks and global markets as well as fostering innovation in business and demand for innovation. The NPP was developed by five working groups formed of experts, public officials and social partners and led by the main ministries. The policy proposals were discussed with the society during public debates.

The current debate on the future development of innovation policy in Lithuania is structured around several 'hot' topics and/or challenges:

- *Public-private R&D collaboration and commercialisation of research results*. The majority of R&D is performed in the public sector and the main challenge is to orient it towards Lithuanian enterprise base for greater productivity, innovative capacity and other economic outcomes. So far the attempts to address this gap have faced considerable challenges. Therefore the debate focuses on increasing the effectiveness of policy instruments (e.g. science parks, grants for collaborative projects etc.).
- Favourable 'framework conditions of innovation', especially the *financial engineering measures (venture capital, risk/seed capital)*. The policy makers acknowledged the emergence of the so called 'subsidies culture' - over-emphasizing of the direct support to business distorts the market and supports the consultants/advisory sector rather than supporting innovative business ideas. Although the supply-side innovation measures, e.g. the direct support for R&D in business, will remain, but it is expected that the next periods of the funding will bring more emphasis on the alternative forms of innovation support, closer to the business needs and producing less market distortions.
- *Demand side policy instruments such as pre-commercial procurement*. This discussion is led by the Ministry of Economy and the idea is to pilot the first instruments in the coming years.
- *Addressing societal challenges with social innovation*. This debate became more apparent in the context of the preparation of the National Progress Programme: in the first version the Ministry of Social Security and Labour had introduced the objective of fostering social innovations. Although the current version of the programme does not include this objective, it is integrated horizontally into other objectives. Social innovation, addressing social challenges, as well as public sector innovation, e.g. modernising provision of public services, are becoming hot topics at the public policy debate / discussion.
- *Prioritising research and innovation*. This is the hot and recent topic imposed by the European Commission in the context of smart specialisation. As noted in Chapters 2.6 and 2.7, the national foresight exercise was launched with the aim to establish a list of 'smart priorities'. The current debate is structured around the policy intervention logic and the definition of a 'priority' as well as the process which is required to define the priorities (having in mind the sensitivity of this issue in the scientific and business communities).

The latter debate on R&I priorities is crucial as it introduces the 'mind-changing' process and therefore requires a lot of consensus building, analysis and awareness building activities. As noted in Chapter 2.2, the current policy documents tend to address 'their own' priorities (see Annex 1), what means that most of the existing economic sectors or research fields are 'prioritised' in one way or the other. Some R&D fields or business sectors have been more successful than others in attracting public or private funding for R&D (especially biotechnologies and ICT, as well as laser, electrical and optical technologies, and food technologies). However, it remains unclear how the prioritisation of a broadly defined 'sector' or 'research field' actually contributes to solving the societal or economic problems. If the R&I policies have to be better

aligned with the societal and industrial challenges as proposed by the 'smart specialisation' concept, more clearly defined priorities with justified value added have to be proposed.

Analytical reports, evaluations[9] and discussions carried out over the period of 2010-2012 show that the current policy mix is relevant and quite comprehensive. Especially, a significant impact on strengthening the public R&D base and knowledge production in the public sector is expected since the greater part of public R&D funding as well as systematic reforms are concentrated in this area. Analytical reports also note that the policy measures had a positive impact on private R&D investments during the economic downturn (R&I investments in indigenous companies increased over 2010-2011). Despite the versatile policy mix already in place, Lithuania needs to ensure better support to newly established firms and knowledge commercialisation, as well as to take a leap in linking supply and demand-side measures and exploring the full potential of demand-side policies. Overall, the national priorities for 2012-2020 defined in the mid-term policy documents are consistent with the structural challenges described in the previous chapter, but a lot will depend on how the practical instruments proposed for tackling these challenges will be implemented.

4.2. Evolution and analysis of the policy mixes

The planned RTDI policy mix and budgets have not changed much since 2009 as these budgets are planned on a multiannual basis. The structure of the policy mix is bound to the NRSF 2007-2013 and remains constrained by the state budgetary crisis. The current policy mix is mainly directed at three principal routes: (1) to increase knowledge production capacities in the public sector; (2) to stimulate greater R&D investment in R&D performing firms; (3) to increase knowledge transfer and links between the industry and university sectors thatis currently the least effective policy objective, although additional efforts are dedicated to make the existing instruments more productive.

