



EUROPEAN COMMISSION

# ERAWATCH COUNTRY REPORTS 2010: Belgium

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ERAWATCH Network – Technopolis Group

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***Acknowledgements and further information:***

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

The analytical framework and the structure of the reports have been developed by the [Institute for Prospective Technological Studies of the Joint Research Centre \(JRC-IPTS\)](#) with contributions from [Directorate General for Research and Innovation](#) and the [ERAWATCH Network](#). The report has been produced by the [ERAWATCH Network](#) in the framework of the specific contract on ERAWATCH Research Inventory and Analytical Country Reports 2010 and 2011 commissioned by JRC-IPTS.

In particular, it has benefited from comments and suggestions of Marco Vivarelli, who reviewed the draft report. The contributions and comments of Karel Haegeman from JRC-IPTS and DG-RTD are also gratefully acknowledged.

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

The opinions expressed are those of the authors only and should not be considered as representative of the European Commission's official position.

## Executive Summary

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Belgium is a small densely populated federal State (10.8 million inhabitants in 2009, 2.2% of EU27 population) divided into three regions: Flanders (6.2m inhabitants), Wallonia (3.5m) and Brussels-Capital (1.1m); and three language communities: the Flemish (7.1m speakers), the French (4.3m) and the German (0.08m). Total GDP was €294b (PPS) in 2009 (2.5% of EU27) with GDP per capita at 126% of the EU27 average. There are significant regional differences in GDP per capita: Wallonia is below the EU27 average (90% in 2007<sup>1</sup>), Flanders is well above (127%) and Brussels-Capital more than double the EU27 average (242%). Belgian gross expenditure on R&D (GERD) as a share of GDP was 1.90% in 2007, slightly above the EU27 value (1.85%); provisional data shows that research intensity grew to 1.96% in 2008 and 2009, which is a slower growth than EU27 average (2.01%).<sup>2</sup>

Belgium is a federal State with a considerable devolution of responsibility for science, technology and innovation policy to the highly autonomous regions and the communities. Given that the Federal Government does not oversee a national policy framework, there is no longer a single “Belgian research and innovation system”. The decentralised governance of the research and innovation system calls for a complex analysis of several individual systems in order to provide an overview of the Belgian system. The Federal level still oversees a limited number of scientific policy fields (notably space policy) and is responsible for fiscal measures, the communities control matters related to individuals such as higher education and scientific research and the regional governments support strategic and applied research, business innovation and research-industry co-operation.

In 2009, enhanced inter-regional cooperation was emphasised in the regional Governments’ policy declarations. This has led to a slightly increased collaboration, primarily between Wallonia and Brussels-Capital, such as co-operation between some clusters and the opening up of the Walloon competitiveness poles to Brussels stakeholders. Nevertheless, the high regional autonomy combined with the current political impasse (i.e. regions working together with a certain reluctance) impede inter-regional synergies in STI policy.

Although there is broad consensus on the need to invest more in research and development (R&D), Belgian research intensity is not growing towards the 3% target. Current growth rates of R&D investments are insufficient to attain the objective. Belgium is characterised by relatively high but decreasing private R&D investments, which compensate for the growing but relatively small public sector investment. Moreover, Wallonia still relies strongly on Structural Funds and to keep R&D funding stable will require other sources to be found when the Structural Funds are phased out in 2013. The low public expenditure on R&D, together with stagnating levels of business expenditure, the high level of public debt, and the political instability limit the room for action, particularly in the context of the global financial crisis.

Business investments in R&D rely on a few big players, often multinational firms with foreign decision centres making Belgium vulnerable to economic downturns, both abroad and in the country. The structuring of public-private research efforts is a good

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<sup>1</sup> There is no more recent data at the regional level in Belgium.

<sup>2</sup> Provisional data from Eurostat as of 21/02/2011 estimates the GERD was 1.96% of GDP in 2009; which is slightly below EU27 average (2.01%).

step towards an embedding and attracting force for the large foreign R&D players – examples include strategic research centres and competitiveness poles. There is also a need for incentives to better exploit innovation efforts, e.g. lessening the tax burden, and further reducing red tape. The Belgian innovation system is dominated by a relatively small number of larger R&D performing firms, which are not necessarily linked into the local economy mainly consisting of SMEs. As a response, new indigenous R&D performing firms received growing support over the last decade and all three regions have a large variety of measures focusing on R&D cooperation and promoting entrepreneurship. More top-down initiatives in key technology fields that mobilise smaller firms may help to broaden the reach of R&D policy.

There has been a growing focus on human resources as despite the relatively high share of human resources in science and technology (HRST) the rate of new S&T graduates is well below the EU average. There is a shortage of highly qualified researchers in certain domains, which will become more severe if planned additional investments in R&D are implemented. Both the French Community and Flanders are implementing action plans to improve the status of the researcher and the refinancing of basic research, in line with the European Charter for Researchers and the Code of Conduct for researchers' recruitment. Moreover, a number of programmes are in place aiming to build up a high-quality research capacity - mostly focussing on excellent researchers. Lastly, a reduction in social security charges are offered in order to improve the competitiveness of the salary costs of scientific personnel. Apart from policies to improve the labour conditions for researchers (salary, career perspectives, funding), entry of new researchers is promoted especially in the S&T domains, both by increasing the inflow from secondary education as well as by international inward mobility (e.g. awareness and image campaigns).

