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Agne Paliokaite

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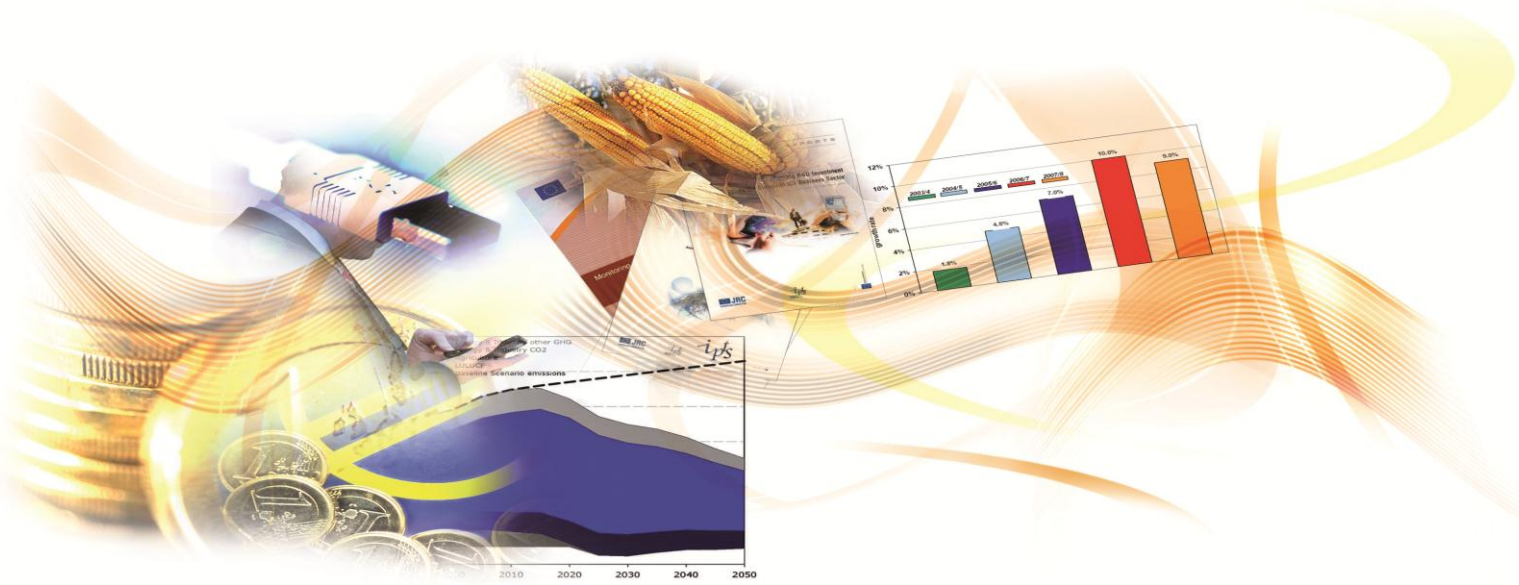

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Abstract

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

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

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

ACKNOWLEDGMENTS AND FURTHER INFORMATION

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

The Country Report 2013 builds on and updates the 2012 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between 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 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefited from the comments and suggestions of Gerard Carat from JRC-IPTS. The contributions and comments from DG-RTD and Jovita Surdokiene, Ministry of Economy of the Republic of Lithuania 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 2010-2013; and Lithuania with 3.3% increase in GDP over 2013 was the second fastest growing economy in the EU. Strategic objectives and funding for the Lithuanian research and innovation (R&I) policies have gained weight over 2009-2013. The R&I policy mix has improved significantly in the context of the National Strategic Reference Framework (NSRF) 2007-2013, the Lithuanian Innovation development programme 2014-2020 and the public research and education system reform that took place in 2009-2012. The availability of high quality research infrastructure has been addressed by 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 Strategic Council for R&D and Innovation was set up in 2013 to coordinate R&I policies at strategic level.

The economic crisis has not had a major impact on public R&I funding in Lithuania. The majority of R&I funding comes from the EU structural funds based on multiannual planning. The authorities have set a national R&D target of 1.9% of the national GDP/R&D intensity in 2020, of which 0.9% should be contributed by business investments. The stable low-medium technology dominated structure of private knowledge demand, low numbers of newly created knowledge-intensive companies and a low rate of entrepreneurship have so far made it difficult to reach the national commitment to the R&D target, especially on the private side. The main knowledge producers in the Lithuanian R&I system are the universities along with a few government research institutes. Lithuania's gross domestic expenditure on R&D as a percentage of GDP fluctuates within 39-45% of EU-27 average. R&I funding indicators demonstrated positive trends during the last four years, but the rate of change is too slow to bridge the gap. According to Eurostat data, total GERD in Lithuania increased by more than €70m over 2009 - 2012. The Business enterprise R&D expenditure (BERD) as a percentage of total GDP increased from 0.20% in 2009 to 0.24% in 2012 (an increase of 35% in absolute figures). The contrast in terms of the EU average is sharp: Lithuania's BERD as a percentage of total GDP was only 19% of the EU27 average. The investments undertaken in enhancing R&D capabilities thus have not led so far to a significant change in how companies compete in international markets. According to the Innovation Union Scoreboard (IUS) 2013, Lithuania, despite the leap forward to the group of 'moderate innovators', 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. In summary, the main structural challenges facing Lithuania are:

1. *Private sector R&I capacity building: up the 'competence ladder'.* The key mid- to long-term challenge for Lithuania, instead of focusing on few existing innovators, is to promote the structural change of economy by providing transformation agenda for diversification of existing (also traditional) sectors and transition to new knowledge based activities. More tailor-made approach to the R&I capacity building is needed taking into account that the current capacity levels and the potential to move up in the 'stairway to excellence' (or the 'competence ladder') largely differ within the target groups.
2. *Commercialisation of public sector research results: entrepreneurial culture and cross-sectoral collaboration.* Most of Lithuania's universities have limited experiences with, capacities and motivation for patenting, licensing, start-up companies and other commercialisation efforts. 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 low. An innovation culture and skills in universities and institutes need to be urgently developed.

3. *Mainstreaming internationalisation.* The public research system can be characterised as rather closed with limited institutional incentives and targets for internationalisation. It is unfortunate given the current quality of Lithuanian research and few niches of international science excellence. To benefit more from transnational R&I collaboration today's general declaration of importance of international collaboration should be replaced by more strategic R&I internationalisation policy, including respective positioning, target setting and incentives at the national level. In line with that all national R&I measures should include relevant international dimension, stimulate partnerships, open-up for international partners and clusters, etc. Moreover, none of the smart specialisation priorities should involve purely national agendas.
4. *Reduce R&I policy and governance fragmentation and improve policy implementation capacities.* Key remaining weaknesses are (i) fragmentation of strategies and institutions, failure to leverage different funds and create synergies between measures, lack of systemic coordination and policy monitoring capacity, and (ii) process-oriented 'administration of funds' *vs* partnership-based programme management and project pipeline building. A systemic and consistent initiative has to be taken to address this challenge. It is critical when considering the implementation of the smart specialisation policies. To tap the potential of smart specialisation, public authorities and implementation agencies will need to behave more like accelerators, brokering new connections in the economy, and moving beyond the circle of 'usual suspects', both in terms of stakeholders involved and R&I activities concerned.

The process of preparation for the 2014-2020 period has gained acceleration and many of the new and continued policy routes are framed by the National Progress Programme for 2014-2020, and the Operational Programme for 2014-2020 (as previously, the EU structural funds will remain the key funding source for R&I policy). The process of defining the national R&I priorities for smart specialisation has been launched and the six broader priority areas, each with their 2-4 specialisations - thematic priorities) were defined by the end of 2013. 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, but the smart specialisation policy mix and the implementation structure were under discussion. It is expected that the policy mixes for 2014-2020 will be designed and approved by the end of 2014. The draft Operational Programme provides that the 2007-2013 policy mix will be largely continued, with some new measures, e.g. innovative and pre-commercial public procurement, support for product validation and integration into the European infrastructures. Continuity ensures stability of R&I policies. On the other hand, by the end of 2013 it was not entirely clear how the weaknesses of the previous period will be solved, e.g. how the valleys / joint projects will be realigned with clusters, if/how it is intended to invest into the entrepreneurial discovery processes, how the public-private or business-to-business collaboration platforms will be facilitated, etc. Moreover, it is a huge challenge ahead for Lithuania to adjust its governance to fit with the new demanding role it is expected to play for the successful implementation of smart specialisation.

The assessment of alignment between the national policy mix and the ERA priorities shows that the national policy is only formally aligned with the key ERA priorities, and the objectives of trans-national collaboration, open market for researchers as well as gender equality and gender mainstreaming need urgent policy attention. The national progress towards these Innovation Union Commitments should be strengthened (progress is weak or there has not been any national involvement):

- Member State strategies for researchers' training and employment conditions, integrated policies to attract the best researchers (from abroad), and scientific cooperation with third countries;
- Public Procurement and public sector innovation; European Social Innovation pilot;
- Venture capital funds, EU Patent, European Knowledge Market for patents and licensing, open access and knowledge transfer, as well as safeguarding intellectual property rights;
- European Innovation Partnerships and Global Research Infrastructures.

TABLE OF CONTENTS

1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

Lithuania is a small country with less than 0.6% of the total EU27 population (3m inhabitants in 2012, according to Eurostat). The country's economy experienced the European Union's second-worst recession in 2009, when real GDP per capita fell by 14% compared to 2008 and stood almost 70% below the EU27 average (€6,900 per inhabitant). During 2010-2013 the country demonstrated signs of an economic recovery: in 2010 the real GDP grew by 1.5%, in 2011 – by 5.9%, and in 2012 the increase was 3.7%, making Lithuania one of the fastest growing economies in the EU.

Since joining the EU, RTDI policy has rapidly grown in importance. The breakthrough was achieved after the Government reached an agreement to invest a significant amount of funding (10% of the total EU structural assistance for 2007-2013) into research. A versatile mix of new policy instruments and competitive research programmes was planned; most of investments started in 2009-2010. Moreover, in 2013 the Government put emphasis on the effective R&I policy system by approving the Lithuanian Innovation Development Programme for 2014-2020 and by establishing the Science, Technology and Innovation Agency in 2010. According to the 'National Development Programme 2014-2020' issued in 2012, Lithuanian authorities have set a national R&D target: R&D intensity in Lithuania should account for 1.9% of the national GDP in 2020, of which 0.9% should be contributed by private (business) investment. 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.

The stable low-medium tech dominated structure of private knowledge demand, low numbers of newly created knowledge-intensive companies and a low rate of entrepreneurship have so far made it difficult to reach the national commitment to the target, especially on the private side. Lithuania's gross domestic expenditure on R&D fluctuates within 39-45% of EU-27 average. R&I funding indicators demonstrated positive trends during the last four years, but the rate of change is too slow to bridge the gap. According to Eurostat data, total GERD in Lithuania increased by more than €70m over 2009 - 2012. The Business enterprise R&D expenditure (BERD) as a percentage of total GDP increased from 0.20% in 2009 to 0.24% in 2012 (an increase of 35% in absolute figures). The total intramural Government R&D expenditure (GOVERD) fell from 0.44% in 2009 to 0.36% of the total GDP in 2012 (however, it remained almost the same in absolute terms in 2012 compared to 2009).

The 14 universities form the backbone of the Lithuanian research system. The majority of governmental research institutes merged with these universities in 2009-2011. The higher education sector is the main R&D performer: HERD accounted for 54.3% of GERD in 2011. Government sector in 2011 performed roughly 19.6% of all R&D. In terms of international publications, the most productive are the biomedicine and medicine science fields (especially, 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 (Bumelis V. et. al., 2012).

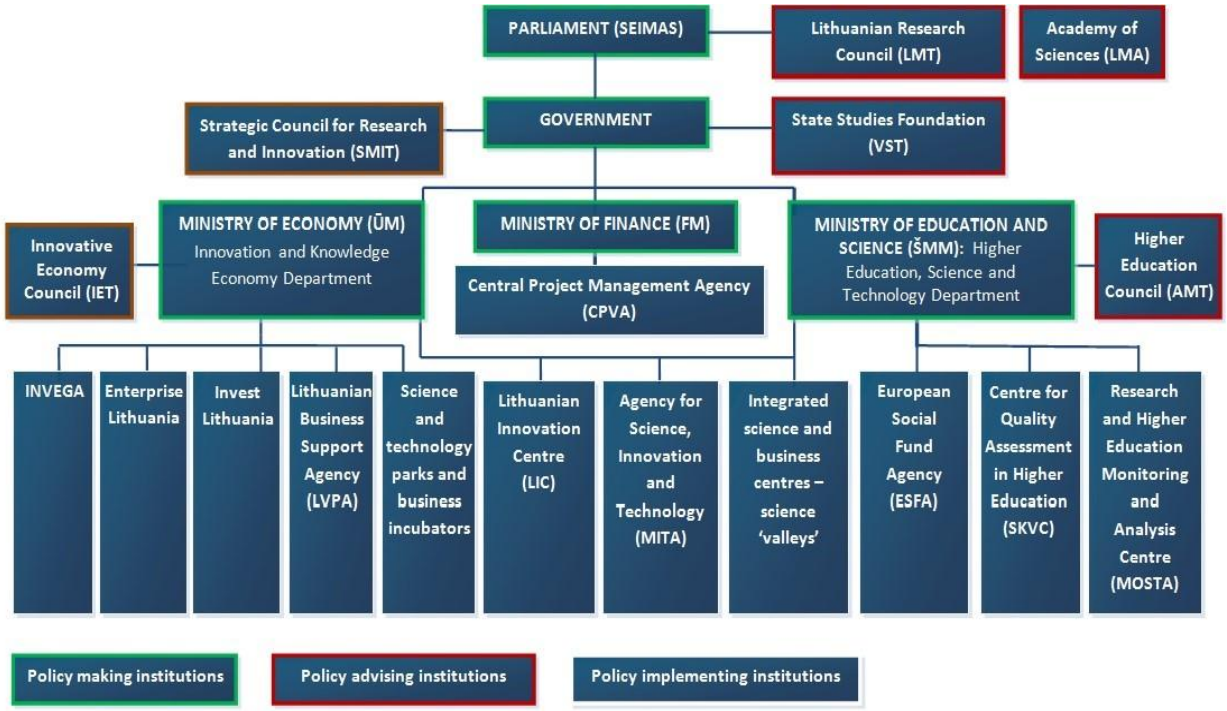
The share of R&D performed by the Business sector constituted 26.1% of all R&D in the country. In terms of economic specialisation, Lithuania remains a country of predominantly traditional economic sectors (transport and logistics, food and beverages, textile, wood and furniture), that so far have not 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.

Lithuania is among the EU-27 leading countries in producing tertiary education graduates, including those with science and technology education. Nevertheless, the country lags substantially behind both the leading and the catching up EU-27 countries with regard to the capacity to produce and commercialise knowledge. Weak effectiveness of the research system gave impetus for the extensive research and higher education sector reform with a re-focus on research and studies quality. The reform gained acceleration in 2009-2010: student vouchers[1], performance based research funding and peer review based external evaluation of research institutes were introduced; network of research institutes optimised; HEIs gained full autonomy, and the governance of HEIs was under reform. A government change took place with the October 2012 elections. One of the key goals of the current Government is to abolish the system of 'student vouchers'. The decision on the new higher education funding model is pending.

The two *principal governing bodies,* shaping R&D 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 (mainly public) R&D 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 1 below) are responsible for funding of research and innovation, and several other institutions are responsible for regulating the field and/or providing specific services.

Figure 1. Overview of Lithuania's research and innovation system governance structure



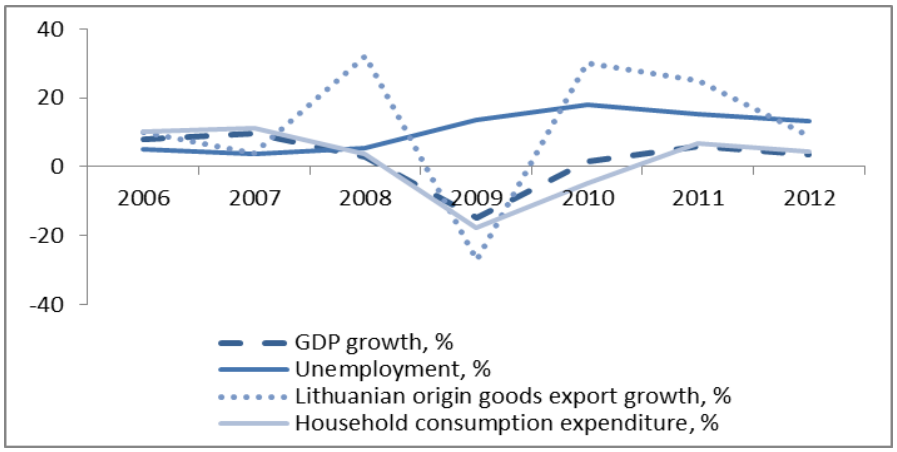
[1]According to the voucher based funding system, student' decisions to choose particular HEIs and programme determine the amount of funding the HEI receives from the Government.

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

2.1. National economic and political context

The Lithuanian economy continues to recover after the peak of the crisis in 2009 recording rather stable growth of 3.7% in 2012 and 3.3% in 2013[2]. With slowing down growth in domestic demand, export becomes the key contributor to economic development growing by 25% in 2011 and 9% in 2012 (see Figure 2). The economic recovery, however, is not sufficiently large to spur job creation and the level of unemployment remains 10.5% at the end of 2013 (source: Lithuanian Labour Exchange). Exports will have enough strength to drive the economy in the nearest future, unless the main export markets (the EU and Russia) are stagnated.

Figure 2. Key indicators of Lithuania's economy development, 2006-2012



Source: Statistics Lithuania, 2012

The crisis clearly slowed Lithuania's structural change towards technology-driven industries while favouring capital and labour intensive industries. As a result the Lithuanian economy structure remains disadvantageous for rapid productivity growth and high value added activities development. Due to capital shortage industry was reluctant in investing. Manufacturing industry and other export-oriented sectors grew at impressive rates in 2012. Most of companies expanded their production volumes without increasing production capacity or hiring more labour force. Meanwhile decline in investment in 2012 shows that quite a few companies raised their production by upgrading their technologies or implementing innovations (despite of inflow of the EU funds for technology upgrading). However, the sectors, demonstrating strong performance in foreign markets — industry and agriculture — are likely to invest more (Paliokaitė and Kubo, 2013).

Unlike Latvia and Estonia, which re-elected the parties that had led them through austerity, the parliament elections in October 2012 led to the change in Lithuania's government. The coalition that took office in December 2012 consists of four parties. The largest is the Social Democratic Party of Lithuania, led by the Prime Minister Algirdas Butkevičius. The Labour Party, the Order and Justice Party, and a party representing the Polish minority complete the current coalition. It

[2] GDP at market prices, percentage change on previous period. Source: Eurostat. [25-03-2014]

replaced a center-right government under former Prime Minister Andrius Kubilius of the Homeland Union Party. The announced economic policy aims to foster job-creation and simulate further economic recovery. There are many challenges ahead. The new Government inherited an incomplete recovery from a crisis. Unemployment remains high - in Lithuania, it was 12.5 percent as of November 2013, down from its peak of 18.3 percent. Lithuania will need to press ahead with structural reforms to sustain even that reduced rate of growth. The previous government made some progress in reforming state enterprises, education, and pensions, but the incoming government may find it hard to maintain the momentum. Beyond these tasks, the new government faces a difficult problem of national energy policy. As a condition of entry into the EU, Lithuania shut down a Soviet-era nuclear plant that had supplied most of its electricity. Now it is dependent almost entirely on Russia for both electricity and gas. The outgoing government favoured construction of a modern nuclear plant to replace the old one, but the opposition preferred seeking less costly alternatives. The nuclear project was put to a nonbinding referendum at the time of last fall's elections, and lost by a two-to-one margin. The Government discusses an LNG terminal to bring in gas and a crash programme of energy upgrades for aging Soviet-era apartment buildings. It has not completely ruled out a new nuclear variant, although it is far from clear where the funding would come from for the above-mentioned options (Ecomonitor, 2013).

Lithuania took hold of the Presidency of the Council of the European Union in July 2013. By the start of 2014, the legislation and architecture had to be in place to launch Horizon 2020, which includes the European Institute of Innovation and Technology and Euratom. Efforts were needed to simplify project administration, improve researchers' mobility and career prospects, make Europe a more attractive destination for researchers, and engage more strategically in cooperation with third countries. Hence, Lithuania's government was leading European discussion and continuing national reforms at the same time (Paliokaitė, 2013a).