Although during the last three years, that is, from December 2009 to December 2012, the policy mix has remained quite stable, some trends became apparent, especially the efforts towards the promotion of the establishment of new firms, the attraction of knowledge intensive FDI and efforts in stimulating public private collaboration. The trends in the evolution of the policy mixes are shown below, following the policy routes taxonomy proposed by Guy et al (2009) [10].

Route 1: Efforts to promote the establishment of new, domestic R&D performing firms

Overall, the policy mix over 2009-2012 has not been favourable for stimulating firms that do not yet perform R&D and for the establishment and growth of young innovative firms, especially given the tax policy reforms during 2008-2009 (the increase of VAT). The major share of business R&D funds is allocated to private businesses that are already involved in R&D, while very few measures aim at supporting firms, which have not yet started to carry out R&D or that are still in the establishment stage. This gap, however, has recently been addressed by launching several seed/pre-seed capital funds, business accelerators and a specific measure for university spin-offs. Regulative measures have also been introduced, e.g. another form of enterprise with simplified accounting – the 'small partnership' in 2012, and the reform of business regulating authorities took place, which reduced the time needed to establish a company, to submit or get required documents etc.

[9] Paliokaite A., Skuodis M. (2010): Study on the innovation policy and innovation governance in Lithuania. Knowledge Economy Forum, Vilnius; Paliokaite A. (2010b): Systemic innovation policy evaluation report. Prime Minister's Office in Lithuania, Vilnius; Paliokaite A. et al. (2011): Evaluation of the industry and science collaboration policy mix in Lithuania. In addition, the Report by the National Audit Office on science/business interaction was also conducted in support of many of the previous conclusions (2011).

[10] Ken Guy, Patries Boekholt, Paul Cunningham, Reinhold Hofer, Claire Nauwelaers, and Christian Ramme (2009). *Designing Policy Mixes: Enhancing Innovation System Performance and R&D Investment Levels. Methodology Deliverable, Task 3*. The 'Policy Mix' Project. European Commission, DG Research, March.

Route 2: Efforts to stimulate greater R&D investment by R&D performing firms

Investments are spread over a number of small measures varying from the idea testing (Idea-LT) to the direct support to R&D in business (Intellect-LT and Intellect LT+), innovation services (Inogeb LT-1, Inogeb LT-2). The target groups are primarily business companies with the exception of the Inogeb-LT group of measures where the innovation services providers such as the science parks and incubators can apply for support.

One of the major weaknesses of R&I policies in Lithuania is the lack of a market- and the demand-driven policy approach. This leads to the absence of market incentives and public procurement for innovation in strategically important economy sectors such as energy, waste management and health care. The national R&D policy, relying primarily on the EU SF funds, and strengthening the public sector along with the innovation support understates the importance of the creation of an innovation culture and innovative markets in the country. As previously noted, the emerging policy discussion on applying more demand-side policy instruments arises, especially concerning innovative and pre-commercial procurement, as it would stimulate private R&D in the fields that are important for the society and public services provision. None of these instruments has been launched yet. The Inno Policy Trendchart Mini Country Report for Lithuania (2011) discusses in detail the demand-side innovation policy in Lithuania.

Route 3: Efforts to stimulate R&D investment by firms that do not participate in innovation activities

The efforts for creating the innovation friendly environment have focused towards introduction of tax incentives for R&D (in 2008-2009) and venture capital for business. The venture capital funds comprise the highest share (about €74m in 2011) of the funds in this category. However, it is disputable what part of the financial engineering funds is attributed to the funding of innovative enterprises, as these funds are open to all types of enterprises. The financial engineering funds as well as support to organisational innovations received the highest political attention during the financial and economic crisis.

Route 4: Efforts to attract R&D performing firms from abroad

The 15th Government (in office December 2008 -December 2012) has put a lot of efforts in attracting FDI to research intensive businesses and knowledge intensive services. The measures Invest LT, Invest LT+ and Invest LT2 provide support for the establishment of industrial parks and providing specific incentives for foreign investors. Although there have been a couple of success stories in Vilnius region, overall impact of FDI policies on R&I is not significant and needs closer policy attention.

