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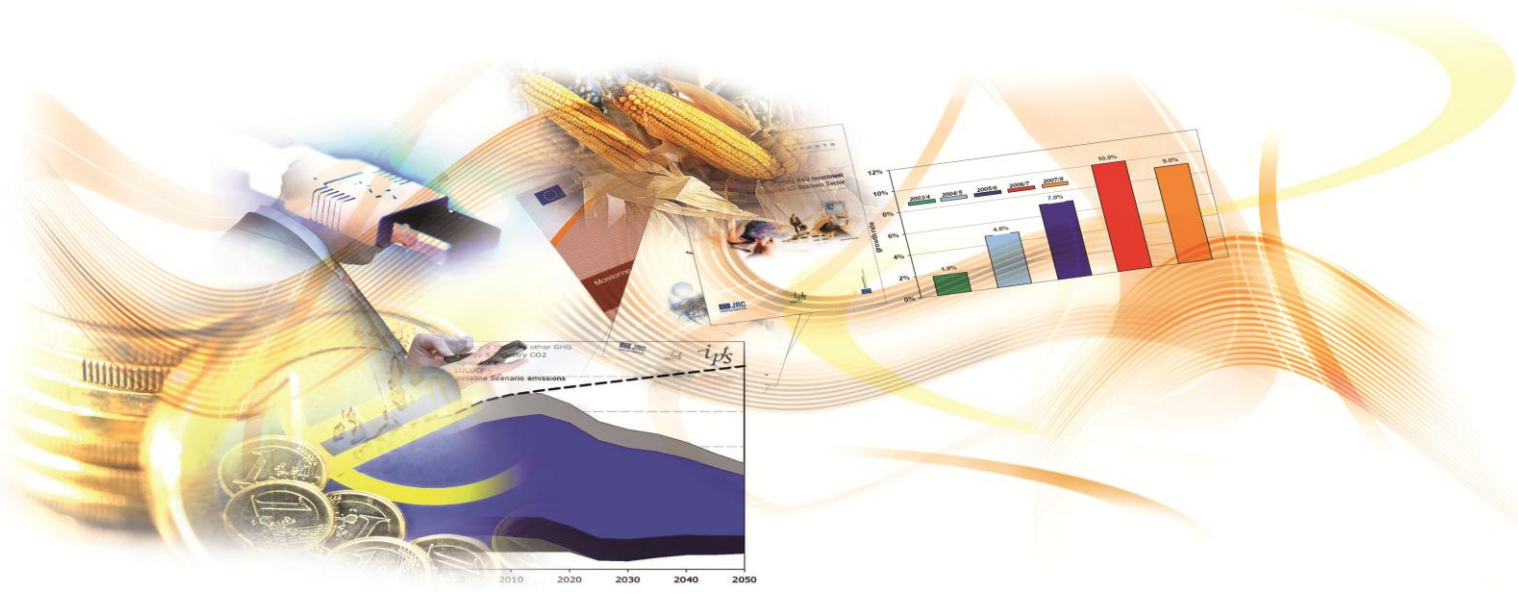

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Abstract

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 benefitted from the comments and suggestions of Mariana Chioncel from JRC-IPTS, Peter Teirlinck and Ward Ziarko from BELSPO and Niko Geerts from EWI. The contributions and comments from DG-RTD 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

Research and innovation policy in Belgium is designed and implemented in a multi-level governance framework involving the Federal Government and autonomous regional and (linguistic) community governments. Although complex, the clear constitutional demarcation of responsibilities means that in practice there is no reason for the various authorities not to be able to design and implement effective policies. Indeed, the possibility for the three regions (Brussels-Capital, Flanders and Wallonia) to design policies that suit the specific needs of their business sectors for innovation and that are tailored to optimise the potential of their higher education research capacities can be considered as positive.

Despite the economic crisis, and in part as a result of a commitment by all of the competent Belgian authorities to meet the 3% gross expenditure on R&D (GERD) in gross domestic product (GDP) target, GERD has increased in absolute terms in recent years. In 2011 it was 2.21% of GDP[1]. In total, Belgian authorities spent 1.1 billion on tax credits and an additional 2.4 billion in GBOARD which represents EUR 3.5b in 2011 or nearly 1% of GDP which is in line with the Barcelona target of 1% for public R&D funding.

Belgium, although not among the innovation leaders in the EU, is placed third in the second tier of 'innovation followers' in the Innovation Union Scoreboard 2014 (European Commission, 2014) and over the last five years has achieved moderate growth in innovation performance. The country has a strong, internationally competitive research infrastructure (most importantly its universities and a handful of major research facilities) driven by a globally connected and highly productive workforce. At the same time, the business sector in Belgium is more active than the EU28 average in terms of both the financing and performance of research and development (R&D). A small number of foreign owned companies play a key role in underpinning this strong performance with the R&D investments of a few large companies in a limited number of sectors and mostly managed overseas making significant impact on the R&D performance figures. As a whole, the country is characterised by a relatively large share of SMEs, which typically make lower R&D investments as compared to large multinational companies. At the same time, in comparison with EU SMEs, the results of the CIS survey reveal that Belgian SMEs are highly innovative and have the highest absorptive capacity in terms of employment of highly skilled labour force. One important challenge is to **link research capacities to the economic eco-system**. Several measures are in place in each region aimed at economic exploitation of research, but it seems that research outputs are not aligned with the absorptive capacity of Belgian companies.

While Belgium has strengths in terms of openness and international knowledge exchange and a well educated population, and despite a very good performance (strongly above the EU28 average) both in terms of R&D labour force as in terms of highly educated labour force, there are still some areas with a lack of qualified labour, i.e. shortage professions. Apart from policies to further improve the working conditions for researchers (career prospects, financing for projects), increasing the numbers choosing to enter the profession (e.g. awareness and image-improving campaigns), improving the number of graduates in the S&T domains and creating easier access to the labour market for an increased number of foreign graduates are areas for improvement, e.g. overcome language barriers to attract more students from abroad. To this end, a number of programmes have been setup in communities and regions, and partnerships for

[1] For 2012 provisional data indicate 2.24%.

researchers have been created, such as the Wallonia-Brussels Partnership for Researchers, where public authorities undertake, alongside the research stakeholders, to place researchers at the centre of the agenda for the consolidation of research as a driver of the future.

On the institutional level, there is a **need for enhanced co-ordination between the authorities** in terms of the use of financial resources available. Similarly, the remaining responsibilities of the Federal Government, in fields such as taxation, corporate law (including intellectual property), mean that the implementation of certain regional initiatives may be conditional on coordination with Federal policy. If anything, fragmentation of the innovation system is more problematic at the regional level where a 'sub-regionalism' leads to a multiplication of stakeholders in the different layers of regional governance. More positively, there has been in recent years a consolidation of smaller universities and third level institutes into larger partnerships with the major universities.

Over the last years, the **trends in the priorities of the policy-mix** in each of the three Belgian regions have tended to display some distinctive features, reflecting their specific institutional and economic environments. At the same time, a number of measures are similar in their objectives yet differ in the approach to implementation. A common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. In addition, the overall efforts to structure and develop major specialised 'clusters' of R&D and innovation need to be pursued and further consolidated. The evidence from the Flemish strategic research centres suggests that it may take years before such initiatives become fully operational and realise their objectives, achieve 'critical mass' and attain international recognition. The Walloon competitiveness clusters and the research and technology centres created over the last decade will need sustained funding, regular evaluation and expert management if they are to begin to contribute effectively to structural adjustment of the economy. The realignment of research and innovation policies to contribute to tackling the structural adjustment of the economy or for taking on 'grand challenges' will require better orientation and focus of the limited amounts of public funding available. There is currently limited recent evaluation evidence on the effectiveness of the measures in place and a wide-ranging review would be beneficial in each region in order to focus regional support on initiatives best able to contribute to raising the intensity of industrial R&D and innovation (including service sector and other non-technological forms of innovation).

The Belgian authorities are strongly committed to and participate in European initiatives, especially the EU Framework programme for R&D, or in related initiatives such as the ESFRI programme on research infrastructure. In a number of cases this commitment matches national challenges or priorities, for instance, the implementation of the European Partnership for Researchers in both Communities, which should make it easier to attract and retain qualified human resources. With regard to cross-border cooperation, Belgium is actively engaged in a range of European initiatives, as well as a number of federal, Community and regional initiatives, which include bilateral agreements, joint-R&D projects and shared research infrastructures. Most instruments in innovation and research policy are, however, still nationally /Community / regionally oriented and not open to cross-border or cross-regional cooperation. An interesting recent evolution is the stronger focus on the coordination/opening of programmes between the Walloon and the Brussels-Capital regions, in parallel to the stronger coordination between Wallonia and the Wallonia-Brussels Federation.

In December 2012, the governments of Flanders, Wallonia and the Walloon-Brussels Federation adopted of a joint action plan for recovery through R&D, aimed at taking a series of actions around 3 areas: launch of joint calls for submission of projects, strengthening collaboration between regional and community actions and definition of common positions, particularly at

European and international level.

In the field of international cooperation through the EU Regional Fund, there exist a number of Interreg projects whereby STI actors, public authorities and private partners from Flanders jointly support multiannual projects.

Given the economic crisis over the last 5 years, the Belgian economy and research and innovation system appears to have 'weathered' the storm better than some other neighbouring countries. The introduction and extension of R&D tax reductions on researchers' salaries may well have acted as an 'automatic stabiliser' without which R&D intensity would have declined rather than remaining relatively stable. Similarly, tax incentives for business may have contributed to maintaining the relative attractiveness of Belgium as a place to do research. The structuring of the higher education system should foster, if the correct policy incentives are in place, a corresponding realignment of the way research is carried out. This is one element that would help to reduce the overall fragmentation of the Belgian research system and further improve its performance. At the same time, the balance between institutional and competitive funding of the system would merit further review in order to further focus and concentrate efforts. Finally, while the remit of the Federal Government to fund 'nation' wide research programmes has been further limited[2], there is a clear rationale for organising joint programming, sharing certain research infrastructures or 'pooling' research efforts in certain fields. This has already been possible for coordinating Belgium's participation in the research infrastructures fields of the ESFRI roadmap. Finally, the proposed Inter-Federal Plan for Research and Innovation has led to concrete initiatives.

[2] With the decided transfer of the inter-Community programmes Inter-University Attraction Poles and Technology Attraction Poles to the Communities and the Regions

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1. BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

The various Belgian authorities are fully autonomous. Constitutionally there are seven Belgian authorities[3], in practice there are five active entities when it comes to science, technology and innovation (STI) policy as the Flemish Region and the Flemish community merged their institutions since the start in 1980 and the German Community does not have a research policy.

The Federal Government has competence for the federal scientific institutes, intellectual property (IP) law, standardisation, fundamental metrology, nuclear research, corporate taxation, employment legislation and social security. The Communities are competent for matters related to individuals including scientific research and (higher) education, and the Community Scientific Institutes; the regions are competent for territorial matters such as energy, environment, and economic support, thus including innovation, applied and industrial research, science parks, and technology transfer (see Ziarko, Reid & Bruno (2012) and BELSPO (2013) for a more detailed overview of the system).

Belgium is a small densely populated federal State (11.162m inhabitants in 2013, about 2.21% of the EU28 population). It is divided into three regions: Flanders (6.37m inhabitants in 2012), Wallonia (3.56m) and Brussels-Capital (1.16m); and three communities: the Flemish (7.1m speakers), the French (4.3m) and the German (75,000). The Belgian research system is highly decentralised. The main responsibility for research policy and funding lies with the three regions and the three language communities. Total gross domestic product (GDP) was €375.9b (at market prices) in 2012 (2.9% of EU28). Per capita GDP in 2012 was €30, 400. This is 18.75% above EU28 average (i.e. €25,600).

There are significant regional differences in the GDP per capita: Wallonia lies just below EU27 average (98.3% in 2010), Flanders lies well above (132.7%) and Brussels-Capital lies extremely high above (250.2%). The dispersion of regional GDP per inhabitant was 26.8 in 2010, which puts Belgium amongst the highest countries in Western-Europe. Belgian gross expenditure on R&D (GERD) as a share of GDP was 2.24% in 2012, above EU28 value (2.06%) and EU17 (Euro area) average (2.14%).

Belgium is unique amongst the EU Member States in that it is the only country where, since the early 1990s, most of the research policies has been decentralised across several governments, each enjoying complete autonomy of decision-making power in these matters. The law(s) on the reform of the institutions (state reform) states that the primary jurisdiction for research policy lies within the three regions and the three communities, while the federal State retains some competences as an exception to this rule. Governmental responsibilities are arranged as follows: The regions have authority on research policy for economic development purposes, thus encompassing technological development and applied research (see Figure 1 in the Annex for an overview of the responsible governments and a full overview of the STI governance system).

The communities (French-, Flemish- and German-speaking) are responsible for education and fundamental research at universities and higher education establishments (see Figure 1 for an overview of the responsible governments and a full overview of the STI governance system).

[3] The Federal Government, the regional governments of Flanders, Wallonia, Brussels Capital, and the Flemish, French and German Communities. In Flanders, there is one Parliament and one Government as the Flemish Region and Community were merged in 1980.

The federal state retains the responsibility for research areas requiring homogenous execution at the national level, and research in execution of international agreements (e.g. space research, defence research).

This institutional context has a profound influence on the governance of research policy. There are formally seven independent Belgian authorities carrying out their own policy in the wider field of science, research, technology and innovation. In practice, there are only five active entities, since the region of Flanders and the Flemish community's governments have merged into one since their establishment in 1980 and, due to its small size, the German-speaking community does not carry out any policy in the research area. All the other entities have their own policies. This has created a very complex system and means e.g. that university policy in Brussels is governed by the Flemish and the French Communities, while the Brussels Capital Region has no say in this. The logic behind the division of competences is however quite strict and clear (mutually exclusive as well) and does not lead to disputes over competences very often. There is no hierarchy of powers between the federal government and the other authorities.

Policy making is driven by the normal election cycles for all authorities (elections at federal level do not coincide with regional elections) as well as by the annual budget cycles. In Flanders a structured process, including heavy stakeholder involvement (employees' federations, trade unions, universities, etc), was set up a number of years ago to address the Lisbon Agenda and its successor, the EU2020 strategy. The effects of the resulting actions are monitored annually.

All authorities commit to the target of 3% of GDP invested in R&D (2% coming from the private sector and 1% from the public sector). This is reflected in the policy documents relevant for R&D policy of all entities (Marshall Plan 2.Green 2010-2014 in Wallonia, Brussels Regional Innovation Plan 2007-2013, Flemish Policy Note 2009-2014 on Scientific Research and Innovation, Vlaanderen in Actie and Pact 2020, Declarations of regional and community policies in Wallonia, the French Community and Flanders (2009)). The federal Government Agreement of 1 December 2011 suggests an "inter-federal plan for research and innovation" to coordinate efforts of all entities towards this objective.

The Federal Science Policy Office (BELSPO) is responsible for coordinating science policy at federal level, the design and implementation of research programmes and networks; the management of Belgium's participation in European and international organisations and the supervision of ten federal scientific establishments. BELSPO also offers the government reliable, validated data, allowing it to take decisions with full knowledge of the facts in areas such as sustainable development, the fight against climate change, biodiversity, energy, health, mobility and the information society. It also manages the Belgian contribution to the European Space Agency and BELNET, the Belgian national research network, provides high-speed internet access to Belgian universities, colleges, research centres and public services. STIS (Scientific and Technical Information Service) completes the system by offering an information brokerage service to the scientific community, the economic and social world and public services. The Federal Science Policy also co-ordinates the research effort lead by all the country's authorities and is responsible for introducing Belgian researchers into international research networks.

In the Brussels-Capital Region, The Brussels Institute for Research and Innovation (INNOVIRIS) manages the implementation of research and innovation funding. Innoviris funds scientific research and technological innovation. Businesses, universities and colleges in the Brussels-Capital Region can apply for financial support for research with and without an economic purpose.

- **Research with an economic purpose**:

Innoviris provides a number of services:

- Grants and subsidies for industrial research and precompetitive development at SMEs and large businesses;
- Accepting the results of academic research on the Brussels economy;
- Providing assistance to spin-offs from scientific research;
- The universities and colleges may apply for grants and subsidies for research under the "Brains (Back) to Brussels" and "Prospective Research for Brussels" programmes, as well as studies on specific themes.

Innoviris promotes financing tools applicable to scientific research on various relevant forums. It manages databases and databanks on Brussels R&D. Innoviris also represents the Brussels-Capital Region at various scientific research coordination bodies. It also maintains international relations in this field. Finally, Innoviris generates the economic indicators needed to develop effective research policy. It also runs the secretariat of the Conseil de la politique scientifique (scientific policy council) of the Brussels-Capital Region.

Flanders has various competencies as well as types of institutes in the field of science, research and innovation in practice (Geerts et al.; 2013):

- Direct support for R&D and innovation in broad sense (grants, fees, PhD and subsidies or other support channels for basic, fundamental, cutting- edge, and applied research that is conducted by researchers at universities, institutes, companies, networks of knowledge and businesses, etc.; all business-oriented support (e.g. technology transfer, technology advice, technology scans, networking, dissemination of innovation, knowledge and technology, valorisation or research results, feasibility studies, knowledge vouchers,…); various forms of collective research (joint industry-science research, innovative networks, clustering); and promotion and popularisation of STI (in education, society, business, science centres), mobility of researchers,...

- All research related to the community (= person-related) and the regional (= territorial related) competencies: broad innovation policy as well as the scientific research policy (fundamental, applied and strategic basic research); (research at) higher education institutes (university colleges, universities); (research at) public research organisations (PROs); (research at) Community scientific institutes and policy research centres; (research at) various institutes that generate knowledge or scientific output; infrastructure in the field of research and innovation (small, medium-scale and large-scale research infrastructure (e.g. supercomputers, data collections, networks, clean rooms, etc.); science parks, technology parks, incubator sites,...

- Access to finance: support for start-ups, spin-offs, participations, seed capital, risk capital, guarantees, fast-growing or technology-oriented businesses, business angels, loans.

In Flanders, the field of science and fundamental research (= community competencies), as well as of innovation and applied research (= regional competencies) are being dealt with in one specific commission of the Flemish Parliament and by a single minister in the government (Geerts et al., 2013). Furthermore, there is one advisory council (VRWI), and a single administration (department) responsible for preparing and monitoring policy within the policy domain. At the implementing level, the Agency for innovation by Science and Technology (IWT) is responsible for innovation (= a regional competence); while for the community competencies, specific funding agencies (notably, the Research Foundation Flanders (FWO), Hercules research infrastructure fund and initiatives such as the Special Research Fund (BOF), support universities, university colleges, scientific institutes, research centres and companies of the Flemish Community which are located in both the Flemish Region and the bilingual Brussels-Capital

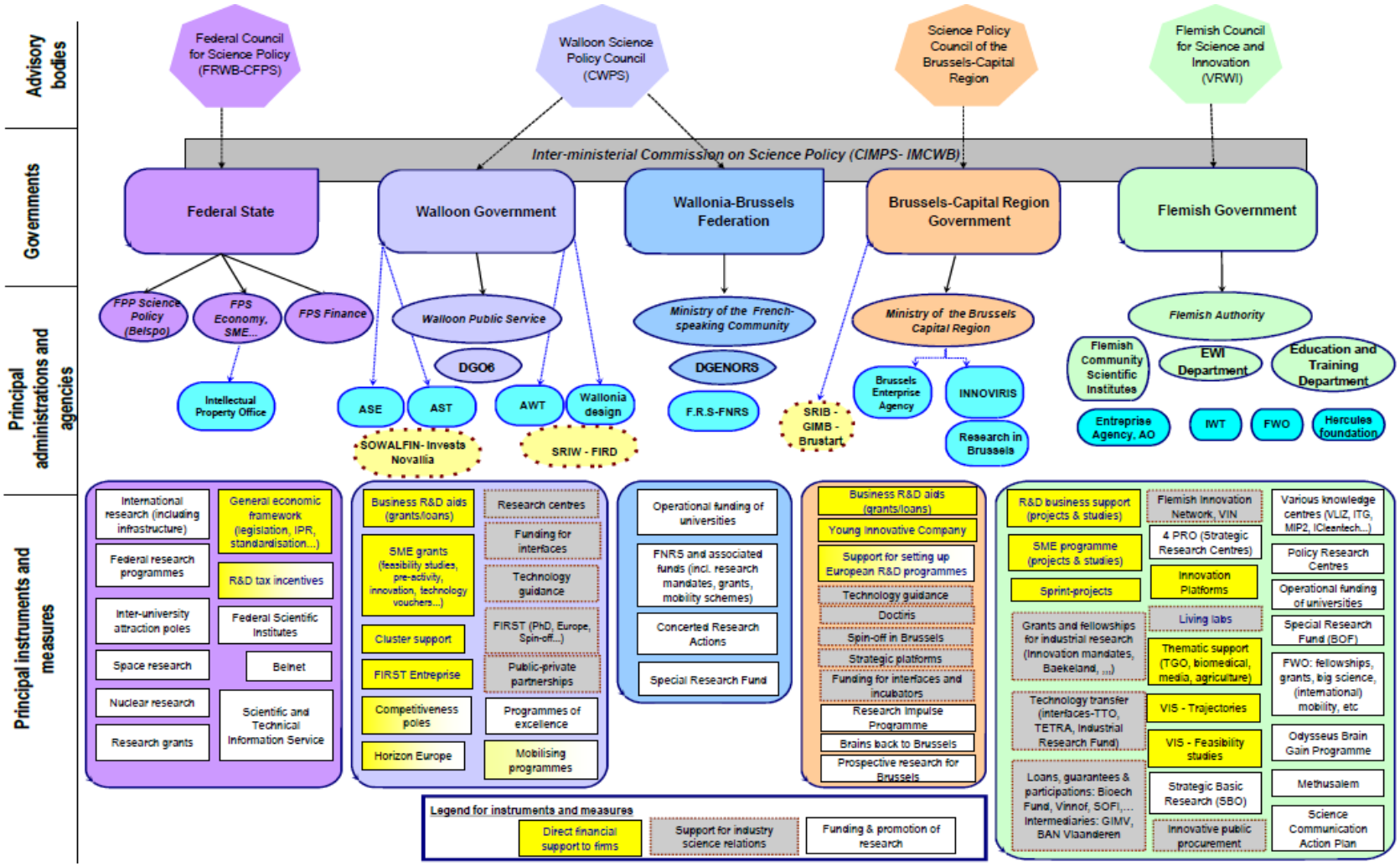
Region. The Flanders Holding Company (PMV), supports (innovative) companies with guarantees, loans, risk capital, etc.