2.2. Funding trends

2.2.1. Funding flows

The National Reform Programme of Lithuania (adopted in 2013) has set the national R&D target of 1.9% of GDP by 2020, and a target of 1.86% by 2015. 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 four years. The intensity of R&D funding in Lithuania measured as the GERD percentage of GDP in 2012 remained almost the same as in 2011 0.9% of total GDP in 2012. According to Eurostat data, total GERD in Lithuania increased by more than €70m over 2009 - 2012. The Business enterprise R&D expenditure (BERD) as a percentage of total GDP increased from 0.20% in 2009 to 0.24% in 2012 (an increase of 35% in absolute figures). The total intramural Government R&D expenditure (GOVERD) fell from 0.44% in 2009 to 0.36% of the total GDP in 2012 (however, it remained almost the same in absolute terms in 2012 compared to 2009).

In 2012, GOVERD as a percentage of GDP in Lithuania (0.36% or €118.43 m in total) was below the EU28 average (0.68% in 2011). Moreover, in terms of GOVERD per capita, Lithuania with €39.4 was sharply below the EU28 average (the Eurostat's estimate is €171.1 per inhabitant in 2011). The contrast in terms of BERD was much sharper: Lithuania's BERD (0.24% of total GDP) as a percentage of total GDP was only 18% of the EU28 average (1.3% of the total GDP). The respective figure for BERD was even more pronounced: €26.3 per inhabitant in Lithuania compared to €332.8 per inhabitant on average in the EU28. In terms of GERD per

capita, Lithuania (with €98.9 per inhabitant) is only above Cyprus (€96.1), Poland (€89), Croatia (€77.2), Latvia (€71.7), Bulgaria (€34.6) and Romania (€27.6) and differs significantly from the EU28 average (€527.6).

Table 1. Basic indicators for R&D investments*

	2009	2010	2011	2012	EU (2012)**
Real GDP growth rate per capita	-13.9	3.7	8.3	5.1	-0.6
GERD (% of GDP)	0.84	0.8	0.92	0,9	2,06
GERD (euro per capita)	70.2	69.9	92.6	98.8 (provisional)	527.6 (provisional)
GBAORD - Total R&D appropriations (€ million)	139.22	118.05	126.22	119.61	90 690.52
R&D funded by Business Enterprise Sector (% of GDP)	0.20	0.23	0.24	0.24 (provisional)	1.3
R&D performed by HEIs (% of GERD)	52.2	53.06	54.21	53.74 (provisional)	23.7 (estimated)
R&D performed by Government Sector (% of GERD)	23.41	17.54	19.58	19.67 (provisional)	12.35 (estimated)
R&D performed by Business Enterprise Sector (% of GERD)	24.39	29.40	26.22	26.6 (provisional)	63.08 (estimated)
Share of competitive vs. institutional public funding for R&D	No data	No data	No data	No data	No data
Venture Capital as % of GDP	No data	No data	No data	No data	No data
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	2.1%	1.9%	1.7%	1.8%	No data
Employment in knowledge-intensive service sectors as share of total employment	3.7%	4.5%	4.8%	4.9%	No data
Turnover from Innovation as % of total turnover	9.6% (2008)	6.6%	No data	No data	13.4% (EU-27, 2010)

Source: Eurostat, December 2013.

Overall, the economic crisis has not had a major impact on public R&I funding in Lithuania. The majority of R&I funding comes from the EU structural funds based on multiannual planning. There were no shifts in funding sources over 2012-2013. Hence, the research and innovation budgets were 'secured' in 2010–2013. Moreover, the implementation of most R&I measures introduced during 2009-2011 gained acceleration in 2011-2013, influencing increase in the real R&I policy expenditures.

As noted, the current R&I 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). Trans-national/trans-regional funding is applied to a relatively limited extent. For example the Eurostars and other programmes promoting transnational cooperation, five bilateral/multilateral research programmes are implemented (the annual budget of bilateral/multilateral programmes is about €1m).

2.2.2. Funding mechanisms

Competitive vs. institutional public funding

After the heavy public research and education funding and the governance reforms carried out in 2008-2011 (see Erawatch country reports for 2010-2012), the share competitive funding of research has increased. The text below is based on LT ERA Communication fiche (Paliokaitė, 2013b)

The new Law on Higher Education and Research (adopted in 2009) and accompanying bylaws led to considerable increase in the share funds that are allocated through competitive procedures. The reforms had the largest impact on two streams of funding for public higher education institutions (HEIs) and research institutes: basic funding, grants for research projects (allocated through competitive procedure by Research Council of Lithuania (LMT)).

The Government decision (adopted in 2009 and subsequently amended in 2010 and 2012) on the method for allocation of budgetary appropriations for R&D for public higher education and research institutions[3] stipulated that higher share of basic funding should be linked to research performance. The Decision established that 40% in 2010 and 50% in 2011 and subsequent years of basic funding will be allocated to public HEIs and research institutions on the basis of results of assessment of R&D activities. The remaining 50% as of 2011 are allocated on the basis of "normative number of staff" that is approved for each institution by the decree of Minister of Education and Research.

The "competitive" half of basic funding from 2012 onwards are reallocated every three years taking into consideration the results of assessment of R&D activities. The ministerial decree adopted in 2012 November 15[4] stipulates that assessment of R&D activities is based on four criteria: a) funding received from participation in international research projects; b) funding received from R&D contracts with private establishments; c) public funding from participation in joint R&D projects with private establishments; d) results of evaluation of research production. The latter focuses on publications and patents and is annually carried out by LMT in accordance with the principles of international peer review. These criteria are given unequal weights for assessment of R&D activities in different fields of science. For example, results of evaluation of research production are given the highest weight in social sciences and humanities (80%) as well as physical and biomedical sciences (55%). Assessment of R&D activities in other fields of science mostly depends on institutions' capacities to attract funding from privately and internationally funded R&D projects. It was expected that linking public basic funding with the capacity to attract additional funding should create incentives for institutions to increase the relevance of their research programmes.

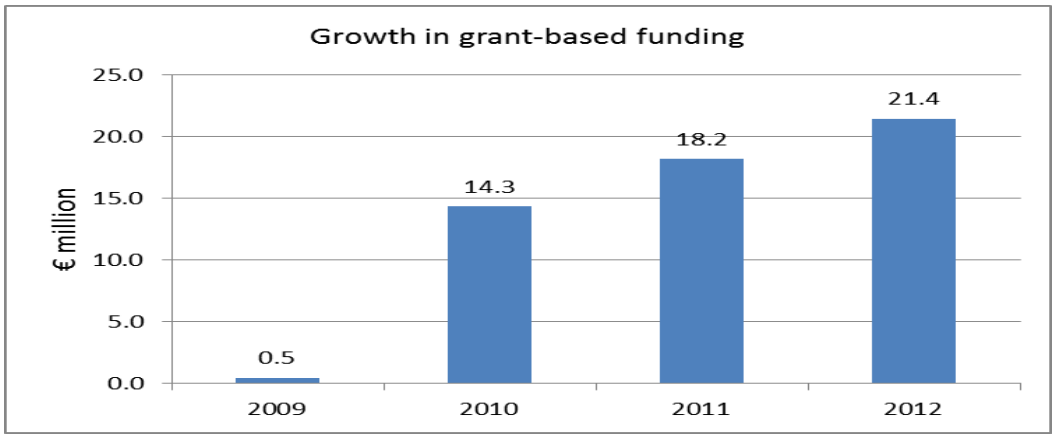
[3] LR Vyriausybės nutarimas dėl LR valstybės biudžeto lėšų moksliniams tyrimams, eksperimentinei (socialinei kultūrinei) plėtrai ir meno veiklai plėtoti valstybinėms mokslo ir studijų institucijoms skyrimo tvarkos aprašo patvirtinimo, Nr. 76-3103, 2009 September 27.

[4] LR švietimo ir mokslo ministro įsakymas Dėl valstybinių mokslo ir studijų institucijų bazinio finansavimo lėšų, skirtų moksliniams tyrimams, eksperimentinei (socialinei, kultūrinei) plėtrai ir meno veiklai plėtoti, paskirstymo 2013 metams tvarkos aprašo patvirtinimo, Nr. V-1562, 2012 November, 15

As of 2009 State Research and Higher Education Fund was abolished and LMT acquired the functions of a funding agency. It provides grants to research projects through competitive calls for proposals that are subject to peer review. The scale of grant-based funding has significantly increased and reached more than €21m in 2012 (see Figure 3). The funding is allocated through a number of programmes, "Promotion of High-Level International Scientific Research" is one of the latest measures approved in 2012.

In 2013, the basic funding for public HEI and research centres amounted[5] to approx. €60m so that €38m (62%) were allocated to R&D activities and €22m (38%) to administrative activities. Another €19m were allocated on competitive basis by the agencies LMT and MITA. In total, in 2013, the competitive funding constituted 33% of total budgetary appropriation for research activities (€57m), similarly to 2012, when €20m or 34% of total funding allocated to competitive R&D funding. Only the national budget sources, excluding the EU structural funds, approx. €100m per year, are included in these calculations. The exact ratio of competitive versus State planning (institutional) funding for R&D using EU structural funds is unknown as the national authorities do not monitor it on an annual basis. The above-mentioned approx. €100m per year include both competitive funding for public R&D (approx. €19m in 2011) and State planning measures that consume the largest part of the EU structural support for public R&D (e.g. funding for large research infrastructures constituted approx. €60m in 2011). State planning is institutional R&D funding method with competitive funding elements – best R&D infrastructures are funded, however it cannot be assumed that the selection of 'best' infrastructures follows the international standards of competitive funding (international peer review, rigorous procedures etc.).

Figure 3. Growth in grant-based funding of LMT, 2010-2012



Source: Research Council of Lithuania (2012). Research Council of Lithuania: 2011-2012. Start of a new decade.

Government direct vs indirect R&D funding[6]

There are no changes to report since 2012. Direct support grants dominate competitive R&I 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.

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-

[5] The data was provided by the Ministry of Education and Science.

[6] ***Government direct R&D funding*** includes grants, loans and procurement. *Government indirect R&D funding* includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

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).

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. 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 the implementation of the innovative public procurement and the pre-commercial procurement instruments. 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 pre-commercial 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 in November 2012) contains a set of demand-side innovation policy measures, e.g. innovative public and pre-commercial procurement, regulation, financial and tax incentives for innovation consumers.

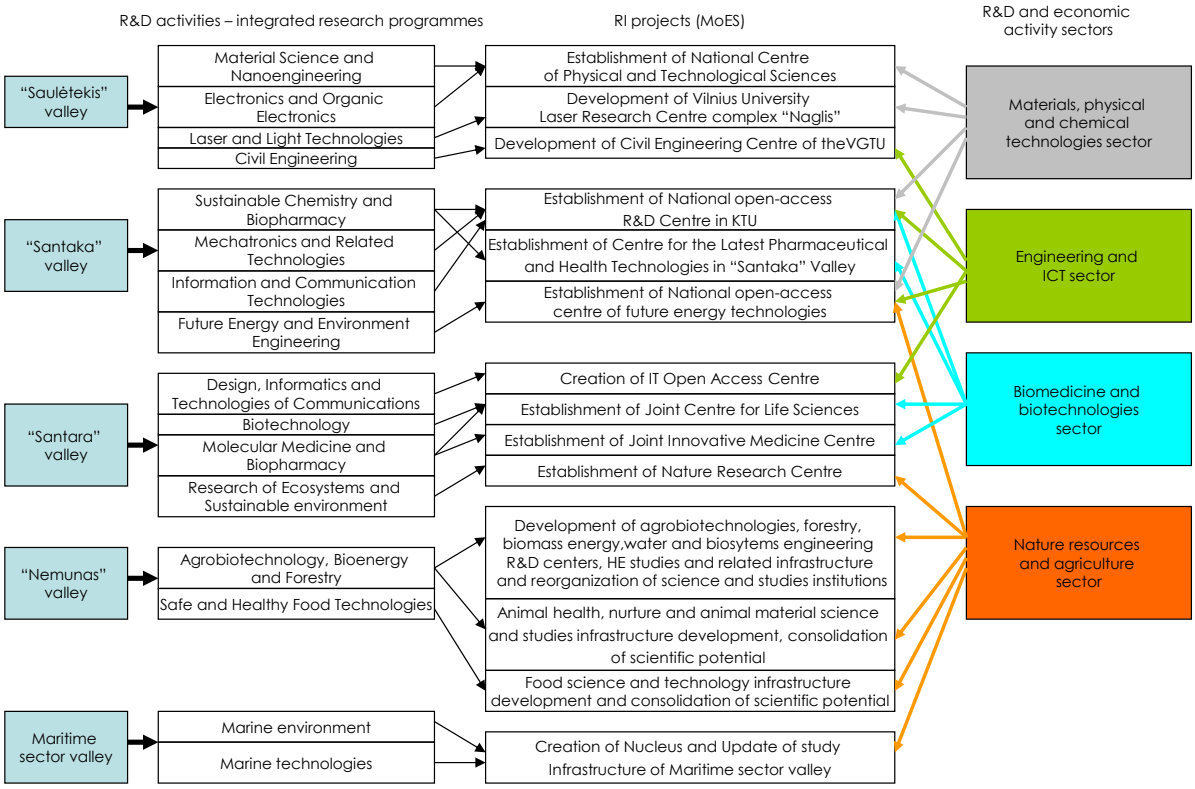
2.2.3 Thematic versus generic funding

Clearly defined thematic/sectoral R&D funding comprises less than 10% of the total R&I funding (for example, the annual budget of the six thematic national research programmes is less than 2% of the total annual competitive funding for R&I).

Although there are no official or publicly available calculations on the ratio between generic and thematic/sectoral R&I 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.

Establishment of the 'valleys' was driven by the need to build critical mass in several strongest fields of research and to foster inter-disciplinarily. Notably, Lithuania had not invested into existing research infrastructures (RI) for almost twenty years after gaining the Independence in 1991. Therefore the existing research infrastructures were not only outdated, but also suffered from a very fragmented structure. €450m are to be invested in building and upgrading existing research centres over the period 2010-2015, of which €300m will be used specifically for strengthening the leading RIs in the valleys (see Figure 4 on the thematic specialisations in the valleys).

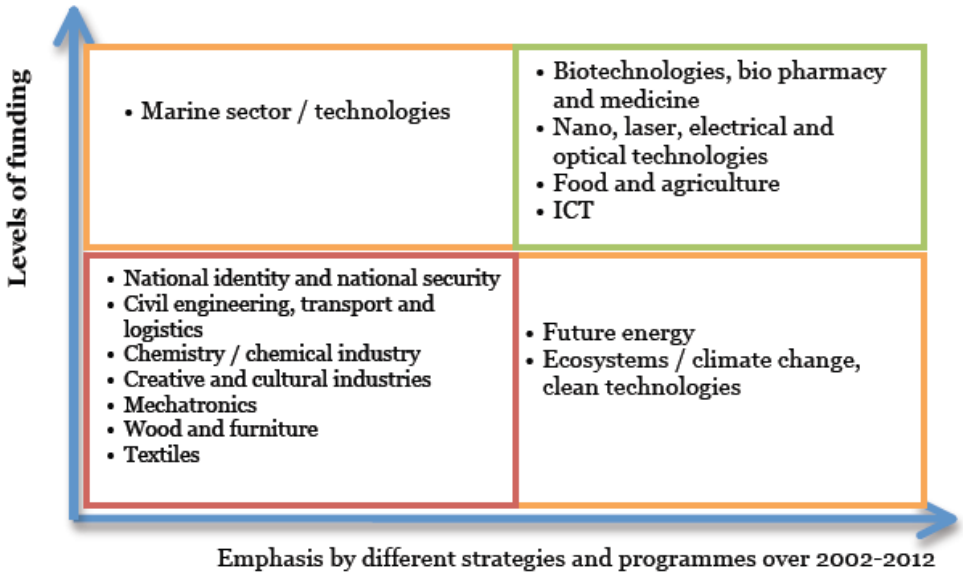
Figure 4. The 'specialisation' of the science 'valleys' in Lithuania



Source: the Ministry of Education and Science, 2013

Figure 5 highlights the fields that received or will receive the largest share of funding for R&D between 2007 and 2015 and summarises trends in setting the thematic priorities for investments into R&I.

Figure 5. Lithuania's investments into R&D priorities over 2007-2011



Source: Reid, Martinaitis and Paliokaitė 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 pharmacy and medicine; Nano, laser, electrical and optical technologies; Food and agriculture; ICT. No information is available on how current R&I funding in Lithuania is related to the grand challenges.

A process for defining the national R&I 'smart specialisation' priorities and designing the related R&I policy mix was ongoing since February 2013. By the end of December 2013 Lithuania approved six new priority areas and 20 'specific priorities' within the selected broader priority areas (see next sub-chapters). These priorities will guide the Structural funds investments into R&I over 2014-2020.

2.2.4 Innovation funding

It is difficult to assess the balance between research funding and innovation funding as R&D is often a crucial part of the innovation development cycle. Also, innovation in a broad sense can cover many forms of innovation, including social, public sector, organisational innovations etc. When assessing the balance between research funding and innovation funding, this Report takes a stance that there are three groups of measures:

a) Those indirectly contributing to innovation (e.g. access to finance for business development, facilitation of organisational innovations in business);

b) Direct funding for R&D and innovation (further on – R&I) with the specific aim to facilitate development of innovative products and services to be later introduced into the market;

c) Direct funding for research activities not necessarily aimed for commercialization, including mostly basic research activities of the public sector organisations (universities and research institutes).

Table 2 below presents an overview of the budgets that are related to research and innovation (in a broad sense), based on the latest data available (year 2011). This picture more or less represents overall balance of budgets dedicated to specific innovation and growth related policy aims.

Table below shows that, first, about 52% of budgets in 2011 were spent on creation and growth of enterprises (organisational innovation, technology acquisition, FDI attraction and access to finance for business development). These measures were not specifically designed to support research and innovation, but they directly or indirectly contribute to the development of innovative businesses and non-R&D innovation.

Second, only a small part of budgets (about 12% in 2011) are annually dedicated directly for business R&I activities. Moreover, these measures over 2007-2013 period mainly focused on the "research" part of the R&D activities in business and did not cover the full innovation development cycle, for example, support for development and validation of prototypes was not available. Lessons were learnt and the measures for SME innovation designed for the 2014-2020 period are covering the full innovation cycle from idea to the market (including prototype development, pilot lines, demonstration, validation, etc.).

Third, a substantial part of funds (36.32% in 2011) over 2007-2013 were annually dedicated for (basic/fundamental) research activities and related infrastructure upgrade mainly in the public sector.

Table 2. Funds transferred to the beneficiaries, 2011

Classification	Measures	% of total funds transferred to the beneficiaries
R&I FUNDING **Target group – mainly business organisations. Managing agencies: LVPA, MITA**		
Innovation-friendly environment	• Innovation support services and investments into institutional/absorptive capacity (Inogeb LT group of measures), • Assistant-2 (construction of technology and art incubators)	2.33%
Technology and knowledge transfer and cluster cooperation	• Inocluster LT/ LT+, R&D thematic networks and associations • Innovation vouchers	1.29%
R&D in firms	• Idea LT, Intellect LT, LT+	8.44%
INDIRECT INNOVATION FUNDING **Target group –business organisations. Managing agencies: LVPA, INVEGA**		
Creation and growth of enterprises (SMEs competitiveness, Economy Development OP, Priority 2) NB: this group of measures is **not** specifically designed to support R&I	• Leader LT (production technology acquisition/upgrade in firms); • Process LT (organisational innovations); • Invest LT; Invest LT+, Invest LT-2, Assistant-3 (FDI attraction measures and development of industrial parks); • Controlling fund, Compensation of SMEs' credit interests, and Guarantees fund (general access to finance for business, financial engineering instruments)	49.19% (loans and guarantees – 32.09%, other – 17.10%)
Demand-side interventions	• E-business LT (facilitation of e-commerce)	2.43%
RESEARCH FUNDING **Target group – mainly HEIs and PROs. Managing agencies: LMT, CPVA, ESFA, MITA**		
R&D Infrastructure	• Economy Growth OP, Priority 1, investments into the development and upgrade of research infrastructures in the science, studies and business 'valleys'	25.82%
National and international programmes for (mainly) basic research	• Six National Research Programmes, • Programme of Industrial Biotechnology Development in Lithuania for 2011-2013, • High Technology Development Programme for 2007-2013, • bilateral and multilateral research programmes	3.91%
Human Resources for research	• 'Global grant', research mobility and other measures under the HR Development OP, Priority 3	6.59%
	Total	100% ~€230m

Source: based on Paliokaite A. (2012) Inno-policy Trendchart Mini Country Report, unpublished. Data provided by LMT, LVPA, ŠMM.