Route 5: Efforts to increase R&D by stimulating public private collaboration

The direct financial support for collaboration of science and business in joint R&D projects, cluster development projects is relatively low, especially compared to the innovation leaders such as Finland. The group of measures in this route comprises the innovation vouchers, the investments in innovative clusters development (Inocluster LT, Inocluster LT+, and Inogeb LT-3), and the joint R&D projects funded by the High technology development programme (2011–2013), the Industrial biotechnology development programme (2011–2013), and the so called 'joint research projects' that started in 2012 (LVPA funds the business part of the project (the measure Intellect LT); MITA finances the part of the project where universities and research institutes are involved so that they can get support up to €0.9m from the measure 'Promotion of high level international research'. The pilot innovation vouchers scheme was launched in 2010 and after the confirmed success was upgraded to the Ino-vouchers LT scheme in 2012.

The knowledge transfer between science and industry is also strengthened by the non-financial measures introduced by the Ministry of Education and Science, e.g. the results-based university

funding model (more value is attributed to R&D contracts with industry) and the Recommendations on the intellectual property management in universities.

The initial idea for the development of the 'valleys' as integrated business-science centres/clusters has not yet fully materialised. Several studies[11] have questioned the role of business in the valleys development process, in using the constructed 'open access' research infrastructures. Moreover, the 'valleys' concept is criticised in the public discussion for being focused too much on 'bricks and mortar' rather than on joint R&D projects or professional knowledge transfer services. The questions on how to 'employ' the valleys infrastructure for collaborative R&D projects remain open for discussion.

Route 6: Efforts to increase R&D levels in public sector organisations

The biggest share of the R&I funds is targeted at increasing higher education and R&D (a majority of measures aimed at public research grants, research mobility and researchers careers via the 'Researchers Career Programme' with total budget of €182.5m) and investments in public research infrastructure (about €290m distributed mainly through the targeted 'science valleys' programmes). The main target groups are universities, public research organisations (PROs) and individual researchers, as well as PhD students. Alongside the financial measures, the Ministry of Education and Science implements major reforms of the public higher education sector, with the aim of optimising the fragmented system of research and higher education organisations, introduction of the market funding elements (student vouchers), increase in the competitive and results-based funding and university governance reforms.

26% of the total public R&I funding (or €59.4m) was allocated to infrastructure for research or innovation in 2011[12]. Most of it was allocated to strengthening the public R&D infrastructure in the five integrated science, business and studies 'valleys'. The real expenditure in this category almost tripled in 2011 compared to 2010. The real expenditures to support R&D activities increased from €21.7m to €28.2m in 2011. About 6-7% of the R&I funding was allocated to the investments in human resources for research and innovation (€10.6m in 2010; €15.2m in 2011), for the attraction of the highly-skilled researchers, funding the short-term visits of the researchers from abroad, the researcher mobility between science and industry, etc.

4.3. Assessment of the policy mix

Analytical reports, evaluations[13] and discussions in 2010-2012 show that the current policy mix is relevant and quite comprehensive. Especially, significant impact on strengthening the public R&D base and knowledge production in the public sector is expected since the greater part of public R&D funding as well as systematic reforms are concentrated in this area. Analytical reports also note that the policy measures had a positive impact on private R&D investments during the economic downturn (R&I investments in indigenous companies increased over 2010-2011). Nevertheless, there are weak links where the existing policy mix does not sufficiently reflect existing structural challenges:

- Technological development and *commercialisation of research products* as well as lack of related, professional, well-targeted innovation support services. The evaluation of the utilisation of the innovation support infrastructure (science parks and incubators at the five science valleys) shows that the policy goals will be only partially achieved due to the four major problems: a) too much focus on the infrastructure instead of funding research; b)

[11] One of the sources: Inteligentsia Consulting (2009). Report on the Lithuanian Valleys Programme. Available at: http://www.mosta.lt/senas/Tyrimai/Files/Sleniu_valdymo_modelio_ataskaita.pdf

[12] Source: InnoPolicy Trendchart mini country report 2012 produced by Agnė Paliokaitė in September 2012 (not published)

[13] Paliokaite A., Skuodis M. (2010): Study on the innovation policy and innovation governance in Lithuania. Knowledge Economy Forum, Vilnius; Paliokaite A. et al. (2010): Systemic innovation policy evaluation report. Prime Minister's Office in Lithuania, Vilnius; Paliokaite A. et. al. (2011): Evaluation of the industry and science collaboration policy mix in Lithuania. In addition, the Report by the National Audit Office on science/business interaction was also conducted in support of many of the previous conclusions (2011).

insufficient communication of information on the utility and opportunities given by the R&D and innovation infrastructure in the country; c) the absence or low quality of the innovation support services.