As regards Wallonia and the French Community, since 2009, a single Minister-president chairs the two governments and several other ministers have portfolios both for regional and community affairs. The avowed aim is to enhance the level of coherence of government action in a number of policy fields. This is notably the case for scientific research, which is the responsibility of a single minister for both regional and community aspects. Similarly, the Minister in charge of higher education at community level is also responsible for business support (incl. the coordination of competitiveness clusters) and ICT policy at regional level. Other individual ministers, from either government are autonomously responsible for funding research in their specific fields of competence (agriculture, environment, energy, health).

The Ministerial cabinets, more or less in consultation with the administrations, are responsible for policy development. Science policy councils at Federal level (FRWB-CFPS: Federal Science Policy Council) and in the three regions (the Science Policy Council of the Brussels-Capital Region, Flemish Science and Innovation Policy Council (VRWI), Walloon Science Policy Council (CWPS) advise their respective governments on science policy strategies and on funding mechanisms (design and evaluation).

Cooperation between the various governments takes place in the Inter-Ministerial Conference for Science Policy (CIMPS/IMCWB) and two permanent sub-committees CIS (International Co-operation) and CFS (Federal co-operation). As regards the CFS, coordination tends to focus on practical issues such as carrying out harmonised statistical surveys (R&D, Community Innovation Survey (CIS), etc.) and submission to the European Commission, Eurostat, OECD, etc. of statistics or policy surveys.

Figure 1. Policy governance of the Belgian Innovation System



Source: Reid and Bruno (2012) and (BELSPO 2013)

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

2.1. National economic and political context

The federal government Agreement of 1 December 2011 sets out a range of measures to tackle the financial crisis and contains a number of austerity measures. In the field of R&D, major cutbacks are not planned. The Federal Government's Coalition agreement points to a need for more coordination between the communities, the regions and the Federal Government in order to achieve the 3% target. Noteworthy though is the plan to end the federally-organised and supported inter-university 'attraction poles' as of 2017. These poles are one of the very few initiatives fostering collaboration in basic research across regions.

2.2. Funding trends

2.2.1. Funding flows

All Belgian authorities are committed to the 3% target, both at the federal level and the regional levels. Equally agreed upon is the target to finance 1% of this R&D from public sources; i.e. government and higher education.

The latest provisional figures for research and development indicate that Belgium has in 2012 invested 2.24% of its GDP in R&D. This is a historical record for the country and a trend that is in line with the EU target of 3% for 2020.

As part of its science policy, the federal government financially supports the Belgian actors involved in the innovation effort of the country to enable Belgium to be an economy increasingly oriented towards knowledge. This policy is part of the EU 2020 Strategy to promote smart, sustainable and inclusive growth in member countries to establish conditions conducive to competitiveness and higher employment rates. In particular, one of the five objectives of this strategy is to achieve a level of investment in R&D of 3% of European GDP.

In this context, the Federal Science Policy Office, in consultation with the Belgian regions, has just released the final figures for R&D based on data collected in 2013 for the period 2011-2012. These figures indicate an investment in R&D which corresponds to 2.21% of Belgian GDP in 2011 and 2.24% in 2012. This R&D intensity decreased after 2001 to reach a level of 1.83% of GDP in 2005, and was followed by a systematic annual increase from 2006 to reach a record for Belgium of 2.24% of GDP in 2012 or €8.4b.

In comparison with its European neighbours, Belgium is behind Germany (2.92%) and France (2.26%), but ahead of the Netherlands (2.16%) and the United Kingdom (1.72%).

The upward trend in the Belgian R&D intensity illustrates the serious involvement of Belgium in innovation as the country manages to maintain the growth of its R&D efforts over GDP growth. These figures are encouraging for Belgium because the R&D is one key indicator (but not only) of the efforts made by Belgium in relation to its innovation system.

The upward trend of R&D in Belgium for the period 2011-2012 is largely explained by the R&D performed by firms, which account for 68% of spending in Belgium (2012). The private component of R&D, strongly linked to the economic situation, saw its growth to fall in 2009 before a strong recovery in 2010, 2011 and 2012. This recovery is supported by some of the major private players in the Belgian technological landscape, but the trend is also positive for the rest of the companies.

Public actors (government and higher education) also contribute significantly to the increase of the Belgian high R&D growth. The annual growth rate of R&D in the government sector from 2011 to 2012 was of 4.2% and in the higher education sector of 6.6% (against 1.5% in the private sector).

Total public funding of R&D in Belgium amounted to 3.5 billion €. Government budgetary appropriations for R&D (GBAORD) in Belgium were €2,401m in 2012, a slight increase from 2009. In euro per inhabitant, GBAORD remained stable to 217 in 2012 and is above the EU average (179). In absolute terms, although all regional authorities have succeeded to increase the GBOARD, this increase is lower than GDP growth rate, so public R&D intensity is stable at around 0.7% of GDP. Furthermore, forgone revenues, due to the various fiscal measures to stimulate R&D activities, steadily increased to reach in 2010 almost one third of total public funding (1.1 billion €).

In 2012, 67.8% of intramural R&D expenditure was performed in the business sector (EU28: 63.0%) and 23.2% in the higher education sector (EU28: 23.8%). The share of research performed in the government sector in 2012 (8.2%) is below the EU28 average (12.4%).

In 2012, Belgium employed 110,031 people in the R&D sector, including 65,979 researchers. 50% of researchers are employed in private companies and 43% in higher education institutions. The figures for researchers is characterised by a continuous rise in recent years, with a particularly sharp increase in the number of researchers employed by private companies in 2010, 2011 and 2012. This increase is supported by the significant efforts of the government in recent years in relation to the R&D tax credits FiA an exemption of 80% (75% before 2013) of withholding tax for their researchers (also valid in other sectors, particularly universities). In addition to these tax incentives for researchers, benefits also exist for companies that file patents and those that invest in research infrastructure.

Belgian academic researchers are relatively productive with a share of 1.1% of the total world publication output in 2011 (BELSPO, 2013). On average in 2011, Belgium produces 22.63 publications per 10,000 inhabitants, well above the EU-28 average (13.69). They are also internationally orientated with 50.66% of publications internationally co-published. In terms of public-private co-publications per million publication, Belgium scores 97.1 in 2013 against 52.8 for the EU27 (European Commission, 2014). In 2011, Belgium had about 1300 international scientific co-publications per million population (compared to 350 for the EU27) (Deloitte, 2013). In 2008, nearly 14% of Belgian scientific publications were in the top 10% most cited publications worldwide in comparison with 11% of top scientific publications produced in the EU27 (Deloitte, 2013). PCT patent applications (per billion GDP) amount to 3.73 in 2013. This performance is slightly lower than the EU27 average of 3.9 (European Commission, 2014). Licence and patent revenues from abroad represent 0.5% of GDP in Belgium in 2013 against 0.58% for the EU27 average. The relative performance of Belgium to the EU28 in terms of SMEs with product and or process innovations is 131 in 2013 (European Commission, 2014). For SMEs with marketing and/or organizational innovation, Belgium scores 104. The same figure is observed for the share of fast growing firms in the economy.

The structure of Belgium's SME sector is very similar to that of the EU28. This is reflected in, for example, the similar distribution of SMEs and large companies in the business economy. In 2012, there were 511,726 SMEs (99.8%) and 840 large enterprises (0.2%) totalling 68.9% and

31.1% of total employment. According to the SBA Factsheet Belgium (2013), Belgium´s SMEs have weathered the crisis much better than those of most other Member States. Employment in Belgian SMEs increased by 4% between 2008 and 2012, while in many other Member States this period was associated with considerable job losses in SMEs.

Table 1. Basic indicators for R&D investments

	2009	2010	2011	2012	EU (2012)*
GDP growth rate (in %)	-2.8	2.3	1.8	-0.1	-0.4
GERD (% of GDP)	2.03	2.1	2.21	2.24	2.06
GERD (euro per capita)	642.1	690.7	742.8	757.6	525.8
GBAORD - Total R&D appropriations (€ million)	2285	2371	2388	2401	86309
R&D funded by Business Enterprise Sector (% of GDP)	1.19	1.21	1.33	-	1.12 (2011)
R&D performed by HEIs (% of GERD)	24	24	22	23	24
R&D performed by Government Sector (% of GERD)	9	8	8	8	12
R&D performed by Business Enterprise Sector (% of GERD)	66	67	69	68	63
Share of competitive vs. institutional public funding for R&D	-	-	-	-	
Venture Capital as % of GDP	0.054	0.026	0.031	0.030	0.025
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	5.2	5.3	5.2	-	5.6 (2011)
Employment in knowledge-intensive service sectors as share of total employment	45.3	46.1	46.1	-	46.2 (2011)
Turnover from Innovation as % of total turnover	9.5 (2008)				13.3 (2008)

* EU27 (or 28 as far available) average data.

The total entrepreneurial activity (TEA)[4] is particularly low compared to innovation–driven economies in the EU. The diffusion power of the Belgian innovation system is in general considered as low, the R&D and innovation efforts have yet to bring sufficient new activities capable of ensuring economic development of the country. Even if manufacturing industries and services with high technological content have a strong importance in Belgium, such as pharmaceuticals or ICT activities, the added value is indeed rather low. Gross value-added of the industry in 2010 was 12.8%.[5] Furthermore if one considers the lower level in Belgium as compared to the EU-28 of the community trademarks and designs (performance of 90 relatively to the EU28 (=100)), European Commission, 2014), the R&D and innovation efforts do not seem to lead to significant economic outputs.

Funding from the European level is an important source of research funding in Belgium, for instance, under FP6, Belgian researchers secured funding of close to €700m. As reported in the 2013 Belgian annual report on STI indicators (BELSPO, 2013), for Belgium, the most popular

[5] Own calculations based on http://www.nbb.be/belgostat/

FP7 thematic areas are "Information and Communication Technologies" and "People", followed by "Transport (including Aeronautics)", "Health" and "Research for the Benefit of the SMEs". This is also reflected by a high percentage (>12.5%) of Belgian project partners with a role as coordinator for the thematic areas "Information and Communication Technologies" and "Health", which is less the case for "Transport (including Aeronautics)" and "Research for the Benefit of the SMEs". Another feature is the high percentage (almost 15%) of Belgian project coordinators in the thematic area "Space". This means that Belgium has a significant amount of very good and experienced researchers in this domain, a statement that is supported by one of the highest success ratios. In contrast, the thematic area "Nanosciences, Nanotechnologies, Materials and new Production Technologies" has also a very high percentage of Belgian project partners with a role as coordinator, but the success ratio of this group is much lower as that of the thematic area in general (19.2% vs. 34.7%). This means that Belgian project coordinators would benefit from some support. The same conclusion can be drawn for the thematic area "Research Infrastructures", with a significant difference between the rates of success of projects with at least one Belgian partner involved (39%) and the ones led by a Belgian partner (15.79%). On the other hand, the success rate for a project increases considerably when the Belgian project partner is taking the lead of the project for the thematic area "Security" (23.2% vs. 36.8%).

In the European context, Belgium's performance is far from bad. In terms of total number of applicants, Belgium is positioned at an eight place when comparing EU-27. This is slightly better as one would expect based on the number of habitants (tenth place). Because it's difficult to compare a high variety of countries in Europe, it's fairer to compare the total number of applicants to the number of inhabitants in a country. Also for this indicator Belgium is holding the eighth position, but doing much better than the European mean. Belgium is best in class when it comes to overall success rate.

From the total Structural Funds for Belgium over 2007-13 (€2,258b), Wallonia receives 61%, Flanders 32% and Brussels-Capital 4%. ERDF means will be spent on sustaining regional competitiveness and strengthening territorial cohesion (Brussels); promoting the science and innovation economy, stimulating entrepreneurship, improving the attraction for foreign companies and on urban development (Flanders); creation of companies and employment, development of human capital, sciences and research, and sustainable development of the region (Wallonia). In Wallonia, the total amount dedicated to research activities for the period 2007-13 represents €250m (ERDF plus contribution from the Walloon Region), which is an increase of 30% in comparison to the previous period (25% of these funds are dedicated to SMEs).

The financial allocations of cohesion policy for Belgium over the new period 2014-2020 amount to €2.28b. Almost half of this budget (€1.04b) concerns transition regions all based in Wallonia.[6]

According to the Ernst & Young's 2013 Barometer on Belgium's Attractiveness[7], in 2012, 169 new foreign investment projects were launched in Belgium. This is a 10.5% increase from the previous year and is the country's best figure since 2007. Meanwhile, Europe has witnessed an overall decrease in the number of foreign investments by 2.8%, underlining that Belgium is among the top destinations for foreign investment on the continent. Belgium has an open economy, and foreign investment plays a critical role in it. The latest data reveal strong levels of investment across all three of Belgium's regions. Although Flanders remains the first destination for foreign investment, with a total of 80 new investments last year, Wallonia made a significant comeback in 2012, with new investments rising from 39 to 52. Additionally, there were 37 investments in the Brussels Capital region.

[6] http://www.internationalentrepreneurship.com/total-entrepreneurial-activity/

[7] http://www.ey.com/Publication/vwLUAssets/Belgium_Attractiveness_Survey_2013_FR/$FILE/Belgium-Attractiveness-Survey-2013_FR.pdf

2.2.2. Funding mechanisms[8]

2.2.2.1. Competitive vs. institutional public funding

No statistics on the share of institutional versus competitive public funding could be found for Belgium. Yet, according to the Federal Office for Science Policy (BELSPO, 2013), the share (in percentage of government civil budget on R&D) of the R&D content of "block grants" to the higher education sector, as captured by the general university funds, is with 16.8% (compared to 35.2% for the EU27), relatively low in Belgium.

2.2.2.2. Government direct vs indirect R&D funding[9]

Two thirds of public aid (€2.4b) is funded through R&D budgets covering all forms of subsidies –– be it through competitive funding or through institutional block funding. Forgone revenues, due to the various fiscal measures to stimulate R&D activities, steadily increased to reach in 2010 almost one third of total public funding (1.1 billion €) (BELSPO, 2013). This demonstrates a shift in science policies in Belgium in favour of tax measures. It further underlines the growing importance of the federal level in research funding.

Government funding of R&D in the business sector runs through two distinct channels: indirect and direct funding. Measures such as subsidies, grants, loans and contracts are direct measures that apply to cover costs incurred in specific R&D projects. Indirect measures for R&D, of which only the one on R&D staff is included for the Belgian figure, have a looser relation to R&D activities.

According to the Federal Office for Science Policy (BELSPO, 2013), when looked at indirect government support, Belgium occupies the fourth position compared to other countries. Of the selected countries only France outperforms Belgium in the case of direct support, while smaller countries like the Netherlands, Ireland and Austria all fall to some extent behind. Some countries with high R&D intensities – like Sweden, Finland and Germany – do not engage in offering indirect support to firms, and even their direct funding proves to be modest (around 0.1% of GDP).

In the case of total government funding – i.e. direct and indirect funding – in percentage of GDP, Belgium takes the sixth position (out of 35 OECD countries) in order to help in attracting additional R&D (BELSPO, 2013 based on OECD, 2013).

Based on an opinion poll that looks into the mix between using direct and indirect measures by firms, the Federal Office for Science Policy (BELSPO, 2013) reports that about one third (32%) of firms exclusively relies on direct fiscal measures; whereas a minority of 3% only uses subsidies. Two thirds of the firms (65%) use a mix of both fiscal measure and subsidies.

2.2.3. Thematic versus generic funding

The share of the total GBAORD (Total civil R&D appropriations) allocated for specific thematic priorities amounts in 2012 to 57.1%. Compared to the EU28 (47.1%), this share is relatively high. The table below shows the distribution (in %) of GBAORD by socio economic objectives (2012).

[8] See also Section 5.1.1 for a more detailed description of the Belgian research funding system.

[9] *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.

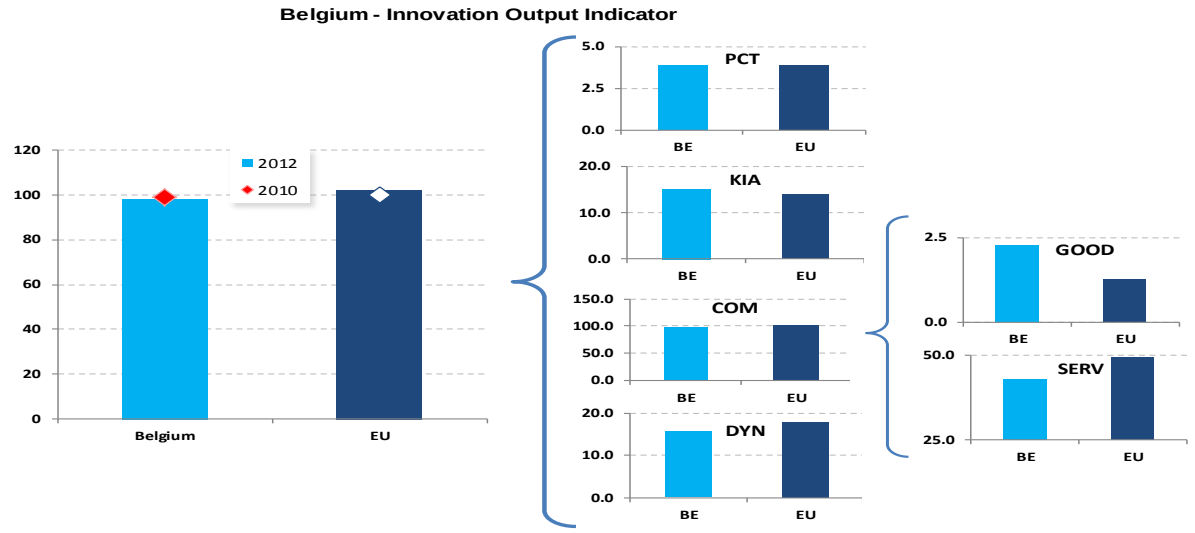
Table 2. Distribution (in %) of GBAORD by socio economic objectives (2012)

	Belgium	EU28
Exploration & exploitation of the earth	0.5	1.8
Environment	2.3	2.6
Exploration & exploitation of the space	8.7	4.9
Transport, telecom,…	2.1	2.9
Energy	2.2	4.1
Industrial production & technology	33.1	9.1
Health	1.9	8.6
Agriculture	1.5	3.6
Education	0.3	1.1
Culture, mass media	1.9	1.1
Political & social systems	3.5	3.1
GUF	16.5	34.1
General advance of technology	25.4	18.0
Defence	0.2	5.0

2.2.4 Innovation funding[10]

The "Indicator of Innovation Output"[11], launched by the European Commission in 2013, was developed at the request of the European Council to benchmark national innovation policies and monitors the EU's performance against its main trading partners. It measures the extent to which ideas stemming from innovative sectors are capable of reaching the market, providing better jobs and making Europe more competitive. The indicator is zooming in on four policy axes i.e. growth FiA technology – (patents); jobs (knowledge intensive employment); long-term global competitiveness (trade in mid/high-tech commodities) and future business opportunities (jobs in innovative fast-growing firms). The graph below allows comprehensively comparing Belgian positions of subsequent components of indicator:

[10] This section is a revised (by BELSPO) version of the Research and Innovation Performance Profile of Belgium in 2013 (http://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2012/countries/belgium_2013.pdf).
[11] http://ec.europa.eu/research/press/2013/pdf/indicator_of_innovation_output.pdf



Source: DG Reseach and Innovation - Economic Analysis Unit
Data: Eurostat, OECD, Innovation Union Scoreboard 2014
Notes: All data refer to 2012 except PCT data which refers to 2010.
PCT = Number of PCT patent applications per billion GDP, PPP
KIA = Employment in knowledge-intensive activities in business industries as % of total employment
DYN = Innovativeness of high-growth enterprises (average, employment weighted)
COMP = Combination of sub-components GOOD and SERV, using equal weights
GOOD = Contribution of medium and high-tech products to trade balance
SERV = Knowledge-intensive services exports as % of total service exports

Belgium is a medium performer in the innovation indicator. It is performing in all components around the EU average, but is clearly outperforming the EU average in the sub-indicator on contribution of medium/high-tech manufacturing goods to the trade balance (with a score nearly twice the EU average). Its score is also significantly higher than the EU average concerning the employment in knowledge intensive activities.

Its composite score is dragged down by a share of knowledge intensive services in services exports significantly below EU average. This is explained notably by high volume of exports in some logistic, transport and trade related services which are linked to the geographical intermediation role of Belgium and which are classified as non-knowledge-intensive. As the low scores of Belgium on this indicator reflect some specificities of the Belgian economic structure unrelated to any underperformance, the situation of Belgium in terms of innovation output is more positive than the image given by the indicator.