Policy initiatives that stimulate knowledge demand remain relatively limited. More strategic initiatives in foresight and technology assessment may be a means to for policy makers to better anticipate demand for technologies, HRST, etc. Especially in Wallonia and Brussels-Capital evaluations of policy measures could increase the quality of the knowledge demand.

Since 2009, research policies are increasingly targeting societal challenges: in Brussels-Capital and Wallonia there is strong focus on environmental concerns; in Flanders a broader set of challenges is addressed as a result of the societal agenda setting process (Flanders in Action). This leads to increased targeting of (public-private) research towards these challenges; both established policies as well as newly launched measures.

**Barriers to R&D investments - Policy opportunity and risks**

The barriers to R&D investments identified are summarised in the following table.

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Strong reliance on a few large & foreign R&D players	Structuring of public-private research efforts in strategic research centres and competitiveness poles are a good step towards an embedding and attracting force for the large foreign R&D players. However, high tax burden and relatively high labour costs remain a negative element for conducting research in Belgium.
High public debt and financial crisis affect capacity of public sector	The Belgian authorities have all increased public spending on R&D and are committed to continue this trend. The financial crisis and a growing unemployment may put public research budgets under pressure.
Low attractiveness for researchers	A range of measures was taken to foster the researcher's conditions. However, there is no evidence yet that this is paying off in terms of

A number of prestigious research infrastructures but a need to further develop their capacities.	retaining or attracting high-quality HRST. Initial efforts are being made to strengthen and coordinate Belgian efforts to develop and consolidate European level research infrastructures.
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### Knowledge triangle

The effectiveness and complementarities of coordination mechanisms between the Belgian authorities is limited by the decentralised policy structure in which each entity has complete autonomy. Due to the distribution of policy tasks, at least two knowledge triangles co-exist in Belgium. The division of responsibilities for research and innovation policies on the one hand and education policy on the other hand to different entities complicate the functioning of the knowledge triangle. From a national perspective the coordination between the different communities and regions is low, notably between the Flemish and French language communities. At regional level, the synergies between innovation and research policy are relatively strong as these policy fields fall under one minister or department; while education policy is more aligned with research than with innovation policy. Other policy domains such as social security or other policies (e.g. agriculture, health) that fund research tend to be less aligned. The table below summarises knowledge triangle policies.

### Effectiveness of knowledge triangle policies

Domain	Recent policy changes	Assessment of strengths and weaknesses
Research policy	Refinancing of F.R.S FNRS and new development plan. Implementation of European Partnership for Researchers. Opening of new research centres (e.g. Flemish Centre for Medical Innovation, WELBIO in Wallonia). Modest increases of public research budgets in 2010.	Strong policy commitments and participation in European initiatives. The implementation of the European Partnership for Researchers makes it easier to attract human resources. Low funding for researchers is a weakness. Low public funding for research is a weakness. BERD is at an adequate level, but it is largely depending on a few big foreign players. The opening up of new research centres leads to competences in several areas, assumingly attracting both researchers and companies.
Innovation policy	Increased funding and development of a set of tailored measures for SMEs; Strengthening of research industry collaboration (Technology innovation partnerships in Wallonia; Strategic platform in Brussels; "spearhead" policy in Flanders) Alignment of comprehensive longer-term innovation policy (2009-14) Implementation of Flanders in Action – focus on societal challenges Launch of the programme Creative Wallonia	SMEs are a driving force of the Belgian economy, but their level of innovativeness could be higher (CIS survey 2009). Particularly Flanders puts a lot of efforts in policies to increase innovation in the sector in an attempt to link R&I policy to the actual economic structure. However, still not many SMEs use this support. R&D policy remains focussed on R&D champions. In order to strengthen its innovativeness Belgium keeps initialising initiatives on the verge of academia and industry. This resulted in the start of partnerships and platforms in 2010. In Flanders, the Flanders in Action (ViA) is being implemented. This plan is composed in a society-wide process and emphasises a focus on Flemish strengths in innovation and societal challenges, similar to Grand Challenges. One of the 7 breakthroughs of the ViA future plan is oriented towards innovation: "Innovatiecentrum Vlaanderen". Strengths of ViA is alignment of all policy domains on several goals; although there needs to be attention for specific focus.

Domain	Recent policy changes	Assessment of strengths and weaknesses
Education policy	Further implementation of the Bologna process On-going merger of HEIs in Wallonia. Drafting of a joint action plan of the ministers of research and education in Flanders. Main missions are now aligned with the European Partnership.	The further implementation of the Bologna process leads to higher compatibility with other EU countries and thus to lower barriers for mobility. The joint action plan for research and education also aims at removing barriers for mobility. However, language restrictions in the regions and remuneration levels of researchers are de-facto barriers. Because of coordination issues between research and education, there is slightly more attention paid to the current skills mismatch in Belgium. Neither the deficit in life long learning nor the relatively low share of S&T graduates is adequately tackled by policies.
Other policies	Strong focus on environment (Wallonia, Brussels-Capital, Flanders) and societal challenges (Flanders)	Strong focus on environmental issues in Wallonia and Brussels-Capital; strong focus on societal challenges (e.g. health, energy, eco-innovation) in Flanders. Other sectoral ministries also fund research in their own field. There is however little coordination between these entities.