To summarize, the data suggest that balance between direct funding for research activities and innovation activities (including R&D for innovative products development) is not productive in terms of focus on innovative output, commercialization and growth. First, the current set of enterprise policies reinforces a general systemic tendency to favour technology absorption through capital investment over innovation. Second, policies targeting specifically R&I favoured investments into public research infrastructure and centres of competence versus commercialization of public research (e.g. through spin-offs), science-business collaboration and professional technology transfer services, or even direct funding for business R&I activities. This has tended to reinforce the existing trend of low investment in R&D and innovation by business sector and 'passive' adoption of technologies developed elsewhere. Limited funds for business

R&I activities can also be explained by small absorptive capacity. However, it is a complex issue, addressed by sub-chapter 3.2.

Also, as was already discussed in the previous Erawatch reports (Paliokaitė and Caturianas, 2012; Paliokaitė 2013c), the 2007-2013 policy mix tended to follow the 'linear model of innovation' perspective. It was 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 lacked a clear view about the systemic nature of the innovation process and the importance of non-technological dimensions. The terminology reflected in the policy documents, measures, projects and monitoring systems focused 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, was not captured, and key support elements for innovation development were missing. 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 (Paliokaitė and Kubo, 2013).

2.3. Research and Innovation system changes

There were no major changes between April and December 2013 – the structure of R&D providers and policy implementation agencies remained stable.

The Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) approved in late 2012 was a basis for the establishment of a new R&I policy coordinating body – the Strategic Council for Research, Development and Innovation (the Council). The Council was approved in May 2013 by the Prime Minister of Lithuania. Its main purpose lies in considering and providing the Government and governmental agencies with conclusions and recommendations for the R&I policy development and implementation in all economic sectors. Currently, the Councils centre of attention is appointed for warranting and guaranteeing smooth implementation of the Valleys concept in practice. This Council consists of 25 members - the high(est) positions holding representatives of the main stakeholders. Representatives are from the ministries and agencies, higher education and research institutions, associated business structures and independent experts. The Council is chaired by the Prime Minister of Lithuania.

2.4. Recent Policy developments

The four key longterm and midterm policy documents were introduced or revised in 2012: the National Progress Strategy 'Lithuania 2030', the National Progress Programme for Lithuania for the period 2014-2020 (NPP), the State Studies and R&D Programme for 2013-2020, and the updated Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) on 24 October 2012. These documents are discussed in more detail in Erawatch country report for 2012 (Paliokaitė, 2013c).

The year 2013 mainly witnessed ongoing processes of preparation for the period of 2014-2020, but there are no new policy decisions to report. Several ongoing processes could be mentioned. First, the Ministry of Economy launched an update of the Lithuanian Innovation Strategy for 2010-2020 –the new strategic document in the form of Lithuanian Innovation Development Programme for 2014-2020 was approved by the Government in December 2013. Second, the Ministry of Education and Science is working on a revision of the Law on Research and Studies. Key changes are expected with respect to the funding model of higher education – the current model of the 'student voucher' (introduced by the previous Government in 2009) will be

revoked. The decision on the alternative funding model is pending. Several alternatives were discussed by the time when this Report was prepared, including the introduction of a unified study payment for all students. However, the latter alternative contradicts the State Constitution which guarantees free higher education for best students.

Third, Lithuania launched a national foresight process aimed at defining the smart specialisation priorities and discussing the strategic policy framework with the key actors in the innovation system. Discussions on the methodology for defining the priorities have started as early as August 2012 whereas official launching by the Ministry of Education and Science was on February 2013. This process and its results are discussed in more detail in the subsequent sub-chapters.

Finally, the Ministry of Finance was leading a process on elaborating the Operational Programme (OP) for 2014-2020 and other programming documents related to the use of the EU's structural assistance, e.g. the Partnership Agreement. The draft version of the OP, namely its Investment Priority 1 and its objectives 1 and 2 are related to the implementation of the R&I policy measures for smart specialisation. From the draft OP[7] it seems that the 2007-2013 policy mix will be largely continued, with some new measures, e.g. innovative public procurement and pre-commercial procurement, support for product validation and integration into the European infrastructures. Continuity ensures stability of R&I policies and investments. However, at the time when this Report was drafted it was not entirely clear how the weaknesses of the current period such as the lack of synergies between the measures of different institutions will be solved, if/how it is intended to invest into the entrepreneurial discovery processes, how the public-private or business-to-business collaboration platforms will be facilitated, and especially - how the valleys / joint R&D projects will be realigned with clusters, etc. There could be several implementation scenarios (for example, the clusters could act as platforms around which joint R&D projects are initiated), however the key message is that these policy measures should be coordinated. Sub-chapters 3.2 and 3.3 discuss the remaining policy challenges in more detail.

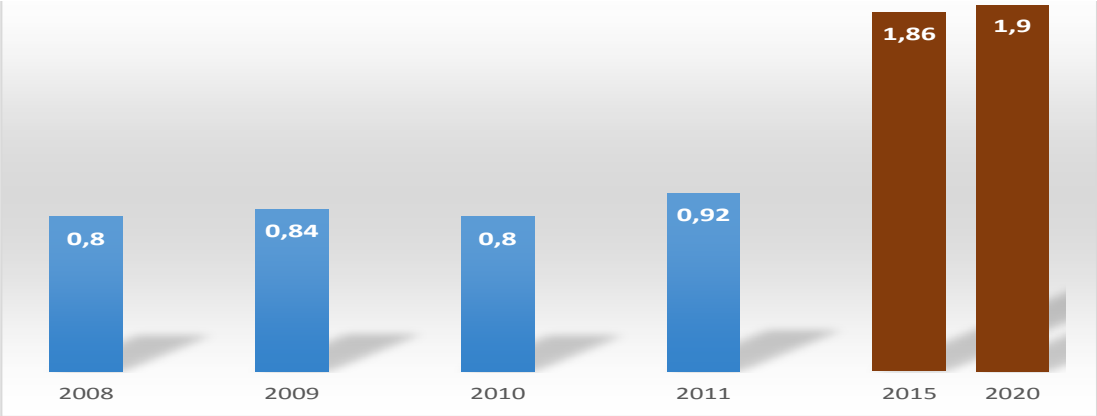
2.5. National Reform Programme 2013 and R&I

The National Reform Programme 2013 set out one target with R&I relevance - the Gross domestic expenditure on R&D (GERD) should reach 1.9% of GDP by 2020.

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). However, only if the GDP, GERD and BERD growth rates remain at least at the level of 2010-2011 (e.g. the private R&D investments grew by 16%), Lithuania may be able to bridge the gap and meet the 2020 R&D targets. However, the NRP 2013 target for 2015 (1.86%) does not seem realistic.

[7] Version of December 2013.

Figure 6. Gross domestic expenditure on R&D, % of GDP; NRF targets for 2015, 2020



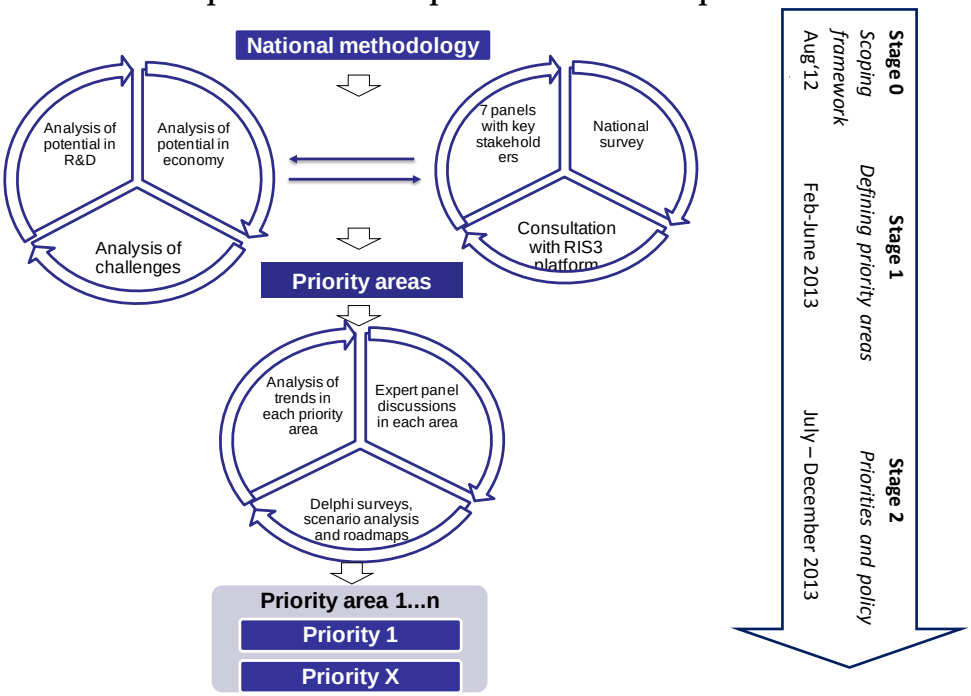
Source: Eurostat, 2013; NRF 2013

2.6. Recent evaluations, consultations, foresight exercises

The process for identifying the national R&I priorities and drafting the Smart Specialisation Strategy for 2014-2020[8] is the key analytical – consultation initiative launched in 2013 and still ongoing at the beginning of 2014. In spring 2013, the Lithuanian Ministry of Education and Science and Higher Education Monitoring and Analysis Centre (MOSTA) launched a process for identifying the smart specialisation priorities. MOSTA got a mandate for coordinating the process. An International Independent Expert Group (IIEG) consisting of the national and international experts, implementing agencies and social-economic partners was formed in March 2013 to provide conclusions on the current R&I potential and recommendations on the priorities for smart specialisation as well as routes how the priorities should be implemented.

A three-staged design was adopted (see Figure 7).

Figure 7. Stages and methods adopted in the R&I priorities definition process



Source: Paliokaitė, Martinaitis, Reimeris, 2013

[8] More on smart specialisation process in Lithuania available at: http://www.mosta.lt/en/smart-specialisation

The Stage 1 analysis found out that:

- The most prominent sectors in economy are the traditional ones (e.g. food industry, transport) accounting for the largest share in value added, employment and leading in the Lithuanian exports. However, to sustain the competitiveness also in the future they face the need of upgrading and diversification. For the time being, the majority of enterprises in these sectors are consumers rather than creators of innovation. At the same time, the R&I potential in the Lithuanian economy lies within emerging high-medium high tech sectors like biotechnology and pharmaceuticals, information technology (both manufacturing and services), and engineering industry (manufacturing of metals and machinery), which are still rather small with little to contribute to Lithuania's economy in terms of value added and employment (Martinaitis et al. 2013).
- From the overall modest R&D efforts, fields as physics and material sciences, chemistry and biological sciences/ life sciences as well as medicine stand out in terms of excellence, while engineering and computer sciences as well as some social sciences demonstrate significant strengths in establishing links to business and attracting business R&I investment (Valinčius et al. 2013).
- The analyses on the long term challenges facing Lithuanian society and economy found out that the most critical challenges are the social challenges (e.g. social inclusion and social capital, mismatch between skills and market demand etc.) as well as energy efficiency and effective energy supply issues.

Based on the analyses made and the results of 7 panel discussions with stakeholders, six priority fields and sub-fields (see Table 3) were identified by IIEG as the ones where a breakthrough can be expected through the collaborative business-science efforts. The priority fields were mapped according to the following criteria: (1) high potential to increase global market share of Lithuanian ventures and commercialise available knowledge; (2) high R&I potential in private and (3) public sector; (4) can provide an appropriate response to the national and global challenge(s). Additionally the IIEG mapped the potential priority fields with 'valleys' – integrated research, studies and business centres which stand for largest investment in R&D infrastructure during the Structural Funds programming period of 2007-2013 for Lithuania. The 'Inclusive and learning society' did not meet all the criteria, however after prolonged discussion it was approved as responding to the highest rated social national challenges.

The priority areas were too broad and all-inclusive, hence it was the task of the *Stage 2* to come up with more specific specialisations within those fields. These specialisations (the specific priorities) were identified on the basis of a thorough analysis of trends and strengths of each field; a stakeholders' consensus on specific priorities; businesses' commitment to co-finance implementation of priorities; and research group's commitments to take part in the implementation of priorities. Table 3 presents the specific priorities that were proposed by the expert panels and approved by IIEG in December 2013.

Table 3. Results: suggestions by the International Independent Experts Group on the R&I priority areas and specific priorities

Priority areas (proposed by IIEG *and* approved by the Government)	Long term challenges	Research potential	Business role	Priorities (sub-fields in which tangible structural changes can be expected), proposed by the IIEG in December 2013
Efficient energy system and sustainable environment (Priority field approved by the Government in October 2013: **Energy**	*** E.g. high energy prices, inefficient use of energy.	High/having prospects	'Consumers' (except ICT)	1. Smart systems for generators, grids and users energy efficiency, diagnosis, monitoring, accounting and management. 2. Energy and fuel production from biomass or waste, storage and disposal of waste.

Priority areas (proposed by IIEG *and* approved by the Government)	Long term challenges	Research potential	Business role	Priorities (sub-fields in which tangible structural changes can be expected), proposed by the IIEG in December 2013
and sustainable environment)				3. Smart low energy buildings development and maintenance technology – digital construction. 4. Solar energy equipment and their use for power, heat and cool production.
Health, health technologies and biopharmaceuticals (Priority field approved by the Government in October 2013: **Health technologies and biotechnology**)	* E.g. ineffective prevention, diagnostics and treatment of chronic diseases.	High	'Creators' and 'Consumers'	5. Molecular technologies for medicine and biopharmacy. 6. Intelligent applied technologies for personal and public health. 7. Advanced medical engineering for early diagnostics and treatment.
Agroinnovation and food technologies (Approved by the Government in Oct 2013)	* E.g. food wastage, lack of new nutrition sources.	Having good prospects	'Consumers'	8. Safer food. 9. Functional food. 10. Innovative development, improvement and processing of bioresources (biorefinery).
New processes, materials and technologies for industry (Approved by the Government in Oct 2013)	* E.g. low business productivity and lack of advanced technologies.	High	'Creators' and 'Consumers'	11. Photonic and laser technologies. 12. Functional materials and coatings. 13. Construction and composite materials. 14. Flexible technological systems for product design and manufacturing.
Transport, logistics and e-systems (Priority field approved by the Government in October 2013: **Transport, logistics and ICT**)	* E.g. the potential of smart technologies in managing logistics and transport flows.	Having good prospects	'Consumers' (except ICT & engineering industry)	15. Intelligent transport systems and information as well as communication technologies. 16. Models/technologies for management of the international transport corridors and integration of different types of transport. 17. Technologies for developing advanced e-content and information interoperability. 18. Solutions and services for ICT infrastructure and cloud computing.
Inclusive and learning society (Priority field approved by the Government in October 2013: **Inclusive and creative society**)	*** E.g. gap between skills and labour market needs.	Having good prospects/ emerging	'Consumers' (except ICT)	19. Modern learning technologies and processes. 20. Technologies and processes for breakthrough innovations.

Notes: * Responding to the challenges which have been identified as very important in the analysis; *** Responding to the challenges which have been identified as very important in the analysis and which have been identified by most stakeholders as key challenges for Lithuania.
Source: IIEG (2013); Paliokaite, Martinaitis, Reimeris (2013); Visionary Analytics, Valinčius, Pundzienė (2013).

The list of R&I priorities will be used as a background for practical implementation of national R&I and industrial policies. Next step is initiation of discussions on the instruments of implementation of the strategy for smart specialisation. Such instruments should include both horizontal and subject measures necessary to achieve a substantial breakthrough in innovation, and ensure compatibility and coordination of measures (Paliokaite, Martinaitis, Reimeris, 2013). Six panel discussions were launched in January-February 2014 and policy roadmaps were prepared. The 'policy roadmaps' developed for each specific priority describe targets (e.g. what products and technologies will be developed), policy measures and their implementation over time, etc. These roadmaps will become the basis for thematic R&I priority development

programmes. The consensus on the R&I priorities development achieved in the course of expert panels and other activities should create a platform for further concerted actions and policies that are consistent not just with national strategies but could be shared by all parties involved in their implementation.

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

The process for defining the RIS3 priorities is described in the previous sub-chapter. Sections below discuss the features of the RIS3 approach adopted in Lithuania (as far as it was known at the time of drafting the Report).

The priorities for future areas of specialisation. A traditional approach to priority setting in Lithuania in 2000-2012 has focused on identification of research fields or R&D sectors. ICT, biotechnology, civil engineering or agriculture are all examples of such sector-based approach. However, the focus on sectors has a number of drawbacks:

- It impedes rather than facilitates inter-sectoral cooperation that is needed for the development, commercialisation and spill-overs of innovations;
- It is focused on measurable statistical units, but neglects cross-sectoral challenges (for e.g. climate change) or opportunities (for e.g. application of mobile communication technologies in a broad range of new areas). As a result potential synergies remain unexploited.
- It is not sufficiently focused on expected outcomes that implementation should aim to achieve. This impedes management of implementation and accountability to the society.
- It emphasises competitiveness or growth of identified sectors, which does not necessarily lead to tackling the most prominent challenges faced by the society (Paliokaite, Martinaitis, Reimeris, 2013).

In contrast to the traditional approach, the current approach adopted in Lithuania seeks to (1) foster interactions between sectors by (2) linking priorities with emerging opportunities and challenges and (3) focusing on measurable outcomes. Accordingly *priority area* is understood as a field of concerted actions of government, research and business community with the highest potential in responding to key emerging drivers and challenges that could have a significant effect on Lithuanian R&D and innovation system and competitiveness of the economy. *Priority* refers to the development of new output – technology or process – that has high potential to transform Lithuanian economy. The 20 thematic priorities (specialisations) were approved in December 2013.

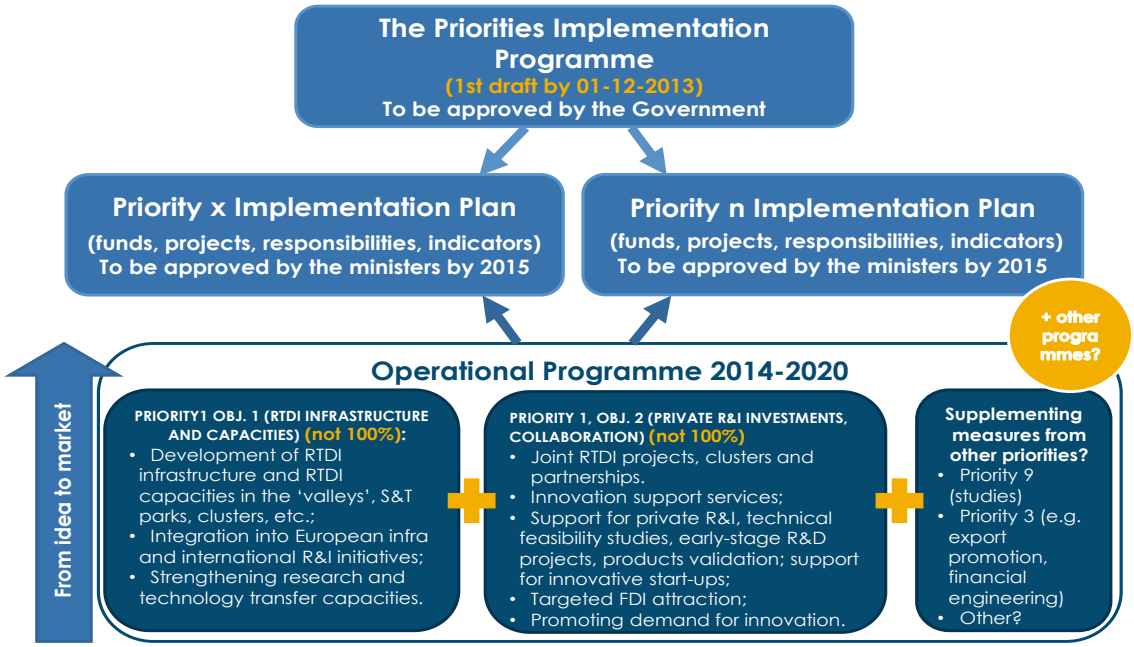
The priority areas and priorities were defined following the carefully designed process involving analytical and participatory /consultation methods as well as stakeholder consultation, involving both entrepreneurs and research communities, as well as public authorities.