Belgium also scores relatively low in fast growing innovative enterprises, since a comparatively high share of these companies is in sectors with low innovativeness scores, such as construction and transport. Belgium needs more growing firms in innovative sectors to fasten the renewal of its economic fabric and speed-up the transition towards a more knowledge-intensive and innovation-driven economy.

2.3. Research and innovation system changes

In May 2014 took place the first common elections of the regions/communities and the national level.

The sixth Belgian state reform is an important extension of the regional competences and a big step forward in the process of forming a new government. A whole range of responsibilities is transferred, some of them completely, others partly. As regards science and innovation, the main change concerns the transfer from the federal to the regional level of policies regarding technological attraction poles, the inter-university attraction poles.

All Belgian authorities commit to the target of 3% of GDP invested in R&D (2% coming from the private sector and 1% from the public sector). This is reflected in the policy documents relevant for R&D policy of all entities (Marshall Plan 2.Green 2010-2014 in Wallonia, Brussels Regional Innovation Plan 2007-2013, Flemish Policy Note 2009-2014 on Scientific Research and Innovation, Declarations of regional and community policies in Wallonia, the French Community and Flanders (2009)). For instance, the R&D intensity for Flanders in 2011 was of 2.0% (1.64% for the private sector and 0.76% for the public sector, for 2012 the provisional figure was 2.42% (ECOOM, 2013; Flemish government, 2014)). For Wallonia the total R&D divided by GDP was in 2011 of 2.54% and 1.4% for the Brussels-Capital Region (EUROSTAT and BESLPO).

The Government Agreement of 1 December 2011 suggests an "inter-federal plan for research and innovation" to coordinate efforts of all entities towards this objective. A concrete initiative with this regards is the launch of a transversal platform for technology monitoring which aims at combining the expertise available at different levels and in all entities of the country and providing academia and businesses a better look at the strengths and weaknesses of the know-how available in Belgium as well as to offer more insight into which sectors investments will be profitable (Science Connections, 2013).

While the remit of the Federal Government to fund 'nation' wide research programmes will be further diminished (with the decided transfer of the inter-Community programmes Inter-University Attraction Poles and Technology Attraction Poles to the Communities and the Regions in 2017 (Science Connections, 2013)), there is a clear (financial at a minimum) rationale for organising joint programming, sharing certain research infrastructures or 'pooling' research efforts (e.g. the Scottish example of research pools could be applied) between Flemish, Brussels, Walloon and Wallonia-Brussels based research teams in certain fields. This has already been possible for coordinating Belgium's participation into research infrastructures of the ESFRI roadmap.

Due to the Bologna reform process, the universities have been structured into three academies (Wallonia) and five associations (Flanders). The structuring of the higher education system (in both Communities) into larger institutions ('associations' or 'academies' bringing together several third level education institutes) should foster, if the correct policy incentives are in place, a corresponding realignment of research potential (e.g. greater scope for inter-disciplinary work or merging or pooling of research teams across formally autonomous institutes). This is one element that would help to reduce fragmentation of the overall Belgian research system and further improve its performance. At the same time, the balance between institutional and competitive funding of the system would merit further review in order to further focus and concentrate efforts.

Within its fields of competence, the Federal Government committed itself to supporting activities of the European Space Agency, polar research (notably at the Belgian polar base) as well as basic research, notably through the inter-university attraction poles. Apart from this, scientific research on renewable energies as well as activities of the research centre on nuclear energy (SCK-CEN) on the reduction of the life-cycle of nuclear products and of the National Institute of Radio-elements (IRE) on medical isotopes should gain federal support as well.

Following the regional elections of June 2009, the new Flemish government made the implementation of the renewed Flanders in Action (FiA) plan the central theme for its term. This action plan should lead Flanders to reach the top five of excelling regions in Europe in terms of economic performance and 'be a nice place to live'. At the core of the FiA is the Vilvoorde Pact, as well as a new agreement between the social partners to boost innovation, the Pact 2020, which pursues several goals related to research policy, such as: Devote 3% of GDP to R&D by 2014;

- Boost creativity and innovative capacity, for instance by increasingly involving the non-academic higher education institutes in innovation projects;
- Put more focus on 'spearheads', i.e. innovation policy focused on themes where Flanders has a strong knowledge position and good economic prospects;
- Give more attention to output of research policy;
- Stimulate students to study sciences, and give researchers better prospects;
- Increase investments in higher education institutions up to 2% of GDP.

The Policy Note 2009-2014 on Scientific Research and Innovation draws up the long term plan for the 'Open Innovation Centre Flanders' and addresses the following main issues:

- Economic exploitation of research results through creativity and innovative entrepreneurship;
- Focus on 'grand projects', 'thematic spear heads' and economic clusters in the Flemish economy and innovation system; and
- Flanders as an international player: strengthening basic research, human potential in research, research infrastructure and a more output driven research policy.

On most topics, the policy note is a continuation of the policy plans of the previous Ministers: simplification and efficiency of the current set of STI policy instruments is still on the agenda. Main changes in this Policy Note when compared to the previous Policy Letter (2009) are the explicit preference for light (often virtual) instruments, the focus on 'grand projects' and the widening of the definition of innovation.

The long-term policies of the ministers are updated on a yearly base. The annual policy letter on innovation lists 5 strategic targets that each consists of a number of operational targets (Geerts et al., 2013). These strategic targets are determined by the objectives of the policy note for the governing period 2009-2014 and are:

- Focussed innovation strategies;
- More innovative strength for the Flemish economy;
- Flanders as an innovation-friendly top region;
- Strengthen the fundaments of science policy;
- Increase the impact, persist in more inputs for research and innovation, and improve efficiency

These objectives, based on an interaction of research and innovation with other specific policy domains and with overall socio-economic objectives (as set e.g. in the FiA action plan), clearly demonstrates the relative importance of STI in the Flemish policy-agenda. These must take into account the significant societal as well as economic challenges, and be in line with a number of major EU initiatives, such as the EU 2020 strategy, the Commission's Flagship initiative on "Innovation Union", the objectives of the European Research Area (ERA), and the principles in the EU's Horizon 2020 programme on R&D and innovation.

Following the regional elections of 2009, the formation of the Walloon and French Community governments was based on a common political strategy. The socio-economic priorities of this strategy have been translated into an operational plan called the Marshall Plan 2.Green (Plan Marshall 2.Vert), which endorses the 3% Objective. In summary, it aims to improve competitiveness of firms by improving the performance and integration of research with industry. This plan, which has been allocated a budget of €1.6b over five years (2009-2014), is a continuation and a reinforcement of the previous plan implemented during the period 2006-2009. The addition of 'Green' underlines the new orientations to better integrate 'sustainable development' as a crosscutting priority. The third priority area of the new plan 'Strengthen scientific research as an engine of the future' incorporates the main actions to be pursued as regards STI policy. Funds from both authorities will be invested in the implementation of a joint research strategy, which also involves the Brussels-Capital Region, and focuses on strategic crosscutting themes, e.g. sustainable development, renewable energy, new technologies, longer life, etc. Additionally, the authorities intend to pursue the efforts undertaken since 2005:

- Reinforcing investment in basic research by the French community through the implementation of the second development plan of the National Scientific Research Fund (FRS-FNRS);
- The continuation of STI programmes started within the first Walloon Marshall Plan: programmes of excellence, mobilising programmes, support of research projects of competitiveness poles, research commercialisation through the creation of spin-offs;
- A continued support to partnerships between university academies and between research actors and industry.

Both authorities also intend to work together to offer an attractive career to researchers, better integrate French-speaking researchers in international networks, reinforce activities for science awareness in order to encourage young people to pursue scientific and technical careers and implement a technology assessment process as a tool for decision-making in various areas of public action. Other measures, forming part of the priority areas 2 and 6 of the Marshall Plan 2.Green, aim at supporting research and innovation in the specific field of the environment with the creation of a 6th competitiveness cluster dedicated to 'green' technologies, the creation of a centre of excellence in the field of sustainable development and funding of research programmes in areas such as renewable energy, sustainable construction and smart technologies for the management of the electricity network.

The Wallonia-Brussels Partnership for Researchers was adopted in 2011. It is the contribution of the Wallonia-Brussels Federation to the implementation of the European Charter for Researchers, the European Code of Conduct, the European Commission Partnership for Researchers, the recommendations of the Helsinki Group on Women and Science and the human resources strategy of the "Innovation Union" of the European Union. It is worked out in twenty-five actions divided into six chapters, where public authorities undertake, alongside the actors in research, to place researchers at the centre of the priorities given to the consolidation of research as a driver of the future.

In 2011 the Brussels-Capital Region started the preparation of a new regional RDI strategy in line with the EU 2020 strategy, in particular adopting smart specialisation priorities (identification of sectors in which the region will invest), reshaping and adapting the financial measures and instruments, and rethinking a governance model. This exercise identified a number of priority sectors and Technology-orientation such as ICT; Life sciences; Environment. In term of evaluation, the Brussels Capital Region developed a scoreboard, in order to track the development of innovation and innovative capacity in the region, focussing on both input and output factors.

2.4. Recent Policy developments

All governments

Given the problematic financial situation and the political will to arrive at a balanced budget in 2015, several austerity measures were already taken. It is positive that tax deductions and other fiscal measures to support R&D are continued under the new Federal Government. The Flemish Government continues to increase its annual public budget for R&D and innovation. The Governments of Wallonia and of the Wallonie-Bruxelles Federation are continuing their efforts to intensify investment in R&D and in innovation and to improve the effectiveness of policies linked to European guidelines, in particular, the flagship initiative "Innovation-Union". It is firstly a matter of supporting excellence in scientific research and making Wallonia's active participation in the European Research Area more robust. Secondly, emphasis is placed on the distribution and development of results of research and innovation in the widest sense within the economic fabric, as well as on improving the functioning of the regional innovation system in all its elements. In this perspective, the implementation of the 2011-2015 Integrated Research Strategy and the "Creative Wallonia" Plan has been continued. The Government of the Wallonia-Brussels Federation, by decree, recently consolidated the legal and budgetary basis of all Funds associated with Scientific Research Funds (FRS/FNRS). That allows financial efforts made by public powers to be continued, as well as the jobs of the researchers. Also in terms of research infrastructures, current involvements are under review such as the Belgian investments in the Antarctic, including the maintenance of the Princess Elisabeth station.

Two areas of action have been led by the Governments of Wallonia and of the Wallonia-Brussels Federation with a view to ensuring overall cohesion between the various R&D policies being followed at federal, community and regional levels, and to exploit possible synergies in full:

1. In 2012, reinforcing the Joint Action Plan between Wallonia, the Wallonia-Brussels Federation and the Brussels-Capital Region by adding four measures:

- Development of collaboration in the area of researcher training and access to the job market for those with the title of Doctor.

- Comparison, evaluation and possible harmonisation of different tools allowing doctorates to be carried out in business-university partnerships.

- Bringing closer together the two interfaces connected to Industrial Higher Institutes.

- Setting up of the Wallonia-Brussels Council of Scientific Policy.

2. Adoption of a joint action plan shared by Flanders, Wallonia and the Walloon-Brussels Federation for recovery through R&D, adopted by the 3 Governments on 7 December 2012. This aims to take a series of actions around 3 areas: launch of joint calls for submission of projects, strengthening collaboration between regional and community actions and definition of common positions, particularly at European and international level.

Ghent University Library is the Belgian partner in the DRIVER projects and created a Belgian repository community, DRIVER Belgium which is instrumental for developing Open Access awareness across the Belgian scientific community. Open Access Belgium is a partner in OpenAire. In October 2012, the three responsible ministers (federal government, Flemish and French Community) signed the "Brussels Declaration on Open Access".

Through fiscal incentives the government mobilises private capital of individuals. This capital is then used for matching private venture capital. In this way the available VC is doubled with limited costs for the government.

Federal government

At Federal level, BELSPO and the Minister for Science Policy agreed (in July 2012) on a management agreement defining roles and commitments of the Minister for Science Policy and the Office for Science Policy (BELSPO). This agreement also defines and specifies respective missions and resources allocated to do so. The latest management agreement between the Minister for Science Policy and BELSPO covers the period from 2012 to 2015.

The objectives of this agreement are to:

- Ensure the proper execution of tasks assigned to BELSPO;
- Ensure the consideration of government expectations;
- Encourage a drive for modernisation and professionalization of management of BELSPO;
- Increase transparency and efficiency of operation of BELSPO;
- Provide a basis for discussion regarding management and finance of BELSPO.

These objectives are translated into concrete action plans described in the management agreement and regarding reform and reorganisation of structures or programmes, in the wider context of the Horizon 2020 EU framework programme. The aim is to reinforce BELSPO as a key stakeholder and backbone of the research landscape in Belgium, as well as increasing coherence and interactions between different levels of responsibility, in a more "client-oriented" approach.

To do so, this management agreement integrates strategic commitments and as well as operational commitments regarding reorganisation and restructuration of BELSPO, management of collections and heritage, scientific research and expertise, modernisation of services to users, communication and promotion, management of BELSPO.

This management agreement should be replaced in the wider context of reform and modernisation to better foster R&D and innovation and support research policies. The 2010 BRISTI report analysed the levels of responsibility in science and technology (STI) policies and the role of the federal level. The strategic part and the development of instruments part of it are very important and reflected in the recent Management Agreement. The role of BELSPO is also to coordinate all policies at different levels. STI policies are mainly implemented by BELSPO and concern financing of R&D activities, support for R&D activities and R&D policy and performing research. According to the report, even with the effects of decentralisation, it still is a very important body for STI policies support but problems linked to governance might rise. Efforts have been made at different levels to enhance the effectiveness of governance of research and innovation policies (strategies, target setting, broad-based partnerships, evaluation), that the given Management Agreement is one of the tools used to do so.

Objectives of BELSPO, as recalled in the Belgian Report on Science, Technology and Innovation (BRISTI) report, are to:

- Fund research carried out at universities, research centres and federal scientific institutions;
- Undertake scientific research in a number of fields (space, climate, biodiversity, art history, ethnology, geology, archival science, library science) through its scientific institutions;
- Coordinate research activities at an international and inter-federal level;
- Manage and study scientific and cultural heritage, of an estimated value of €6.5 billion.

Internationalisation (mobility of researchers, international cooperation, etc...) is also an increasing matter of interest for BELSPO.

Several projects are detailed under operational commitments. Indicators, qualitative and quantitative, used to measure performance and success, are project specific. As there are 60 projects in total, some of them might have common performance indicators. For example, if we take the implementation of the environmental management system (or EMAS), what is expected is a 7.5% reduction of energy bills including water, 10% reduction of paper consumption, 10% of waste reduction, 5% increase in sustainable mobility, 15% increase sustainable public procurement.

The main policy priorities set are to enable better allocation of tasks and missions and reform management practices to foster efficiency of the organisation.

Region of Brussels-Capital

Many changes have taken place and several new challenges have appeared in 2013 for innovation actors in Brussels in general and Innoviris in particular. After nine years of development and growth, Innoviris needs to become a more mature institute. These early years, the Institute was mainly oriented towards its own development. Innoviris now also directs its efforts outward, to identify RDI opportunities, to form strategic alliances with Brussels, national and international partners. Many political and strategic decisions have impacted the landscape of scientific research of the Brussels-Capital Region in 2013. A new Minister is in charge of the Economy Employment and scientific research. From April 2013, The Brussels-Capital chaired commissions of Federal Cooperation and International Cooperation for science policy (CIS and CFS). The strategy of the new Parliament in 2014 will be prepared and the new framework programme H2020 and the Structural Funds ERDF will be implemented in 2014.

Different types of financial support are granted to companies and research organisations.[12] Run by INNOVIRIS, one of these instruments is the scheme 'Young Innovative Companies' targets companies at their growth stage. Companies selected are entitled to financial help and support for the execution of their strategic innovation plan (PSI), for a maximum of three years and for a maximum of €300,000.

Companies eligible to participate to the programme should:

- Be either a small or medium-sized enterprise (definition based on the recommendation 2003/361/CE);
- Be less than 6 years-old;
- Develop its activities on the regional territory;

[12] A comprehensive presentation of these schemes is available at: http://www.innoviris.be/site/indexa382.html?page_id=25&lang=en

- Provide an evaluation performed by an external and independent expert, proving that they aim at developing innovative products or processes and that presenting a risk of a technological or industrial failure;
- Companies should prove they spend 15% of the total company spending on R&D (for one of the last three years).

This support measure is part of an overall effort by the Brussels-Capital region to stimulate the number of new 'high-tech' or knowledge intensive firms being created and growing in the region. The region is home to a significant research potential, notably around the Free University of Brussels (ULB). Nonetheless, the Regional Innovation Plan 2007-2013 highlighted a number of weaknesses notably the very low level of R&D expenditure in enterprises. This situation still prevails now that the update of this Regional Innovation Plan has been adopted in 2012.

This specific scheme has been set up so as to support innovative companies at their growth stage. This support measure main priority is to support the growth of young innovative companies so as to increase competitiveness of the economy and foster creativity.

Flemish region[13]

The Government of Flanders is aware of the importance of STI as a necessary condition for maintaining wealth and well-being in Flanders. Already since the mid-1990s it has started to develop a broad-based strategy on STI policy and consistently increased the public budget for STI. This STI-strategy is developed through a number of agreements, initiatives and statements, including:

- the government agreement in which the various political parties that take part in the governing coalition outline their priorities for the five-yearly parliamentary term;
- the policy note of the minister charged with scientific research and innovation for the five-year governing period;
- the annual policy letter of the minister, which further elaborate and specify the general policy framework announced in the policy note.

Moreover, a number of multi-annual strategic plans and targets have been agreed upon by a broad-ranging group of stakeholders from government, civil society and industry. These plans set out a set of targets across a range of policy fields, amongst which STI is assigned a clear priority. Major plans include:

- the Innovation Pact (2003), a commitment by Flemish public and private stakeholders to meet the EU's Barcelona target (GERD/GDP ratio of 3% by 2020);
- the Flemish Reform Programmes for the Lisbon strategy on Growth and Jobs (in 2005-2010), and currently the Reform Programmes for the Europe 2020 strategy;
- Flanders in Action (Vlaanderen in Actie, FiA), the future plan for 2020, that is composed by several Breakthrough initiatives including "Innovation Centre Flanders", and the related Pact 2020 that sets specific targets and strategic objectives for the FiA Breakthroughs;
- the Concept Note "Innovation Centre Flanders" of May 2011, which elaborates a framework for the future of oriented innovation in Flanders;

[13] This section borrows from Geerts et al. (2013: pp. 12-14).

- all relevant treaties, acts, decrees, agreements, MoU's or other legislation designed for shaping and implementing policy in the field of science, research and innovation.

Through the FiA action plan, Flanders aims to rank among the top-5 EU regions by 2020 and strategic breakthroughs, crucial for the future wealth and well-being of all in Flanders, are identified. These breakthroughs in various fields are: the open entrepreneur; Flanders learning society; Innovation centre Flanders; Green and dynamic urban region; Europe's smart hub; Caring society; Decisive governance. STI is not just the major theme of the "Innovation Centre Flanders" Breakthrough, but also plays a transversal role across the various other themes and policy initiatives designed to match the overall goals of the FiA framework.

The importance of STI in FiA is not only reflected by the target to spend 3% of GDP on R&D (idem in the governing agreement and policy note), but also in different targets of the 2020 Pact, which include:

- Flanders will progress towards a competitive and multi-faceted knowledge economy distinguished by the generation of sustainable prosperity and welfare. In terms of prosperity and welfare, and investments, it will rank among the top five knowledge-intensive European regions;
- Innovation will be more widely and better distributed across all sectors, types of businesses, and segments of society.

In concrete terms, targets set include: a year-on-year increase of the number of patent applications, to be amongst the EU's top-5 regions for public spending on eco-innovation, an increase of turnover from new or improved products and services, and a higher share of 'spearhead' areas such as ICT and health, logistics, smart electricity networks (GRID) in the economy.

The 2009-2014 Flemish Government coalition agreement explicitly restates that Flanders aims to reach the 3% R&D expenditure to GDP target, reconfirmed as a EU objective in the Europe 2020 strategy in March 2010, and includes the intention to draw up a new Innovation Pact (as a successor to the 2003 pact).

The annual policy letter on innovation (legislative period until 2014) lists 5 strategic targets that each consist of a number of operational targets. These strategic targets are determined by the objectives of the policy note for the governing period 2009-2014 and are:

- Focussed innovation strategies;
- More innovative strength for the Flemish economy;
- Flanders as an innovation-friendly top region;
- Strengthen the fundaments of science policy;
- Benefits from the research and innovation system through better impact, higher efficiency and increasing resources and R&D budget.

These objectives, based on an interaction of research and innovation with other specific policy domains and with overall socio-economic objectives (as set e.g. in the FiA action plan), clearly demonstrates the relative importance of STI in the Flemish policy-agenda. These must take into account the significant societal as well as economic challenges, and be in line with a number of major EU initiatives, such as the EU 2020 strategy, the Commission's Flagship initiative on "Innovation Union", the objectives of the European Research Area (ERA), and the principles in the EU's Horizon 2020 programme on R&D and innovation.