### European Research Area

Research and innovation policy in Belgium is mainly based on regional considerations; the ERA 2020 objectives do not play a pivotal role, although the attention for ERA is growing. As can be seen from the table below, a large number of measures support the ERA objectives. A significant share of Federal science fund are allocated to the European Space Agency and the Belgian authorities have developed large-scale facilities in the context of the ESFRI roadmap. Actors from all three regions have been active in ERA-NETs, JTIs, ETPs and JPIs.

Internationalisation strategies aim primarily at developing a competitive advantage to attract excellent researchers and organisations (both non-EU and EU). In particular, Flanders has invested in infrastructures and centres with an internationally outstanding reputation. All regions have human resource focused internationalisation strategies: inward mobility has been made easier, but obstacles remain such as the relatively low remuneration of researchers. Nevertheless, there is relatively high number of foreign students at Belgian universities, especially from the Netherlands and France and to a lesser extent Germany. Belgian universities have a high degree of autonomy with respect to ERA-related issues, although the Bologna Reform has been implemented. The development of a higher international profile remains a challenge partly due to language issues.

Further progress has been made in mobilising research addressing societal challenges. The Walloon policy is primarily focused on greening society; the Flemish policy is aimed at a broader set of societal challenges.

**Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)**

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers	<ul style="list-style-type: none"> <li>• Launch of the programme Creative Wallonia;</li> <li>• Adoption of the Action Plan for Researchers in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively high share of S&amp;T employees with strong demand for qualified science, engineering &amp; technical employees is high;</li> <li>• Share of new S&amp;T graduates is below EU-average (BE: 15.8%, EU27: 21.9%);</li> <li>• Low participation in life-long learning;</li> <li>• Weak incentives to become a researcher in Belgium due to career perspectives.</li> </ul>
2	Increase public support for research	<ul style="list-style-type: none"> <li>• Public support for R&amp;D increased in all entities;</li> <li>• Launch of several public research institutes.</li> </ul>	<ul style="list-style-type: none"> <li>• Compared to the EU27 average, the levels of public R&amp;D funding in Wallonia and Brussels-Capital is relatively lower but increasing; while Flanders performs better.</li> </ul>
3	Increase European coordination and integration of research funding	<ul style="list-style-type: none"> <li>• No policy changes since 2009;</li> <li>• Re-continuation of ERA-NETs (e.g. MNT II and MATERA +).</li> </ul>	<ul style="list-style-type: none"> <li>• Active involvement in COST, EUREKA and FP7 and participation in inter-governmental research infrastructures;</li> <li>• Involvement in ERA-NETs, Art.185 initiatives, JTIs, ETPs &amp; JP. Research programmes are opening up to foreign researchers.</li> </ul>
4	Enhance research capacity across Europe	<ul style="list-style-type: none"> <li>• Further implementation of Bologna process;</li> <li>• Adoption of a joint Action Plan for Researchers.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased international recruitment;</li> <li>• Constant HERD;</li> <li>• Temporary small decrease of the non-directed FWO budget (Flanders)<sup>3</sup> but increase in F.R.S-FNRS budget (Wallonia);</li> <li>• Increased participation of women in research.</li> </ul>
5	Develop world-class RIS & ensure access to them	<ul style="list-style-type: none"> <li>• Growing participation to ESFRI</li> </ul>	<ul style="list-style-type: none"> <li>• Limited number of world-class infrastructures (notably Flanders) but participation in several ESFRI infrastructures. Start of a supercomputing facility in Flanders.</li> </ul>
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> <li>• Further implementation of the Bologna process.</li> </ul>	<ul style="list-style-type: none"> <li>• Total HERD in Belgium rose with 10% in the period 2002-2007. Number of students increased faster than the personnel at HEIs. Further implementation of the Bologna process leads to increased synergies in the HEI sector. High academic autonomy.</li> </ul>
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> <li>• No policy changes since 2009.</li> </ul>	<ul style="list-style-type: none"> <li>• A main risk is that BERD is dependent on a the strategies of a few large foreign owned firms. High tax burden and relatively high labour costs have a negative impact on research intensity in Belgium (even if R&amp;D tax incentives at federal level exist). The political instability may render Belgium less attractive for private investments (incl. R&amp;D).</li> </ul>

<sup>3</sup> Although recovering budgets in 2011.