Placing RIS3 in the existing structure of strategies and priorities. At the time when the Report was drafted the discussions on whether there should be a separate national level strategy for the implementation of smart specialisation were ongoing. The prevailing opinion was that there is no need for a separate strategy - the set of strategic R&I policy documents is already 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), Lithuanian Innovation Development Programme 2014-2020, the State Studies and R&D Programme for 2013-2020, as well as the (draft) Operational Programme for 2014-2020. Therefore RIS3 will be designed on the basis of already existing documents. The updated (as of autumn 2012) Concept of the Establishment and Development of Integrated Science, Studies and Business Centres (Valleys) provides that research and innovation priorities are to be approved by the Lithuanian

Government, and the RIS3 process should also feed the *Priorities Implementation Programme* to be approved by the Government. Figure 8 pictures how the authorities pictured linking RIS3 to the existing policy documents[9]. It is foreseen that the Operational Programme for 2014-2020 will be the main funding source for implementing the smart specialisation priorities.

[9] NB: this information refers to the policy debate of October-December 2013.

Figure 8. Emerging RIS3 implementation structure



Source: draft Priorities Implementation Programme (December 2013); Paliokaitė (2013d).

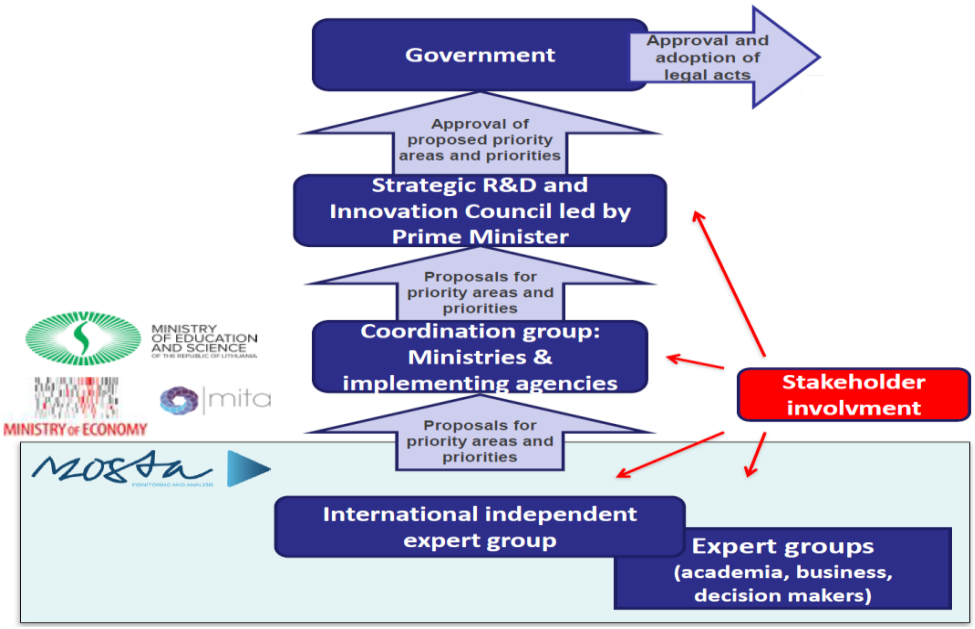
The draft Priorities Implementation Programme, prepared by the Ministry of Education and Science in December 2013, in consultation with the Ministry of Economy and other institutions, provides the basic principles for implementing the smart specialisation priorities, such as the rules for choosing and approving the new priorities, monitoring and review procedures, key implementing bodies and their responsibilities. The Priorities Implementation Programme also provides for the establishment of the coordinating structures, for example, a working group consisting of the key policy forming and implementing institutions. After the specific smart specialisation priorities and the Priorities Implementation Programme are approved by the Government, an implementation plans (specific thematic programmes) will be designed for each specific priority. The *Priority Implementation Plan* will discuss the topics of R&D and innovation, objectives and targets to be achieved by implementing each specific priority. Also, it will discuss specific policy mixes for the implementation of the priorities.

Lithuania is a small country, hence it is considered as one region in the future Smart Specialisation Strategy. The links and co-ordination mechanisms between the national and regional level will not be discussed in the Lithuanian Smart Specialisation Strategy or related documents.

Governance structure set up to define, implement and review the RIS3. Implementing the RIS3 is a huge governance challenge. The present governance mode in Lithuania is administrative and reactive rather than proactive and innovative. However to tap the potential of smart specialisation, public authorities and implementation agencies will need to behave less like traditional public bureaucracies and more like innovation animateurs, brokering new connections and conversations in the economy. Otherwise the entrepreneurial discovery and experimentation as the focal ideas of smart specialisation remain unexploited. Orchestration of policies affecting R&I performance would require both strengthened policy coordination and informed policy design processes. Moreover, sufficient attention and adequate resources should be granted to effective programme management. These have been one of the weakest links, including the risk-aversion in implementing R&I policies, weak capacities of administration, and poor management of programmes (Paliokaite and Kubo, 2013).

Governance structure set up to define the smart specialisation priorities and eventually the Smart Specialisation Strategy strives to include all key stakeholders (see Figure 9).

Figure 9. Governance structure set up to define the priorities and RIS3



Source: Lithuania's presentation for RIS3 platform, available to download at: http://s3platform.jrc.ec.europa.eu/documents/10157/120308/LITHUANIA.pdf

The process was led by the Ministries of Education and Science and Economy, but the informal Coordination Group, which approved the operational decisions of the process and the key decisions related to the implementation of the priorities, also included the Ministry of Finance, MITA, the Lithuanian Research Council, and MOSTA. The priority areas and the priorities were discussed and approved by both Strategic R&I Council and the Lithuanian Government (only the priority areas). The sectorial ministries (the ministries of Transport, Culture, Health, Social Security and Labour, etc.), their related agencies, and members of the science and business communities were involved in the process of setting the priorities.

Links between the RIS3 and the programming documents for the 2014-2020 EU funding cycle (Partnership Agreement and Operational Programme). The current EC regulations and communication provide that the OPs should be 'in line/consistent' with the smart specialisation strategy. This implies that up to 100% of funding allocated to thematic objective 1 (TO1, 'Strengthening research, technological development and innovation') has to be devoted to projects that are consistent with the strategy. This ex-ante conditionality is requested by the ERDF Regulations and eventually (still pending from Council and EP) by the EAFRD. However, it is not formally requested that only the selected 'priorities' are funded by TO1 funds - RIS3 can include potential and emerging fields that a country wants to exploit, it can define policy mixes to attract FDI – including tax exemptions, actions turned to the cooperation in Baltic region, etc. EC recommends (but it is not a formal conditionality) that RIS3 should contain all horizontal and specific measures that are required to achieve the 'vision' on how to improve innovation performance in the selected priority fields. Hence, ideally that the RIS3 strategy applies not only to TO1 but should be extended to other thematic objectives (notably TO3 on 'Enhancing competitiveness of SMEs'; TO2 'Enhancing access to, and use and quality of ICT' and TO4 'Support the shift to a low- carbon economy in all sectors') and draw on funding resources from a range of budgets (based on Paliokaite and Kubo, 2013).

RIS3 implementation in Lithuania is primarily linked to the 2014-2020 Operational Programme and its Priority 1 concerning R&I. The preliminary structure and planned group of measures of the Priority 1 of OP for 2014-2020 is depicted by Figure 8 and consists of both infrastructure and capacity building measures, innovation supply and demand side measures (e.g. pre-commercial procurement, public procurement of innovation). While the RIS3 implementation

structure (especially the policy mix) is being put in place and discussed, there are several observations:

- The prevailing RIS3 interpretation in Lithuania at the public debate is rather narrow as it mainly discusses the measures under thematic objective No.1 (TO1, 'Strengthening research, technological development and innovation'). It has to be made clear how the RIS3 implementation will relate to the human resources development (including the researchers' careers and supply of labour force) and export as well as FDI promotion (given the orientation towards global markets in the RIS3 logic and the current lack of critical mass in the innovative economy sub-sectors).
- It is not entirely clear how the weaknesses of the 2007-2013 period such as the lack of synergies between the measures will be solved, if/how it is intended to invest into the entrepreneurial search and emerging public-private or business-to-business collaboration platforms, how the valleys / joint projects will be realigned with clusters. It is up to the national authorities to come up with agreement on the referred solution. Also, it is imperative that the focus of 2014-2020 policies is on the 'soft measures' (capacity building, R&I activities, and services provision) in contrast to the investments into R&I infrastructure (here the focus should be placed on the technology transfer and research commercialisation capacities).
- Joint research and business cooperation projects (initiatives) between public and private sectors are portrayed as the key instrument for implementing the smart specialisation strategy. Lithuania does not yet have good practice in implementing such complex initiatives. It is crucial that the required preconditions are thought through, given the low collaboration culture and lack of ties between the public and private sectors, for example:
    - Investing into project pipeline building, facilitating new connections and new ideas - considerable efforts by MITA are needed (see also subchapters 3.2 and 3.3).
    - Facilitating permanent open innovation platforms around the priority areas with support for foresight, discussions, invited foreign experts, allowing international partners to join the 'projects consortiums', etc.
    - Acknowledging the different maturity of the priorities and at the same time putting more focus on the results, which would imply that the implementation of the 'joint project/initiative' is organised following a 'stage gate' process, where funds for the next stage are allocated if the required previous stage results are achieved (e.g. a viable collaboration consortium or cluster created, a valid research idea is created with high potential for commercialisation, the first research results are successful, the prototype is produced and validated, etc.).

Other policy measures included in an action plan to implement RIS3. The European Commission recommends that RIS3 should contain all horizontal and specific measures that are required to achieve the 'vision' on how to improve innovation performance in the selected priority fields, and should build on a range of budgets. No action plan to implement RIS3 has been approved at the moment when this Report was drafted. However, it seems that Lithuania has interpreted RIS3 in a relatively narrow sense. First, it appears that RIS3 is mainly associated with the EU structural funds, ignoring the links to international programmes, like Horizon 2020 or bilateral programmes, and national funding (e.g. the national research programmes). As with all countries, Lithuania needs to both compete and to collaborate when it comes to research and innovation. Paliokaite and Kubo (2013) suggested that none of the priority areas should involve purely national agendas. National funding programmes should take into account the international dimension in order to facilitate international networking and mobility. More importantly, the priority areas should be positioned to connect appropriately into European research and innovation programmes in order to contribute to pan-European agendas (e.g. in the areas of

'green' economy, energy, health, food and transport where Lithuania has high research potential). This can help accessing international expertise and networks, share the costs and risks of performing R&I and leverage funding. More efforts could be put to the transnational cooperation within Baltic Sea Area. Collaboration with the world innovation leaders in Nordic countries could facilitate R&I policy learning, enable to achieve critical mass and wider visibility, and provide bigger test market for innovative products and services to mention just some of the possible untapped benefits. There is scope for more intensive and better coordinated transnational collaboration in developing the R&I infrastructures, especially within the Baltic Sea Region. Baltic research cooperation programmes, especially in line with the Baltic Sea Region Strategy, should be promoted.

There are plans to use the cohesion funding for 2014-2020 for integration into the European RIs, especially the ESFRI roadmap. The preliminary Operational Programme foresees financial support for the 'integration of Lithuanian R&D infrastructure into European infrastructures, especially ESFRI, according to the Roadmap of Lithuanian research infrastructures'.

Second, there is still concern that implementation of RIS3 will be only linked to the thematic objective 1. Holistic view to innovation means that several policy areas are concerned with the RIS3, beyond the traditional science and technology and economy ministries and agencies. One of the new ideas discussed at the European scale is viewing public sector as a client for innovation. The preliminary priority areas include such sectors as transport, health and energy as well as social challenges (e.g. inclusive society), hence the ministries and agencies responsible for developing these fields should take the (co-)ownership of the priority.

Monitoring and evaluation mechanism. The design effort of RIS3 implies it does not come to an end when the strategy moves on to the implementation phase. A strategy for smart specialisation should evolve and adjust to changes in economic and framework conditions, as well as to emergence of new evidence during implementation (Foray et al. 2012). It implies that, first, multiannual research and innovation agendas and priorities' review procedures should be put in place. Some 'priorities' can fail, and new prospective fields can emerge, hence intelligence and review procedures should allow for flexibility. The priority areas should set the multiannual R&I agendas (roadmaps) for the coming seven years. A process for regular review of the priority areas must be put in place, with the possibility to renew the priorities based on specific reported outcomes. Reviewing the priorities should be organised so that the support will not be discontinued too soon, nor continued so long that subsidies are wasted on non-viable priorities (Paliokaite and Kubo, 2013).

The RIS3 strategy for Lithuania or its monitoring and evaluation instruments have not yet been approved by the time when this Report was drafted, so could not be reported. The monitoring and evaluation framework is being drafted and discussed. The preliminary framework includes these proposals:

- That the interim evaluation (in 2017) should allow for review of priorities or their implementation system.
- The ex post evaluation should be carried out (after 2020).
- The continuous monitoring of the priorities should be implemented, and assigned institution (or committee, working group, etc.) should coordinate the actions and instruments implemented by numerous policy agencies.
- Implementation of S3 priorities should follow a 'stage-gate' approach where the priorities can be reviewed and funds reallocated if the priority is not viable (does not achieve the targets at some stage in the implementation process). The responsible coordinating institution should assess the risks related to priorities viability and for proposing shutting down the priorities and/or allocating the funds to other more viable or new (emerging) priorities.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1. National Research and Innovation system

According to the assessment of the Innovation Union Scoreboard (IUS) 2013, the Lithuania's aggregate innovation index stands at 0.28 in 2012, considerably below the EU-27 average (0.54). Nevertheless, Lithuania is the only country who managed to improve group membership from modest innovators to moderate innovators. Also Lithuania was a growth leader in the moderate innovators group. For the analysed five-year period 2008-2012, Lithuania has improved its average annual rate of innovation performance of 4.95% and takes the second place after Estonia of 7.1%. For comparison, for the same period overall EU annual average growth rate of innovation performance reached 1.6%.

Despite the fact that Lithuania is among growth leaders it is still the fifth least innovative in the group of 27 EU countries right after Bulgaria, Romania, Latvia and Poland. Lithuania scores low in majority of R&D performance indicators, except for indicators in the categories of Human resources, Finance and support and Firm investment (see Table 4 for the main IUS indicators for Lithuania and EU27). For community designs and employment in knowledge-intensive activities growth rates are the highest among all Member States. High growth is also observed for Non-R&D innovation expenditures, community trademarks and license and patent. Relative weaknesses are in Open, excellent and attractive research systems and intellectual assets. Moreover, according to the New innovation output indicator scores in 2010 and 2011, Lithuania is one of the lowest performers[10] - it has a second lowest score in EU-27 and is just above Bulgaria. It is unlikely that Lithuania will bridge the innovation gap in the short or medium term.

Table 4. Main Innovation Union indicators

Index	Current performance, Lithuania	Current performance, EU-27*	Growth performance, Lithuania
ENABLERS			
Human resources	**0.65**	**0.56**	**0%****
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.9 (2010)	1.5 (2010)	6.5%
Percentage population aged 25-64 having completed tertiary education	34.1 (2012)	27.7	1.79%
Open, excellent and attractive research systems	**0.14**	**0.48**	**-6.25%****
International scientific co-publications per million population	265 (2011)	300	8.3%
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	5.95 (2008)	10.9	4.8%
Finance and support	**0.56**	**0.59**	**30.23%****
R&D expenditure in the public sector as % of GDP	0.68 (2011)	0.75	4.1%
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	0.36% of enterprises. 457 enterprises.	No data available.	104.93% (growth of enterprises

[10] European Commision communication "Measuring innovation output in Europe: towards a new indicator" >

Index	Current performance, Lithuania	Current performance, EU-27*	Growth performance, Lithuania
(NB: indicator used for Lithuania: Public funding for innovation activities, Enterprises that received any public funding. Source: Eurostat)	(2010)		from 2008 to 2010)
FIRM ACTIVITIES			
Firm investments	**0.4**	**0.41**	**66.67%****
R&D expenditure in the business sector as % of GDP	0.24 (2011)	1.27	1.1%
Venture capital and seed capital as % of GDP	No data available.	0.094 (2011)	No data available.
Linkages & entrepreneurship	**0.23**	**0.53**	**0,2**
Public-private co-publications per million population	9.6 (2011)	52.8	13.2%
Intellectual assets	**0.13**	**0.56**	0,13
PCT patents applications per billion GDP (in PPS€)	0.31 (2009)	3.9	-3.0%
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.05 (2009)	0.96	-5.7%
OUTPUTS			
Economic effects	**0.21**	**0.6**	**0%****
Medium and high-tech product exports as % total product exports	-1.27 (2011)	1.28	1.0%
Knowledge-intensive services exports as % total service exports	13.69 (2010)	45.14	2.7%
License and patent revenues from abroad as % of GDP	0.00 (2011)	0.58	18.1%

Sources: Innovation Union Scoreboard 2013, Annexes B-E; Eurostat, December 2013.
* - same source and year is applied for corresponding EU27 current performance and growth performance indicators, unless indicated otherwise.
** Calculated by comparing data from Innovation Union Scoreboard 2011 and Innovation Union Scoreboard 2013.
NB: the figures in bold correspond to the IUS performance scores per dimension.

In Lithuania RDI effort is predominantly ensured by the public sector (higher education and government), a sign that conditions for business R&D investment are still insufficiently attractive, and that supporting specialisation with a view to establishing more knowledge-based business activities is still proving difficult (IUC, 2013). Public RDI investments are close to the EU average (0.66% in 2011), public sector is also the key knowledge producer. Number of ISI publications increased by 3% in 2011, but share of most cited publications is twice below the EU-27 (source: Scopus). Business RDI investments remain sharply below EU average (BERD/GDP makes only 19% of the EU27 average) and there are no signs of convergence. Although Lithuania advanced from 'modest' to 'moderate' innovators group, it seems that Lithuanian companies have increased spending on non-R&D based innovation. Businesses in Lithuania still rely more heavily on the acquisition of machinery as one of the most important mechanisms for knowledge acquisition. According to IUC 2013, Lithuanian firms spend more than 70% of their innovation expenditure on acquiring machinery, whereas this number in Denmark or Austria is less than 10%. The share of researchers employed in the private sector is also very low (below 20 %) Lithuania, compared to the EU countries such as Denmark, Malta, Austria and Sweden with a high share of business researchers (over 60 %). This points out to the typical 'innovation paradox' which means that simply increasing the R&I funding for businesses may not solve the problem (the less peripheral is the region in terms of innovation capacity, the less likely that it will absorb increased funds for R&I), and indicates the need to 'smartly' invest into the business absorptive capacities.

Universities have the highest potential of research activity in Lithuania and they are in fact the most productive (ca. 70% of all scientific publications, 45% of FP7 grants). Still, despite high public RDI inputs, Lithuania suffers from low research outputs. Especially, the productivity in preparing the highest quality research is low. The proportion between the highest quality research production and the rest was 1:9 (in 2007). It could be interpreted as (a) lack of incentives or (b) poor quality of the major part of the research production. The research output achieved using the same human and financial resources are substantially weaker than in other EU MS. 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. Number of EPO patents per mio habitants is 18 times below the EU27 average (118.59) in 2010 (the indicator for high technology patents is 16 times lower).

A well-performing national innovation system is an essential framework for any holistic attempts to build up knowledge based economies. The above gap between R&I input and output is an 'old' problem and it has been addressed by the dedicated policies. The R&I policy mix has improved significantly in the context of the National Strategic Reference Framework (NSRF) 2007-2013, the Lithuanian Development Programme for 2014-2020 and the public research and education system reform that took place in 2009-2012. The availability of high quality research infrastructure has been addressed in the policy actions focusing on the development of five '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.