In recent years, the Flemish government has further elaborated and shifted its STI strategy in various ways, namely through various measures such as broaden and widen the support to the

innovation trajectory, stimulate the diffusion of innovation esp. among SMEs, better facilitate the access to finance and broaden the existing instruments, stimulate demand-driven initiatives, support initiatives in the field of grand challenges, support the transformation of the economy by innovation, continue the net increase of the available public budget for STI, etc. Examples of these priorities include the setup of the TINA fund, the SOFI and SOFI2 fund for the setup of spin-off companies, 4 proeftuinen (living laboratories on the topics of social innovation, electric vehicle, care innovation space Flanders, construction renovation), SPRINT-projects for innovation projects in large companies, VIS IV-trajectories for so-called "innovation follower" companies, the campaign "ikinnoveer" to increase the innovation capacity of SMEs, the call for proposals for themes of the EU KET-roadmap, the call for projects on social innovation, the establishment of a new strategic research centre on manufacturing, the establishment of a new initiative on innovative sustainable chemistry (FISCH), a new programme on transformative medical research (TGO), the re-orientation of the excellence centres into innovation platforms (Lichte Structuren) with a minimal overhead structure, etc.

As stated earlier, the public budget for R&D&I experienced a net-increase even during difficult budgetary periods, whereby the R&D-intensity reached its highest level ever: 2.40% in 2011 (2.42% in 2012, provisional data).

The Government of Flanders also approved a concept paper "Een slimme specialisatiestrategie voor een gericht clusterbeleid" (A smart specialisation strategy for a targeted cluster policy) on 8 March 2013. Innovation policy is considered critical for a smart specialisation strategy and there are strong links with the various "innovatieknooppunten" (innovation hubs) and the work of the "innovatieregiegroepen" (IRG) (innovation steering groups) on the one hand and the VRWI foresight study on the other hand.

Walloon region

The Walloon Government recently set up methods to create the Walloon Institute for Sustainable Development (WISD); this will be one of the areas for the all new Fundamental Strategic Research Funds (FRFS), accommodated within the FNRS. The WISD will have a budget of €5 million per year to finance fundamental research in sustainable development. It will include a platform for animation and development. The Walloon Virtual Institute of Research Excellence in Life Sciences and Biotechnology, WELBIO, also accommodated within the FRFS, will be continued at a level of €6 million per year, 15 projects were financed on the first call for submission, for a budget of €9.5 million; these projects have led to the creation of 35 jobs and the publication of 4 works and 35 scientific articles. 8 projects were selected at the start of 2013 in the context of the 2nd call for project proposals to be submitted.

Within the implementation of Creative Wallonia, actions will be continued and strengthened and new actions will be launched:

- Launch of a tool for diagnosis of innovation potential for SME.
- Creation of Creative Labs in two Higher Education Establishments of Teacher Training in order to test the possibility of extending the tool and see if eventually all pupils of basic teaching could benefit from new approaches in this subject.
- Creation of one or more Living Lab/Fablab: a feasibility study is underway.
- Fulfilment in the 1st semester of an assessment of the Creative Wallonia Plan.

The Walloon region launched in the context of the Joint Research Strategy for Wallonia and the

Federation of Wallonia-Brussels in 2011 a Collective research call which has been running in 2012 and a new opening phase for 2013. The main goal of the project is to strengthen the expertise and know-how of research centres in fields that would fulfil the needs of SMEs. So as to foster a collaborative spirit, collaboration with a university unit is compulsory for this call. Projects should be oriented towards a specific industrial need and have a measurable impact on the economy. The projects will have a maximum duration of two years.

Collective research, at the regional, national or international level is one of the main priorities for research in Wallonia. Projects submitted in this programme will be part of the concept of collective research. Collective research aims at reaching and benefiting to a maximum possible number of SMEs. A search Collective research is usually initiated by groups of companies with technical and economic needs in common and carried out by specialised research institutes or technology centres in a given industrial field. It is a generic type of research, more than in contractual research or collaborative research for instance where some programmes are specifically designed.

There is an important international dimension to collective research in Wallonia as it perpetuates the ERA-NET CORNET programme of the European Union. Although funding for the CORNET II programme by the European Commission has ended 31 December 2010, Wallonia continues to participate in CORNET with 9 partners from 7 countries.[14]

In 2012, the Walloon region set a Public-Private Partnerships (PPP) for breakthrough innovation. The public-private partnership for R&D aims to federate the financial resources of the Walloon Region with those of a company and a research institution to meet the requirements of a technological breakthrough in a given sector of activity. This type of action supports university level research programmes in partnership with private companies. The project should focus on acquiring new scientific and technological knowledge needed for the development of products, processes or services of the industry concerned. The subsidised research activities particularly relate to the strategic field of the partner companies. The private partner, in return, gets priority access to research results based on the specific agreements. Hence, the derived results are likely to be exploited by the co-financing company.

In practice, the programme provides funding for research in apportioning costs between the Walloon Region that supports half the budget, the company covering the quarter and the research institution providing the balance. The projects are concluded for a term of two years, possibly renewable.

The eligible expenses covered by the Walloon Public Service are:

- Staff expenses related to researchers, technicians and other supporting staff, provided they are assigned to the project;
- Costs of the instruments and equipment used for the project;
- Additional overheads directly incurred by the project;
- Other operating costs, inter alia, the costs of the materials, supplies and similar products, directly incurred by the project.

The eligible expenses covered by the industrial partner are the direct defraying of the expenses incurred or the recruitment of staff or the defraying of the purchase of equipment, i.e. a defraying of certain expenses directly incurred within the research institution.

[14] www.cornet-era.net

2.5. National Reform Programme 2013 and R&I[15]

In the 2011 National Reform Programme, the Belgian authorities aspired to ensure a rate of R&D expenditure equal to 3% of GDP in 2020, including the budgetary costs of federal tax measures in favour of R&D staff. The budgetary cost is estimated at 0.18% of GDP in 2020.

In order to improve the coordination of innovation policy measures at the different levels of governance, on 7 December 2012, the governments of Flanders, Wallonia and the Wallonia-Brussels Federation adopted an action plan for boosting economic activity through R&D with a set of measures focused on 3 themes: issuing joint calls for projects, reinforcing the collaboration between the actions of the Regions and Communities and defining joint positions, in particular with regard to European and international level.

In spite of the economic crisis and the resulting budgetary difficulties, the Belgian authorities have been careful to reinforce research and innovation support measures by focussing on sustainable development and responses to social challenges. The fiscal support policy for R&D was continued in 2012 and has been consolidated in the light of the available budget, particularly with regard to payroll tax exemption for researchers (which increased from 75% to 80%).

The Belgian authorities' concern was also to increase the economic fabric on the basis of innovative large companies and SMEs with a view to reinforcing the presence of these companies on Belgian territory and maximizing the economic opportunities for conducted research and for making innovation the key to reindustrialisation.

The simplification of the institutional structure and more consistency and efficiency in the actions of the public administration also represented a major objective of the Belgian authorities. Wallonia approved a series of streamlining schemes for its innovation support system, in particular the organisation of the 22 accredited research centres in 7 thematic institutes and the merger of the intermediation agencies into one enterprise and innovation agency.

The updated Regional Innovation Plan of the Brussels Capital Region (2012) proposes a series of concrete short-term actions (2013-2014) as well as certain directions for future improvements (to be developed for 2014-2020), all of which is organized under fourteen operational directions and five strategic objectives (use smart specialisation to drive development of the economy and employment; create a favourable environment for innovative companies; increase the attractiveness of Brussels as the European hub for knowledge; increase Brussels' participation in European projects; strengthen the governance of innovation).

The short-term concrete actions (2013-2014) strengthen and perpetuate existing tools. Everything was created in function of available budgetary means and their impact on these actions. The Brussels-Capital Region remains committed, as are all the other Belgian entities, to the European objective to dedicate 3% of gross national product (GNP) to research and development, 1% of which to be financed by the public authorities. These objectives were made operational through the introduction of new support instruments and the consolidation of existing ones. The new regional innovation plan focusses on the following actions:

- Strengthening of the transversal character of strategic programmes;
- Development of clusters;
- Identifications of potential niches for specialisation;
- Strengthening of financing of innovation and seed funding;

[15] http://www.be2020.eu/uploaded/uploaded/201304301405170.NHP_2013_FR_avril_25.pdf

- Strengthening of the assistance and support of innovative companies throughout their development;
- Strengthening of the availability of human capital by encouraging scientific, technological and entrepreneurial careers;
- Simulation of demand for innovative goods and services through innovative public procurement;
- Simulation of the joint development of innovation through living labs;
- Promotion of the image of 'innovative Brussels';
- Increasing European support to leverage the Region;
- Organisation of strategic monitoring and analysis;
- Evaluation of actions and adjustment of RDI policy;
- Strengthening of the Scientific Policy Board (CPS);
- Cooperation with other Belgian regions.

2.6. Recent evaluations, consultations, foresight exercises

Evaluation of research and innovation policy is not a systematic practice but all the authorities seek to evaluate specific measures or initiatives or organisations on a periodic basis. For example, in 2011, according to its management contract, the Walloon Technology Promotion Agency (AST) was evaluated and Wallonia invited the OECD to review its regional innovation system.

Regarding the Walloon "Marshall Plan 2.Green", all measures implemented are subject to monitoring by a unit especially set up for this purpose within the General Secretariat of the Public Service of Wallonia and a program of thematic assessments currently in progress was defined by the Walloon government.

The same applies to the programs co-financed by Structural Funds. A thematic evaluation of actions for development and exploitation of innovation potential was carried out in 2012.

The implementation of a strategic approach for the management of programs to support RDI was introduced in the legal texts in 2008 (Decree of 3 July 2008 to support Research, Development and Innovation). This initiative has become concrete with the adoption of the Strategy for an integrated research 2011-2015. This Decree provides for an external evaluation of the implementation of this strategy at the end of five years of its implementation as well as the organization of a systematic collection of data on the outcomes and impacts of all projects financed under the Decree. This data collection was implemented in 2012.

Peer assessment of the Walloon regional innovation system, produced by the OECD, was finalised in 2012 and publicly presented at the start of 2013. This analysis has already guided the Government in several areas of reform, in fact mentioned in this document, in particular with regard to the reorganisation of the innovation landscape in Wallonia (Creation of WALTECH, of the Enterprise and Innovation Agency); furthermore it backs up the Government concerning consolidation of different policies, in particular the poles of competitiveness, the integrated Research Strategy and the Creative Wallonia Plan.

In Flanders, the EWI department set up a dedicated unit for policy monitoring and evaluation in 2009. The influential 2007 Soete review recommended simplification and a more "customer friendly set of instruments in Flanders". The Flemish research and innovation system has been

reviewed for the second time by Luc Soete in 2012. Evaluation needs are defined in the programming documents of specific measures and performance indicators are set out in the management agreement for implementing organisations with the Government, which enables a clear and transparent evaluation process. Evaluations at programme level are often assigned to external experts. These are usually published in a complete or summarised version or are available on demand.

In the Brussels Capital Region, even if evaluation practices have been up to very recently very limited, during the preparation of the updated R&D strategy in 2011, the regional R&D system has been assessed (financing, governance, policy mix). At the same time, the region has elaborated a "R&D scoreboard" a tool which should allow monitoring the regional R&D policy at programme and projects level. Furthermore it is planned that Innoviris will set up a specific unit dedicated to the task of monitoring R&D evolution in the region and ensuring a "strategic R&D intelligence".

With regard to the quality of research institutions, the quality is often hard to appraise as they are not yet systematically evaluated and monitored at federal level neither in Wallonia nor in Brussels. In Flanders, an evaluation culture has been emerging strongly in the last decade, e.g. all Strategic Research Centres have been evaluated in the last five years. The quality of research at HEIs is under pressure in Belgium, as in several other EU countries, due to the strong increase of students while funding is lagging behind this trend. In addition, Belgium has only limited competitive funding at HEIs - which might offer a further stimulus to enhancing the quality of research.

Belgium has quite a number of Public-Private partnerships (notably the competence poles in Flanders, competitiveness poles in Wallonia). Many of these initiatives have not been subject to an external evaluation, or the results were not made public, which makes evidence-based assessment of these initiatives hard. However, in Flanders the instrument has recently been subject to change,

competence poles are now 'light structures', which should enhance synergies between public and private partners and enable more transparent governance. In this light, the performance of the new competence pole is measured FiA Key Performance Indicators (KPIs) and funding depends on these KPIs. A final challenge remaining may be the integration and search for synergies at Belgium level, as competence poles have a relatively high regional character. Particularly noteworthy is the recent opening of Walloon competitiveness poles to Brussels stakeholders.

On April 28th 2011 the Flemish Council for Science and Innovation (VRWI) received a letter from the Science Policy Council of the Brussels Capital Region (RWBBHG), asking for a bilateral consultation with the presidents of both councils. This request came about as a result of the assignment to the RWBBHG by Benoît Cerexhe, Minister for Economics of the Brussels Capital Region, to investigate opportunities for a joint strategy with regard to science and innovation policy. To this end an Independent Expert Group (IEG) was established. On the basis of the current initiatives in both regions, the IEG sees opportunities for a joint strategy between Brussels and Flanders on five topics.

1. ICT and Society (vertical theme) (Brussels ICT industries, Brussels living lab; iBBT, IMEC, ICT testbeds, Flemish Supercomputer Centre);

2. Environment and Energy:

- Sustainable Construction (vertical theme) (Eco-build; iRG Construction, Round Table Construction);
- Green Energy (vertical theme) (Bru-wind; Generaties, Smart Grids Flanders, Flemish Photovoltaic Initiative,

- Energyville, Living lab 'electric vehicles', Innovations node 'Green Energy', iRG 'Green Energy');

3. Sustainable Mobility and Logistics (vertical theme);
4. Medical Research & Medical Care (vertical theme) (ClinicoBru & Flanders' Care);
5. Industrial Transformation through Innovation (horizontal theme);

These themes can be used to trigger collaborative research between the regions. Such collaboration will be facilitated by removing the main bottlenecks for a joint strategy. Exchange of best practices between similar platforms in both regions (e.g. ClinicoBru & Flanders' Care) could be a first phase. In a second phase, it should be investigated whether a joint call in both regions is feasible for these themes. Practical problems should be well outlined before implementing any joint calls.

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

It should be noted that many of the regional aspects are covered in other sections, due to the specificities of the Belgian research and innovation system. e.g. there are explicit regional smart specialisation strategies, as described before, even if they are not labelled explicitly that way.

According to the IEG (cfr. section 1.6), a joint strategy between Brussels and Flanders in the framework of smart specialisation, clearly provides added value as both regions would reinforce each other's strengths, and synergies can be created. The main actors that can benefit from a joint strategy are industry, knowledge centres (including the federal research institutes in Brussels), universities (particular attention should be given to the community-dependent universities situated in the Brussels Capital Region outside the regions of Wallonia and Flanders) and citizens.

A comparative study of sectoral strengths in science, technology and economy, the so-called "specialisation profiles", was performed within the smart specialisation study of the OECD Working Group on Innovation and Technology Policy (ECOOM & EWI department, 2011). This study analysed the relative performance of Belgium, focusing on scientific development (based on the analysis of publications[16]), technology development (based on patent analysis) and economic development (based on labour market data). Belgium has a relatively high activity compared to the reference countries[17] in the major science fields of: biology, clinical and experimental medicine and neuroscience and behaviour. The top three technology specialisation profiles, with the highest share of patents, are: macromolecular chemistry & polymers, textile & paper machinery and other special machinery. The top three economic specialisations are manufacture of chemicals & chemical products, post & telecoms and manufacture of basic materials. The analysis highlights a mismatch between knowledge production and the technological and economic fabric of the country and more particularly in the Southern part of the country (, as the strengths in science do not correspond with the technological and economical strengths.[18]

Belgium focuses on key enabling technologies as well as on specific sectors. Flanders increased its focus on the set-up of cluster initiatives and Strategic Research Centres. In December 2011

[16] Analysis of the so-called Activity Index.
[17] Australia, Austria, Czech Republic, Finland, Germany, Netherlands, Poland, South Korea, Spain, Sweden, Turkey and the UK.
[18] This mismatch has already been identified in Capron and Cincera (2002).

after an evaluation, the Management Agreements of three Strategic Research Centres were revised and new ones signed for five years, and in 2010 the Strategic Initiative Materials (SIM) and CMI were launched. The basic ambition is to strengthen the economic position of industry in Flanders in the medium-to-long-term, by executing and transferring accumulated knowledge through strategic research. End 2011 the Flanders Innovation Hub for Sustainable Chemistry (FISCH) excellence centre was established on sustainable chemistry. Wallonia puts a stronger focus on environmental issues. Following the adoption of the Marshall Plan 2; Green in 2009, specific initiatives were launched in the field of the environment with the creation of a 6th competitiveness pole dedicated to green technologies in 2011 (GreenWin). Brussels Capital region has launched in 2010 its first ICT strategic platform followed by the strategic platforms in Health: Expertise platform specialised in the toxicology of nano materials (NANO- IRIS) and platform for clinical research common to the three hospitals in Brussels (CLINiCOBRU). In 2012 this programme will be extended to the environment sector (renovation of buildings) and a new strategic platform will be set up in this sector.

3. PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1. National Research and Innovation policy

Belgium is ranked seventh in the EU-27 by the 2013 Innovation Union Scoreboard and is amongst the group of "innovation followers" (first before the UK). As illustrated in Table 2, Belgium has relatively to the EU average high shares of international scientific and public-private co-publications per capita. However, R&D expenditure in the public sector as % of GDP is lower in Belgium as compared to the EU average. Belgium also appears to score relatively less well in terms of PCT patents applications in societal challenges (i.e. climate change mitigation; health) per billion GDP (in PPS€) and in terms of License and patent revenues from abroad as % of GDP.

Table 3. Innovation performance of Belgium (Indicator values relative to the EU27 =100)

HUMAN RESOURCES	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	100
Percentage population aged 30-34 having completed tertiary education	123
OPEN, EXCELLENT AND ATTRACTIVE RESEARCH SYSTEMS	
International scientific co-publications per million population	426
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	125
FINANCE AND SUPPORT	
R&D expenditure in the public sector as % of GDP	87
Public Funding for innovation (innovation vouchers, venture/seed capital, access to finance granted by the public sector to innovative companies)	-
FIRM ACTIVITIES	
R&D expenditure in the business sector as % of GDP	108
Venture capital and seed capital as % of GDP	96
LINKAGES & ENTREPRENEURSHIP	
Public-private co-publications per million population	184
INTELLECTUAL ASSETS	
PCT patents applications per billion GDP (in PPS€)	96
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	84
ECONOMIC EFFECTS	
Medium and high-tech product exports as % total product exports	101
Knowledge-intensive services exports as % total service exports	92
License and patent revenues from abroad as % of GDP	86

Source: Innovation Union Scoreboard (2013)

Although there is no national strategy, each region/community has its own multi-annual plan that covers research and innovation (either as a sub-element of an overall plan or as a specific strategy), namely: the Flanders in Action initiative ; the Brussels-Capital Regional Innovation Plan (PRI 2006); the Walloon "Marshall Plan 2.Green" completed recently by the Research Strategy 2011-2015 and the Wallonia-Brussels partnership for researchers, both adopted by the Wallonia-Brussels Federation and the Walloon Region in 2011. Moreover, the 2011 Federal Government Agreement foresaw the drafting of an overarching inter-regional STI-strategy in order to reach the 3% GERD/GDP target and meet the goals of the National Reform Plan and the EU 2020 Strategy. The inter-regional/community plan would aim to improve the coordination and efficiency of STI policy.

Following the regional elections of 2009, the formation of the Walloon and the Wallonia-Brussels Federation governments was based on a common political strategy. This strategy has been translated into an operational plan called the Marshall Plan 2.Green (Plan Marshall 2.Vert, budget of €1.6b over five years (2009-14)), which endorses the 3% Objective and aims to improve competitiveness of firms by improving the performance and integration of research with industry. This plan is a continuation and a reinforcement of the previous plan implemented during the period 2006-09. The addition of 'Green' underlines the new orientations to better integrate 'sustainable development' as a crosscutting priority. The third priority area of the new plan 'Strengthen scientific research as an engine of the future' incorporates the main actions to be pursued during the 2009-14 period as regards STI policy. Funds from both authorities were sought to be invested in the implementation of a joint research strategy, which also involves the Brussels-Capital Region, and focuses on strategic crosscutting themes e.g. sustainable development, renewable energy, new technologies, longer life, etc.

As a follow-up, a Framework Policy was published in November 2011 entitled Research Strategy 2011-2015 "Towards an Integrated Research Policy". This document sets out eight strategic objectives (including reiterating the 3% objective), identifies five priority thematic areas and includes a detailed plan of action for meeting the objectives. The five thematic fields identified are: sustainable development, energy, research in technological fields, health and ageing and quality of life. A first new measure was launched to support public-private partnership working on these thematic fields (PPP-2012). Although technically a policy statement of the Walloon - Wallonia-Brussels Federation governments, an additional aim of the Strategy is to develop a joint action plan with the Brussels-Capital region.

In addition, the Wallonia-Brussels Partnership for Researchers was also adopted in 2011. It is the contribution of the Wallonia-Brussels Federation to the implementation of the European Charter for Researchers, the European Code of Conduct, the European Commission Partnership for Researchers, the recommendations of the Helsinki Group on Women and Science and the human resources strategy of the "Innovation Union" of the European Union. It is worked out in twenty-five actions divided into six chapters, where public authorities undertake, alongside the actors in research, to place researchers at the centre of the priorities given to the consolidation of research as a driver of the future.

The Action Plan "Creative Wallonia" is another important component of the innovation policy in the Walloon region. This Plan brings together a number of measures based on a common philosophy:

- A vision on innovation that is not restricted to simple discovery or invention: innovating is modifying several elements with regards to the existing reference; this for the product level or service level itself as well as for its production, design, marketing, etc. It is no longer valid to consider an increase in R&D investments as being sufficient to make us innovators. Without a mental attitude aimed at systematic changes, all classic efforts will remain in vain.