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> <li>• Launch of strategic partnerships in Brussels and Wallonia and Flanders;</li> <li>• Development of 'Grand Projects' in Flanders.</li> <li>• Launch of centres with a valorisation component in Flanders &amp; Wallonia.</li> </ul>	<ul style="list-style-type: none"> <li>• Many measure aim to stimulate public-private cooperation and knowledge transfer. The level of interaction between SMEs and universities is, however, relatively low. Knowledge transfer is a recognised mission of universities and there is an increasing professionalisation of the commercialisation process.</li> </ul>
9	Enhance knowledge circulation across Europe and beyond	<ul style="list-style-type: none"> <li>• Adoption of the Action Plan for researchers with focus on 'brain circulation' instead of 'brain gain/drain'</li> </ul>	<ul style="list-style-type: none"> <li>• Significant measures to promote mobility of knowledge workers, grants for international activities, etc.;</li> <li>• High rate of co-publication with foreign partners</li> <li>• Belgium is 5<sup>th</sup> in world for attracting foreign PhD holders.</li> </ul>
10	Strengthen international cooperation in S&T & the role and attractiveness of European research in the world	<ul style="list-style-type: none"> <li>• No changes since 2009.</li> </ul>	<ul style="list-style-type: none"> <li>• Belgian organisations participate relatively successfully in international R&amp;D programmes, such as the FP7, and in ERA-NETs, Joint Programming, etc.</li> </ul>
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> <li>• Ministerial portfolio of Economy has been separated from portfolio of Science and Innovation in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>• Policy coordination between the different authorities low due to the highly decentralised governance structure.</li> </ul>
12	Develop & sustain excellence and overall quality of European research	<ul style="list-style-type: none"> <li>• Increasing budgets in Flanders, Wallonia &amp; French community.</li> </ul>	<ul style="list-style-type: none"> <li>• Belgium has a relatively high academic output with some top ranked European universities;</li> <li>• Limited competitive funding for universities is may hinder generalised excellence in knowledge production.</li> </ul>
13	Promote structural change and specialisation towards a more knowledge intensive economy	<ul style="list-style-type: none"> <li>• Implementation of fiscal incentives for R&amp;D.</li> </ul>	<ul style="list-style-type: none"> <li>• Economy dominated by intermediate goods and medium-tech sectors, and highly dependent and sensitive to the decisions of a handful of large (foreign-owned) enterprises;</li> <li>• Contrary to the other entities, the Flemish policy has a substantial focus on strategic research.</li> </ul>
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> <li>• Increased attention to sustainability issues (e.g. Marshall Plan 2.Green);</li> <li>• Implementation of the Pact 2020 in the Flemish long-term innovation strategy;</li> <li>• Increased attention for aging and health care.</li> </ul>	<ul style="list-style-type: none"> <li>• The Flanders in Action Plan focuses on greening of society, better health care adapted to aging, entrepreneurship, more innovation, and improved mobility;</li> <li>• Wallonia's policy is aimed strongly towards sustainability. Other societal challenges are addressed to a lesser extent.</li> </ul>
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> <li>• Implementation of Flanders in Action</li> <li>• No major policy changes.</li> </ul>	<ul style="list-style-type: none"> <li>• Long-term agenda (Pact2020) set up in Flanders with broad stakeholder involvement (annual update with a policy letter);</li> <li>• High level of policy expertise &amp; high number of science centres;</li> <li>• A developing evaluation culture, notably in Flanders.</li> </ul>

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## 1 Introduction

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The objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the Europe 2020, post-Lisbon Strategy. The assessment focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments in R&D, the articulation between research, education and innovation, and on the realisation and better governance of the European Research Area (ERA). In doing this, the 15 objectives of the ERA 2020 are articulated. The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision. Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report does not cover innovation per se, but rather the '**inter-linkage**' between research and innovation, in terms of their wider governance and policy mix.

## 2 Performance of the national innovation system and assessment of recent policy changes

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The aim of this chapter is to assess the performance of the national innovation system, the '**inter-linkages**' between research and innovation, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national innovation policy and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

### *2.1 Structure of the national research and innovation system and its governance*

Belgium is a small densely populated federal State (10.8m inhabitants in 2009, 2.2% of EU27), structured into three regions: Flanders (6.2m), Wallonia (3.5m) and Brussels-Capital (1.1m); and three language communities: the Flemish (6.2m Dutch speakers), the French (4.3m) and the German (75k). Belgium is a relatively wealthy country; gross domestic product (GDP) per capita was 15% above EU27 average in 2009, adding to a total GDP of €294b<sup>4</sup> with a GDP/capita representing 126% of EU27 average. There are significant regional differences in GDP/capita compared to the EU27 average: Wallonia lies below (90% in 2007<sup>5</sup>), Flanders well above (127%) and Brussels-Capital more than double (242%). Belgian gross expenditure on R&D

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<sup>4</sup> Data provided in this report is sourced from Eurostat for the latest available year, unless explicitly stated otherwise

<sup>5</sup> Data at regional level is available only for the year 2007 (Eurostat or Federal Planning Bureau)

(GERD) was 1.96% of GDP in 2009<sup>6</sup>, slightly below the EU27 average (2.01%).