- Support for the *establishment and growth of new innovative companies*; this gap is already being addressed by launching the new 'business accelerators', the seed and pre-seed capital programmes and the support for university spin-offs in 2012, as described in Chapter 2.3.
- The 'subsidies culture' and the *lack of demand-oriented policy measures*. There is emerging recognition that the policy mix need to acknowledge the importance of facilitating demand-led innovation, especially via public procurement of research. This has been reflected in the current policy discussion and development of innovative and pre-commercial procurement measures (still at the very early stage of discussion).

The policy increasingly focuses on commercialisation of the publicly-funded research that has primarily taken place within the higher education sector. Moreover, it also seek to ensure an economic return from the investment in basic research and research infrastructures made during the last several years through the transfer of knowledge from higher education institutions to industry which if successfully converted into commercially marketable products and services would lead to increased employment and export sales. So far, the impact of the current policy mix on the collaboration between the science and business sectors is estimated to be average[14] because of the lack of a proper legal base for the successful commercialisation of scientific projects, information asymmetry, low quality of scientific research, and – especially - the insufficient in-house capabilities and the passive and bureaucratic stance adopted by universities as well as a lack of a collaboration projects pipeline.

The evaluation results also suggest that the bottlenecks to respond to the identified challenges rest in systemic issues related to policy design and implementation. Firstly, the effectiveness of the policy mix was undermined by the insufficient coordination among the different policy perspectives which precludes the development of a systemic approach to tackle the challenges. The design and implementation of research and innovation policies has not been sufficiently steered and coordinated at the highest political level and between the different policy making institutions. Furthermore, up to the date of this Report (December 2012) any clear orientations concerning 'smart specialisation' existed and the policy was targeted at a broad and overlapping mix of priorities. Another bottleneck is the dominance of a 'linear model of innovation' perspective. It is assumed that investment in science and the 'transfer' of scientific knowledge to companies would be the key to ensure an innovation based competitive approach. This perspective lacks a clear view about the systemic nature of the innovation process and the importance of non-technological dimensions.

These issues are further aggravated by the institutional failures. Although extensive, the current institutional base for the implementation of R&I policies is at the same time very fragmented. This weakness prevents the current institutional system from exhausting all the existing competences and advantages of scale economy. R&I governance system lacks strategic intelligence systems, especially where the business-related RDI policies are concerned. There is a great need to develop the strategic intelligence (policy evaluation, monitoring and foresight) systems in the innovation policy field. This gap is tackled by both MOSTA and (increasingly) MITA, but so far the monitoring and analysis efforts mostly tackle public research and education, when the policy design process mostly lacks data on R&D and innovation in business, especially at the sectoral and sub-sectoral levels.

Moreover, the evaluation results conclude that the policy implementation has been one of the weak links. Though improvements are continuously introduced, companies and PROs complain

14 Paliokaite A. et. al. (2011): Evaluation of the industry and science collaboration policy mix in Lithuania

that the process is too bureaucratic; unnecessary requirements reduce the uptake by the target actors. The Ministry of Economy has launched the internal project on 'Reducing the administrative costs of the EU SF support'. This includes proposals for making implementation easier and more efficient, simplification of the planning procedures, of evaluation of applications, monitoring and supervision of projects.

The following table provides the assessment on how appropriate the existing policy actions are for addressing the specific structural challenges.