- An innovation policy founded on the entire society – on a creative society. If innovation is the capacity to transform reality, creativity is the capacity to transform its perception of reality. In the contemporary world, the companies cannot be separated from the entirety of their normative, social and cultural context.
- This is clearly the reason why all of them must move on together. In this respect, Wallonia is not without aces: it consists in a rather compact territory, it has operational institutions, actual cultural diversity and numerous industrial spearheads in various sophisticated domains.
- The will to proceed though leveraged effect in order to convince rather than to impose.

The Regional Innovation Plan of the Brussels Capital Region (2006) covering the period 2007-2013 focuses on regional R&D strategic platforms, clusters and plans to increase regional R&D capacities up to the 3% target. This plan is the result of the agreement between regional government, universities, entrepreneurs and other regional stakeholders. It aims to implement a set of measures to improve the regional innovation capacity. It pursues six strategic objectives:

1. Promote the three most innovative sectors: ICT, Life Sciences and environment
2. Increase the rate of innovation through the implementation of specific programmes;
3. Stimulate the use of innovation through marketing research results and assistance to SMEs so that they assimilate and use innovations;
4. Foster the internationalisation of innovation;
5. Attract and anchor innovative activities;
6. Create an environment that favours innovation.

These objectives were made operational through the introduction of new support instruments and the consolidation of existing ones. The sectors were selected because of the identified potential as regards research, innovative content, growth and job creation in Brussels. In 2011 the region has started the preparation of a new RDI strategy for the region in line with the EU 2020 strategy. The objective is to elaborate a "smart specialisation strategy" for the region by identifying the sectors in which the region will invest, in order to reshape and adapt the financial measures and instruments, rethink a governance model and align the priorities with future EU funding (ERDF, HORIZON 2020).

Flanders in Action (FiA) is the central statement of the Flemish Government and is based on an agreement between the social partners, stakeholders and the government aimed at making Flanders one of the top five EU regions by 2020. The FiA plan includes a number of goals related to research and innovation policies which the Minister for Science and Innovation Policy has set out in more detail in the Policy Letter 2010-2011.[19] In 2011, the concept note on "Flanders Innovation Centre" indicated the importance of societal challenges and identified so-called 'innovation crossroads (or hubs)' where the strengths of the Flemish innovation system meet the needs of the Flemish society. The selected innovation crossroads were: Innovation in care; Eco-innovation; Green energy: Sustainable mobility and logistics; 'social innovation' and 'innovation for transformation of industry'. The innovation hubs should take into account the six strategic clusters identified in 2006 by the VRWI, after a foresight exercise and SWOT study and an assessment of societal needs through broad-ranging stakeholder round tables. The VRWI

[19] Main priorities are: (i) A focused innovation strategy, (ii)
Improved innovation power for the economy, (iii) Making landers a top region by proving to be receptive for innovation(iv) Reinforcing science
fundament of innovation; and Increase the intensity, efficiency and impact of R&D..

clusters have been updated in 2013-14 during a foresight 2025 exercise. On March 8, 2014, the Flemish Government approved the Concept Paper 'A smart specialisation strategy for oriented cluster policy'. Within the new Cohesion Policy, the regions have to document their smart specialisation strategy, before they can receive EU financial support through the Structural Funds.

The VRWI welcomes this concept paper, as Flanders needs a policy strategy that incentivises setting priorities and making choices. The VRWI (2013) gives the following comments:

- Important questions are left unanswered in the concept paper;
- While the concept paper brings together a number of existing initiatives, this does not negate the fact that these initiatives were developed without the necessary coherence;
- Fragmentation and duplication will only be avoided through explicit coordination;
- A smart specialisation strategy should be able to integrate existing clusters;
- Now is the time for Flanders to make decisive choices and to extend its choices to its policy instruments.

All three regional innovation policies put an emphasis on life sciences as a sector of growing economic importance (employment, or commercialisation of research for instance): the sector is one of the three priority areas of the Brussels-Capital innovation policy; in Wallonia, a competitiveness pole is dedicated to the life sciences and e-health policies are gaining in importance. It is a joint initiative by the three Ministers responsible for Health, Economy and Science & Innovation. In Flanders, the VIB has gained a strong position over many years in the biotechnology and life sciences, and there are new and reinforced initiatives such as the Flanders Care initiative (innovative health), the research centre CMI (medical innovation) and ageing and innovative health care..

Societal challenges are increasingly targeted by research policy since the community and the regional elections in 2009. The main evolution is the focus put on broad societal needs and challenges in Flanders[20] and on environmental and health concerns in all regions and in all communities and the willingness to increase collaborations between research actors in the academic and industrial sectors through the continuation of now well-established policies (excellence centres (now innovation platforms) in Flanders, competitiveness poles in Wallonia, mobilising programmes) and the launch of new ones (technological innovation partnerships in Wallonia, strategic platforms in Brussels-Capital) and the opening of new research centres focused on environmental or health issues. In Wallonia, in addition to sustainable development and energy, health and ageing/quality of life are also priority themes. The innovation hubs defined in the new Concept Note Innovation Centre Flanders are all oriented towards societal challenges as well.

Over the last years, at Federal level, there has been a move to improve and optimise the fiscal incentives it can allocate to both scientific and industrial research. This effort has made some in-roads into reducing the competitiveness gap for undertaking research in Belgium due to high wages and social charges. The most important measures at the Federal level are the various tax reduction schemes for R&D activities, introduced in the last five years. Given the limited scope for action in favour of enterprise level investments in innovation of the Federal authorities this orientation is coherent and responds to a long running criticism of the ineffectiveness of fiscal measures for R&D and innovation in Belgium.

Over the last years, the trends in the priorities of the policy-mix in each of the three Belgian regions have tended to display some distinctive features, reflecting their specific institutional and

[20] Identified in the aforementioned FiA process.

economic environments. At the same time, a number of measures are similar in their objectives yet differ in the approach to implementation. A common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. A major difference between the two systems has been the strong focus in Wallonia on schemes aimed at encouraging knowledge diffusion through the exchange or temporary assignment of skilled researchers or innovation specialists from the university/research centres to enterprises (and vice versa), the FIRST family of measures. In Flanders, this type of action is subsumed within more general industrial R&D subsidy schemes. The regions have all made commitments to invest more in R&D and there is concerted effort to focus this funding on either thematic or sectoral approaches such as the Flemish strategic research centres (IMEC, VIB, etc.) and excellence centres, or the Walloon competitiveness poles and the Brussels' clusters and strategic platforms. An interesting recent evolution is the strong focus on the coordination/opening of programmes (cf. competitiveness poles, S&T awareness raising campaigns) between the Walloon and the Brussels-Capital regions, accelerated since 2011 and the strong coordination of policies between Wallonia and the Wallonia-Brussels Federation.

3.2. Structural challenges of the national R&I system

The policy priorities and the mix of measures implemented by the Belgian authorities have not changed significantly over the last five years. Wallonia and Wallonia-Brussels Federation Research have published their first multi-annual strategy Research 2011-2015 "Towards an integrated research policy". For the rest, the emphasis has rather been on consolidating and expanding existing policy initiatives (for instance, strategic research centres in Flanders, Competitiveness clusters in Wallonia, Impulse programmes and Strategic Platforms in the region of Brussels-Capital reinforcing the financing and restructuring of university researchers). At the same time, the three Belgian regions have continued to adapt and focus their policy effort to their specific institutional and economic environments. In Flanders, several initiatives have been taken in recent years in the field of renewable energy e.g. with the setup of ICleantech, Energyville, a testing ground on Electric Vehicles and the VEB (Flemish Energy Company).

The financial weight of the budget of the policy measures, as presented in the European Inventory of Research and Innovation Policy Measures (ERAWATCH), helps to shed light on the responsiveness of the policy mix to the structural challenges identified in Chapter 3. Maghe, Capron and Cincera (2014), classified each Belgian policy measure detailed in the Erawatch database within functional matrices crossing three main dimensions: the objectives pursued, the instruments used and the organizations targeted by the public intervention. The examination of the functional matrices permits several interpretations in terms of percentage of all the national policy measures allocated to each dimension. Looking at the raw budget weighted distribution allows for an idea of how the policy measures are implemented, according to the budget allowed by the Belgian government to each dimension of the innovation system. One can also make statements on the distribution of policy measures among the crossed dimension, i.e. what objectives dedicated to education organization are prioritized by the authorities.

When analysing the results by broad categories of objectives, instruments and organizations related to innovation policies, one can see that globally, Belgian authorities set their priorities on the creative and transfer capacities (respectively 57.23% and 35.88% of all implemented policy measures), the instruments being almost equally distributed among the support, diffusion and framework types. Regarding the sub-dimensions of creative capacity (see table 10 in annex), a very strong focus is set on the applied R&D (42.02%). Comparatively, fundamental research only accounts for 7.93%, expressing the fact that firms and private RTOs' research activities are much more targeted than others. Regarding the transfer capacity, a strong focus is set on knowledge

networking (17.39%), more than on knowledge transfer (5.73%) and knowledge exchanges (3.97%). This can be explained by a public willingness to create network of innovation actors such as competitiveness clusters. This can be linked to the results obtained for the sub-dimensions of the STI Diffusion measures. The instruments aiming at the stimulation of collaboration, partnerships and synergies account for 17.88% of all policy measures. The improvement of firm's innovation capacities is also taken into account but to a lower extend (6.07%). However, mobility only account for 0.25% of all the policy measures implemented in Belgium, which is a relatively low rate, that could be put in perspective with the performances of the Belgian IS in terms of international collaborations.

Concerning the public intervention through general economic framework, the main priorities of Belgian authorities are infrastructure (19.81%), education (10.01%) and labour market conditions (4.38%). The intellectual property right account only for 0.53% of all the policy measures implemented in Belgium, which is a relatively low proportion, compared to the other sub-dimensions. As for all other results presented here, it has to be put in perspective with a diagnosis of the current performances of Belgium in terms of patents.

Regarding the targeted organizations, a strong focus is set on business organizations (26.13%, among which companies accounting for 17.77%) and RTOs (67.78%, among which university research units account for 41.43% and other non-profit organization for 23.27% of all policy measures implemented in Belgium). The education organizations are less prioritized in general (0.57%). It raises the question of the participation of universities and higher education institutions in the innovation process and the support that could be provided by governments to this purpose. As one will see below, the research function of higher education institutions is much more solicited than the education one. Moreover, 3.63% of the policy measures are dedicated to "other organizations" which are mainly individuals as researchers, and are targeted independently to a specific organization, i.e. PhD students applying for an individual scholarship.

In a nutshell, Belgian authorities are mainly prioritizing applied R&D activities in firms, universities and other non-profit research centres, and knowledge networking through policy instruments facilitating the collaboration, partnerships and synergies between innovation actors.

The functional matrices also permit cross-dimensions analysis, which states the proportion of policy measures dedicated to a specified couple of dimensions, i.e. which objective is pursued for each research and technology organization. The analysis of the distribution among the crossed-dimensions shows that companies, university research units and other non-profit organizations beneficiate mainly from direct financing. Support to collaboration and intervention dedicated to infrastructures are also used in the organizations reported in table 1. Policy measures aiming at education are mainly directed to HEI research units. This last point can be considered in the light of the previous results shown for education organizations, as a stronger focus is set on graduated researchers of PhD students rather than students with lower degrees, concerned by the education function of universities, who can enter the labour market directly after graduating.

Increasing the R&D budgets allocated to scientific research and improving the co-operation with industry clearly is the priority and receives the lion's share of public funding, about 8% of the estimated public budgets also aim at improving the overall quantity and quality of human resources for science and technology. As this calculation does not include the close to 1.1 billion euro of annual foregone tax revenues (BELSPO, 2013) from the Federal wage tax reduction for researchers, the policy-mix is clearly giving a significant emphasis to tackling challenge 3.

A number of measures aim at fostering research industry collaboration and commercialisation of research results (Challenge 3). The strengthening of research industry collaboration is promoted through new initiatives such as the Public-Private Partnership (PPP-2012) programme in Wallonia; in thematic strategic platforms in Brussels; and the "spearhead" policy of FiA in Flanders (and in addition the focus on societal challenges by way of 6 thematic Innovation Hubs

as described in the Concept Note Innovation Centre Flanders of May 2011). Softer instruments primarily aiming at innovation support and management services also focus on Challenge 3 but are relatively smaller in budgetary terms with about 5% of the research and innovation policy funding allocated by the Belgian authorities. Similarly, the launch of the programme Creative Wallonia in 2011 underlines the recognition by the regional authorities of the need to boost non-technological innovativeness in SMEs.

Finally, in terms of demand side innovation policies, although the Belgian authorities (collectively) have sought to use investment in space research (through the European Space Agency) as a form of pre-competitive public procurement, the use of public procurement to stimulate research and innovation is not yet widespread. Innovation-driven public procurement initiatives in Belgium have been mostly implemented in Flanders and managed by IWT. Since 2009, 12 Innovation Procurement Platforms have been launched in 10 domains such as Culture, Sustainable building, Public Works, Agriculture, Environment, Social Innovation, Education, Geographical Services, Healthcare, and Economy. Using ICT as enabling technology is an important element in many of them (ex. Culture, Education, Geographical Services…). IWT also participates in cross-national joint procurement initiatives (Smart@Fire).[21]

In terms of related policies, the higher education sector has been undergoing changes in the framework of the Bologna process. This led to a partnership (or quasi-merger) of smaller HEIs (university colleges, autonomous faculties, third-level institutes) with one of the major universities in each Community. The commitment of the Belgian authorities to implementing the requirements of the European partnership for researchers is also strong. These process lead to higher compatibility of research and higher education with other EU countries and thus lowers barriers for mobility. However, language requirement and remuneration levels of researchers are de-facto barriers.

Finally, there is a strong and growing focus on environmental issues in Wallonia and Brussels-Capital and on societal challenges (such as health, energy, and eco-innovation) in all regions.

There remain a number of challenges of the Belgian NIS including an overall governance challenge and two main structural challenges. The latter differ in intensity between the regions.

Challenge 1: Increasing co-ordination and synergies within the governance system

The multi-level governance of the Belgian system creates specific challenges (Boekholt & Georghiou, 2011) such as a risk of sub-optimal scale of public-private investments that may create disincentives for co-operation between the main research performers and businesses at an inter-regional level. Given the trend to further empowerment of the communities and the regions, policy making in scientific research and innovation happens essentially at community and regional level, but several important policy areas that influence the effectiveness of research and innovation policies, such as the tax system, remain at the Federal level. While co-operation and coordination mechanisms exist essentially at operational level regarding international issues, co-operation and coordination regarding national issues is much more sporadic. Co-ordination happens through bodies like the CIS (dealing with research and innovation) and the International Economic Commission (IEC) (dealing mainly with the economy and non-research related innovation). Intra-regional co-operation is increasing with neighbouring countries (for example, the Leuven-Aachen-Eindhoven triangle). At the same time, the devolution of research and innovation policy competences to the communities and regions enables each community and region to pursue diversified strategies that respond to specific socio-economic challenges or to further boost specialisations. The Federal government acknowledges such advantages of

[21] http://www.innovatiefaanbesteden.be/

regionalisation while seeking to limit any 'negative externalities' by proposing, in the Government Agreement that *"there should be an inter-federal plan for research and innovation*" that "*will make technological innovation more efficient*", "*while respecting each entities' competences*" (Belgian Federal Government, 2011).

The issue of fragmentation also exists at regional level with several studies in both Flanders and Wallonia pointing to the drawbacks of sub-regionalism and an institutionally heavy system of intermediaries and sub-critical research centres. Initiatives such as the strategic research centres and excellence centres in Flanders and the Competitiveness Poles in Wallonia are an attempt to structure the R&D capacity in specific fields and sectors. However, a rationalisation of intermediary structures and a centralisation and professionalization of business advisory networks and financing structures would provide more cost-effective support to business innovation.

Challenge 2: Improving the ranking of Belgium in Science, Technology and Innovation scoreboards

Belgium, although not among the innovation leaders in the EU, is placed third in the second tier of 'innovation followers' in the Innovation Union Scoreboard 2014 (European Commission, 2014) and over the last five years has achieved moderate growth in innovation performance. According to the Scoreboard, the increase in the country's performance has been below that of the EU which resulted in Belgian's relative performance declining from almost 20% above average in 2006 to 14% above average in 2013.

Strong indicators where Belgium is performing well above the average EU performance include international scientific co-publications, innovative SMEs collaborating with others and public-private co-publications. Relatively weak indicators include sales share of new innovations, non-EU doctorate students and new doctorate graduates. Performance has improved most in Community trademarks and international scientific co-publications. Performance has worsened in non-R&D innovation expenditures and to a lesser extent also in venture capital investments, SMEs with marketing and/or organisational innovations and fast-growing innovative firms.

The OECD STI Outlook (2012) highlights three hot issues concerning the Belgian NIS: addressing expected shortages in human resources in S&T; attracting inward foreign investment and encouraging further commercialisation of R&D projects.

Challenge 3: Matching knowledge production with the economic fabric

Despite the high research outputs in quantitative and qualitative sense and relatively high investments in research centres and R&D measures, the take up by Belgian companies appears to be sub-optimal (Bruno & Van Til, 2010, 2011; ECOOM, 2013). While the number of patent applications per million GDP is the same as the EU average (European Commission, 2014), community trademarks and designs are below (90 and 91 respectively compared to the EU average of 100). Belgium appears also to underperform in knowledge-intensive services exports (93) and the share of new innovations in total sales (86).

The main challenge is to link the accumulated research capacities to the economic eco-system. Several measures are in place in each region aimed at economic exploitation of research, but it seems that research outputs are not aligned with the absorptive capacity of SMEs. In Flanders, strategic research centres offer high-class and knowledge intensive services, but these are often only used to a limited extent by players from Belgium. IMEC, for instance, is considered to be a world-class research institute, but although it attracts a lot of industrial players from all over the globe, it struggles to link to Flemish companies, as this sector is marginally represented in

Flanders. From a business perspective, the limited public support to an economically important sector like the chemical industry (in Flanders: 40% of BERD and 27% R&D personnel) is striking (Van Til, 2011).[22] A recent review of the science production (publications), the technology production (patents) and the economic specialisation (employment) by ECOOM & EWI Department (2011) further substantiates a certain mismatch between knowledge production and the economy in Flanders. As already emphasised, this mismatch is also present in the other Belgian regions.

3.3. Meeting structural challenges

Broadly speaking when assessing the policy mix, there is a need to keep in mind that while the Belgian research and innovation performance could be higher, in overall terms the country is firmly located in the top half of the 'league table'. Equally, despite concerns expressed in various reviews about 'co-ordination and synergies' due to the multi-level governance context, there are clear signs that the Belgian authorities have understood the need to optimise (if not rationalise) the public support provided FiA various governments and their agencies and to seek, where relevant, enhanced synergies.

As noted above, the policy mix and focus of policy effort has not changed dramatically over the last five years (and it could be argued over a decade). A considerable policy effort and corresponding investment has been made in reinvesting in scientific research (FiA the Federal Government and the Communities) and on enhancing the attractiveness of Belgium as a place to conduct both scientific research (the communities) and science-industry collaboration and commercialisation (the regions). At the same time, the targeting or strategic orientation of this investment has been subtly changing through a mix of competitive funding programmes and investments into thematically specialised research facilities and centres. The driving forces behind this specialisation are both economic (ensuring that the business sectors are assisted to reconfigure towards new competitive products or that new higher value added sectors emerge) and societal (e.g. dealing with environmental degradation nationally and contributing to tackling climate change globally).

The Belgian policy mix (at all levels) is sophisticated and the various authorities have put in place or further improved a mix of policy advisory and strategic intelligence actions that provide a stronger basis for policy decisions than existed a decade ago. Equally, the evaluation of policy outcomes has become an increasingly, if not systematically, applied tool to assist in improving policy effectiveness.

This said, the trends in research and innovation performance discussed above, and the evidence from benchmarking exercises such as the IUS, tend to suggest that the rate of improvement both in terms of increasing investment intensity and in terms of innovation performance are insufficient to meet the targets set in policy strategies. In particular, the following observations can be made.

- There is little chance of Belgium meeting the 3% GERD/GDP target even by 2020, even if the Belgian authorities have confirmed the 3%-target. The tax credits as well as other broader tax measures are adding funds to the research system, but are not counted in the calculations. Public investment is on slightly upward trend but even, for instance, the doubling of public investment in Wallonia over the last decade has only inched the region up to 2% GERD/GDP intensity. Even if the public investment gap with the EU-

[22] An initiative on sustainable chemistry has been in preparation, which resulted end 2011 in the establishment of a new Excellence Centre, the FISCH initiative.

27 average has been surpassed, this still leaves a considerable gap of more than half a percentage point to be met by the business sector. Given current industrial structures, this is unlikely to happen.