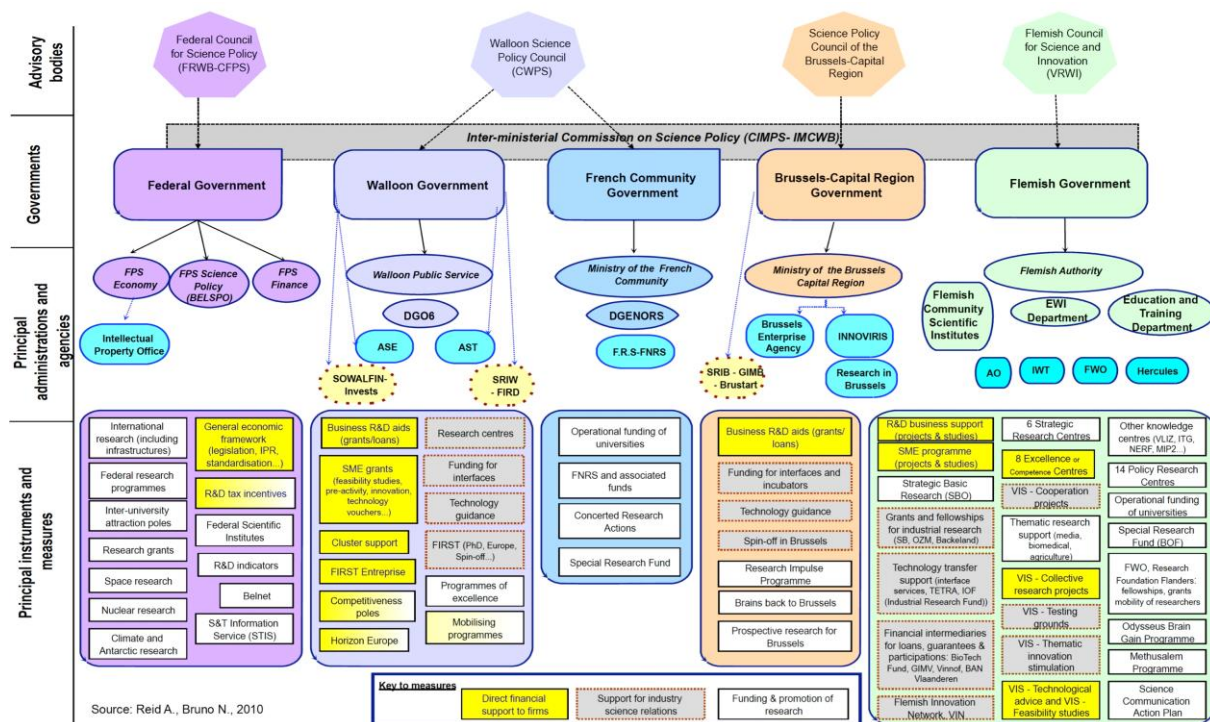
### Governance

As a federal country, the responsibilities for research and innovation (R&I) policy largely distributed to the three regions and two main language communities:

- the federal level is responsible for scientific research in the federal science institutes, intellectual property rights (IPR), corporate taxation, employment legislation and social security;
- the communities are competent for matters related to persons including scientific research and education;
- the regions are competent for issues related to territorial matters such as energy, environment, and economy, and thus for innovation, applied and industrial research, technology transfer, etc.

Hence, there is not a “Belgian research and innovation system” since the regions and communities have full autonomy. Figure 1 provides an overview of the research and innovation governance system of the five authorities<sup>7</sup> including the most important agencies and measures.

**Figure 1: Overview of the Belgian research & innovation system governance**



Each entity has a Minister responsible for research and innovation (R&I) as one element of a broader portfolio. At federal level, the Minister for SMEs, Agriculture and Science Policy and in Brussels-Capital, the Minister in charge of Economy, External trade, Employment and Scientific Research is responsible for R&D issues. Since 2009, scientific research is part of one portfolio in Wallonia and the French

<sup>6</sup> Provisional Eurostat data suggests that research intensity grew to 1.96% in 2008 and 2009, which would represent a slower growth than EU27 average (2.01%)

<sup>7</sup> There are formally seven independent Belgian authorities, but in practice, there are five active entities: Flanders (the entity that covers both the Flemish Region and the Flemish Community) and the German community does not have a research policy, due to its small size

Community, dealing with regional and community aspects. Similarly, the Minister in charge of higher education at community level is also responsible for business support and ICT policy at regional level. Other ministers are responsible for funding research in their specific fields of competence (agriculture, environment, energy, health). In Flanders there is a single ministerial portfolio for STI: the Minister of Innovation, Public Funding, Media and Poverty Prevention.

The [Federal Science Policy Office](#) (BELSPO) is responsible for coordination, design and implementation of science policy at federal level as well as the management of Belgium's participation in European and international organisations and the supervision of ten federal scientific establishments. Co-operation 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). Coordination tends to focus on practical issues such as statistics and policy surveys that are submitted to the European Commission, Eurostat, or the OECD. In Brussels-Capital, INNOVIRIS<sup>8</sup> (Institute for the support of Scientific Research and Innovation of Brussels) manages the implementation of research and innovation funding. In Flanders, the department [EWI](#) is principally focused on policy design and management, while agencies such as the [Research Funding Council \(FWO\)](#), and the [Institute for the promotion of Innovation by Science and Technology \(IWT\)](#) deal with implementation issues. The Ministry of the French Community funds fundamental research through the [National Scientific Research Fund \(FRS-FNRS\)](#). In Wallonia, research funding is managed by the [General Operational Directorate for Economy, Employment and Research \(DGO6\)](#).

### **Main research performer groups**

The main research performers in Belgium are HEIs, i.e. universities and university colleges (see chapter 3.3 for more information on their role). Additionally, the collective research centres are key research performers in Belgium. Three types of collective research centres exist: (i) the centre 'De Groote'; (ii) the assimilated collective research centres (CRCs); and (iii) the 'autonomous' collective research centres. The first two operate in all Belgian regions; the latter reflect the regional mandate for S&T policy developed since the 1980s. CRCs are private initiatives in which member firms initiate, follow and fund R&D. The collective research centres are also a measure to enhance competitiveness through R&D and technology transfer. Public funding is also obtained from the regional authorities where the centre is located. The largest regional research centres are located in Flanders, including four large strategic research centres<sup>9</sup>, and a range of knowledge institutes and policy research centres. Walloon efforts remain comparatively small; a number of Walloon research centres are funded through the Structural Funds.