Table 3: Assessment of the Lithuanian R&I policy mix

Challenges	Policy measures/actions addressing the challenge[15]	Assessment in terms of appropriateness, efficiency and effectiveness
International excellence and capacity to commercialise public research	Research grants and researchers mobility. Strengthening of research infrastructures in the context of building science 'valleys'. Optimisation of research institutes and universities network. Technology transfer centres, technology incubators and science parks. Support for protecting industrial knowledge. High technology programme (support to start ups and spin offs).	Current focus is on the modernisation of research infrastructures. Still more emphasis is needed on the attractiveness of researchers careers, focusing not only on financial rewards, but also on cultural change and nonfinancial incentives, working conditions and internationalisation issues, such as open recruitment. Moreover, the implementation system for research grants needs revision (e.g. legal requirements to employ researchers, including foreign ones, in the institution which receives a grant, low remuneration rates, etc.) and reduction of administrative load. There are few examples of good practice in commercialising public research, but overall the entrepreneurial culture and education need to be fostered in Lithuanian universities. The technology transfer centres at HEIs are not functional. Stronger incentives for commercialisation of public research (e.g. related to research funding and researchers careers) are needed. Professional innovation services (idea testing, prototype creation, IPR consulting and market research) are not sufficient.
R&D and innovation intensity in business	Restructuring the economy towards higher value added creating sectors is the overarching R&I policy objective. Grants to business R&D. Tax incentives for R&D intensive companies.	Positive impact on the new R&D investments and the new products development during the economic crisis. To achieve a more significant breakthrough in business R&I investments, the four important aspects could be further improved: (i) strong demand for new products and services - ensuring the consistency of supply and demand-side policy instruments; (ii) good framework conditions (e.g. venture capital, services) promoting private investment, especially focusing on the young innovative companies and start-ups; (iii) encouragement to SMEs cooperation for innovation and internationalisation; (iv) attraction of new knowledge-based companies from abroad.
Public-private research collaboration	Innovation vouchers Industry clusters Science valleys (competence centres, science parks) Joint research projects (forthcoming)	There has been considerable focus on developing support measures to increase linkages between HEIs and industry for greater productivity, innovative capacity and other economic outcomes. So far the effectiveness of these measures was limited. The innovation voucher measure has been successful in encouraging SMEs to develop linkages with knowledge providers. There is a potential for new policy initiatives to target value chain networks (as well internationally).
Low absorptive capacity of indigenous SMEs	Modernisation of study programmes Industrial researchers programme	Data on the effectiveness of the listed measures are so far unavailable. Further policy attention needs to be given to sufficient supply of skilled labour, with specific focus on qualified science and engineering personnel, but also giving due attention to the quality of studies (both higher education

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

Challenges	Policy measures/actions addressing the challenge[15]	Assessment in terms of appropriateness, efficiency and effectiveness
	Support to employee training Support to technological upgrading of industry	and vocational training) in general and to lifelong learning (e.g. learning in companies).
R&I policy design, coordination and approach to implementation	Lithuanian Innovation Strategy 2014-2020. National Progress Programme 2014-2020. Strategic Research and Innovation Council. Launching the research priorities setting exercise.	Introduction of LIS and NPP does not automatically solve the policy coordination problems. Moreover, the structure of the mid-term policy documents is very fragmented. The R&I policy has been characterized by the absence of clear prioritisation of specific fields. A systemic and consistent initiative has to be taken to address this challenge. The priority setting exercise has been launched, but a lot will depend on an effective coordination of this initiative. Strategic Research and Innovation Council, which will replace the Valleys Monitoring Council, has not been yet approved by the Government (December 2012).

Source: developed by the author, partly based on Paliokaite and Caturianas, 2011.

5. NATIONAL POLICY AND THE EUROPEAN PERSPECTIVE

The Lithuanian R&I policy mix has improved significantly over 2007-2012in the context of NSRF 2007-2013, the Lithuanian Innovation Strategy 2014-2020 and the research and higher education governance reform which took place over 2009-2012. Despite the versatile policy mix already in place, Lithuania needs to ensure better support to newly established firms and knowledge commercialisation, as well as to take a leap in linking supply and demand-side measures and exploring the full potential of demand-side policies. To achieve a more significant breakthrough *in business R&I investments*, the following policy directions should be addressed in the short and medium terms:

- Creating strong demand for new products and services - better use of the innovative public procurement and the pre-commercial procurement; creating the necessary regulations and standards for innovative markets; using the financial and tax incentives if necessary.
- Creating good framework conditions (venture capital and professional services) for private R&I investment, especially focusing on young innovative companies and start-ups;
- Facilitation of SMEs cooperation for innovation and internationalisation (focus on global markets);
- Attraction of new knowledge-based companies from abroad. Although there have been a couple of success stories in the Vilnius region, the overall impact of FDI policies on R&I is not significant.