- There is a need to be wary of hasty conclusions that the current policy mix is not working due to the lack of significant progress. Given the economic crisis over the last five years, the Belgium economy and research and innovation system appears to have 'weathered' the storm better than some other neighbouring countries. The introduction and extension of R&D tax reductions on researchers salaries (in both the higher education and business sectors) may very well have acted as an 'automatic stabiliser' without which R&D intensity would have declined rather than remaining relatively stable. Similarly, tax incentives for business such as the notional interests[23] measure may have contributed to maintaining the relative attractiveness of Belgium as a place to do research. This type of hypothesis requires validating and it would be timely to see an evaluation of the R&D tax measures to understand if they are maintaining current or inducing additional R&D spending by the beneficiaries.
- The structuring of the higher education system (in both Communities) into larger institutions ('associations' or 'academies' bringing together several third level education institutes) should foster, if the correct policy incentives are in place, a corresponding realignment of research potential (e.g. greater scope for inter-disciplinary work or merging or pooling of research teams across formally autonomous institutes). This is one element that would help to reduce fragmentation of the overall Belgian research system and further improve its performance. At the same time, the balance between institutional and competitive funding of the system would merit further review in order to further focus and concentrate efforts. Finally, while the remit of the Federal Government to fund 'nation' wide research programmes has been further diminished (with the decided transfer of the inter-Community programmes Inter-University Attraction Poles and Technology Attraction Poles to the Communities and the Regions), there is a clear (financial at a minimum) rationale for organising joint programming, sharing certain research infrastructures or 'pooling' research efforts (e.g. the Scottish example of research pools could be applied) between Flemish, Brussels, Walloon and Wallonia-Brusselsnetworks
- based research teams in certain fields. This has already been possible for coordinating Belgium's participation into research infrastructures of the ESFRI roadmap. Finally, the proposed Inter-Federal Plan for Research and Innovation has led to concrete initiatives.
- The efforts to structure and develop major thematically, sectorally or technologically specialised 'clusters' of R&D and innovation over the last decade (and in the case of Flanders several decades) through strategic research centres, excellence centres, competitiveness poles, clusters and targeted research programmes need to be pursued and further consolidated. The evidence from the Flemish strategic research centres (IMEC, or VIB for instance) suggests that it may take over a decade before such initiatives become fully operational and realise their objectives, achieve 'critical mass' and attain international recognition. The Walloon competitiveness clusters and the research

[23] The "notional interest deduction" enables all companies subject to Belgian corporate tax to deduct from their taxable income a fictitious interest calculated on the basis of their shareholder's equity (net assets). The main purpose is to reduce the tax discrimination between debt financing and equity financing. Indeed, in the case of loan capital, the interest paid is deductible from the taxable base, while with equity capital the dividends are taxable. These rules are intended to have the following positive effects: a general reduction of the effective corporate tax rate for all companies, and a higher return after tax on investment and the promotion of capital-intensive investments in Belgium; and an incentive for multinationals to examine the possibility of allocating such activities as intra-group financing, central procurement and factoring to a Belgian group entity.

and technology centres created over the last decade will need sustained funding, regular evaluation and expert management if they are to begin to contribute effectively to structural adjustment of the economy. The realignment of research and innovation policies to contribute to tackling the structural adjustment of the economy or for taking on societal (grand) challenges such as the environment and climate change, will require better orientation and focus of the limited amounts of public funding available in the coming years with the need to possibly cut funding from non-priority centres or sectors. This implies the need for a political will to close or merge structures created over the previous decades.

- Aside from the Federal R&D tax measures, business R&D and innovation is supported FiA a range of measures managed by the regional authorities. The innovation policy mix has evolved over recent years but remains essentially based on grants (or reimbursable loans) for individual firms to undertake R&D. The IUS 2010 suggests (based on Community Innovation Survey (CIS) data) that the intensity of business innovation activity, notably non-technological innovation, is not improving and that the impact of such activity is not as positive as would be hoped in terms of boosting turnover from new products. Despite initiatives such as the VIS (Flemish Innovation Co-operation network) programme in Flanders or new coordinating agencies such as the Walloon Technological Stimulation Agency (AST) aimed at identifying and supporting firms with a potential to innovate more intensively, the situation has not evolved positively. There is a need for a further re-assessment of the effectiveness of the direct support measures and of intermediary support structures that are often over-complex and fragmented that would lead to a more radical 'pruning' of the system to ensure value for money. In 2011, an update started of the report drafted by the Soete-commission in 2006 on the Flemish STI-landscape. The results have recently been published. At the current time, there is limited recent evaluation evidence on the effectiveness of the measures in place and a wide-ranging evaluation and review would be beneficial in each region in order to focus regional support on initiatives best able to contribute to raising the intensity of industrial R&D and innovation (including service sector and non-technological forms of innovation).
- Finally, the issue of public sector innovation is given a remarkably low priority in policy declarations or strategies, except for e-practices in all entities and public procurement for innovation in Flanders. Many observers would consider that the potential to increase the efficiency of public expenditure in Belgium and the effectiveness of services provided to the population is significant.

The table below summarises the policy response to the challenges identified in section 3.2 of this report.

Table 3. Challenges, Policy measures and assessment of appropriateness, efficiency and effectiveness

Challenges	Policy measures/actions addressing the challenge[24]	Assessment in terms of appropriateness, efficiency and effectiveness
1. **Increasing co-ordination and synergies within the governance system**	December 2011 Federal Government Agreement foresees an inter-federal research and innovation plan Strategy 2011-2015 (Framework note) on an Integrated Research policy for the Wallonia-Brussels Federation, Wallonia (and Brussels-Capital) The (national) interministerial council for science policy (uniting all ministers in charge of research) is addressing issues concerning improving national co-ordination as well as issues regarding a better co-ordinated approach towards Europe.	Recent assessments (e.g. ERAC peer review 2011) concluded that fragmentation hampers the effectiveness and efficiency of the Belgian STI system. The transfer of the Interuniversity Attraction Poles (IAP) and Technological Attraction Poles (TAP) Federal measures further reduces inter-federal funding. Increasing integration and co-ordination of Walloon- Wallonia-Brussels Federation-Brussels-Capital policies with further actions foreseen by March 2011 action plan
2. **Addressing expected shortage of human resources in S&T**	Federal R&D wage tax reduction measures Range of measures at Federal, community and regional levels to support international mobility, industrial PhDs, recruitment of innovation managers, S&T studies	No robust data (yet) or evidence to allow a judgement as to whether the policy measures are paying off in terms of reversing brain drain or attracting more people to work in research or innovation careers.
3. **Matching knowledge production with the economic fabric**	Instruments include: Flemish strategic research centres and competence poles, Walloon Competitiveness clusters, support for business angels, regional risk capital measures, incubators and funding for university technology transfer centres.	There is quite a comprehensive set of measures in place, targeted at interfaces between research institutions (incl. universities) and companies. Assessing the efficiency and effectiveness of these measures is out of scope of this report. However, there seems to be a certain mismatch between knowledge production and the economy from a sector viewpoint.

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

4. NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1. Strengthening the knowledge base and reducing fragmentation

4.1.1. Promoting excellence in education and skills development

	2009	2010	2011	2012	EU-27 average 2012
R&D performed by HEIs as % of GERD	24	24	22	23p	24s
New doctorate graduates (ISCED 6) per 1,000 population aged 25-34				1.5	1.5
Share of the population aged 25-64 having completed tertiary education	33.4	35	34.6	35.3	27.6
Employment in Knowledge-intensive service sectors as share of total employment	4.67*		-		4.4*
HRST as a share of total labour force (EUROSTAT)	48.2	49.3	49.6	50.3	42.9

Source: EUROSTAT
Note: The data was updated end Dec 2013
p: Provisional value
s: Eurostat estimate
*: 2007 average

The level of education of the population is relatively high with in 2012, 35.3% of the employed population aged 25-64 having a tertiary education level (EU-27: 27.6%). Belgium demonstrates a slowly increasing absolute number of HRST. As a share of the labour force for the 25-64 age group, Belgium increased its share continually. In 2012, the share reached 50.3% (EU 42.9%). The total number of researchers is growing steadily over time (30500 FTE researchers in 2000; 40500 FTE in 2011). Most researchers (in Full Time Equivalent, 2011) work in the business enterprise sector (46.0%) and the Higher Education sector (46.0%); the government sector plays a marginal role (7.3%). Both business and HEI sector are thus relatively more important in Belgium than in the average EU27. Researchers are employed at universities, which are independent institutions. Both temporary contracts as well as fellowships are subject to social and health taxes and also enjoy social accompanying social security.

National bodies do not monitor inward and outward flows of researchers in Belgium, so no reliable data are available on transnational mobility. However, in 2009, 9% of the HRST was non-national. A recent survey of junior researchers (doctorates) in Flanders showed that 16.8% of the researchers are foreigners; half of which comes from an EU country. The personnel records of the Flemish universities and research institutes give a similar picture (17%). The share of foreign researchers declines with increased seniority: only 5% of the professors is foreign, against about 30% of the postdocs.

Several measures have been taken to attract Belgian researchers who settled abroad: return mandates from the federal level, scientific impulse mandates - ULYSSE from the French Community (F.R.S-FNRS) as well as a measure in the Brussels-Capital region ('Brains Back to Brussels').

Flanders offers brain gain programmes (Odysseus and visiting fellowship grants) as well as brain drain prevention (Methusalem). These brain gain instruments become increasingly important in Flanders. Until recently, instruments boosting researcher mobility in Flanders are primarily aimed at providing research budgets. From 2011 onwards, Flanders is inventing substantially in setting up tenure tracks (€3,5mln), and graduate schools (€4mln). The F.R.S-FNRS also proposes short-term (3 years) positions and grants to non-national PhD holders coming into a university lab within the French Community. Another way of attracting researchers is setting up top class research (infrastructures); especially the Strategic Research Centres (IMEC, VIB, VITO, iMinds) in Flanders are internationally renowned. In this light, Wallonia-Brussels International (WBI) allowed the competitiveness clusters designated by the Marshall plan to allow universities to host students from institutions of excellence abroad. An identical programme exists for graduates from Wallonia and Brussels who wish to study in a university of excellence abroad.

Moreover, a practical guide for mobile researchers coming to Belgium has been published on the Belgian EURAXESS portal. It contains information to mobile researchers on visa and residence permit, social security, taxes and bringing along family members.

Furthermore, inward mobility is being promoted at federal level by the scientific visa since 2007, which is implemented by law and which improves framework conditions for foreign researchers. The procedure to obtain a visa and a residence permit for any researcher from a third country hosted by a chartered organisation in Belgium is simplified.

A main challenge as regards the labour market for researchers is the relatively low remuneration of researchers compared to similar countries as well as a low participation of women in research. To a certain extent also a mismatch may be identified in the supply and demand for high-skilled researchers and engineers: there are indications that there is a shortage of highly skilled engineers and scientists in the field of physics, chemistry and IT. Lastly, in an EU perspective, community regulations prescribe the use of the official language at HEIs, which can be a barrier to foreign researchers.

The level of salaries of academic staff in research organisations are established by law for the federal scientific institutes (FOD Justice 1998), for the F.R.S-FNRS and for the Flemish research institutions. According to the Researchers' report 2013 (Deloitte, 2013), Belgium is amongst the best paying countries for First stage researchers (i.e. researchers up to the point of PhD) According to the same source, PhD stipends (in PPPs) were about the double as the EU28 average.

Several measures exist to attract Belgian researchers who settled abroad: return mandates form the federal level, scientific impulse mandates - ULYSSE from the French Community (F.R.S-FNRS) and the FWO's Odysseus and Pegasus programmes of the Flemish Community as well as measures in the Brussels-Capital region ('Brains Back to Brussels', 'Research in Brussels'). One can nonetheless highlight that this co-existence of mobility schemes in all Belgian entities might play against the external visibility of the country for foreign researchers. This might be one of the entrance points where a coordinated approach between Belgian entities could have large added value.

The FWO's Odysseus programme is a brain gain initiative which offers both high potentials and senior PI's the necessary means to start up a new research group at a Flemish university. These can either be foreign researchers or Belgian researchers that have worked abroad for the last couple of years. The engagement is double: on the one hand the university ensures a fixed appointment with a competitive salary, while the FWO on the other hand provides the

researcher with substantial start-up funding (up to 150,000 EUR per year for senior researchers and up to 200,000 EUR per year for high potentials). Moreover, the Pegasus programme (Marie Curie COFUND) was set up to attract non-national PhD's for one or three years to Flemish institutes. As becomes clear from the large amount of applications, external visibility is definitely ensured.

The F.R.S-FNRS also proposes short-term (three years) positions and grants to non-national PhD holders coming into a university lab within the French Community. In 2008, a new grant programme has been set up by WBI, which sets out to reflect the themes of the competitiveness clusters. It is designed to allow universities of the region to host university students from institutions of excellence abroad, whatever countries. A similar programme exists for graduates from Wallonia and Brussels who wish to study in a university of excellence abroad.

In Wallonia, the scheme FIRST International allows Walloon companies and research centres to collaborate with foreign research organisations, which host a researcher for a minimum of six months. Nonetheless most of the Walloon programmes remain open to Walloon stakeholders only. Only recently, some programmes were opened to partners of other Belgian regions, most notably the competitiveness poles. A member of Enterprise Europe Network, "Enterprise Wallonia Europe" is a consortium launched in 2008 that brings together ten local organisations dedicated to helping regional business get information and advice, to compete effectively in Europe.

Moreover, there is a range of smaller instruments that promote exchange and (temporary) outward mobility in a context of learning. In Flanders, the rather ad-hoc strategy is developed in the Action Plan for researchers (EWI, 2010).

In Wallonia-Brussels, the Action Plan adopted in May 2011 under the name 'Wallonia-Brussels Partnership for Researchers' is composed of 25 actions organised in six chapters, where public authorities undertake, alongside the actors in research, to place researchers at the centre of the priorities given to the consolidation of research as a driver of the future: Open recruitment and portability of subsidies; Social security, tax system, visas and other matters falling under federal authority; Employment and working conditions; Training of researchers; Gender equality; and Access to Job Market for PhD Holders.

The F.R.S.-FNRS is amongst the participating organisations of the initiative EUROHORCs. In order to remove mobility barriers for European researchers, EUROHORCs partners agreed on authorising researchers moving into partnering countries to take with them the remainder of a current grant.

In Flanders, the FWO has underwritten the Science Europe roadmap, which is the result of an update of the former EUROHORCS roadmap. FWO fellowships are therefore open to all nationalities, except for the pre-doctoral grants where a Master's degree from a university of a European member state is required. Moreover, FWO fellows are free to perform parts of their research abroad while maintaining both their salary and bench fee. Grants of the IWT cannot be footloose: as it is the goal of IWT to strengthen innovation performance of Flanders, the research is principally executed done in Flanders or gears results towards Flemish actors. Only EU inhabitants and companies (active inside and outside Belgium) are eligible for IWT grants. In Wallonia, only companies with an establishment in Wallonia are eligible to regional grants whereas all French-speaking universities can apply.

4.1.2. Research Infrastructures

According to the European portal on research infrastructure (RI), the Belgian RI provides essential resources, at a high cost. They are open to external researchers and have a clear European dimension and added value. Improved coordination at national level could lead to more critical mass at this level. Bundling of initiatives for example in computing could lead to a stronger Belgian position, thus leading to win-win situations for all communities or regions involved. Belgium is quite strongly engaged in a wide range of international RI projects, for example FiA the FWO's Big Science programme, while also strongly developing national and regional research infrastructures. Given the keen eye for the development of RI in Belgium, a challenge might be to look for further synergies in RI at cross-community or cross-regional level.

4.2. Getting good ideas to market

4.2.1. Improving access to finance

Several agencies and measures have been implemented to support financing innovation, venture capital and shaping demand for innovative products and services. In the Brussels-Capital Region the Enterprise Europe Nework network hosted by the Brussels Enterprise Agency provides a guidance, networking and orientation to SMEs wishing to collaborate at international level.

In Flanders, internationalisation is framed in a broader perspective than research (FWO) and innovation (IWT) only; it aims at "internationalisation of the Flemish economy". The "Flanders Investment and Trade, FIT" agency for instance, provides financial support to internationalisation of SMEs, which includes co-operation in STI. Moreover, specifically aiming at RDTI, Flanders offers the Enterprise Europe Network that aims at stimulating international co-operation FiA networking, brokerage and raising awareness. Through the PMV, various schemes exist to support start-up of growing companies in the field of R&D&I, e.g. SOFI, SOFI2, Vinnof, TINA. Wallonia actively participates in several ERA-NET initiatives co-financing projects by according grants to regional R&D performers in consortia and takes also part in the Eurostars initiative. Since the mid-2000s, Flemish universities have increasingly professionalised their commercialisation activities. Universities have set up Knowledge Transfer Offices (KTO) that provide information and support on all aspects of IPR and are capable of setting up spin-offs. For example, several universities work together with financial institutions that provide venture capital for the start-up of companies and spin-offs and have their own funding scheme.

4.2.2. Protect and enhance the value of intellectual property and boosting creativity

By signing the Berlin Declaration on Open Access in 2007, Belgian research institutions and research funders agreed to support the dissemination of publicly funded scientific research through Open Access. Open Access to scientific research offers stakeholders an alternative for traditional ways of disseminating scientific research results, which do not always meet the demands of stakeholders. Free, online access is the most effective way to ensure widespread and democratic consultation and usage of publicly funded research results. During the last years, research results available in Open Access gained considerable visibility internationally, which proves beneficial to individual authors, institutions and funders. In October 2012, the ministers of Science and Research at federal level and from each Community signed a Declaration on

Open Access in Brussels in which they agreed to make Open Access the default for all Belgian research output. The main funding agencies (FWO and F.R.S.-FNRS) oblige to self-archive all articles coming from research funded by them. The DRIVER project led by the Ghent University (UGent) played an important role to promote Open Access awareness in the scientific community and among repository managers. It was followed by other initiatives, in particular from the University of Liege.

The Flemish and French Communities fund knowledge transfer offices (the so-called interface structures) at their respective universities and other HEIs under their competencies, the so-called TTO's. Interface structures have the mission of stimulating external contacts at the universities.

4.3. Working in partnership to address societal challenges

With regard to cross-border cooperation, Belgium is strongly engaged in a range of European initiatives, as well as a range of federal, Community and regional initiatives. These initiatives include multilateral agreements, bilateral agreements, , joint-R&D projects and shared research infrastructures.

4.4. Maximising social and territorial cohesion

A comparative study of sectoral strengths in science, technology and economy, the so-called "specialisation profiles", was performed within the smart specialisation study of the OECD Working Group on Innovation and Technology Policy (ECOOM & EWI department, 2011). This study analysed the relative performance of Belgium, focusing on scientific development (based on the analysis of publications[25]), technology development (based on patent analysis) and economic development (based on labour market data). Belgium has a relatively high activity compared to the reference countries[26] in the major science fields of: biology, clinical and experimental medicine and neuroscience and behaviour. The top three technology specialisation profiles, with the highest share of patents, are: macromolecular chemistry & polymers, textile & paper machinery and other special machinery. The top three economic specialisations are manufacture of chemicals & chemical products, post & telecoms and manufacture of basic materials.

Belgium focuses on key enabling technologies as well as on specific sectors. Flanders increased its focus on the set-up of cluster initiatives and Strategic Research Centres. In December 2011 after an evaluation, the Management Agreements of three Strategic Research Centres were revised and new ones signed for five years, and in 2010 the Strategic Initiative Materials (SIM) and CMI were launched. The basic ambition is to strengthen the economic position of Flemish industry in Flanders in the medium-to-long-term, by executing and transferring accumulated knowledge through strategic research. End 2011 the Flanders Innovation Hub for Sustainable Chemistry (FISCH) excellence centre was established on sustainable chemistry. Wallonia puts a stronger focus on environmental issues. Following the adoption of the Marshall Plan 2; Green in 2009, specific initiatives were launched in the field of the environment with the creation of a 6th competitiveness pole dedicated to green technologies in 2011 (GreenWin). Brussels Capital region has launched in 2010 its first ICT strategic platform followed by the strategic platforms in

[25] Analysis of the so-called Activity Index.

[26] Australia, Austria, Czech Republic, Finland, Germany, Netherlands, Poland, South Korea, Spain, Sweden, Turkey and the UK.

Health: Expertise platform specialised in the toxicology of nano materials (NANO- IRIS) and platform for clinical research common to the three academic hospitals in Brussels (CLINiCOBRU). In 2012 this programme wasto the environment sector (renovation of buildings) and a new strategic platform has been set up in this sector.[27]

4.5. International Scientific Cooperation

International cooperation in Belgium is relatively well developed and in this regard the most apparent challenge is to further work towards a more integrated approach at the national level, by coordinating the scattered initiatives at community and regional levels insofar as the regional and community competences are respected.

Knowledge exchange with EU partners is given strong emphasis at Community level. The co-publication rate of institutes of the Flemish Community is among the highest in Europe and also the number of non-Belgian residents is relatively high. Flanders has a number of specific cooperations in Dutch-Flemish context, with various countries in the world, and with e.g. Nordrhein-Westphalia in the field of sustainable chemistry and microtechnology, whereas Wallonia and the Wallonia-Brussels Federation have developed cooperations mainly with neighbouring countries and French-speaking areas.

In terms of recent policy changes, all authorities are involved in European and inter-regional co-operation initiatives in field of research and innovation. Internally, there is a better cooperation between Wallonia and the Brussels-Capital region. Opening up of R&D programmes is slowly emerging in Belgium, though most R&D programmes are still relatively closed. In addition to the federal programme in space research and a few international programmes, all federal research programmes are open for participation of research teams of EU Member States (with a limit of 50% funding). For Flanders, the IWT R&D-support programmes are open to foreign research institutes as a subcontractor of a company that is located in Flanders. At the FWO, pre-doctoral fellowships are open to all students having obtained a Master's degree in one of the European member states. For the postdoctoral fellowships there are no nationality restrictions whatsoever. Foreign researchers can moreover act as co-promoters of research projects lead by a Flemish PI, and programmes like Pegasus stimulate foreign exchange and Odysseus specifically aims to (re)attract researchers from abroad (back) to institutes of the Flemish Community.

In Wallonia, R&D-support programmes are also open to foreign research institutes as a subcontractor of a company that is located in the Walloon region.

In general, the Belgian authorities are strongly committed to and participate in European initiatives. In a number of cases this commitment matches federal/national/community/regional challenges or priorities. For instance, the steps taken to implement the European Partnership for Researchers should make it easier to attract and retain qualified human resources. The FWO's HR label Excellence in Research shows the efforts are fruitful. At Interministerial Conferences, certain common engagements are agreed upon if there exist common interest or priority-setting among the various concerned authorities on topics such as Open Access, ESFRI-ERIC, etc.