## **2.2 Resource mobilisation**

Since 2000, Europe has made progress towards ERA goals but at the same time Europe's overall research performance has not improved, especially R&D intensity, which remains too low. The latter is mainly a result of lower levels of business investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for business sector R&D investments.

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<sup>8</sup> INNOVIRIS was called IRSIB/WOIB till 2010

<sup>9</sup> i.e. IMEC, VITO, VIB and IBBT and two strategic research centres are being created in health and materials.

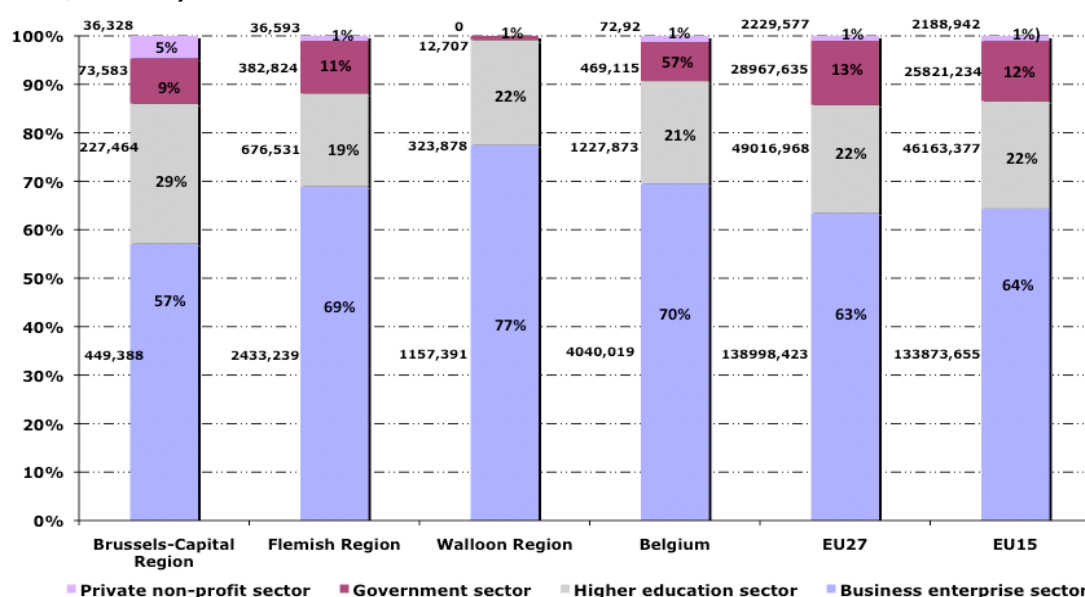
This section assesses the progress towards national R&D targets, with a particular focus on recent policy measures to support business R&D and governance changes. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. The main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy measures.

### 2.2.1 Resource provision for research activities

Although the Belgian authorities aim to meet the 3% GERD/GDP target, R&D intensity remained rather stable over the past decade with a decrease until 2006 (2.00% in 2001 falling to 1.86% in 2006) and a small increase to 1.90% in 2007. Provisional data indicates a further increase to 1.96% in 2009. The Belgian research intensity was just above the EU27 average in 2007 (1.83%) but by 2009 it fell back below the EU27 average to 1.96% (EU27 2.01%). Wallonia has the highest R&D intensity (2.1% in 2007), followed by Flanders (1.99%) and Brussels-Capital (1.38%).

As can be seen from Figure 2, the business sector<sup>10</sup> is a relatively large contributor to Belgian intramural R&D expenditure; accounting for 67.2% of GERD (EU27: 61.5%). While, the higher education sector accounts for 22.7% of GERD (EU27: 23.9%), the share of research performed by the government sector is relatively small if increasing, (8.6% of GERD funding compared to the EU27 average of 13.6%). The private non-profit sector accounts for only 1.4% of GERD.

**Figure 2: Intramural R&D expenditure by sector of performance & region (€m PPS, 2007<sup>11</sup>)**



Belgium has a high level of public debt (96.2% of GDP in 2009), which limits a sustained increase of public investment in R&D. Most notably, it is unlikely that Wallonia will be able to maintain similar levels of investment in R&D after the phasing out of Structural Funds in 2013 (Walloon Council for Science Policy, 2010).

Given the constitutional setup, each region has its own STI strategy. However, policy-makers acknowledge the need to increase R&D co-operation between, in

<sup>10</sup> Based on Eurostat provisional data, updated on 24/02/2011

<sup>11</sup> No data at regional level is available after 2007 (Eurostat or Federal Planning Office)

particular, Brussels-Capital and Wallonia, to improve critical mass and enhance synergies.