Despite the systemic approach to innovation was introduced with the national innovation strategy in 2010, the national innovation system is far from being 'ready'. Still the linear and R&D centric policy approach is prevailing at cognitive, but also measure's level. As the innovation system in Lithuania is still evolving, improving its performance should be high on the policy's agenda FOR 2014-2020. This includes building up effective organisations, filling the gaps, removing misbalances and facilitating connections between different stakeholders in Lithuania and beyond. But it also assumes moving beyond the current narrow understanding of innovation and circle of 'usual suspects', both in terms of stakeholders involved and activities concerned. There remain several structural challenges that are discussed in the sub-chapter 3.2.

3.2. Structural challenges of the national R&I system

The below discussed structural challenges require sustained and significant policy efforts to tackle them.

Private sector R&I capacity building: the 'competence ladder'

The most prominent sectors in the Lithuanian economy are the traditional ones (e.g. food, transport) accounting for the largest share in value added, employment and leading in the Lithuanian exports. However, to sustain the competitiveness also in the future they face the need of upgrading. At the same time, the R&I potential in the Lithuanian economy lies within emerging high tech sectors like biotechnology and pharmaceuticals, information technology

(both manufacturing and services), and engineering industry (manufacturing of metals and machinery), which are still rather small with little to contribute to Lithuania's economy in terms of value added and employment (Paliokaitė and Kubo, 2013). Hence, the key mid- to long-term challenge for Lithuania, *instead of focusing on existing innovators*, is to promote the structural change of economy by providing transformation agenda for diversification of existing sectors and transition to new activities.

For Lithuania the capacity building is an important way to improve its R&I performance in terms of excellence; though it is a rather long way to go considering the baseline situation at the point of departure. As the existing target group in Lithuania for the excellence-based competitive research measures is rather limited – consisting mainly of the limited number of top-tier research groups and few knowledge-based (spin-off) companies - raising the allocations for direct R&D measures without simultaneously dealing with the pipeline creation through capacity building might result in problems with absorption of available funding and stagnation in terms of participation in Horizon 2020.

Lithuanian 2007-2013 R&I policy mix has been mainly targeting the limited number of existing R&I performers, thus leaving the vast bulk of existing economy players and possible newcomers in the form of start-ups with their development needs out of the scope. Building innovation capacities and project pipeline in the form of 'soft' measures constituted a marginal share of total R&I investments, while majority was invested into the research infrastructures and S&T parks. Given the above, the new period's policy needs to focus on extensively and effectively investing into firms' innovation capacities building and leveraging private sector investments into R&I. R&I policy mix should focus on providing incentives to encourage companies, entrepreneurs and other organisations (universities, research institutes) to become involved in the discovery of possible specialisations and opportunities for diversification therein, such as: (i) open innovation and collaboration platforms keeping in mind the complexity of innovation process and the chain from basic research to product development, design, pre-production, and market placement; (ii) mechanisms (e.g. vouchers) to boost experiments and discoveries while encouraging connections among economic agents; (iii) prizes and bonus mechanisms for entrepreneurial discovery to reward those entrepreneurs who discover new domains and activities, also those who initiated or integrated into international value chain; (iv) industry, technology and market foresights, studies on long term future trends and likely development of technologies

To build an effective stairway to excellence, **'soft' capacity building measures are required to deliver the expected change** in R&I and knowledge based growth. Thereby, more sophisticated approach to the capacity building is needed taking into account that the current capacity levels and the potentials to move up in the 'stairway to excellence' largely differ within the target group. While the today's R&D performers would need the boost to expand their activities and engage into different collaborations (e.g. with other companies in the field, local SMEs, public research or international partners), those with the R&I potential, but only modest or no R&I activity at present, would mostly benefit from 'soft' capacity building measures like innovation and technology audits, vouchers, clusters, foresights etc. Therefore, also in capacity building, one size doesn't fit for all and designing target group specific policy interventions could be the solution.

Moreover, while defining smart specialisation strategies and deciding about perspective fields, **lock-in should be avoided and policy kept open for newcomers.** As the sprouts of the new knowledge based economy in Lithuania are still small and the respective actors not consolidated, there is a threat of the 'usual suspects' dominance in the policy discussions, or that this group starts to resist the newcomers as possible competitors for the R&I support. Spin-off policy is rather new in Lithuania and the focus is on universities and technology transfer through IP commercialisations therein. However taking the development phase of Lithuanian economy and the international R&D commercialisation experience, other forms of knowledge transfer could be more or equally relevant to target like e.g. collaborative projects with industry, industry PhDs,

joint study programmes with industry etc. In addition spin-off policy should be extended also to encourage business spin-outs as a possible source for greater variety and knowledge spillover. Role of **FDI as one possible source of new activities and variety** cannot be underestimated in the Lithuanian context.

Commercialisation of public research results: entrepreneurial culture and cross-sectoral collaboration

The majority of overall modest research and development (R&D) efforts in Lithuania are funded by the public sector and carried out by public research institutions. The R&D policies over 2007-2013 mainly invested into precompetitive research and related infrastructure at public R&D institutions. The investments were necessary considering the worn out state of the research base. However, this approach has proven relatively weak in leveraging private sector investments into R&I and fostering public research commercialisation, and tended to reinforce the existing trend of low investment in R&D and innovation by business sector. Despite the huge potential, weak capacity to commercialise and exploit public research for economic benefits becomes more evident after heavier investments in research production. Thus, there remains a need for subsequent efforts to encourage research commercialisation, for example through spin-offs. The entrepreneurial culture is not developed in Lithuanian universities and thus requires a change of the mind-set at the universities via incentive systems, e.g. modifications to the research funding (e.g. more focus on the outcomes of R&D) and researchers' career criteria, university IPR policies, development of the knowledge transfer offices, and entrepreneurial training. The related objective is to exploit already created research infrastructures for research commercialisation by (a) further reducing the fragmentation and better streamlining the investments into existing research infrastructures, with the focus on exploiting the created infrastructures for collaborative and contract R&D and commercialisation; (b) creating an effective system for research commercialisation and industry-science linkages' fostering, including the technology transfer offices at the universities and the dedicated infrastructures aimed at solving specific technological development objectives, such as competences centres, technological development centres or similar.

Further challenge is the lack of productive cross-sectoral (including science-industry) collaboration. The starting point is rather weak. Clusters could provide arenas for related variety/cross-sector links internally in the region and externally. However, the cluster formation is in early phase in Lithuania and few of the first results of the respective support programmes are encouraging. The way clusters or the 'valleys' were initiated didn't support effectively enough the cross-sectoral approach and connections with the local knowledge sources (institutes, universities at 'valleys') and to outside Lithuania. As a result clusters are rather sector based, inward looking and with limited inter-regional connections.

An increasing concern in Lithuania 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 policy increasingly focuses on commercialisation of the publicly-funded research that has primarily taken place within the higher education sector. Moreover, it also seeks 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 below average (Paliokaitė et al. 2011) 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. Despite the establishment of intermediary organisations (formal and non-functional 'valleys'

associations, S&T parks, open access centres etc.), cooperation between industry and research organisations remains at a rather low level and success stories on the technology transfer or commercialisation of public R&D are rare. Universities and their research institutes are mainly dedicated to the roles of teaching and basic research. Lithuania, unlike other EU Member States, lacks a network of specialised application-oriented research institutes whose mission is to provide technological services to SMEs for industrial research and product development.

All public research institutes and research centres with a mandate to engage with industry, and especially the open access centres in the 'valleys', must develop a distinctive industry-focused culture. They have to become better at marketing their research to the business sector. The state's role is therefore to introduce appropriate incentives. For example, the R&I infrastructure investments in the next cohesion funding period should be limited strictly with the requirement for the actual and strategic R&I collaboration between research and business community, whereas giving the preference for those consortia who are able to present longer-term research agenda plan, incl. demonstration of strong industry commitment (incl. co-financing), cross-cutting approach to research in terms of industry sectors and science fields and having international collaboration dimension. Large investments into R&I projects have to be linked with cross-sectoral collaboration. Most importantly, there is a need for better links between the fragmented R&I policy routes, e.g. development of the 'valleys' infrastructure should be more clearly linked to the clusters projects and soft measures for networks, R&I collaboration and capacity building. Efforts to concentrate funds and create connections have so far been able to deliver only very limited effect. Instead of fostering open innovation platforms around the key areas or sectors, the state has created separate 'pockets' of funding (clusters, 'R&D networks', 'joint research programmes', 'S&T parks', 'valleys' infrastructure projects) for similar purposes. This is a critical issue, considering the policy mixes planned for the implementation of S3.

Mainstreaming internationalisation

The public research system can be characterised as rather closed with limited institutional incentives and targets for internationalisation. Lithuania is one of the weakest Member States in terms of the number of signed FP7 contracts (24th out of 27) and budget share (25th). It is unfortunate given the current quality of Lithuanian research and few niches of international science excellence. There is scope and rationale for more targeted, intensive and better coordinated transnational collaboration. Additional support mechanisms could be needed for the research pools to encourage further collaboration with European peers. Equally, Horizon 2020 can offer more value for the emerging high-growth potential fields/companies to increase their international competitiveness. To benefit more from transnational R&I collaboration today's general declaration of importance of international collaboration should be replaced by more strategic R&I internationalisation policy, including respective positioning, target setting and incentives at the national level. In line with that all national R&I measures should include relevant international dimension, stimulate partnerships, open-up for international partners and clusters, etc. Moreover, none of the smart specialisation priority areas should involve purely national agendas.

For Lithuania it is justified to focus its transnational R&I cooperation efforts towards the Baltic Sea Region to amplify the networks and projects already established and make better use of the reinforced framework of the EU's Strategy for the Baltic Sea Region by including respective arrangements into the Operational Programmes. This is particularly relevant concerning the further investments into R&D infrastructures. Also synergies between Horizon 2020 and transnational collaboration under cohesion policy need to be improved. E.g. establishing more joint R&I programmes, cluster alliances etc. where BSR countries pool funds and launch common calls for proposals could have a role to initiate and support the co-operation at its initial phase whereas build the capability for participation in Horizon 2020. Also as foreign students and researchers might be a considerable source for knowledge transfer from abroad and bring in

diversity, the internationalisation policy of higher education and R&I should also be linked with the smart specialisation (Paliokaitė and Kubo, 2013).

From the governance perspective today's practice reflects that FP activities (NCPs), cohesion funded and national programmes and transnational cooperation (under ETC and EUSBSR) activities are all rather separate streams of planning and actions (even if operated by the same organisation) in Lithuania. Therefore linking between them both at strategic and operational level and looking for complementarities is needed. The strategy might not be enough; it also needs supportive governance processes to be implemented. For example, structures should be set up to facilitate the strategic identification of priorities for the different instruments and to seek to avoid duplication of effort and identify areas where additional financial support is needed.

Reducing policy fragmentation and improving policy implementation capacities

Fragmentation is a keyword to describe the current situation in R&I governance. There is fragmentation of policy priorities, programmes, funds and institutions, and insufficient leverage of different funds as well as few synergies between measures. Efforts to concentrate funds and create connections have so far been able to deliver only very limited effect. This is a critical issue, considering the policy mixes planned for the implementation of smart specialisation. **Collaboration and co-operation across all the relevant funding and development agencies and funding sources has to be ensured to facilitate streamlined, joined-up implementation of the actions required to realise the priority areas**. The smart specialisation priorities are expected to provide different public sector stakeholders with the common framework and focus to be able to mobilise priority-relevant resources across different funding instruments. In practice, it also means that there has to be a coordinating centre assigned with a responsibility to monitor synergies (and duplications) between the programmes and measures, to monitor calls for proposals (e.g. of ESFA, LVPA, LMT), and review how successful are the different priorities in moving from stage to stage in the implementation process.

The efficacy of public support is also reduced by the formal, technical and 'desk-top' selection procedure. Due to alleged concerns over potential corruption, officials from the implementation agencies are banned from face-to-face interaction with applicants throughout the selection process. The 'paper-based' application procedure provides incentive for firms to hire consulting companies to draft grant applications that appeal to the reviewers but favour form over substance. The above-mentioned weaknesses create high administrative load for beneficiaries and reduce experimentation. Hence, public support may be replacing, rather than complementing, private expenditures on innovation and R&D. Such obstacles can be overcome in an efficient institutional environment, for instance by engaging professional programme managers. Importantly, experience from other countries suggests that early interactions between entrepreneurs and selection bodies often prove pivotal, as they allow entrepreneurs to acquire invaluable feedback on their business model, thus improving their future prospects for commercialisation or helping them abandon projects that may already be under implementation elsewhere. Face-to-face interaction, therefore, is more than justified in the broader context of entrepreneurial mentoring and attempts to build real and lasting entrepreneurial R&I capacity. This is especially relevant in the context of smart specialisation that is expected to facilitate entrepreneurial discovery processes in firms in order to move to more promising (although risky) new fields or interactions. **Sufficient attention and adequate resources should be granted to effective programme management, with a focus on pipeline building, 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.** Involvement of MITA's staff into the pipeline building and working with potential clients could be a solution.

3.3. Meeting structural challenges

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

Table 5: Assessment of the Lithuanian R&I policy mix

Challenges	Policy measures addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
1. Private sector R&I capacity building: the 'competence ladder'	Restructuring the economy towards higher value added creating sectors is the overarching R&I policy objective. Grants to business R&D (Idea LT, Intellect LT/LT+) Inogeb LT1/LT2/LT3 Tax incentives for R&D intensive companies.	Positive impact on the new R&D investments and the new products development during the economic crisis. Key gaps: ➢ Low innovation capacity of majority of businesses is hampering the absorption of respective public support measures. Moreover, technology absorption was funded via grants, not revolving instruments. This suggests that while encouraging technology upgrading should remain an important task of enterprise policies, the non-reimbursable grants should be the preferred instrument *only* for direct business R&D investments in order to reduce competition between the measures. ➢ Investments into innovative capacities and project pipeline building constituted a marginal share of R&I investments. Moreover, a large bulk of funds dedicated for 'innovation services' (Innogeb LT group of measures) focused on infrastructure of incubators and S&T parks, but not on innovative services, and the funds of these measures dried out around the midterm of the 2007-2013 period. ➢ Suboptimal selection procedures tend to discriminate against riskier innovation projects. There is a tendency in the system to finance low-risk technology projects, with tangible and guaranteed outcomes. ➢ Public procurement and other demand-led policy instruments have not been used so far. The overly restrictive interpretation of public procurement rules has been discriminating against demand-led innovation, especially among SMEs. ➢ The policy mix was mainly designed for the existing R&I performers, but not for fostering the creation and growth of new knowledge intensive firms. Although supporting the 'champions' can be a viable strategy, but it cannot be an only strategy in a country with a limited number of 'champions'. Support for the establishment and growth of new innovative companies was nearly non-existent until very recently. This gap is being addressed by launching the new 'business accelerators' and the support for university spin-offs. Policy mix should focus on providing incentives to encourage companies, entrepreneurs to become involved in the discovery of possible specialisations and opportunities for diversification therein, such as: (i) open innovation platforms keeping in mind the complexity of innovation process and the chain from basic research to product development, design, pre-production, and market placement; (ii) mechanisms (e.g. vouchers) to boost experiments and discoveries while encouraging connections among economic agents; (iii) prizes and bonus mechanisms for entrepreneurial discovery to reward those entrepreneurs who discover new domains and activities; (iv) industry, technology and market foresights, studies on long term future trends and likely development of technologies that could improve the forward looking capabilities and agility. More tailor-made approach to the R&I capacity building is needed taking into account that the current capacity levels and the potential to move up in the 'stairway to excellence' largely differ within the target group. While the today's R&D performers would need the boost to expand their R&I activities and engage into different collaborations and alliances, those with the R&I potential, but only modest or no R&I activity at present, would mostly benefit from 'soft' capacity building measures like innovation and technology audits, vouchers, clusters, foresights etc. FDI and spin-off creation are also viable routes.

Challenges	Policy measures addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
2. Commercialisation of public sector research results: entrepreneurial culture and cross-sectoral collaboration	Main policy focus on (indirectly related to the structural challenge): • Research grants and researchers mobility. • Strengthening of research infrastructures in the context of building the 'valleys'. Directly related to the structural challenge: • Technology transfer centres, technology incubators and S&T parks. • Support for protecting intellectual property. • High technology programme (support to start ups and spin offs). • Innovation vouchers • Support for clusters • Valleys (competence centres, S&T parks) • Joint research projects (forthcoming)	Weak capacity to commercialise and exploit public research for economic benefits becomes more evident after heavier investments in research production. Thus, there remains a need for subsequent efforts to encourage research commercialisation, for example through spin-offs. The entrepreneurial culture is not developed in Lithuanian universities and thus requires more effective 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. There been considerable focus on developing support measures to increase linkages between HEIs and industry. So far the effectiveness of these measures was limited. The key weakness is that the limited effectiveness of the attempts to create synergies between the different measures, e.g. to re-align the 'valleys' and clusters, or the enterprise and public research institutions projects. Instead for fostering open innovation platforms around the key areas or sectors, the state has created separate 'pockets' of money for similar purposes. Creating synergies between 'enterprise' and 'public research' projects remains largely unresolved. The measures faced mixed success. For instance, in terms of the Ino-cluster measures, the measure design followed a top-down approach instead of cooperation in building the pipeline of open innovation programmes. The calls did not consider that clusters have various integration levels which correspond to different stages of maturity and therefore require a step by step approach, with intermediate control gates. Lithuanian companies (esp. from the traditional sectors) were not ready for strategic collaboration with competitors and the calls were not preceded by sufficient ground-work (seminars, workshops, special meetings to present good practices to candidates, etc). Some also claim that the role of the cluster facilitator was underestimated. All public research institutes and research centres must develop a distinctive industry-focused culture. They have to become better at marketing their research to the business sector. The state's role is therefore to introduce appropriate incentives. For example: ➢ There is a need for better links between the fragmented R&I policy routes, e.g. development of the 'valleys' infrastructure should be more clearly linked to the clusters projects and soft measures for networks, R&I collaboration and capacity building. ➢ The R&I infrastructure investments in the next cohesion funding period should be limited strictly with the requirement for the actual and strategic R&I collaboration between research and business community, whereas giving the preference for those consortia who are able to present longer-term research agenda plan, incl. demonstration of strong industry commitment (incl. co-financing), cross-cutting approach to research in terms of industry sectors and science fields and having international collaboration dimension integrated into their research strategies. ➢ The challenge of lacking technological development infrastructure and related technological services (e.g. prototype development) has to be addressed, as well as specific infrastructure aimed at technology transfer and building science-industry linkages has to be developed. It is up to the key stakeholders to decide which model has to be adopted as long as the necessary preconditions are met (high quality research and technological development services, convenient access for clients, involvement of businesses and other key stakeholders in the discussion on the demand for research and technologies to the developed). Most importantly, there is a need for better links between the fragmented R&I policy routes, e.g. development of the 'valleys' infrastructure should be more clearly linked to the clusters projects and soft measures for networks, R&I collaboration and capacity building. A mix of 'top-down' and 'bottom-up' approaches in designing integrated programmes. Coordinating agency with good programme management capacities needed to reduce fragmentation.