[27] http://www.brusselsretrofitxl.be/

5. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1. More effective national research systems

Description of the Belgian research funding system

Belgium is characterized by a highly decentralised and mainly federalised system. Research and innovation policy is distributed across several Federal and Regional Communities actors enjoying a complete autonomy in their area of competence. The Erawatch online country fiche describes the respective areas of competence:

> "- The regions (Flanders (6.31m inhabitants in 2011), Wallonia (3.54m), Brussels-Capital (1.12m)) have authority on research policy for economic development purposes, thus encompassing technological development and applied research;
> - The communities (Flemish (7.1m speakers), French (4.3m), and German (75,000)) are responsible for education and fundamental research at universities and higher education establishments; and
> - The federal state retains the responsibility for research areas requiring homogenous execution at the national level, and research in execution of international agreements (e.g. space research)."[28]
> - The German Community does not have a proper research policy.

The Flemish Parliament Act on financing the universities and HEIs in Flanders of 2009[29] describes the mechanism for the allocation of institutional funding in Flanders. The Flemish Parliament Act on the organisation and budgeting of Science and Innovation policy of 2009[30] (adapted afterwards) set the framework for the organisation and the budgeting of Flemish RTD policy and FWO and IWT. In Flanders, the Flemish Government defines policy orientations and provides institutional funding to HEIs. Its main funding instrument is the Special Research Fund (BOF) allocated depending on defined criteria (BOF-key). Project-based funding is managed by two agencies: the Research Foundation - Flanders (FWO) and the Institute for the Promotion of Innovation by Science and Technology in Flanders (IWT). FWO stimulates fundamental research, whereas IWT promotes innovation by science and technologies..

The Hercules Foundation (Hercules Stichting) was set up by the Flemish Government in 2007 with the aim to fund medium-scale and large-scale research infrastructure. The infrastructure serves for cutting-edge-driven and strategic basic research in all scientific disciplines including the humanities and the social science. The Hercules Foundation organises calls for applications and assesses project proposals. Application may be submitted for either:

- medium-scale infrastructure: proposals submitted by HEIs (universities and university colleges);

[28] Erawatch online country fiche for Belgium : http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/be/country?section=RegionalResearchPolicies&subsection=Overview

[29] Flemish Parliament Act on financing the universities and HEIs, 26/06/2008: http://www.ond.vlaanderen.be/edulex/database/document/document.asp?docid=13988

[30] The Flemish Parliament Act on the organisation and budgeting of Science and Innovation policy, 30/04/2009: http://www.ond.vlaanderen.be/edulex/database/document/document.asp?docid=14104

- Large-scale infrastructure: proposals submitted by HEIs and a number of other knowledge institutes: the Flemish strategic research organisations (IMEC , VIB, VITO, iMinds)[31], the ITM (tropical medicine) and the Vlerick Leuven Ghent Management School.

The Flemish Government funds 70% to 90% of the costs of the investment; if a third party is part of the consortium, 100% of the eligible costs can be funded. 'Third parties' are private and public bodies (such as companies or other organisations) not necessarily established in Flanders. (source: STI in Flanders, 2014)

PMV – Flanders Holding Company

The Flanders Holding Company, PMV (ParticipatieMaatschappij Vlaanderen), provides financial leverage to projects that are important for the future of Flanders, acting as an 'entrepreneur' and as a facilitator. It supports investment projects that strengthen the structure of the Flemish economy and fit the government's economic policy objectives. The organisation creates, structures and manages co-operation with private partners. Its goals are to support innovative starters, facilitate growth of Flemish companies, stimulate 'spearhead' sectors, support specific sectors and solve temporary liquidity problems of creditworthy companies. PMV invests in companies, projects and sustainable development. PMV's activities mainly consist of three pillars: risk capital, loans and mezzanine finance. It has developed a wide range of instruments aimed at different purposes, at various target groups, and ranging from the pre-start phase to the international growth phase. Innovative companies are eligible for support through these instruments; while, complementary incubation support is managed through IWT. The total value of the amounts managed in the different PMV instruments exceeds 1 billion euro.

Among its instruments there are several innovation-oriented initiatives. The "Vlaams Innovatiefonds" (Vinnof, Flemish Innovation Fund) is specifically aimed at innovative start-up companies. It provides risk capital for the early stage of a company, with the expectation that entrepreneurs will find it easier to call upon private investors in later phases. Vinnof invests seed capital during three stages: pre-start, start and initial growth. PMV also manages the TINA-fund, a 200 million euro fund aimed at supporting innovative projects that support the transformation of the economy in Flanders. This is actually also a transversal topic defined as an one of the six innovation crossroads in the Concept Note "Innovation Centre Flanders". The SOFI-fund has been established to support spin-off companies setup from research results in one of the four Flemish PROs (IMEC, VIB, VITO, iMinds) or the universities. Another example is Flanders' Care Invest, designed to invest in innovative companies in the care sector. Finally, the Innovatiemezzanine scheme is a subordinate loan for starting companies that have already received a grant from the IWT (source: STI in Flanders, 2014).

BAN Vlaanderen, the business angels network in Flanders, is a platform in which starting or growing entrepreneurs seeking risk capital are matched with informal private investors, so-called 'Business Angels'. The latter offer not only money but also their own know-how, experience and contacts. BAN Vlaanderen is a market place where demand and supply meet, rather than an investment fund.

GIMV (Flanders Investment Company) is Belgium's most important private equity and venture capital provider and a major European and international market player. It makes venture capital investments in promising high-tech companies and also focuses on buyouts and growth

[31] IMEC (micro-electronics research), VIB (biotechnology), VITO (environment and energy) and iMinds (formely IBBT) (broadband technology).

financing, to support companies' development and growth. Initially it was setup by the Flemish Government that still holds a minority stake in the company. GIMV manages for example the Biotech Fonds Vlaanderen that was set up in 1994 to provide venture capital to existing and starting medium and large sized companies in the Flemish biotechnology sector.

The 2002 Royal Decree "establishing the Federal Public Service for Science Policy"[32] (BELSPO) sets-up this institution which is responsible for the preparation, implementation and evaluation of the federal science policy. It also coordinates the Belgian participation in European and International organisations.

The Decree covering research, development and innovation activities in Wallonia of 2008[33] provides the legal basis for the regional measures covering research and innovation.

The Brussels-Capital 2009 Ordinance aiming at promoting research, development and innovation[34] provides the legal basis for the regional measures covering research and innovation.

In the French Community, the National Scientific Research Fund (F.R.S-FNRS) aims at stimulating new scientific knowledge in all scientific areas. It supports projects following a bottom-up approach. Its experts assess projects proposed by individual researchers and research teams (competitive project funding).

Description of main policies/measures for allocation of funding through calls for proposals

It is difficult to provide an exact measure of the sharing between project funding and institutional funding due to the diversity sources of funding from the Federal State and Communities. Project funding is limited at Federal level (only 11.2% of the Federal budget[35]), but seems more developed at Community level.

In Flanders, the Parliament Act on the organisation and budgeting of Science and Innovation policy of 2009 set the framework for the organisation and the budgeting of RTD policy and FWO and IWT. For the French Community, the Decree covering research, development and innovation activities of 2008 provides the legal basis for the regional measures covering research and innovation.

Despite the diversity of instruments due to the division of competence, Belgium presents a well-established project-based system covering fundamental and applied research and implemented by dedicated agencies.

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[32] Royal Decree establishing the Federal Public Service for Science Policy, 12/12/2002: http://www.ejustice.just.fgov.be/cgi_loi/arch_a1.pl?sql=(text+contains+('))&language=fr&rech=1&tri=dd+AS+RANK&value=&table_name=loi&F=&cn=2002121235&caller=archive&fromtab=loi&la=F&ver_arch=002

[33] Decree covering research, development and innovation activities in Wallonia, 3/07/2008: http://wallex.wallonie.be/index.php?doc=11217

[34] Ordinance aiming at promoting research, development and innovation, 26/03/2009: http://www.innoviris.be/site/wp-content/documents/legal_documents/nouvelle_ordonnance.pdf

[35] Online Belgian Erawatch country fiche : http://erawatch.jrc.ec.europa.eu/erawatch/opencms/information/country_pages/be/country?section=ResearchFunders&subsection=GovernmentAndRegionalAuthorities

Description of main policies/measures for allocating institutional funding on a competitive basis

In Flanders, a share of the funding for each university is distributed based on an allocation key (called BOF-key). It is calculated using several criteria including the share in the total Flemish academic publication and citation output in the Science Citation Index (extracted from the Expanded Web-of-Science, ISI-Thomson), whereas for the French community it is only based on a key taking into account the number of students.

Description of main mechanisms for provision of project based funding

Funding of research activities through projects is managed in Flanders and French community by agencies. A majority of core principles of international peer review are covered by legislations or soft law measures. Even if differences can exist between both Communities, the main principles are covered by the funding provided by all the agencies.

5.2. Optimal transnational co-operation and competition

Efforts taken to implement joint research agendas addressing grand societal challenges

Belgium is very active in joint research agendas initiatives at EU level. Belgium is involved in 4 Article169/185 initiatives (Ambient Assisted Living, European and Developing Countries Clinical Trials Partnership, EMRP and Eurostars), in 8 of the 10 joint programming initiatives and in 30 ERAnet and ERAnet+ covering a diversity of societal challenges.

Several bilateral agreements reinforce cooperation. These agreements are signed at Federal level or Community level. At Federal level, agreements exist with Bulgaria, China, Poland, Russia, Vietnam. The Wallonia-Brussels signed agreements with Argentina and Flanders with Brazil, Equator, Quebec, Vietnam, South Africa, Luxembourg, Netherlands and Slovenia. The Flemish Community agreementswith Luxembourg, Netherlands and Slovenia set-up lead agency system with these countries.

In August 2013, Belgium was involved in 125 joint calls related to EU joint research agendas. Moreover, bilateral agreements are also implemented by yearly joint calls.

Mutual recognition of evaluations that conform to international peer review standards

The main mutual recognition mechanism in Belgium is implemented at Community level by Flanders through the Lead Agency process. It is regulated by bilateral agreements signed with Luxembourg, Netherlands and Slovenia set-up lead agency system with these countries.

The key features of the Lead Agency system in are:

- The support to joint projects for a maximum duration of 3 year.
- Thematic areas are defined by the agreements.
- The objective of these agreements is to enhance the cooperation between the scientists of signatory countries.

- The proposal is evaluated by the Lead Agency only, according to national rules. The partner funding organisation accepts the evaluation results as a basis for its decision process.

Cross-border interoperability of national programmes

There is no specific National policy on cross-border interoperability as such. However, Belgium and its Communities develop cooperations with other EU and non EU countries to facilitate cross border interoperability. The implementation guides of these agreements apply to each bilateral call for proposal and set the common priorities. The cross-border interoperability is facilitated in the case of Lead Agency process implemented in Flanders with Luxembourg, Netherlands and Slovenia.

Policies to support construction and operation of ESFRI, global, national and regional Research Infrastructures (RIs)

There is currently no roadmap either at national or at community level. However, it is indicated as planned on the ESFRI website[36]. The Federal authorities coordinate the identification of a list of priorities, with a list of 31 international research infrastructures[37].

- Financial commitments to support construction and operation of infrastructures
- 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 Structural Fund programmes

The Belgian authorities are strongly committed to and participate in ESFRI programme on research infrastructure. However, a national approach is debated to ensure a clear division of responsibilities and guiding rules between Federal authorities and Communities.

Access to Research Infrastructures

Whilst Belgian research infrastructures are considered opened to external researchers and have a clear European dimension and added value, no specific financial support was identified. The information available in the MERIL database indicates that 46,7% of the researchers working in the Belgian research infrastructures providing the data are non-national, which is a high rate showing a clear openness of Belgian research infrastructures.

5.3. Priority area 3: An open labour market for researchers

Open, transparent and merit based recruitment of researchers

In Belgium, the principle is the autonomy of the Higher Education Institutions and Public Research Organizations. However, orientations are provided by the Federal level to encourage an open recruitment and certain rules for the public service at federal level and specific rules at the level of the Communities have to be followed.

The designation of a panel for the recruitment of permanent positions is an obligation for all HEIs and PROs, following public service rules at federal level and IWT and F.R.S.-RNFRS at the level of the Communities.

[36] ESFRI webpage on europa.eu:
http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri-other-roadmaps
[37] Erawatch Belgian report 2012, p. 37 and 38:
http://erawatch.jrc.ec.europa.eu/erawatch/export/sites/default/galleries/generic_files/file_0299.pdf

On other aspects, different requirements exist between the Federal level and each Community. For example, rules on the rights to receive a feedback and to appeal provided to applicants exist at Federal level and in Flanders, but not for the French Community.

Beyond these requirements, Belgian institutions have a wide autonomy, but apply in general open and transparent recruitment processes, e.g. by publishing job vacancies including selection criteria.

The Belgian country profile of the researchers' report 2012 indicates that Belgian institutions apply all the principles of an open and merit-based recruitment system, except to the burden of proof on the employer. However, this judgment is widely based on the practices of Belgian institutions, as mandatory rules are limited to the points mentioned above.

Policies concerning cross-border asses to and portability of national grants

Policies related to cross-border and portability of grants is the competence of the Communities. The Flemish and the French-speaking Communities allow the cross-border grants for foreigners, residents and non-residents, with requirements that differ depending on the Community, but which don't constitute major obstacles.

The portability of grants is allowed for grants of the Flemish Community. It is also allowed for the Federal grants "Back to Belgium", for a limited period of three months. It does not apply for French-speaking Community grants.

Implementation of Euraxess coordinated information and services for mobile researchers

The Belgian Euraxess portal corresponds in fact to three portals: for the Federal, level and both Communities. Each one provides clear information on job opportunities, social security, pension contributions, accommodation and administrative assistance, adapted to each structure.

About job vacancies published on the Euraxess jobs portal, the Researchers Report 2012 indicates that the Federal level and the Flemish Community systematically use it to advertise researchers' positions, and that the French-speaking Community aims to do it systematically too. Thanks to these recent measures, Researcher posts advertised through the EURAXESS Jobs portal per thousand researchers in the public sector increased from 37.3 to 53.3, which positions Belgium among the better ranked of EU and Associated countries.

There are 11 Belgian EURAXESS Services Centres and 6 Belgian EURAXESS Local Information Points. These centres are located in Antwerp, Brussels, Gembloux, Ghent, Hasselt, Liège, Leuven, Louvain-la-Neuve, Mol, Mons and Namur. Several cities have more than one Centre to cover linguistic needs and be located in the main organisations.

Principles of doctoral training programmes

Doctoral training is a competence of the Communities. However, at Federal level Centres of Excellence called Federal Scientific Institutes have been established in partnerships with Belgian universities to enhance the training of human resources, in particular with Doctoral schools.

The French-speaking Community created doctoral schools in 2004. The Flemish Community launched the Support Programme for Young Researchers with a budget of 4 million euros per year to provide to PhD students and young researchers training, career development incentives, support attendance in international events and job fairs.

In Flanders, the main scheme is the Support Programme for Young Researchers described above. It covers several items of the innovative doctoral training principles.

In Wallonia-Brussels, several of the Wallonia-Brussels Partnership points encourage interdisciplinary research and international networking.

Framework for the implementation of the Human Resources Strategy for Researchers incorporating the Charter & Code

Main institutions such as the Belgian Science Policy Office (BELSPO), F.R.S-FNRS, FWO and IWT endorsed the 'Charter & Code' and implement it. In Wallonia-Brussels, a communication plan for the implementation of the 'Charter & Code' is under preparation.

17 Belgian organisations endorsed the Charter and Code: Belgian Science Policy Office, Facultés Universitaires Catholique de Mons, Facultés Universitaires Notre-Dame de la Paix à Namur , Facultés Universitaires Saint-Louis à Bruxelles, Institute of Tropical Medicine Antwerp, Free University of Brussels, The National Funds for Scientific Research (FNRS), The Rectors' Conference of the French-speaking Community, The Research Foundation Flanders (FWO), University of Ghent, University of Hasselt, University of Leuven, University of Antwerp-Belgium, Université Catholique de Louvain, Université de Liège, Université de Mons, Université libre de Bruxelles.

5.4. Gender equality and gender mainstreaming in research

Legal and policy environment to remove barriers related to recruitment, retention and career progression of female researchers

There are essentially soft measures launched at Federal level and by the Flemish and French-speaking Communities. In Flanders, an action plan on Gender Equality in academia was adopted in 2012. The Wallonia-Brussels Partnership for Researchers adopted in 2011 also contains several orientations to improve gender balance in the research community. At Federal level, in Flanders and in the French- speaking Communities, permanent researchers enjoy the same rights for maternity leave as all employees. They also provide mechanisms for the suspension of the grants during maternity leave. In Flanders, a decision of the Flemish Government of 13 July 2007 set-ups quota of a maximum of two thirds of one sexes in boards that advice government or individual ministers. This applies for example to the internal scientific advisors of the Agency for Innovation by Science and Technology (IWT). Such quotas do not exist at Federal level and

in the French-speaking Community. In comparison to the other European countries the participation of women in research positions is below the European average. According to the Researchers' report 2013 (Deloitte, 2013), the probability of women reaching a top-level (Grade A) position in research is in relative terms, the lowest in Cyprus, Lithuania, Luxembourg and Belgium. The female researchers in Belgium also have the lowest degree of probability of reaching a top-level academic position.

Measures to foster partnerships with funding agencies, research organisations and universities for institutional change on gender

The Flemish action plan on Gender Equality in academia and the Wallonia-BrusselsPartnership for Researchers were followed by actions such as the joint interuniversity master Gender Studies established by the 5 Flemish universities.

Measures ensuring that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating research programmes

The Flemish action plan on Gender Equality in academia and the Wallonia-Brussels Partnership for Researchers require a better gender balance in committees. However, they do include neither identified target nor mechanisms.

5.5. Optimal circulation, access to and transfer of scientific knowledge

Policies on access to and preservation of scientific information

Belgium has a proactive policy on open access to scientific publication:

- In 2007, Belgian public funding organisations signed the Berlin Declaration on Open Access.
- In 2012, the ministers of Science and Research at federal level and from each Community signed in October 2012 a Declaration on Open Access in Brussels in which they agreed to make Open Access the default for all Belgian research output. T
- The main funding agencies (FWO and F.R.S.-FNRS) oblige to self-archive all articles coming from research funded by them.

The DRIVER project led by the Ghent University played an important role to promote Open Access awareness in the scientific community and among repository managers. It was followed by other initiatives, in particular from the University of Liege. It is mentioned in OpenAire Belgian fiche that FWO is studying an obligation for research that it funds to deposit relevant raw datasets.

Open Innovation and knowledge transfer between public and private sectors through national knowledge transfer strategies

Several programmes are implemented to facilitate knowledge transfer between public and private sector. Nearly all the items identified in this report are covered. However, distinct measures are established by each Community, and an item can be covered by one and not by the other, as described below.

The French-speaking Community PRODOC programme promotes exchanges between researchers and private sector FiA events such as job forums. In Flanders, IWT Innovation mandates are set up with the objective of connecting the academic and the industrial world. In Wallonia, the programme FIRST Entreprise provides support to companies to train young researchers. In Flanders, the Baekeland programme funds doctoral projects carried out at a Flemish university in close cooperation with a company. Both Communities support knowledge transfer offices that have this role to stimulate contact with the private sector. Moreover, Flanders and Wallonia also competence poles to stimulate cooperation between public research and industry. In Wallonia, a main action to strengthen relations between public research and academia is the establishment of public-private partnerships (PPPs) for R&D. It supports projects financed by the region, private sector and public research organisations on strategic research for companies. The aim is to foster synergies between private and public research. In Wallonia, financial support to patent is provided to public research organisations since they can demonstrate the potential economic value of the patent. Wallonia, Brussels Capital and Flanders established specific funding programmes to support spin-offs: Venture cap for spin-off and FIRST Spin-off in Wallonia; Spin-off in Brussels; and the Flemish programme, the PMV Innovation Mezzanine, ARKimedes programmes in Flanders.

Harmonised access and usage policies for research and education-related public e-infrastructures and for associated digital research services

The main initiative is at Federal level. BELSPO has established an operational unit named BELNET responsible for the design and network management and research education in Belgium. Nearly 200 institutions representing more than 650.000 users are connected to BELNET. It provides on request services such as a platform for e-collaboration or video conferencing. At Community level, Flanders developed Virtual labs in the areas of medicine and new materials.