The federal contribution to R&D expenditure has increased strongly over the last 10 years (about 25% of GBOARD in 2008, or €593.2m without tax breaks, the latter would add an estimated €500m). Despite the difficult economic context in 2010, the federal budget for science policy has increased further, maintaining commitment to supporting R&D (Belgian Science Policy Office, 2010). However, basic research is somewhat neglected accounting for 5.7% of GERD (Federal Planning Office, 2010) or 25% of public research funding in 2007 (Verbeek, 2007). Thus the Council of Rectors of the French-speaking universities and the F.R.S-FNRS have written memoranda<sup>12</sup> requesting the Federal government to increase the budget for basic research. The federal subsidies represent 24% of the funding for basic research in this part of the country. Both the Council of Rectors and F.R.S.-FNRS advocate a budget increase for the [Interuniversity Attraction Poles](#), which are the sole tool promoting cooperation between all Belgian researchers, both inter-regionally as well as at interdisciplinary level. In addition, they request an extension of the federal tax support schemes for supporting basic research.

In 2010, public R&D funding was initially cut in **Flanders** due to the economic downturn, but later increased again in total after a budget revision. After a period of strong growth in public R&D funds (on average +€300m in the period 2004-09) the R&D budget stagnated from 2008 (1.121 billion euro) to 2009 (1.130 billion euro) yet increased again in 2010 (1.224 billion euro). The strong absolute growth in R&D funding in the period 2004-09 was however levelled out in relative terms by a similar strong growth in Gross Domestic Product per region (GDP). The budget cuts in 2010 are exceeding the economic decline: R&D funds decrease faster than the GDP(R) (2009: 0.69%; 2010: 0.65%).<sup>13</sup> Major cuts in 2010 were made in the budget of the PROs and the VIS (managed by IWT). Also in 2009, IMEC received an exceptional on-off budget from the Flemish Government of 35 million euro to set-up a new cleanroom. A number of new initiatives were set up in a response to the Flanders in Action (ViA) plan, such as Energyville, ICleantech, a testing ground for Electric Vehicles and the Centre for Medical Innovation (CMI) in 2010<sup>14</sup>.

In **Wallonia**, budget appropriations for R&D were just over 4% of total public expenditure in 2009. The DGO6 budget for R&D support represents over 80% of the total regional GBAORD; the remainder is allocated to specific actions in fields such as energy, agriculture, environment and natural resources, employment and training, land use and town planning. Between 2005 and 2008, Walloon budget appropriations for R&D have increased significantly (by nearly 95%). In 2009, on the basis of the initial budgetary credits, the budget allocations for R&D stabilised in comparison to 2008.

During the first half of 2000, **French Community** budget appropriations for science policy stagnated in real terms, but since then, have significantly increased. In 2009, the F.R.S-FNRS adopted a strategic plan for 2010-14. Structured around n four main

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<sup>12</sup> Memorandum du F.R.S-FNRS à l'attention du Gouvernement Fédéral, 1 July 2010 and Memorandum du Conseil des Recteurs (CRef) à l'attention du Gouvernement Fédéral, 13 July 2010

<sup>13</sup> This led to public and political debate as reinforcement of RDTI are seen as a strategy to cope with recession (De Standaard, 2010). These discussions may lead to one-off increases of the R&D budgets.

<sup>14</sup> CMI is a virtual research centre that aims to stimulate joint translational research based on biobanks; it received €8m (+€1.5m from IWT) for the initial phase in 2010-11

areas<sup>15</sup>, the plan foresees an increase of 34% (€47m) in the Fund's annual budget by 2014 compared to 2007. In addition, the F.R.S-FNRS will develop new tools to evaluate the scientific output of researchers from the French Community (+€0.8m). The implementation of this plan will depend, however, on political priorities and available budgets of the French Community.

In **Brussels-Capital** the research budget has increased in nominal terms by 47% from 2005 to 2008 (€29m), although the budget in 2009 dropped back to €26m, notably because of the economic downturn leading to budgetary constraints.

### **Funding measures**

R&D policy measures at the **federal level** include: research programmes (space research, targeted research programmes in topics falling under federal competences); support for participation in international research programmes and networks; federal science organisations; the 'inter-university attraction poles' programme across universities of different linguistic regimes within Belgium; technology attraction poles which also involve collective research centres; funding for pre-normative research activities at collective research centres; and individual grants for researchers' mobility. Fiscal incentives like the R&D tax credit and partial exemptions of advance payment on wages in favour of employers of researchers are also R&D policy measures at the federal level.

The **French Community** funds fundamental research in universities and university colleges through institutional funding for universities and the FRS-FNRS. More specific research is funded via the Concerted Research Actions and Special Research Funds. They are the main channels to support research projects within universities and to establish excellence centres within the universities and university colleges. The scientific impulse mandate is a measure launched in 2008, dedicated to internationally recognised researchers.

In **Wallonia**, the main measures for R&D policy are grants for industrial research; grants or reimbursable loans for nearer market technology development projects; specific support for SMEs, including feasibility studies and hiring personnel; and the 'FIRST' programmes for spin-offs, companies and HEIs, to foster staff mobility between universities and enterprises. On the public research side, measures include grants for excellence programmes for research institutes and subsidies for technology development in research centres. Furthermore, there are grants under the 'mobilising programmes' for R&D in enterprises, research centres and universities in areas of specific regional importance. Support for research-industry consortia is organised around key sectors, either from a bottom-up approach (clusters) or from a top-down approach on selected themes (competitiveness poles). Moreover, the Walloon Government supports universities to exploit research results and launched a scheme in 2009 that associates companies and public entities (research centres, HEI) to carry out or coordinate research contributing to the scientific, technological and economic development of the region.