Better results in *commercialising public research* can be achieved, if the priority R&I areas where Lithuania is strong and capable of competing internationally were identified in a consensus building process, with a clear focus on collaboration and commercialisation potential. The efforts by different institutions and R&I funds could then be focused on these areas to achieve economic outcomes. Moreover, a networking culture has to be supported at all levels – from (i) innovation clusters and knowledge transfer platforms to (ii) innovation culture and skills in universities, and (iii) society's social capital (education innovations tackling group work and trust issues).

The process of preparation for the 2014-2020 period has started and much of the new and continued policy routes are framed by the National Progress Programme 2014-2020. The foresight exercise for setting the national R&I priorities is planned in 2013. However, policy objectives and policy results are separated by the deeply-rooted institutional, cultural and administrative shortcomings that hinder the effectiveness of current policies. For example, research is carried out and supported mainly in a linear perspective. The relevant policies lack coordination. The high administrative load created by the research programmes inhibit collaboration, creativity and innovativeness, and ensure that companies seek to compensate planned activities instead of taking risk. Although the national priorities for the period of 2012-2020 defined in the mid-term policy documents are mainly consistent with the structural challenges defined in the previous chapter, but a lot will depend on how the practical instruments proposed for tackling these challenges will be implemented. Therefore, next to the increased attention to R&I markets, framework conditions and commercialisation of research, other supplementing actions are necessary:

- Policies affecting R&I processes and performance need to be orchestrated, and it would require both strengthened policy coordination and informed policy learning processes. R&I monitoring and analysis of innovation performance, ex ante and ex post policy evaluation capacity, foresight capacity should be increased and assisted by consultations with the main stakeholders and actors in the innovation system. The fragmentation in the policy objectives

needs to be reduced, e.g. by developing an effective Smart specialisation strategy (RIS3) based on existing documents.

- Policy implementation weaknesses should be addressed, with the focus on simplification, reducing administrative load, abandoning the risk-averse and process-oriented approach, strengthening of the implementation capacity in the agencies, and overall making the programmes closer to the needs of companies and researchers.

Table 4 provides the assessment of alignment between the national policy mix and the ERA Communication[16] priorities. It shows that the national policy is broadly aligned with the ERA priorities, but the objectives of trans-national collaboration and open market for researchers need an urgent policy attention.

Table 4: Assessment of national policies supporting the strategic ERA priorities

	ERA priority	Main challenges at national level	Recent policy changes
1	**More effective national research systems** – including increased competition within national borders and sustained or greater investment in research	R&D funding relies mostly on ESF/ERDF support. Some research units have acquired world-level capabilities, but most public research institutions lack international competitiveness. Universities are primarily focused on teaching. Entrepreneurial culture, commercialisation of research, ensuring access by industry to research infrastructures is struggling.	New policy documents, e.g. NPP 2014-2020, updated Concept of 'Valleys' support continued investments into research and innovation. Implementation of 'joint research programmes'. National R&I priorities setting exercise (planned in 2013).
2	**Optimal transnational co-operation and competition** - common research agendas on grand-challenges, raising quality through Europe-wide open competition, effective key pan-European research infrastructures	Internationalisation of research remains the challenge to be addressed by both national policies and universities' strategies. Lithuanian research infrastructures have very few ties with international partners and are not integrated into the European RIs. Lithuania has not developed any coherent strategy of international cooperation in the field of R&I, the level of bilateral research funding and the level of cooperation with third countries remains particularly low.	Publication of the 'Lithuanian roadmap on research infrastructures' in 2011, elucidating the strategic needs for further investment in the RI (but no clear policy for collaboration with transnational RIs). Involvement in drafting and adoption of the European Union Strategy for the Baltic Sea Region (EUSBSR). An agreement with the State of Israel on bilateral cooperation in industrial R&D signed in 2010.
3	**An open labour market for researchers -** to ensure the removal of barriers to researcher mobility, training and attractive careers	Ageing researchers and the relatively low rates of Lithuanian researcher mobility remain a problem. Low attractiveness of research as a career, especially the low salaries of researchers, combined with the relatively 'closed' science base (lack of internationalisation strategies within institutions) are the principal obstacles precluding the attraction of highly qualified researchers to Lithuania.	Researchers Career Programme provides funding grants for international researchers and support for researchers who have returned from abroad. The Higher Education Reform of 2009-2012 is assumed the major precondition for the increase in researcher salaries - HEIs have more autonomy in setting the salaries of its research staff.