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

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	**(-) Need for enhanced co-ordination between the authorities** in terms of the use of financial resources available and the deployment of specialised staff required to pursue common objectives (-) Remaining responsibilities of the Federal Government, in fields such as taxation, corporate law (including intellectual property), mean that the implementation of certain regional initiatives may be conditional on coordination with Federal policy. (-) Fragmentation of the innovation system is more problematic at the regional level where a 'sub-regionalism' leads to a multiplication of stakeholders in the different layers of regional governance (-) Realignment of research and innovation policies to contribute to tackling the structural adjustment of the economy or for taking on 'grand challenges' will require better orientation and focus of the limited amounts of public funding available.	(+) Consolidation of smaller universities and third level institutes into larger partnerships with the major universities (+) In 2011, the concept note on "Flanders Innovation Centre" indicated the importance of societal challenges and identified so-called 'innovation crossroads (or hubs)' where the strengths of the Flemish innovation system meets the needs of Flemish society.
2. Design and implementation of research and innovation policies	**(+)** Although complex, the clear constitutional demarcation of responsibilities means that in practice there is no reason for the various authorities not to be able to design and implement effective policies. (+) Possibility for the three regions (Brussels-Capital, Flanders and Wallonia) to design policies that suit the specific needs of their business sectors for innovation and that are tailored to optimise the potential of their higher education research capacities can be considered as positive. (+) Commitment to participate in European initiatives matches national challenges or priorities, for instance, the implementation of the European Partnership for Researchers in both Communities, which should make it easier to attract and retain qualified human resources. (-) Currently limited recent evaluation evidence on the effectiveness of the measures in place. Wide-ranging review would be beneficial in each region in order to focus regional support on initiatives best able to contribute to raising the intensity of industrial R&D and innovation (including service sector and other non-technological forms of innovation).	(+) Flanders in Action (FiA) plan. Main priorities (i) a focused innovation strategy, (ii) improved innovation performance in the economy, (iii) making Flanders a top region by proving it to be receptive for innovation, (iv) reinforcing science as fundamental driver of innovation and increase the intensity, efficiency and impact of R&D.. (+) Introduction and extension over the last 5 years of R&D tax reductions on researchers' salaries may well have acted as an 'automatic stabiliser' without which R&D intensity would have declined rather than remaining relatively stable. (+) Tax incentives for business may have contributed to maintaining the relative attractiveness of Belgium as a place to do research. (+) Hope that the proposed Inter-Federal Plan for Research and Innovation will lead to concrete initiatives for

		organising joint programming, sharing certain research infrastructures or 'pooling' research efforts in certain fields. (-) Remit of the Federal Government to fund 'nation' wide research programmes has been further limited.
3. Innovation policy	(+) Structuring of the higher education system should foster, if the correct policy incentives are in place, a corresponding realignment of the way research is carried out.	
4. Intensity and predictability of the public investment in research and innovation		
5. Excellence as a key criterion for research and education policy	(-) Balance between institutional and competitive funding of the system would merit further review in order to further focus and concentrate efforts.	
6. Education and training systems	(+) Belgium has strengths in terms of openness and international knowledge exchange and a well educated population. (-) Belgium needs to **improve its human resource base in science and technology**. (-) Policies to improve the comparatively poor working conditions for researchers (salary, career prospects, financing for projects) increasing the numbers choosing to enter the profession (e.g. awareness and image-improving campaigns), improving the number of graduates in the S&T domains and creating easier access to the labour market for an increased number of foreign graduates are areas for improvement, e.g. overcome language barriers to attract more students from abroad.	(+) A number of programmes have been setup in communities and regions, and partnerships for researchers have been created, such as the Wallonia-Brussels Partnership for Researchers which was set up in 2011, where public authorities undertake, alongside the research stakeholders, to place researchers at the centre of the agenda for the consolidation of research as a driver of the future.
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(+) A common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. (-) One important challenge is to **link research capacities to the economic eco-system**. (+) Several measures are in place in each region aimed at economic exploitation of research. (+) Overall efforts to structure and develop major specialised 'clusters' of R&D and innovation need to be pursued and further consolidated. (-) It seems that research outputs are not aligned with the absorptive capacity of the SME-dominated	(+) As regards the **policy priorities**, in Wallonia and the Wallonia-Brussels Federation, the Research Strategy 2011-2015 was published end 2011 as a follow-up to the willingness they had demonstrated for closer cooperation between the different policy levels (cfr. Marshall Plan2.Green). (+) The current Regional Innovation Plan of the Brussels Capital Region (2006) covering the period 2007-2013 focuses

	economy (-) The Walloon competitiveness clusters and the research and technology centres created over the last decade will need sustained funding, regular evaluation and expert management if they are to begin to contribute effectively to structural adjustment of the economy.	on regional R&D strategic platforms, clusters and plans to increase regional R&D spending up to the 3% target focusing on three sectors: ICT, life sciences and environment.
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation		
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+) Belgian authorities are strongly committed to and participate in European initiatives, especially the EU Framework programme for R&D, or in related initiatives such as the ESFRI programme on research infrastructure. (+) With regard to cross-border cooperation, Belgium is actively engaged in a range of European initiatives, as well as a number of federal and regional initiatives, which include bilateral agreements, joint-R&D projects and shared research infrastructures. (-) Most instruments in innovation policy are, however, still nationally/regionally oriented and not open to cross-border or cross-regional cooperation.	Stronger focus since 2011 on the coordination/opening of programmes between the Walloon and the Brussels-Capital regions, in parallel to the stronger coordination between Wallonia and the Wallonia-Brussels Federation.
10. The public sector itself is a driver of innovation	(-) Despite the fact that R&D tax credits make up approximately €1.1b additional public support, **public expenditure on R&D remains the weak link** in the Belgian system.	(+) Despite the need for budgetary rigour, public sector funding for R&D has increased in past years

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

The Innovation Union communication of 2010 sets out 34 Commitments for Europe. Certain of these are focused on EC actions while others also draw on activities performed at national level.

		Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	(+) reinforcing the Joint Action Plan between Wallonia, the Wallonia-Brussels Federation and the Brussels-Capital Region (+) Wallonia-Brussels Partnership for Researchers (+) implementation of the Creative Wallonia Plan (+) innovative doctoral training in Flanders (+) Public-Private Partnership programme In Wallonia (+) FIRST schemes in Wallonia (+)Spin-Off and DOCTORIS programmes in the Brussels-Capital Region (+) Recognition of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers	(+) researcher training and better access to the job market for PhD Holders, Open recruitment and portability of subsidies (+) emergence of a generalised culture of innovation in Wallonia, mainly targets the world of teaching and businesses, SMEs in particular (+) train young researchers (doctoral schools); develop careers and open up career prospects; reinforce the international orientation of researchers' careers; cooperate within Flanders (+) training centres and public and private research units, will also be prioritized (+) transfer of personnel between academia and industry (+) doctoral studies in enterprises and universities gave been facilitated (+) improved objectivity and transparency of decision making on recruitment and researchers career paths, including equal opportunities
4	**ERA Framework**	(+) European Partnership for Researchers (+) Tax incentives to decrease loan costs of &D knowledge workers (+) Return mandates form the federal level, scientific impulse mandates - ULYSSE from the French Community (F.R.S-FNRS) and the FWO's Odysseus and Pegasus programmes of the Flemish Community as well as measures in the Brussels-Capital region ('Brains Back to Brussels', 'Research in Brussels') (+) Short-term (three years) positions and grants to non-national PhD holders coming into a university lab within the French Community (+) Scheme FIRST International allows Walloon companies and research centres to collaborate with foreign research organisations, which host a researcher for a minimum of six months	(+) easier to attract and retain qualified human resources (-) shortage of highly skilled engineers and scientists in the field of physics, chemistry and IT (-) Remuneration is increasingly recognised as a barrier to retaining and attracting skilled labour (-) community regulations prescribe the use of the official language at HEIs, which can be a barrier to foreign researchers (+) promote exchange and (temporary) outward mobility in a context of learning (+) lower mobility barriers for European researchers (+). FWO fellowships open to all nationalities. FWO fellows are free to perform parts of their research abroad while maintaining both their salary and bench fee.

		(+) Action Plan for researchers in Flanders (+) Science Europe roadmap in Flanders (+) Simplification of procedures and better use of EURAXESS by opening job offers (+) Vacancies supported by public funds are advertised internationally on the European Researcher's Mobility Portal, and non-nationals are eligible in competition for permanent research and academic positions (+) At Flemish universities, doctoral training has increased and is no longer solely focused on academic skills (+) Recognition of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers as a good basis for improving researchers' career prospects	(+) EU inhabitants and companies (active inside and outside Belgium) are eligible for IWT grants. In Wallonia, only companies with an establishment in Wallonia are eligible to regional grants. (-) language restrictions hamper 'rejuvenation', as it is a barrier for inward mobility. In Flanders for instance, most jobs are still announced in regional media only; however, increased use of EURAXESS can be observed (+) In 2012 new education legislation was developed that made the use of foreign languages in Flemish HEI more flexible (+) more opportunities for training and career development for young researchers (+) improved objectivity and transparency of decision making on recruitment and researchers career paths, including equal opportunities
5	**Priority European Research Infrastructures**	(+) A national approach is debated to ensure a clear division of responsibilities and guiding rules between Federal authorities and Communities.	(+) The Belgian authorities are strongly committed to and participate in ESFRI programme on research infrastructure.
7	**SME Involvement**		As reported in the 2013 Belgian annual report on STI indicators (BELSPO, 2013), for Belgium, one of the most popular FP7 thematic areas are "Research for the Benefit of the SMEs".
11	**Venture Capital Funds**		(+) Several agencies and measures have been implemented to support financing innovation, venture capital and shaping demand for innovative products and services.
13	**Review of the State Aid Framework**		
14	**EU Patent**	(+) The Government agreement of December 2011 does not provide for new legislation but expresses support for a European single patent	
15	**Screening of Regulatory Framework**		
17	**Public Procurement**	(+) In the framework of its action plan for sustainable public procurement, Flanders also launched a series of projects in the fields of agriculture, education, mobility and the labour market. (+) Simulation of demand for innovative goods and services through innovative public procurement (Brussel-Capital Region).	

20	**Open Access**		(+) Belgium has a proactive policy on open access to scientific publication.
21	**Knowledge Transfer**		(+) Several programmes are implemented to facilitate knowledge transfer between public and private sector. Both Communities support knowledge transfer offices that have this role to stimulate contact with the private sector. (+) Flanders and Wallonia also developed competence poles to stimulate cooperation between public research and industry. (+) In Wallonia, a main action to strengthen relations between public research and academia is the establishment of public-private partnerships (PPPs) for R&D. It supports projects financed by the region, private sector and public research organisations on strategic research for companies. The aim is to foster synergies between private and public research.
22	**European Knowledge Market for Patents and Licensing**		
23	**Safeguarding Intellectual Property Rights**		
24	**Structural Funds and Smart Specialisation**	(+). In 2011 the Brussels-Capital Region has started the preparation of a new RDI strategy for the region in line with the EU 2020 strategy. The objective is to elaborate a "smart specialisation strategy" for the region by identifying the sectors in which the region will invest, in order to reshape and adapt the financial measures and instruments, rethink a governance model and align the priorities with future EU funding (ERDF, HORIZON 2020). (+) The Government of Flanders also approved a concept paper "Een slimme specialisatiestrategie voor een gericht clusterbeleid" (A smart specialisation strategy for a targeted cluster policy) on 8 March 2013. Innovation policy is considered critical for a smart specialisation strategy and there are strong links with the various "innovatieknooppunten" (innovation hubs) and the work of the "innovatieregiegroepen" (IRG) (innovation steering groups) on the one hand and the VRWI foresight study on the	

		other hand.	
25	**Post 2013 Structural Fund Programmes**		
26	**European Social Innovation pilot**		
27	**Public Sector Innovation**		(-) The issue of public sector innovation is given a remarkably low priority in policy declarations or strategies, except for e-practices in all entities and public procurement for innovation in Flanders. Many observers would consider that the potential to increase the efficiency of public expenditure in Belgium and the effectiveness of services provided to the population is significant.
29	**European Innovation Partnerships**		
30	**Integrated Policies to Attract the Best Researchers**	(+) Federal R&D wage tax reduction measures (+) Range of measures at Federal, community and regional levels to support international mobility, industrial PhDs, recruitment of innovation managers, S&T studies	
31	**Scientific Cooperation with Third Countries**		(+) In the field of international cooperation through the EU Regional Fund, there exist a number of Interreg projects whereby STI actors, public authorities and private partners from Flanders jointly support multiannual projects.
32	**Global Research Infrastructures**		(+) The information available in the MERIL database indicates that 46,7% of the researchers working in the Belgian research infrastructures providing the data are non-national, which is a high rate showing a clear openness of Belgian research infrastructures.
33	**National Reform Programmes**		

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action code	ERA Action	Recent changes	Assessment of progress in delivering ERA
1. More effective national research systems	**MS01**	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	No recent changes.	(+) Principles of international peer review in application. (+) Allocation of funds to HEIs on the basis of the number of students and full-time equivalent researchers. Additional funding based on competitive peer reviewing procedures and take the excellence of the research production into account.
	MS02	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	No recent changes.	(+) Calls on international experts for the evaluation of fellowships and projects applications.
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	No recent changes.	(+) The various Belgian governments are committed to support the participation of R&D performers in international networks, namely JPI's, ERA-NETs and EUROSTARS initiatives. (+) Joint action plan shared by the governments of Flanders, Wallonia and the Wallonia-Brussels Federation for boosting economic activity through R&D. The action plan provides for the launch of joint calls for submission of projects, strengthening collaboration between regional and community actions and definition of common positions, particularly at European and international level.
	MS07	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions		
	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	No recent changes.	(+) In Belgium transnational cooperation is being executed FiA various channels: participation in supranational / international programmes or initiatives (EU, UN, OECD), structural or ad hoc policy initiatives with (priority) partners; bilateral research cooperation; funding of cooperation exchange projects; lead agency agreements; public support to initiatives of / access for STI-actors in international initiatives or programmes, etc.

		relevant		
	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	No recent changes.	(+) Belgium participates in the following ESFRI infrastructures: INSTRUCT, PRACE, SHARE-ERIC BBMRI (already operational agreements). The Federal authority will cover the national contributions to those infrastructures. Still in preparation is the participation of Belgium in ESSurvey, CESSDA, ICOS, LIFEWATCH and ELIXIR. For CESSDA, ICOS and LIFEWATCH, an in kind participation of federal scientific institutes is planned. (+) At regional level, there are specific measures that finance research infrastructure investments (such as, for instance, the Hercules Foundation and the FWO's Big Science programme in Flanders and the Athena Budgets managed jointly by Wallonia and Wallonia-Brussels Federation since 2011).
	MS16	Action 5: Remove legal and other barriers to cross-border access to RIs	No recent changes.	
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 recent changes.	(+) Belgian institutions have a wide autonomy, but apply in general open and transparent recruitment processes, e.g. by publishing job vacancies including selection criteria. (+) The Belgian country profile of the researchers report 2012 indicates that Belgian instituions apply all the principles of an open and merit-based recruitment system.
	MS25	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants	No recent changes.	(+) The Flemish and the French-speaking Communities allow the cross-border grants for foreigners, residents and non residents, with requirements that differ depending on the Community, but which don't constitute major obstacles. (+) The portability of grants is allowed for grants of the Flemish Community. It is also allowed for the Federal grants "Back to Belgium", for a limited period of three months. It does not apply for French-speaking Community grants.
	MS26	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network	No recent changes.	(+) Researchers Report 2012 indicates that the Federal level and the Flemish Community systematically use it to advertise researchers' positions, and that the French-speaking Community aims to do it systematically too.
	MS27	Action 4: Support the setting up and running of structured	No recent changes.	(+) In Flanders, the main scheme is the Support Programme for Young Researchers which covers several items of the innovative doctoral training

		innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.		principles. (+) In Wallonia-Brussels several of the Wallonia-Brussels Partnership points encourage interdisciplinary research and international networking.
	MS28	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	No recent changes.	(+) Several Belgian Public Research Organisations have recognised the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers as a good basis for improving researchers' career prospects.
ERA priority 4: Gender equality and gender mainstreaming in research	**MS39**	Action 1: Create a legal and policy environment and provide incentives	Gender at Universities high-level action group in Flanders.	(-) There are essentially soft measures launched at Federal level and by the Flemish and French Communities. (-) In comparison to the other European countries the participation of women in research positions is below the European average.
	MS40	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	No recent changes.	(+) Several actions are taken to increase the efforts of universities to deal with the gender inequality.
	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 recent changes.	(+) In Flanders, the FWO makes sure that in its scientific evaluation panels no more than two thirds of the experts are of the same sex.
ERA priority 5: Optimal circulation, access to and transfer of scientific knowledge including FiA digital ERA	**MS45**	Action 1: Define and coordinate their policies on access to and preservation of scientific information	No recent changes.	(+) Belgium has a proactive policy on open access to scientific publication.
	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	No recent changes.	(+) Several programmes are implemented to facilitate knowledge transfer between public and private sector. (+) Flanders and Wallonia also developed competence poles to stimulate cooperation between public research and industry.
	MS47	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for	No recent changes.	(+) The BELNET operational unit is responsible for the design and network management and research education in Belgium.

		associated digital research services enabling consortia of different types of public and private partners		
	MS48	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	No recent changes.	

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LIST OF ABBREFIATIONS

AEQES	Agency for the Evaluation of the Quality of Higher Education provided by the Wallonia-Brussels Federation
AgODi	Agency for Education and Training
AO	Enterprise Flanders
ASE	Walloon Economic Stimulation Agency
AST	Walloon Technological Stimulation Agency
BELSPO	Belgian Federal Science Policy Office
BERD	Business Expenditures on Research and Development
BOF	Special Research Fund (Flanders)
BRISTI	Belgian Report on Science, Technology and Innovation
CERN	European Organisation for Nuclear Research
CFS	Federal co-operation
CIMPS/IMCWB	Inter-Ministerial Conference for Science Policy
CIS	International Co-operation or Community Innovation Survey
CLARIN	Common Language Resources and Technology Infrastructure
CLINiCOBRU	Platform for clinical research common to the three hospitals in Brussels
CMI	Centre for Medical Innovation
COST	European Cooperation in Science and Technology
CTLO	Centre Traditio Litterarum Occidentalium
CWPS	Walloon Council of Science Policy
DG R&D	DG Research and Innovation
DGENORS	Directorate-General for non-obligatory education and scientific research of the Wallonia-Brussels Federation
DGO6	Walloon Operational Directorate General for Economy, Employment and Research
ECOOM	Flemish Expertise Centre for R&D Monitoring
EIROforum	European Intergovernmental Research Organisations Forum
EMAS	Environmental Management System
EPO	European Patent Office
ERA	European Research Area
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency

ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
ESO	European Organisation for Astronomical Research in the Southern Hemisphere
ESRF	European Synchrotron Radiation Facility
ESS	European Social Survey
EU	European Union
EU-27	European Union consisting of 27 Member States
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUROHORC's	European Heads Of Research Councils
EWI Department	Department for Economy, Science and Innovation of the Flemish Government
F.R.S-FNRS	National Scientific Research Funds of the French Community
FDC	Flanders District of Creativity
FDI	Foreign Direct Investments
FFEU	Finance Fund for Paying of Debts and Investments
FiA	Flanders in Action
FISCH	Flanders Innovation Hub for Sustainable Chemistry
FIRST	Training and Impulsion to Scientific and Technological Research
FIT	Flanders Investment and Trade
FP7	Seventh Research Framework Programme 2007-2013
FRIA	Fund for Research and education within Industry and Agriculture
FRWB-CFPS	Federal Science Policy Council
FTE	Full Time Equivalent
FWO	Research Foundation Flanders
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditures on Research and Development
GOVERD	Government expenditures on Research and Development
GUF	General University Funds
HADES	High Acceptance Di-Electron Spectrometer
HEI	Higher Education Institution
HERD	Higher Education Expenditure on R&D
HRST	Human Resources in Science and Technology
IAP	Interuniversity Attraction Poles
IBBT	Interdisciplinary Institute for Broadband Technology

ICC-INFRA	International Cooperation Commission/ Infrastructure
ICOS	Integrated Carbon Observation System
ICT	Information and communication technology
IEC	International Economic Commission
ILL	Institut Laue-Langevin
IMEC	Interuniversity Micro Electronics Centre
INNOVIRIS	Institute for the support of Scientific Research and Innovation of Brussels
INPAC	Institute for Nanoscale Physics and Chemistry, University of Leuven
IOF	Industrial Research Fund
IPR	Intellectual Property Rights
IUS	Innovation Union Scoreboard
IWT	Agency for Innovation by Science and Technology
JRC	Joint Research Centre
JTI	Joint Technology Initiative
KTO	Knowledge Transfer Office
KULeuven	Catholic University of Leuven
LIEU	Liaison Entreprises-Universités
NANO- IRIS	Expertise platform specialised in the toxicology of nano materials
NRP	National Research Plan
OECD	Organisation for Economic Cooperation and Development
OMC	Open Method of Coordination
PASS	Scientific Adventure Park
PMV	Participatie Maatschappij Vlaanderen
PPP	Public-Private Partnerships
PRACE	Partnership for Advanced Computing in Europe
PRINS	Pan-European Research Infrastructure for NanoStructures
PRO	Public Research Organisation
R&D	Research and development
RBINS	Royal Belgian Institute of Natural Sciences
RI	Research Infrastructures
RTDI	Research, Technology, Development and Innovation
S&T	Science and technology
SCI	Science Citation Index
SF	Structural Funds
SHARE	Survey of Health, Ageing and Retirement in Europe
SIM	Strategic Initiative Materials

SME	Small and Medium Sized Enterprise
SOWALFIN	Walloon SME Financing Agency
TAP	Technological Attraction Poles
TBM	Programme for Applied Biomedical Research (Flanders)
TEA	Total Entrepreneurial Activity
T-EMAT	Electron Microscopy for Materials Science, University of Antwerp
TTO	Technology Transfer Office
UCL	Louvain Catholic University
ULB	Université Libre de Bruxelles
USPTO	United States Patent and Trademark Office
VC	Venture Capital
VEB	Flemish Energy Company
VIB	Flemish Interuniversity Institute for Biotechnology
VINNOF	Flemish Innovation Fund
VIS	Flemish Innovation Co-operation network
VITO	Flemish Institute for Technological Research
VLIR	Flemish University Council
VLIZ	Flanders Marine Institute
VRWI	Flemish Science and Innovation Council
VUB	Vrije Universiteit Brussel
WBI	Wallonia-Brussels International
WELBIO	Walloon Institute for Life Sciences

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