Challenges	Policy measures addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
3. Mainstreaming internationali-sation	Support for international projects (FP7, Eureka) Fragmented involvement into ERA-NETs National large infrastructure roadmap (2010) The LT, LV and EE authorities started discussion on coordinating their research capacities, but no visible results.	Transnational cooperation and looking for opportunities for synergies with Framework Programmes has rather stayed outside of the national policy efforts in Lithuania than considered as an integral part it. Limited incentives and targets for internationalisation. Limited involvement in joint research agendas. To benefit more from transnational R&I collaboration today's general declaration of importance of international collaboration should be replaced by more strategic R&I internationalisation policy: ➢ Internationalisation of R&I policy, incl. respective positioning and target setting at the national level is needed to mainstream the transnational collaboration. In line with that all national R&I measures should include relevant international dimension, stimulate partnerships, open-up for international partners and clusters, etc. Moreover, none of the smart specialisation priority areas should involve purely national agendas. ➢ For Lithuania it is justified to focus its transnational R&I cooperation efforts towards the Baltic Sea Region to amplify the networks and projects already established and make better use of the reinforced framework of the EU's Strategy for the Baltic Sea Region by including respective arrangements into the Operational Programmes. ➢ Also synergies between Horizon 2020 and transnational collaboration under cohesion policy need to be improved. E.g. establishing more joint R&I programmes, cluster alliances etc. where BSR countries pool funds and launch common calls for proposals could have a role to initiate and support the co-operation at its initial phase whereas build the capability for participation in Horizon 2020. ➢ The political commitment to transnational R&I cooperation must be translated into administrative commitment, with sufficient resources, staffing and continuity of personnel for policy development in transnational scale and networking.
4. Reduce fragmentation, improve policy implementation capacities	National Progress Programme 2014-2020. Strategic Research and Innovation Council (SRIC). Launching the research priorities setting exercise and following discussions on the smart specialisation policy 'roadmaps' (planned in January 2014)	Key remaining weaknesses: ➢ Fragmentation and failure to leverage different funds and create synergies between measures; lack of systemic coordination and policy monitoring capacity (for example, different monitoring frameworks (valleys, JRPs, etc.), some of the indicators over-optimistic). ➢ The present governance mode, mirrored by process-oriented policy implementation *vs* partnership-based programme management. Introduction of SRIC and NPP does not automatically solve the policy coordination problems. The structure of the mid-term policy documents, policy measures and agencies remains very fragmented. A systemic and consistent initiative has to be taken to address this challenge. It is critical when considering the implementation of horizontal smart specialisation policies. Moreover, to tap the potential of smart specialisation, public authorities and implementation agencies will need to behave more like accelerators, brokering new connections in the economy. Moving beyond the circle of 'usual suspects', both in terms of stakeholders involved and R&I activities concerned. Horizontal R&I policy and broadening the scope of engagement (public sector as a client). Redefining the role of public sector will require new capacity building. Sound and inclusive governance set-up should allow for orchestrated implementation of a 2014-2020 smart specialisation policy framework: ➢ Collaboration and co-operation across all the relevant funding and development agencies and funding sources (in addition to cohesion funding also Horizon 2020 and transnational collaboration in the Baltic Sea macro-region) has to be ensured to facilitate streamlined, joined-up implementation of the actions required to realise the priority areas. The smart specialisation priorities are expected to provide different public sector stakeholders with the common framework and focus to be able to mobilise priority-relevant resources across different funding instruments.

Challenges	Policy measures addressing the challenge	Assessment in terms of appropriateness, efficiency and effectiveness
		However, the strategy might not be enough; it also needs supportive governance processes to be implemented. In practice, it also means that there has to be *one coordinating centre* assigned with a responsibility to monitor synergies (and duplications) between the programmes and measures, to monitor calls for proposals (e.g. of ESFA, LVPA, LMT), and review how successful are the different priorities in moving from stage to stage in the implementation process. ➢ Smart design of priorities implementation (synergies between measures, from capacity building to ideas, from ideas to market). Orchestration of policies affecting R&I performance in the priority areas would require both strengthened policy coordination and informed policy design processes. R&I monitoring and analysis of innovation performance, ex ante and ex post policy evaluation capacity, foresight capacity need to be increased substantially and assisted by consultations with the main stakeholders and actors in the innovation system. ➢ Sufficient attention and adequate resources should be granted to effective programme management, 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 smart specialisation monitoring framework should feed into rigorous impact evaluation system. The monitoring framework should be able to capture the changes in firm behaviour after introducing policy instruments fostering entrepreneurial discovery, e.g. the process of creation, financing, support, organisation, growth of new firms, firms starting to network and invest into R&D for the first time. Moving from stage to stage could be based on the results achieved in the previous stage. Such stage-based monitoring framework would allow identification of the non-viable priorities and hence re-allocation of funds to better performing or emerging priorities.

Source: Paliokaitė and Kubo (2013); Paliokaitė et al (2011).

Concerning the misbalances in the current policy mix, the 2014-2020 R&I policy focus should be moved to 'soft' capacity building and R&I human resource development measures vs. infrastructure investments. The latter could be only justified if clearly focussed on enhancing applied research, through reinforced cooperation with industry to leverage private R&I investments. Smart specialisation should create a favourable environment for underpinning entrepreneurship and innovation and fostering emerging technologies in export-oriented and high value added market segments where Lithuania has the capacity to attain a competitive advantage and develop greater diversity. Pillars of the smart specialisation policies should include both supply side instruments (direct support for R&I) and demand side instruments that provide indirect support to innovations by boosting demand and creating favourable framework conditions for their take up by the market. But it also assumes moving beyond the current narrow understanding of innovation and circle of 'usual suspects', both in terms of stakeholders involved and activities concerned.

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

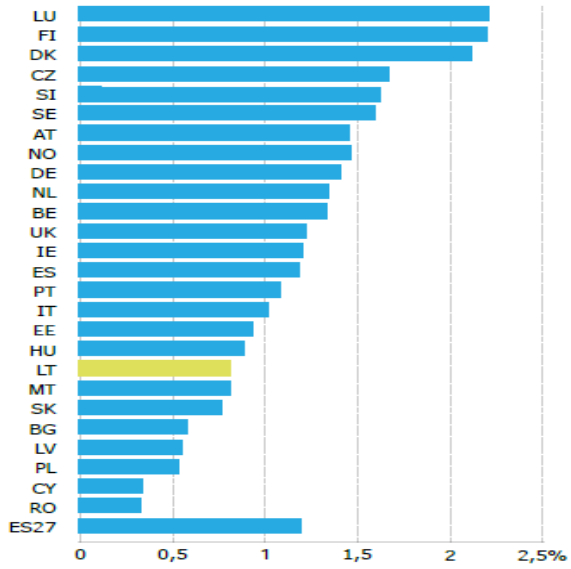
4.1. Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

Over the past five years, human resources have been one of the main drivers of the improvement in research and innovation performance, in particular as a result of the strong growth in S&T and SSH doctorate graduates. The youth enrolment rate is well above the EU average. The number of R&D personnel in Lithuania is approaching the EU-27 average. Albeit slowly, the number of researchers in Lithuania has been increasing since 1995, however in 2011 still remained 30% lower than on average in the EU-27 if compared to the total number of country's population. 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 has also decreased by 13%, from 406 in 2010 to 353 in 2011. This further widens the gap between Lithuania and other EU Members.

Most of Lithuanian researchers work in governmental and higher education sectors – 4 times more than researchers in business sector. In Lithuania only 18% of researchers work in business sector, when the same indicator in the EU is 52% on average. On the positive side, Lithuania enjoys the trends of researchers getting younger (MOSTA, 2013), hence ageing of researchers is not a problem.

Figure 10. Researchers, % of total population



Source: MOSTA (2013), based on Eurostat

The Research and Higher Education Reform that commenced in 2008-2009 has changed the status of researchers and academic staff in Lithuania. The academic staff does not have the status of civil servants in Lithuania; and the autonomy given to the HEIs in 2008-2009 allows the universities and public research organisations higher power in determining the salaries of staff according to their performance. All types of contracts, including the temporary contracts and fellowships are subject to social and health taxes in Lithuania since 2009.

The Researchers Career Programme (RCP) remains the principal instrument for enhancing international research mobility and excellence. RCP foresees funding for these measures: grants for international level researchers (including non-nationals); support for re-integration of researchers working abroad; post-doctoral fellowships; promotion of scientific work of PhDs (support for research, funding scientific internships, PhD scholarships), and other measures. Most of these measures are administered by the Lithuanian Research Council. Since 2009, greater autonomy of universities and research institutes to determine the salaries of academic staff, and increased competitive funding (both policy measures introduced in 2009 by the new Law on Education and Science) might positively affect researcher salaries in those PROs that are more competitive on the national research 'market'.

Lithuania has made some progress in creating open labour market for researchers, but there is also considerable scope for improvement. The legislation promoting open, transparent and merit based recruitment of researchers is in place. Law on Higher Education and Research (adopted in 2009) establishes necessary conditions for open, transparent and merit based recruitment of researchers. Public HEIs and research institutes are legally obliged to: publish information on vacancies, establish selection panel, publish selection criteria, provide adequate time period (three months) between vacancy publication and submission of applications, offer the right of appeal, etc. Furthermore, there is an internet portal (administered by LMT) that should include all vacancy publications[11].

However, the practice suggests that more needs to be done in ensuring competitiveness of the recruitment process. Resources are increasingly available for mobility of Lithuanian researchers. However, inward mobility of foreign researchers is hampered by obstacles in accessing national grants and lack of transparency in institutional recruitment of outsiders (including dysfunctional EURAXESS centre). Higher standards for new PhD programmes introduced in 2010 has led to increased national and international cooperation in the provision of doctoral training.

Research Infrastructures

Investments in the integrated science, study and business centres – 'valleys' - over 2007-2013 was meant to constitute the most important instrument for fostering open innovation and transfer of knowledge between public research and private enterprises**.** Most of the funds reserved for the development of the "valleys" (about €400m) are invested into large research infrastructures. For instance, in 2011 €59.4m was allocated to research infrastructures. These considerable investments have not yet resulted in viable links between business and science system, due to legal, cultural and systemic obstacles, but also just because the investment projects have not yet finalised. Despite reorganisation of research system, large scale investments into up-dating research infrastructure and establishment of intermediary organisations, the real cooperation between industry and research organisations has remained modest and success stories on the technology transfer or commercialisation of public R&D are rare. Additionally, Lithuania, unlike other EU Member States, lacks of industry–led applied research organisations with the mission to perform collaborative R&D and provide technological services to SMEs (like e.g. Technology Competence Centres in Estonia, Sweden and Austria or Strategic Centres for Science, Technology and Innovation in Finland).

There is scope for more intensive and better coordinated transnational collaboration in developing the research infrastructures, especially within the Baltic Sea Region. So far the transnational collaboration in developing the research infrastructures has been limited. In its proposal for Horizon 2020, the European Commission suggested to fund projects aiming at reinforcing European research infrastructure policy and international cooperation. Up to date, the transnational coordination of the RI development using the national funding or FP7 has been limited. Lithuania is involved into the ERA-NETs mostly related to the nature resources,

[11] The EURAXESS portal (http://www.euraxess.lt)

food and agriculture (EMIDA, ERA-ARD II, Ruragri, CORE Organic, EUPHRESCO and BiodivERsA), and two ERA-NETs related to transport (ENR2) and nanomedicine (EuroNanoMed). 21 Lithuanian participants are involved into the FP7 Research Infrastructures priority area, but the involvement into the international RI related projects has so far been a bottom-up, uncoordinated process, without more targeted involvement of the national authorities. In July 2012 Minister of Education and Science issued a decree regulating participation in international RIs. It established that Lithuanian research institutions can submit applications for joining international IRs on a continuous basis and the Roadmap should be subject to major revision every 5 years. The applications will be regularly assessed by LMT. The latter in December 2012 approved internal Guidelines[12] regulating the assessment and selection procedures. The "valeys" once completed should operate as open access centres[13]. This implies that in principle the access to research infrastructure should be granted to national and non-national academic and business establishments. There have been discussions between Lithuania, Latvia and Estonia about coordinating their national infrastructure roadmaps, but the outcomes of these discussions are not known to the expert group.

Thus, the remaining challenges for Lithuania are: (a) to further reduce the fragmentation and better streamline the investments into existing research infrastructures, with the focus on exploiting the created infrastructures for collaborative and contract research and r commercialisation, so that the research infrastructures become more self-sustained; (b) to create an effective system for research commercialisation and industry-science linkages' fostering, including the technology transfer offices at the universities and the dedicated infrastructures aimed at solving specific technological development objectives, such as competences centres, technological development centres or similar; (c) to coordinate integration of the strongest Lithuanian RIs into the European networks of research infrastructures (based on clear rules and infrastructure roadmap), and to stimulate connections of all the constructed infrastructures with related RIs in other countries and regions (Paliokaitė and Kubo, 2013).

Roadmap for Research Infrastructures of Lithuania was approved in 2011. International group of experts reviewed 20 project proposals submitted by consortia of Lithuanian HEIs and research institutes and identified 15 mature or promising projects. The Roadmap also presented the selected list of the European Research Infrastructures to be considered attractive for some national RIs. To our best knowledge, cohesion funding has not been allocated for supporting ESFRI roadmap projects during 2010-2013. However, there are plans to use the cohesion funding for 2014-2020 for integration into the European RIs, especially the ESFRI roadmap. The preliminary Operational Programme over 2014-2020 foresees financial support for the 'integration of Lithuanian R&D infrastructure into European infrastructures, especially ESFRI, according to the Roadmap of Lithuanian research infrastructures' under the Investment priority 1 'Enhancing research and innovation (R&I) infrastructure and capacities to develop R&I excellence and promoting centres of competence, in particular those of European interest' and its specific objective '*Enhancing R&I infrastructure and capacities to develop excellence of research*'. Other preliminary areas of investment into RIs under the same specific objective are:

- Strengthening of R&I infrastructure according to the areas of smart specialisation and further concentration of R&I infrastructure in the 'valleys', which includes investments

[12] Lietuvos mokslo tarybos nutarimas, *Dėl Lietuvos institucijų dalyvavimo tarptautinėse mokslinių tyrimų infrastruktūrose iniciavimo tvarkos aprašo patvirtinimo*, 2012 December 17, Nr. VII-127.

[13] The "valleys" cover the following R&D areas: laser and light technologies, materials science and nanotechnologies, semiconductor physics and electronics, civil engineering, biotechnology, innovative medical technologies, molecular medicine and biopharmacy, ecosystems and sustainable development, ICT, sustainable chemistry (including biopharmacy), mechatronics and related electronic technologies; future energy (including environmental engineering), agrobiotechnology, bioenergy and forestry, food technology, safety and health, marine environment and technologies.

into the specific infrastructure aimed at research commercialisation and provision of research services for businesses (e.g. technology transfer offices, competence centres etc.); further strengthening and development of the science-industry linkages building infrastructure (science and technology parks, technology centres aimed at technological services, e.g. standardisation, testing, provision for businesses);

- Investments into the information, communication and other non-technological infrastructure in the research infrastructures, for example support is planned for the development of publications databases, ICT infrastructure and licences acquisition, and organisational and management innovations and capacities that are expected to improve the capacity to market and commercialise the research results;
- Development of the companies' and clusters' R&I infrastructure, especially if aimed at prototype development, testing, pilot manufacturing, etc.[14]

4.2. Getting good ideas to market

Improving access to finance

In summary, business access to finance is adequately ensured, given the improvements over 2011-2013. The set of measures aimed at the improvement of business access to finance consist of a variety of tools. The'Controlling fund' aims to improve SME access to external funding sources (micro crediting up to €25 000; venture capital fund investments; guarantees for SME financial obligations), while 'Partial compensation of SME credit interests' (budget of both is €274m) aims to ease the burden of financial obligations by partially compensating investment credit interests for SMEs and to support the development of enterprises. In 2010 the risk capital fund "Business Angels Fund I" was founded by the European Investment Fund for investments into innovative and export oriented companies in Lithuania. Establishment Agreement of the Fund is signed under the project "JEREMIE the controlling fund". As of early 2013, Lithuania introduced new venture capital measures aiming to boost investments in early stage innovative companies in Lithuania. The European Investment Fund (EIF) together with Estonia, Latvia and Lithuania launched the Baltic Innovation Fund (BIF) - a "fund of funds" that will invest €100m into the private equity and venture capital funds operating in the Baltic countries. It is expected to encourage risk capital investments in SMEs. EIF and Practica Capital established an initial stage venture capital fund (Practica Seed Capital Fund, €6m) and another venture capital fund (€15.7m) that will invest in Lithuanian SMEs. The Ministry of Economy in partnership with INVEGA planned to launch two new seed and pre-seed capital measures for innovative SMEs in 2013, however there were legal obstacles (the chosen approach was not approved by the Public Procurement Office).

A number of measures offering subsidies for R&D in business are available, same as tax incentives for R&D. It is planned that both financial engineering instruments and grants for R&D (from idea to the prototype development and validation) will be continued in 2014-2020.

Paliokaite and Kubo (2013) note that policy implementation capacities have been one of the weak links, including the risk-aversion in implementing R&I policies, capacities of administration, and management of programmes. Though improvements are continuously introduced, beneficiaries complain that the process is still too bureaucratic, and 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 included proposals for making implementation easier and more efficient, simplification of the planning

[14] Sources: the presentation by the Ministry of Education and Science on 19-06-2013; draft version of the Operational Programme 2014-2020 [December 2013].

procedures, of evaluation of applications, monitoring and supervision of projects. However, simplifying the procedures would not suffice as the key problem is within the management capacities of the implementing agencies and the limited focus on working with the innovative projects pipeline. The system does not sufficiently integrate cutting-edge industrial expertise and knowhow, and it has developed a culture of risk-aversion, biased against early-stage and high risk innovation ventures, particularly in high-technology sectors. Staff of implementation agencies do not possess sufficient knowledge of the industry, and therefore they will remain limited in their capacity to fashion effective, output-oriented programs maximizing the impact of the funding distributed unless industry expertise is integrated in the instrument design and the selection phases. Moreover, the staff face another set of constraints stemming from the overly legalistic approach to programme management. Emphasis on the EU's legal framework, the Lithuanian administrative law and procurement regulations often makes them reluctant to allocate public resources to projects that may not immediately result in commercially viable products and services. In so doing, they are avoiding risk in an industry which by definition must be focused on stimulating risk-taking among innovative enterprises.

Protect and enhance the value of intellectual property and boosting creativity

Basic regulatory framework for intellectual property is in place, however its implementation at the institutional level (the universities and research institutes) is lagging. In December 2009, the Minister of Education and Science approved a set of IP Management Recommendations (guidelines) for the HEIs and PROs. In these Recommendations, the organisations are advised to organise IP management strategies in a way that creates more incentives for knowledge commercialisation (for more data see the Paliokaite A., 2010). Financial support from national sources (provided by the Ministry of Economy) is ensured for legal entities who aim to protect intellectual property rights (up to 95% of costs can be covered). In 2008 the Ministry of Economy introduced new instruments to support the acquisition of patents – prepayment and payment on accounts. After the introduction of prepayment and payment on accounts procedures, the numbers increased dramatically. Still, there are few functional technology transfer offices at the universities, research institutes or S&T parks.

Creativity has been placed rather high on the policy agenda after the approval of the Lithuanian Development Strategy 2030, which declared creative society as one of the key targets for future policies. Nevertheless, there has been no new policy initiatives over 2011-2013 in this area. One of the priority areas for smart specialisation is 'Inclusive and creative society'.

Public procurement

Public procurement and other demand-led policy instruments have not been used so far in Lithuania. The overly restrictive interpretation of public procurement rules has been discriminating against demand-led innovation, especially among SMEs. Lithuania also lacks a developed administrative culture of organizing tenders around innovative ideas (for instance, technologies for the transformation of public administration buildings into zero emission establishments). The Lithuanian innovation system relies mainly on innovation supply side instruments and neglects possibilities to link innovation demand with knowledge producing capacities. It is especially important for (i) supporting those R&D fields and industry sectors that are new, on the rise and outside the scope of existing policies, as well as (ii) using the existing R&D 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).

Since 2012, 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 the implementation of the innovative public procurement and the pre-commercial procurement instruments. 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 pre-commercial procurement, and, with the help of

MITA, to create the legal basis for the pre-commercial procurement and 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 in 2012) contains a set of demand-side innovation policy measures, e.g. innovative public and pre-commercial procurement, regulation, financial and tax incentives for innovation consumers. The draft OP for 2014-2020 contains measures aimed at fostering markets for innovation (firstly, the pre-commercial procurement is foreseen).

It has to be noted that demand-led innovation policies are relatively new even in the innovation leading countries, where the first demand creating measures are being tested. To apply sophisticated measures such as pre-commercial procurement, related capacity building of the ministries, agencies and other public authorities (the 'clients') would be needed to effectively use the new measures.

4.3. Working in partnership to address societal challenges

Since 2010 Lithuania stepped up efforts to implement joint R&I agendas through Joint Programming Initiatives, international programmes, and bilateral programmes. Nevertheless, financial commitments to joint R&I agendas are rather limited and national research programmes are only implicitly aligned with R&D priorities pursued at ERA. Overall, cross-border collaboration in specific areas has so far been bottom-up without greater coordination or focus on specific challenges.

Since 2010 Lithuania participates in the following two Joint Programming Initiatives: Cultural heritage & global change and Healthy & productive seas and oceans. Lithuania together with partner countries also contributes to several international programmes: Joint Baltic Sea Research and Development Programme (BONUS); ERA-NET action „BiodivERsA2"; ERA-NET action „EuroNanoMed" ; ERA-NET action „M-era.NET"; HERA (Humanities in the European Research Area) Network Programme on Cultural Encounters; and LILAN: Nordic Baltic Programme on Living Labs; the 'BSR Stars Programme'. Since 2012, the Ministry of Economy acts as an operator of the Green Industry Innovation Programme (NOR Financial Mechanism 2009-2014, budget of €9.4m), which is aimed to enhance competitiveness of the environment-friendly companies through greening of companies which represent traditional industries, promoting of entrepreneurship as well as through the development and spread of green innovation. In addition, five bilateral or trilateral programmes (with Belarus, Latvia and Taiwan, France, Ukraine and Switzerland) are implemented, although objectives of these programmes are not explicitly aligned with broader grand challenges and the funded projects covered a wide range of R&D areas.