16 Communication from the Commission to the European Parliament, the Council, the European Social and Economic Committee and the Committee of the Regions. A Reinforced European Research Area Partnership for Excellence and Growth. COM(2012) 392 final

	ERA priority	Main challenges at national level	Recent policy changes
4	**Gender equality and gender mainstreaming in research** – to end the waste of talent which we cannot afford and to diversify views and approaches in research and foster excellence	The gap in the annual average salary between men and women in the research sector still exists, increasing with experience. Women are still underrepresented in much better paid research leadership positions.	There is no systemic approach or legal regulations to promote gender equality on research committees, boards and governing bodies. On the other hand, there are no legal restrictions for female academic and administrative careers. The policy has not changed significantly.
5	**Optimal circulation, access to and transfer of scientific knowledge including via digital ERA** - to guarantee access to and uptake of knowledge by all.	Because of the relatively closed Lithuanian research infrastructures, the circulation level of Lithuanian research results is low.	Several measures (2007-2013) aim to create access to international databases. The Creation of National Open Source Scientific Communication Centre measure aims to develop a single infrastructure for research outputs dissemination.

Source: developed by the author, partly based on Paliokaite and Caturianas, 2011.

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LIST OF ABBREVIATIONS

BERD	Business Expenditures for Research and Development
ERA	European Research Area
EPO	European Patent Office
ERA-NET	European Research Area Network
ERDF	European Recovery Programme Fund
ESFRI	European Strategy Forum on Research Infrastructures
ESF	European Social Fund
EU	European Union
EU-27	European Union including 27 Member States
FDI	Foreign Direct Investments
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
ICT	Information and Communication Technologies
IP	Intellectual Property
IPR	Intellectual Property Rights
IUS	Innovation Union Scoreboard
IRP	Integrated research programme
KTO	Knowledge Transfer Offices
LVPA	Lithuanian Business Support Agency
LIC	Lithuanian Innovation Centre
LIS	Lithuanian Innovation Strategy for 2010-2020
LMA	Academy of Sciences
LMT	Lithuanian Research Council
MITA	Agency for Innovation, Technology and Science
MOSTA	Research and higher education monitoring and analysis centre
NIP	National integrated programme
NIS	National innovation system
NSRF	National Strategic Reference Framework
OECD	Organisation for Economic Co-operation and Development
OP	Operational Programme
PCT	Patent Cooperation Treaty
PPS	Purchasing Power Parity
PRO	Public Research Organisations
RCP	Researchers Career Programme
R&D	Research and development
RI	Research Infrastructures
R&I	Research and innovation

RTDI	Research Technological Development and Innovation
SF	Structural Funds
SKVC	Lithuanian Centre for Quality Assessment in Higher Education
SME	Small and Medium Sized Enterprise
S&T	Science and technology
ŠMM	Ministry of Education and Science
ŪM	Ministry of Economy
VST	State Studies Foundation

ANNEX 1. LITHUANIAN R&D PRIORITIES

	National R&D priorities	'Breakthrough areas', LIS 2010-2020	JRC	Valleys	IRP	NRP	Clusters measures
Priority expiry date:	*2010*	*2020*	*2018*	*2015*	*2015*	*2015*	*2015*
Biotechnologies and bio pharmacy	X	X	X	X	X	X	X
Food (and in some cases agriculture)	X	X	X	X	X	X	X
ICT	X	X	X	X	X		X
Future energy	X	X	X	X	X	X	
Laser technologies	X	X	X	X	X		X
Nanotechnologies, electrical and optical technologies	X	X	X	X	X		X
Ecosystems and climate / clean technologies	X	X	X	X		X	
Civil engineering, transport and logistics		X	X	X	X		X
Medicine / healthcare and wellness sectors		X			X		
Marine sector			X	X	X		
Chemistry / chemical industry		X	X		X		X
Mechatronics	X				X		
Humanities and social sciences: national identity and national security	X				X	X	
Creative and cultural industries		X			X		X
Wood and furniture		X					X
Textiles and clothing		X					X

Source: based on A.Paliokaitė „How smart is the priority mix in Lithuania', 19-04-2012 (in Lithuanian).