4.4. Maximising social and territorial cohesion

At the time when this Report was prepared Lithuania has not yet elaborated and approved the R&I Strategy for Smart Specialisation. The process for defining the RIS3 priorities and elaborating a related policy framework is ongoing, as described in sub-chapters 2.6 and 2.7. It should be finished by early 2014. Lithuania is a small country, hence it is considered as one region in the future Smart Specialisation Strategy. The links and co-ordination mechanisms between the national and regional level will not be discussed in the Lithuanian Smart Specialisation Strategy or related documents.

The national Smart Specialisation Strategy should be positioned to connect appropriately into European research and innovation programmes in order to contribute to pan-European agendas.

More focus to the transnational cooperation under the framework of the Baltic Sea Region Strategy (EUSBSR)[15] could contribute to the better integration at the macro-regional level in the field of R&I. Closer coordination of the smart specialisation strategies (or other type of economic specialization strategies) of the region, including research infrastructure development plans etc. could serve a good starting point to better integration (Paliokaite and Kubo, 2013).

The discussions on coordinating the national 'smart' priorities and infrastructures roadmaps have been launched at the level of three countries in the Baltic Region (Lithuania, Latvia, and Estonia). These discussions had not yet led to practical results. More importantly, there is no evidence on intensive collaboration of Lithuanian, Latvian and Estonian researchers at the FP7 projects level. Currently, these countries aren't natural partners in research. Estonian researchers collaborate more often with the Scandinavian countries, and Lithuanian researchers are more integrated in the projects led by coordinators from Germany, UK, Italy, Spain and France. Nevertheless, the Lithuanian researchers are starting to realize that collaboration with the countries in the same region (for Lithuania – the Baltic Sea Region) can be effective due to lower travelling costs and easier access to R&D infrastructures. For example, Vilnius University currently pursues an idea to participate into the development of R&D infrastructure at the Lund University (Sweden).

4.5. International Scientific Cooperation

Internationalisation of R&I 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 R&D 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). "Integrated science, studies and business valleys", once completed should operate as open access centres[16]. This implies that in principle the access to research infrastructure should be granted to national and non-national academic and business establishments.

Enhancement of transnational mobility is an objective of the 'Researchers Career Programme' (RCP) that foresees funding for these measures: grants for international level researchers (including non-nationals); support for reintegration of researchers that used to work abroad; post-doctoral fellowships; promotion of scientific work of PhDs (support for research, funding scientific internships, PhD scholarships). However, the number of participating foreign researchers remains limited. There is a legal requirement that beneficiaries of grants have to be employed in a Lithuanian institution. This poses considerable barrier due to low level of salaries and careers (contractual agreements) elsewhere.

Lithuania has made some progress in creating open labour market for researchers, but there is also considerable scope for improvement. The legislation promoting open, transparent and merit based recruitment of researchers is in place. Law on Higher Education and Research (adopted in

[15] http://www.balticsea-region-strategy.eu/pages/priorities

[16] The "valleys" cover the following R&D areas: laser and light technologies, materials science and nanotechnologies, semiconductor physics and electronics, civil engineering, biotechnology, innovative medical technologies, molecular medicine and biopharmacy, ecosystems and sustainable development, ICT, sustainable chemistry (including biopharmacy), mechatronics and related electronic technologies; future energy (including environmental engineering), agrobiotechnology, bioenergy and forestry, food technology, safety and health, marine environment and technologies.

2009) establishes necessary conditions for open, transparent and merit based recruitment of researchers. Public HEIs and research institutes are legally obliged to: publish information on vacancies, establish selection panel, publish selection criteria, provide adequate time period (three months) between vacancy publication and submission of applications, offer the right of appeal, etc. Furthermore, there is an internet portal (administered by LMT) that should include all vacancy publications[17]. However, the practice suggests that more needs to be done in ensuring competitiveness of the recruitment process. Resources are increasingly available for mobility of Lithuanian researchers. However, inward mobility of foreign researchers is hampered by obstacles in accessing national grants and lack of transparency in institutional recruitment of outsiders (including dysfunctional EURAXESS centre). Higher standards for new PhD programmes introduced in 2010 has led to increased national and international cooperation in the provision of doctoral training.

Lithuania has not yet implemented the Scientific Visa package. At the national level there is little tailoring of Article 17 of regulation 1408/71 for researchers through bilateral agreements. No tax incentives exist to facilitate the participation in supplementary pension schemes. After the European Council Directive No. 2005/71/EB was issued, the Lithuanian Parliament issued an amendment in 2008 to the Law on the Legal Status of Foreigners that provided regulation on the issuing of residence permits for foreign researchers having a contract with a Lithuanian research institution. According to the Law, a temporary residence permit is issued for one year and it is not necessary to apply for a work permit.

[17] The EURAXESS portal (http://www.euraxess.lt)

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1. More effective national research systems

In Lithuania there is a clear policy shift towards increased competition and sustained investment in research. In 2012 around 50% of all research funding were allocated on competitive peer-review based procedures. The major policy shift has occurred in 2009, when the Research Council of Lithuania (LMT) acquired the functions of a funding agency. On the other hand, in 2011 GERD has exceeded the pre-crisis levels and has expanded further. However, the levels of funding (in absolute terms and as % of GDP) remain well below the EU-27 average. There were no major policy changes in this area in 2011-2012.

The Government decision (adopted in 2009 and subsequently amended in 2010 and 2012) on the method for allocation of budgetary appropriations for R&D for public higher education and research institutions stipulated that higher share of basic funding should be linked to research performance. The method is based on two pillars: assessment of R&D activities and "normative number of staff". The competitive assessment of R&D activities is based on four criteria: a) funding received from participation in international research projects; b) funding received from R&D contracts with private establishments; c) public funding from participation in joint R&D projects with private establishments; d) results of evaluation of research production. The latter focuses on publications and patents and is annually carried out by LMT in accordance with the principles of international peer review. The main aim of introducing the competitive assessment was to create incentives for institutions to increase the relevance of their research programmes.

Since LMT became responsible for funds allocation, increasing proportion of funds has been allocated through competitive calls for proposals. They are subject to peer review. The scale of grant-based funding has significantly increased and reached more than €21m in 2012.

There is no publicly available data on the extent to which the peer review involves international scholars. In principle, participation of international peers is not limited. However, in practice a majority of grant proposals are submitted in Lithuanian language (with a short summary in English), which could pose linguistic barriers to participation of international reviewers.

5.2. Optimal transnational co-operation and competition

The developments since 2010 have paved way for closer integration of Lithuanian research system into ERA. However, some challenges were left to be addressed in the near future: (1) national policy efforts have not supported actively transnational cooperation and search for synergies with FPs; (2) limited incentives and targets for internationalisation; (3) limited involvement in joint research agendas; and (4) Lithuania is one of the weakest Member States in terms of the number of signed FP7 contracts (24th out of 27) and budget share (25th).

The current situation analysis suggests that Lithuania has been involved unevenly into ERA-NETs. Even though there have been fragmented actions to implement joint research agendas, financial commitments to joint research agendas are rather limited and national research programmes are only implicitly aligned with research priorities pursued at ERA. The Lithuanian Ministry of Economy actively seeks participation in the international innovation programmes which support international innovation networks, especially in the Baltic Sea Region. For instance, starting with 2012, it has been acting as an administrating institution of the Green Industry Innovation Programme, conducted in cooperation with Norway.

Evaluations of research projects carried out within the framework of ERA, bilateral and trilateral programmes are recognized in Lithuania. It typically results in funding of the projects within the limits of financial commitments made for the said programmes.

Roadmap for Research Infrastructures of Lithuania was approved in 2011. It presented the selected list of the European Research Infrastructures to be considered attractive for some national RIs. However, no financial commitments for construction and operation of the global, national or regional RIs has been made in Lithuania by the time of preparing this report. Currently, the funds are allocated to the 5 "Integrated science, studies and business valleys" with most of the funds invested into large research infrastructures. The National Progress Programme for Lithuania for the period 2014-2020 will provide a basis for the European Structural Funds support for the next programming period.

There is no specific development in removing legal and other barriers to the cross-border interoperability of national programmes. The national authorities together with Latvian and Estonian authorities started discussion on coordinating their research capacities, but no visible results have need achieved. Therefore, the mainstreaming of transnational collaboration is needed. For instance, specific support mechanisms can be established to encourage Lithuanian research teams to engage further in collaboration with their European /global peers. In 2012 the Minister of Education and Science set up the guidelines that shape the procedures that regulate Lithuanian research institutions' involvement in the international RIs.

5.3. An open labour market for researchers

Lithuania has made some progress in creating open labour market for researchers, but there is also considerable scope for improvement. The legislation promoting open, transparent and merit based recruitment of researchers is in place (Law on HE and Research, 2009, 2012). However, in practice, competitiveness of the recruitment process needs to be ensured better. The main obstacles include low attractiveness of research careers, willingness of institutions to employ their own PhD graduates /current staff, and the transparency of the process.

Resources are increasingly available for mobility of Lithuanian researchers. However, inward mobility of foreign researchers is hampered by obstacles in accessing national grants and lack of transparency in institutional recruitment of outsiders (including dysfunctional EURAXESS centre). There is a legal requirement that beneficiaries of grants have to be employed in a Lithuanian institution. This poses considerable barrier due to low level of salaries and careers (contractual agreements) elsewhere. Moreover, national grants are not portable as they are awarded to specific institutions and therefore cannot be transferred to other institutions (in Lithuania or abroad). The EURAXESS portal provides accurate and relevant background information on Lithuanian higher education and research landscape, social insurance, work permits, but it lacks information on job vacancies, fellowships and grants.

Higher standards for new PhD programmes introduced in 2010 has led to increased national and international cooperation in the provision of doctoral training. Institutions willing to register new PhD programmes have to comply with considerably more stringent requirements in terms of excellence of research, relevance of proposed research programmes, human and physical resources, etc. For instance, several universities have started Joint international PhD programmes, (some of them funded by Erasmus Mundus).

There is no specific initiative in the implementation of the HR Strategy for Researchers incorporating the Charter & Code.

5.4. Gender equality and gender mainstreaming in research

Women are relatively well-presented in research in Lithuania (e.g. the number of PhD students). However, two key problems remain significant in Lithuania: a) women are not proportionally represented in all fields of science; b) women are considerably under-represented in senior academic positions. Undertaken steps to fight gender inequality are insufficient to counter historically embedded barriers to gender equality in research.

Already at the undergraduate level, female students are rare exception in engineering and technology and physics fields. As the career progresses, their share approaches zero in these fields. In general, women participation is low in mathematical and technological fields. Moreover, the share of women is insufficient in better paid research leadership positions both in senior academic positions and managerial positions. This is well illustrated by the gap in the annual average salary between men and women as it increases with experience.

A Strategy on Equal Opportunities was adopted in 2008. It provides legal foundations for introduction of "Gender equity and gender mainstreaming" as a horizontal principles in other strategies and programmes (for e.g., the Researchers Career Programme). Since 2011 Lithuanian Academy of Sciences implements a project "Promotion of gender equality in sciences". It was coordinated by the Lithuanian Academy of Sciences and partners that included: LMT, association, BASNET Forumas and the National Union of Student Representations of Lithuania. There is no evidence on development of other institutionalized partnerships.

Gender equality on research committees, boards and governing bodies could be promoted better via establishment of systemic approach or legal regulations. On the other hand, there are no legal restrictions for female academic and administrative careers.

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

Over the past few years there is substantial political focus on circulation of knowledge particularly in the context of fostering cooperation between public research and private enterprises. "Integrated science, studies and business centres – valleys" constitute the most important instrument (worth around €400m) for fostering open innovation and transfer of knowledge between public research and private enterprises. However, to date the involvement of enterprises in these projects has been limited and there is a risk that investments will result in modernisation of public research infrastructures rather than research-enterprise collaboration.

The implementation of open access of scientific information remains problematic due to several reasons. Firstly, institutions and researchers do not have sufficient incentives to ensure open access to research results, since formal evaluation of R&D activities focuses on monographs, ISI journals, patents and other products subject to intellectual property rights. Secondly, public financial support for the development of open access databases has been fragmented over a number of relatively uncoordinated projects. None of them has reached critical mass to become dominant source of information on research production in Lithuanian research system. With the view addressing these challenges the Programme for Development of Lithuanian Research and Studies Informational Infrastructure for 2013-2016 (total budget €18m) was approved. Its target is that 40% of publications and at least 10% of collected data should be publicly available free of charge by 2016.

Despite a large number of strategic documents, there is a lack of consensus on the overall logic of intervention for fostering open innovation and knowledge transfer. Instead, different strategies (and their institutional "owners") focus on separate elements, which implies a risk of fragmentation. Systemic and legal obstacles have prevented business from entering R&D

collaboration with universities (and vice versa). For instance, the existing legal system does not allow universities to bring their funds to the joint R&D and/or cluster collaboration projects as well as it does not allow private enterprises to become stakeholders in the newly constructed "open access" research infrastructures.

The "valleys" concept is criticised in the public discussion for focusing too much on "bricks and mortar", while support for professional innovation services, IPR rights and joint research projects has been limited. The updated Concept of the Establishment and Development of Integrated Science, Studies and Business Centres – Valleys sets the policy mix for fostering research collaboration and bridges between academia and industry for the forthcoming period (including smart specialisation, funding for the 'joint projects' etc.).

On the other hand, there is no national policy related to research and education-related public e-infrastructures and associated digital research services enabling consortia of different types of public and private partners. However, as a general rule publicly funded e-infrastructures are accessible to researchers from public and private sectors without major restrictions.

There was also no significant progress in fostering access to and transfer of scientific knowledge via digital ERA. For instance, there are no national strategies or policies related to for electronic identity that would facilitate researchers' access to transnational digital research services.

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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. Performance of the national and regional Research and Innovation system

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(-) R&I policy governance in Lithuania had been complex and fragmented, with a consequent lack of coordination in policy design and implementation. There is fragmentation of policy priorities, programmes, funds and institutions, and insufficient leverage of different funds as well as few synergies between measures. This is a critical issue, considering the policy mixes planned for the implementation of S3. (+/-) There are small scale programmes devoted to grand (long term) challenges, but they lack critical mass.	(+)The majority of R&I funds over 2014-2020 will be concentrated around a number of challenges-related R&I priorities. The Lithuanian smart specialisation priorities are linked to grand/long term challenges. It is planned that each of the priority will have a dedicated programme (a priority implementation plan). (+/-) There is an urgent need to develop a well- coordinated, coherent and integrated framework geared towards implementing the R&I (smart specialisation) priorities, that would include coordinated efforts by many public authorities, policy sectors and actors. The discussions are ongoing, however the results are far from promising, as the key authorities rather aim at clearly separating their funds and areas of interest, instead of jointly coordinating a diverse policy mix.
2. Design and implementation of research and innovation policies	(+) A multi-annual STI framework providing a long-term policy context to prioritise expenditure on STI is in place. A framework for 2014-2020 is being developed. (-) Despite a versatile policy mix is in place, policy lacks good coordination, continuous monitoring and evaluation efforts for informed and well-coordinated decisions. (+/-) The implementation structure is backed by various committees and working groups involving different stakeholders (industry, researchers, NGOs), these bodies typically work as 'discussion clubs' instead of being lively networks with a viable structure, backed by policy intelligence facilities, ongoing debate platforms and sufficient impact on decision making. (+) By mid-2015 the country will have a multi-annual strategy focused on a limited number of priorities, preceded by an international analysis of strengths and weaknesses at national level and of emerging opportunities ('smart specialisation') and market developments. The analysis was finalised by end of 2014 and a list of priorities was proposed.	(+) Lithuania has been engaged in a participation-based, open and transparent process for setting up the national smart specialisation priorities, which resulted in the proposals of 6 priority areas and 20 specific priorities within those areas, to be approved by the Government. (+/-) At the moment the policy and budgetary framework for the implementation of smart specialisation strategy is being clarified. It will aim at avoiding unnecessary duplication and fragmentation of efforts, exploiting opportunities for joint programming, cross-border co-operation and exploiting the leverage effects of EU instruments. So far, however, it seems that the policy framework will rely on the national instruments (SF funds) and focus on transnational collaboration will be minimal. (+/-) The monitoring and review system is under discussion. It is crucial that it builds on continuous monitoring, which makes full use of output indicators, international benchmarking and ex-post evaluation tools. Coordinated monitoring is needed given that S3 policy framework will be implemented by a number of implementing agencies and other institutions. However, there is still a problem of inter-institutional coordination, and an agreement on the continuous and coordinated monitoring of policy efforts (in order also to review the priorities) has not been reached.

Feature	Assessment	Latest developments
3. Innovation policy	(-) 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. The current policy approach is mainly dominated by the 'linear model of innovation' perspective. This perspective lacks a clear view about the systemic nature of the innovation process and the importance of non-technological dimensions. (-) The current policy mix relies mainly on supply side policies.	(+) The R&I policy documents for 2014-2020 (the National Development Programme 2014-2020, OP 2014-2020) plan for the implementation of both supply and demand side policy measures, facilitating both technological and non-technological innovation, broadening the scope of target groups and innovation types.
4. Intensity and predictability of the public investment in research and innovation	(+) Public investments in education, research and innovation are prioritised and budgeted in the framework of multi-annual plans to ensure predictability and long term impact, and draw on the Structural Funds where appropriate (OPs for 2007-2013, 2014-2020). (+/-) The public funding aims at leveraging greater private sector investments, but the success has been limited as a large proportion of funds was dedicated to public sector's research infrastructures and not directly for research.	(+) Operational Programme for 2014-2020 foresees an increased funding for research and innovation. (+) Innovative financing solutions (e.g. tax incentives, pre-commercial procurement, etc.) are increasingly explored and adopted. The legal base for introduction of the pre-commercial procurement will be prepared over the next couple of years.
5. Excellence as a key criterion for research and education policy	(+) The research funding is increasingly allocated on a competitive basis and the balance between institutional and project-based funding of research is about 50/50. (+) Institutes and projects evaluated on the basis of internationally recognized criteria such as research production, quality etc. Project funding is based on peer review. (-) Grants portability is not possible across borders and institutes. (+/-) Higher education and research institutes increasingly enjoy autonomy to organise their activities in the areas of education, research, and innovation, apply open recruitment methods and to draw on alternative sources of funding. Some of the areas however are still controlled by the State (e.g. approval of study programmes, entering the studies; universities cannot sell real estate). (-) The legal, financial and social frameworks for research careers, including doctoral studies, still cannot offer sufficiently attractive conditions in comparison to international standards, especially those in the US or Western Europe.	(+) Latest developments since 2010 are the increase in competitive funding of research, introduction of the institutional evaluation methodology for research institutes and universities (the methodology introduced and revised over 2010-2012) and increase in the university autonomy since 2009 after introduction of the new Law on Research and Education.
6. Education and training systems	(+/-) Increasing policy attention to ensure a sufficient supply of	(+) The Operational Programme for 2014-2020 will address some of the related issues

Feature	Assessment	Latest developments
	(post)graduates in science, technology, engineering and mathematics and an appropriate mix of skills among the population (including through strong vocational and education and training systems) in the medium-to-longer term. Several reforms were implemented, but it is too early to judge if the reforms were successful (or vice versa). (-) Education and training curricula insufficiently focus on equipping people with the capacity to learn and to develop transversal competences such as critical thinking, problem solving, creativity, teamwork, and intercultural and communication skills. (+/-) Increasingly attention is paid to address innovation skills gaps. Nevertheless, entrepreneurship education and training is not yet widely available or included in curricula. Partnerships between formal education and other sectors are not sufficiently promoted to that end.	(entrepreneurship curricula, addressing the skills mismatches etc.)
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(+)Policies and instruments such as innovation/knowledge clusters, and voucher systems, are in place to encourage co-operation and knowledge sharing and at creating a more favourable business environment for SMEs. (-) None of these instruments have so far proven to be effective in fostering industry-science links. Efforts to concentrate funds and create connections, such as the 'valleys' or clusters, have so far been able to deliver only very limited effect (that's partially due to the 'errors' in the measures' design). Instead of fostering open innovation platforms around the key areas or sectors, the state has created separate 'pockets' of funding (clusters, 'R&D networks', 'joint research programmes', 'S&T parks', 'valleys' infrastructure projects) for similar purposes. There is a need for a complex of direct and indirect incentives for promoting the entrepreneurial culture in the universities and industry-science links. (+/-) There are no obstacles to setting up and operating transnational partnerships and collaborations, but there was no active promotion and such collaborations are rare. (-)There are recommended rules on the ownership of intellectual property rights, but the system at the institutions level	(+) The policy mix for 2014-2020 includes a variety of measures to support the commercialisation of innovative ideas (also incentives for commercialization of public research results, local and international innovation/knowledge clusters, voucher systems, trans-sectorial mobility of researchers, to facilitate knowledge transfer and the creation of university spin-offs and to attract (venture) capital and business angels.

Feature	Assessment	Latest developments
	(universities) is lacking, which could be an obstacle in facilitating university spin-offs and spin-outs.	
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) Policies to promote innovation, entrepreneurship and enhance the quality of the business environment are increasingly interconnected. (+) Favourable conditions are in place to foster a growing and robust venture capital market, especially for early stage investments. (+) The rules for starting up and running a business are increasingly simplified. The legal framework is transparent and up-to-date. Rules are properly enforced. Markets are dynamic and competitive. (-) There is a lack of an efficient, affordable and effective system for the protection of intellectual property at the institutional level (universities etc.), although financial incentives for protecting IPR are in place. (-) There is a lack of an efficient standard-setting system. (-) Willingness to take risks is not effectively promoted. E.g. new companies have to pay taxes since the first day of operation.	(+) The last four years saw substantial efforts in order to promote entrepreneurship, favourable business environment, to reduce time required for starting up a company, etc. (+) Several venture capital funds (incl. seed and pre-seed capital) started operating in 2013. (+) New measures for favourable framework conditions are foreseen in the National Development Programme 2014-2020 and Operational Programme 2014-2020.
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+) A diverse number of policy measures are available to companies, mature ones as well as start-ups. (-) The policy implementation capacities have been one of the weak links, including the risk-aversion in implementing R&I policies, capacities of administration, and management of programmes. Though improvements are continuously introduced, beneficiaries complain that the process is still too bureaucratic, and unnecessary requirements reduce the uptake by the target actors. (-) Only a very limited part of R&I funding is allocated through international evaluation procedures and encourages trans-national cooperation. Applications are in Lithuanian. (-) Funding schemes are not sufficiently evaluated or benchmarked against comparable schemes in other countries, there is a lack of focus on alternative options, rigorous evaluation procedures (rather, a large set of policy objectives are 'evaluated' at once). (-) Simplifying the procedures (see the column to the right) would not suffice as the key problem is within the management capacities of the implementing agencies and the limited	(+) Since 2012, several new policy measures have been launched for start-ups and spin-offs and increasingly policy attention is turning to young fast growing companies. (+) The public authorities seek to reduce the administrative load of SF funded measures in 2014-2020. For example, 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.

Feature	Assessment	Latest developments
	focus on working with the innovative projects pipeline. The system does not sufficiently integrate cutting-edge industrial expertise and knowhow, and it has developed a culture of risk-aversion, biased against early-stage and high risk innovation ventures, particularly in high-technology sectors. Staff of implementation agencies do not possess sufficient knowledge of the industry, and therefore they will remain limited in their capacity to fashion effective, output-oriented programs maximizing the impact of the funding distributed unless industry expertise is integrated in the instrument design and the selection phases. Moreover, the staff face another set of constraints stemming from the overly legalistic approach to programme management. Emphasis on the EU's legal framework, the Lithuanian administrative law and procurement regulations often makes them reluctant to allocate public resources to projects that may not immediately result in commercially viable products and services.	
10. The public sector itself is a driver of innovation	(+) The public sector innovation is an increasingly hot topic, and one of the objectives of the Lithuanian Innovation Development Programme. (-) The objective has been addressed by fragmented efforts and lacks systematic approach. Systematic reforms of the Lithuanian public sector are needed to achieve visible results.	(+) The Lithuanian Development Programme for 2020, Lithuanian Innovation Development Programme 2014-2020 and draft Operational Programme for 2014-2020 foresee implementation of the innovative public and pre-commercial public procurement. Currently the legal basis is being prepared for introduction of the new measures.

Annex 2. National Progress on Innovation Union commitments

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	(-) No specific initiatives in this field. According to the EURAXESS portal, not a single Lithuanian institution has expressed interest in the HR strategy for researchers.	(-) No specific initiatives in this field. (-) No evaluation of this policy in place
4	**ERA Framework**	(+) Emphasis on results-based and competitive funding of research (+) Policy attention to knowledge transfer (+) Policy attention to developing RIs and involvement in international RIs	(+/-) Efforts are focused on strengthening existing research capacities with limited emphasis on internationalisation. (-) Financial commitments to joint research agendas are rather limited and national research programmes are only implicitly aligned with research priorities pursued at ERA. (-) Inward mobility of foreign researchers is hampered by obstacles in accessing national grants and lack of transparency in institutional recruitment of outsiders (including dysfunctional EURAXESS centre).
5	**Priority European Research Infrastructures**	(+) Roadmap for Research Infrastructures of Lithuania was approved in 2011. (+) Draft OP 2014-2020 includes support for involvement into international RIs (+) In 2012 Minister of Education and Science issued a decree regulating participation in international RIs.	(+)No financial commitments for construction and operation of the global, national or regional RIs has been made in Lithuania by the time of preparing this report, but there is a clear progress in developing a related policy and legal framework
7	**SME Involvement**	(+)Starting with 2012, the Ministry of Economy acts as an administrating institution of the Green Industry Innovation Programme (NOR Financial Mechanism 2009-2014, budget of €9.4m), which is aimed to enhance competitiveness of the environment-friendly companies through greening of companies which represent traditional industries, promoting of entrepreneurship as well as through the development and spread of green innovation.	(+) There is progress in collaborating between countries on R&I progress with focus on SMEs
11	**Venture Capital Funds**	(+)As of early 2013, Lithuania introduces three new venture capital measures aiming to boost investments in early stage innovative companies in Lithuania: the Creative Innovation Development (CID) measure in order to promote transfer (i.e. commercialization) of innovative ideas; the Baltic Innovation Fund (BIF) - a "fund of funds"; EIF and Practica Capital fund.	(+) Venture capital funds including seed and pre-seed are increasingly available for SMEs.
13	**Review of the State Aid Framework**	(-) No changes to report.	(-) No policy changes to report / lack of data.

		Main changes	Brief assessment of progress / achievements
14	**EU Patent**	(-) No changes to report.	(-) No policy changes to report / lack of data.
15	**Screening of Regulatory Framework**	(-) No changes to report.	(-) No policy changes to report / lack of data.
17	**Public Procurement**	(+) Innovative public procurement and pre-commercial public procurement are viewed as key instruments for demand-led innovation policies in 2014-2020 (+) The Ministry of Economy launched the update of related legal base.	(+) Legal base required for using innovative public procurement and pre-commercial procurement is in progress.
20	**Open Access**	(+)With the view addressing these challenges the Minister of Education and Science in 2012 approved the Programme for Development of Lithuanian Research and Studies Informational Infrastructure for 2013-2016[18] (total budget €18m). It seeks better integration of previously developed databases and increased accessibility of research outputs (publications, etc.) and data. The target is that 40% of publications and at least 10% of collected data should be publicly available free of charge by 2016 (+)The most recent developments in this respect include allocation of €4.3m in 2011 to Vilnius University for implementation of the project "National open access archive of research information (MIDAS)". It seeks to provide infrastructure for preservation and open access to research data. It is planned to integrate it with other databases.	(+) There have been a number of initiatives aimed at fostering access to and preservation of scientific information via open-access databases. (-) These initiatives, however, remain fragmented and none of them has reached critical mass to become dominant source of information on research production in Lithuanian research system. There was no significant progress in fostering access to and transfer of scientific knowledge via digital ERA.
21	**Knowledge Transfer**	(+) 2012 witnessed proliferation of new strategic documents focused on innovation and knowledge transfer between public research and private enterprises: the National Progress Programme for Lithuania for the period 2014-2020; the Concept of the Establishment and Development of Integrated Science, Studies and Business Centers (Valleys); the State Studies and R&D Programme for 2013-2020. (+) Draft OP for 2014-2020 foresees new measures for knowledge transfer, e.g. development of technology transfer offices.	(+/-) There are many measures aimed at direct support for fostering public-private cooperation and knowledge transfer, e.g. "Inoklaster LT", "Inoklaster LT+" "Inogeb LT-1", "Inogeb LT-2", "Inogeb LT-3", "Intellect LT", "Advanced technologies development programme", "Biotechnologies development programme", „Innovation vouchers", "Eurostars" and "Eureka". Their implementation has faced mixed success. (-) Despite a large number of strategic documents, there is a lack of consensus on the overall logic of intervention for fostering open innovation and knowledge transfer. Instead, different strategies (and their institutional "owners") focus on separate elements, which implies a risk of fragmentation. (-) There is still lack of functional knowledge transfer offices at public research institutions.

[18] LR švietimo ir mokslo ministro įsakymas, Dėl Lietuvos mokslo ir studijų informacinės infrastruktūros plėtros 2013-2016 metų programos patvirtinimo, Nr. V-1738, 2012 December 12.

		Main changes	Brief assessment of progress / achievements
22	**European Knowledge Market for Patents and Licensing**	(-) No changes to report since 2011.	(+) Financial support is provided for IPR protection.
23	**Safeguarding Intellectual Property Rights**	(-) No changes to report.	(-) No policy changes to report.
24	**Structural Funds and Smart Specialisation**	(+) The Smart specialisation Strategy is in progress and should be elaborated by early 2014. (+) A national process for defining smart priorities is launched, which includes evidence based and participatory elements	(+) The Smart Specialisation Strategy is in progress.
25	**Post 2013 Structural Fund Programmes**	(+) The OP for 2014-2020 is in progress.	(+) The OP for 2014-2020 is in progress.
26	**European Social Innovation pilot**	(+) The Lithuanian Innovation Strategy 2010-2020 stated user-centered and demand-driven innovation as one of its objectives. (+) One of the preliminary priority areas of smart specialisation is 'Inclusive and creative society', which could potentially lead to supporting social innovations.	(-) Policy objectives have so far not led to any actions or policy measures.
27	**Public Sector Innovation**	(-) No changes to report.	(-) No visible policy interest in this area.
29	**European Innovation Partnerships**	(-) No changes to report / lack of data.	(-) No policy changes to report / lack of data.
30	**Integrated Policies to Attract the Best Researchers**	(-) No changes to report – no comprehensive / integrated internationalisation policy or targets.	(-) Lack of clear policy targets or policy initiatives, current efforts focus on strengthening the existing national research capacities. (+/-) Separate initiatives in place, e.g. some research grants are open for other countries' nationals, but only if they are of Lithuanian origin and they must be subsequently employed by Lithuanian research institutions
31	**Scientific Cooperation with Third Countries**	(-) No recent changes to report.	(-) No strategy or targets related to cooperation with third countries (+) Separate initiatives in place, e.g. bilateral or multilateral research programmes
32	**Global Research Infrastructures**	(-) No changes to report.	(-) No policy changes. No involvement in developing global RIs.
33	**National Reform Programmes**	(+) R&I funding indicators demonstrated positive trends during the last three years.	(-) The current pace may not be sufficient to meet the R&D targets set by NRF. More effective policy efforts are required to leverage private investments into R&D.

Annex 3. National progress towards realisation of ERA

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
ERA priority 1: More effective national research systems	**MS01**	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	There were no policy changes in this area in 2012-2013.	(+) Lithuania has witnessed an increasing share of Government budgetary funding for research allocated on competitive basis. The proportion has increased from 12.1% in 2006 to approx. 50% in 2012. The major policy shift has occurred in 2009, when the Research Council of Lithuania (LMT) acquired the functions of a funding agency. (-) However, the levels of funding (in absolute terms and as % of GDP) remain well below the EU-27 average. There were no major policy changes in this area in 2011-2012.
	MS02	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	There were no policy changes in this area in 2012-2013.	(+) The peer-review process is organized and managed by Research Council of Lithuania (LMT). It is based on the methodology approved in 2010. (-)There is no publicly available data on the extent to which the peer review involves international scholars. In principle participation of international peers is not limited. However, in practice a majority of grant proposals are submitted in Lithuanian language (with a short summary in English), which could pose linguistic barriers to participation of international reviewers.

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
ERA priority 2: Optimal transnational co-operation and competition	**MS06**	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	In 2013 the Lithuanian, Latvian, Estonian authorities discussed possibilities of transnational R&I collaboration, but no visible results so far.	(+) Overall, since 2010 Lithuania stepped up efforts to implement joint research agendas through Joint Programming Initiatives, international programmes, and bilateral programmes. (-)Nevertheless, financial commitments to joint research agendas are rather limited and national research programmes are only implicitly aligned with research priorities pursued at ERA.
	MS07	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	No specific developments in this area.	(+) Evaluations of research projects carried out within the framework of ERA, bilateral and trilateral programmes (see above) are recognized in Lithuania. Recognition of evaluations typically results in funding of the projects within the limits of financial commitments made for the said programmes.
	MS08	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant	No specific developments in this area.	No data available.
	MS15	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	(+) Roadmap for Research Infrastructures of Lithuania was approved in 2011. The Roadmap also presented the selected list of the European Research Infrastructures to be considered attractive for some national RIs. (+) In 2012 Minister of Education and Science issued a decree regulating participation in international RIs. It established that Lithuanian research institutions can submit applications for joining international IRs on a	(-) No financial commitments for construction and operation of the global, national or regional RIs has been made in Lithuania by 2013. The development of RIs of pan-European interest or joining RIs of pan-European interest was fragmented and uncoordinated. (+) However, over 2012-2013 a system for coordinating the involvement or development of large pan-European RIs was being developed. The draft OP for 2014-2020 foresees financial support for the construction and operation of ESFRI, global,

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			continuous basis and the Roadmap should be subject to major revision every 5 years. The applications will be regularly assessed by LMT. The latter in December 2012 approved internal Guidelines regulating the assessment and selection procedures. (+) The draft OP for 2014-2020 foresees financial support for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, and for joining the international / European RIs.	national and regional RIs of pan-European interest, and for joining the international / European RIs.
	MS16	Action 5: Remove legal and other barriers to cross-border access to RIs	No specific developments.	(+) 5 "Integrated science, studies and business valleys", once completed should operate as open access centres. This implies that in principle the access to research infrastructure should be granted to national and non-national academic and business establishments. The legal regulations are being developed.
ERA priority 3: An open labour market for researchers	**MS24**	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	No specific developments in 2012-2013.	(+) The legislation promoting open, transparent and merit based recruitment of researchers is in place. (-) However, in practice implementation of regulations remains problematic. There is no reliable statistics, but anecdotal evidence has it that the number of applications for a vacancy rarely exceeds one. Inconsistencies in recruitment process could also hinder openness and transparency. Hence, while legal requirements seek to ensure openness and transparency of recruitment process, there is in practice considerable room for improvement.
	MS25	Action 2: Remove legal and other barriers which	No specific developments in 2012-2013.	(-) In principle researchers from EU and non-EU countries can apply for grants

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
		hamper cross-border access to and portability of national grants		administered by LMT. However, there is a legal requirement that beneficiaries of grants have to be employed in a Lithuanian institution. This poses considerable barrier due to low level of salaries and careers (contractual agreements) elsewhere. (-) National grants are not portable as they are awarded to specific institutions and therefore cannot be transferred to other institutions (in Lithuania or abroad).
	MS26	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS network	In 2011, LMT took over from the Centre of Quality Assessment in Higher Education the functions of the coordinator of the Lithuanian national EURAXESS centres. This, however, has not resulted in improvements in relevance and quality of services.	(-) The EURAXESS centre is dysfunctional, information on fellowships and grants is outdated, incomplete and irrelevant.
	MS27	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.	No specific developments in 2012-2013.	(+) The decree adopted in 2010 by the Minister of Education and Science stipulates that institutions willing to register new PhD programmes have to comply with considerably more stringent requirements in terms of excellence of research, relevance of proposed research programmes, human and physical resources, etc. As a result, an increasing number of Lithuanian institutions establish joint PhD programmes, with the view of pooling intellectual resources and research infrastructure. Furthermore, several universities have started Joint international PhD programmes, (some of them funded by Erasmus Mundus).
	MS28	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers	No specific developments in 2012-2013.	(+/-) The implementation of the 'European Charter for Researchers' and the 'Code of Conduct for the Recruitment of Researchers' is not directly promoted at the national level

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
		incorporating the Charter & Code		in Lithuania (Deloitte 2012). 16 Lithuanian research organisations are listed as signatories of the declarations of endorsement of Charter & Code (Euraxess 2013a).
ERA priority 4: Gender equality and gender mainstreaming in research	**MS39**	Action 1: Create a legal and policy environment and provide incentives	No specific developments in 2012-2013.	(-) Despite the relatively high proportion of women researchers, they are grossly under-represented in senior academic (less than 20% of professors are women) and managerial positions. A Strategy on Equal Opportunities was adopted in 2008. Since 2011 Lithuanian Academy of Sciences implements a project "Promotion of gender equality in sciences". These steps, however, do not seem to be sufficient to counter historically embedded barriers to gender equality in research.
	MS40	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	No specific developments in 2012-2013.	(-) Only fragmented efforts - LYMOS project (see above) was coordinated by the Lithuanian Academy of Sciences and partners that included: LMT, association, BASNET Forumas" and the National Union of Student Representations of Lithuania. There is no evidence on development of other institutionalised partnerships.
	MS41	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating	No specific developments in 2012-2013.	(-) At the moment, there is no systemic approach or legal regulations to promote gender equality on academic and research committees, boards and governing bodies in Lithuania.
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including via digital ERA	**MS45**	Action 1: Define and coordinate their policies on access to and preservation of scientific information	No specific developments in 2012-2013.	(+) There have been a number of initiatives aimed at fostering access to and preservation of scientific information via open-access databases. (-) These initiatives, however, remain fragmented and none of them has reached critical mass to become dominant source of information on

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
				research production in Lithuanian research system.
	MS46	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	2012-2013 witnessed proliferation of new strategic documents focused on innovation and knowledge transfer between public research and private enterprises: the National Progress Programme for Lithuania for the period 2014-2020; the Concept of the Establishment and Development of Integrated Science, Studies and Business Centers (Valleys); the State Studies and R&D Programme for 2013-2020. They top already existing strategies and programmes: the Lithuanian Innovation Strategy for 2010-2020 (adopted in 2010), the General National Research and Science and Business Cooperation Programme (adopted in 2008), etc.	(-) Despite a large number of strategic documents, there is a lack of consensus on the overall logic of intervention for fostering open innovation and knowledge transfer. Instead, different strategies (and their institutional "owners") focus on separate elements, which implies a risk of fragmentation. (-) "Integrated science, studies and business centres – valleys" constitute the most important instrument (worth around €400m) for fostering open innovation and transfer of knowledge between public research and private enterprises. However, to date the involvement of enterprises in these projects has been limited and there is a risk that investments will result in modernisation of public research infrastructures rather than research-enterprise collaboration. (+/-) The draft OP for 2014-2020 foresees a number of instruments for fostering open innovation and industry-science cooperation. It is yet unknown if the authorities have learned the lessons of the current period and will introduce more effective instruments, or will duplicate the previously used fragmented instruments.
	MS47	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners	"Lithuanian virtual university programme 2007-2012" has been running since 2007. It provides Lithuanian HE and research institutions with access to academic e-library and distance learning platforms. A new programme for 2013-2016 has been approved in 2012.	(+) As a general rule publicly funded e-infrastructures are accessible to researchers from public and private sectors without major restrictions. In late 2012 there have been discussions to set up a portal that could provide e-services to public research institutions and private enterprises. The overall objective of the initiative is to facilitate commercialisation of ideas generated in research institutions and foster cooperation between public and private sectors.

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
	MS48	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	No progress in this area.	(-) There are not national strategies or policies related to for electronic identity that would facilitate researchers' access to transnational digital research services.

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