In **Flanders**, the largest share of R&D expenditure is Government institutional funding for universities; part of this funding is awarded based on research performance, via the Special Research Fund (BOF). Funding for research co-

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<sup>15</sup> (i) Researchers and research teams: attract, select and promote the best researchers and enable them to develop new teams (+€18.7m); (ii) Strategic research, society-oriented: take into account societal challenges, support research in humanities and disseminate research to other players (+€14.3m); (iii) Means of the researcher: equipment and operation (+€4.6m); (iv) National and international collaborations (+€9m)

operation between research institutes and universities is allocated via the Industrial Research Fund. The Flemish Government has also established policy-relevant support centres at universities, which produce knowledge relevant for policy making. Competitive funding for basic research within HEI is available via FWO-Vlaanderen, including facilities that support excellent research groups (Methusalem), and excellent researchers (postgraduate grants and mobility schemes) as well as large research infrastructures (Hercules Fund). Funding for innovation is channelled via IWT, the innovation agency, including several measures that aim to strengthen business-university co-operation, such the strategic research centres, the strategic basic research programmes, excellence centres or competence poles and a technology transfer fund (TETRA Fund). In addition, companies, notably SMEs, can apply for subsidies and loans for industrial R&D and prototypes. A network of innovation intermediaries is funded through the Flemish Cooperative Innovation Network (VIS) providing at both territorially and thematically-based technology and innovation support to companies.

In **Brussels-Capital**, the measures for R&D policy include subsidies for industrial research as well as for inventors. The 'Prospective Research for Brussels' programme supports projects for the development of the region, whilst the 'Brains back to Brussels' programme offers subsidies to attract foreign researchers to work at universities. There is also support for interfaces at universities and for promoting university spin-offs. Furthermore, impulse programmes support research in three thematic areas (ICT, health and environment), as well as for the logistics in research through [Research in Brussels](#).

Finally, all Belgian entities develop programmes and actions to raise interest in science and technology in the wider public, notably amongst the young.

### **Societal challenges**

A main societal challenge addressed by Belgian STI policy is sustainable development. At **Federal level**, BELSPO manages a multi-annual programmes on 'Science for a Sustainable Development' with a budget of €61m for 2006-12. In 2008, the Federal Government committed to supporting scientific research on renewable energies as well as the reduction of nuclear waste (SCK-CEN).

In **Wallonia** and in **Brussels-Capital**, an increased focus on sustainable development is evident in Government policy and the launch of new measures. The French-speaking greens (Ecolo) became part of the Walloon and French Community coalition Government following the 2009 elections. The change of Government, the need to respect European and international commitments as well as the potential economic importance of the environmental-industries sector has led to increased R&D and innovation funding, notably for the new Greenwin<sup>16</sup> competitiveness pole.

Similarly, in **Flanders** there is a growing emphasis on eco-innovation, notably since 2009, in the context of the Pact 2020 and the Flanders in Action plan. A main aim of the latter is 'the greening of society' and consequently eco-innovation is a core theme for STI-policy. In addition to existing of eco-innovation initiatives, the explicit attention for this topic mobilises additional funds. The total funds for eco-innovation increased from about €180m to €190m in the period 2007-09; which is about 0.1% of regional

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<sup>16</sup> <http://clusters.wallonie.be/greenwin/fr/index.html>

GDP<sup>17</sup>. In the context of Flanders in Action, progress on societal issues, notably eco-innovation, will be monitored and a baseline study was conducted in 2010.

All three regional innovation policies put an emphasis on life sciences as a sector of growing economic importance (employment, commercialisation of research, etc.): the sector is one of the three priority areas of the **Brussels-Capital** innovation policy; in **Wallonia**, a competitiveness pole is dedicated to life sciences (<http://www.biowin.org>) and e-health policies are gaining in importance; while in **Flanders** there is a focus on ageing and innovative health care<sup>18</sup>. Indeed, the Flemish Centre for Medical Innovation was established in 2010 (CMI) and is aligned with demand side instruments such as the In-HAM<sup>19</sup> living lab. In relation to this an open innovation centre and a biobank are developed. In 2010, the Flanders' Care innovation platform was set up and is structured around four main stages: R&D, demonstration, implementation, international valorisation. Stakeholders come together in the platform and match industrial solutions with care sector needs. Health care and nanotechnology are an issue in the Flemish Centre for neuro-electronic research (NERF) that was set up at the end of 2009.

A broad-ranging approach is proposed in the F.R.S-FNRS strategic plan for 2010-14, through a strategic research fund for areas with a strong societal impact. The measure would be called FORESIGHT (Fund for Strategic Research and Innovation for the Earth, the Human and Technologies) and would have a proposed annual budget of €6m.

### Structural Funds

The responsibility of the coordination design and implementation of the Structural Funds programmes lies entirely with the Belgian regions. Wallonia receives 61% (€2.258b over 2007-2013), Flanders 32% and Brussels-Capital 4%. The possible phasing out of the Structural Funds after 2013 will have a large impact on Wallonia's public R&D funding given that €250m (ERDF plus Walloon contribution) is allocated to research activities for 2007-13, an increase of 30% in comparison to the previous programming period. The ERDF is primarily used to promote a knowledge intensive regional economy by stimulating entrepreneurship, the development of human capital and sustainable development. About 25% of these funds are dedicated to SMEs.

### 2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Government budgetary appropriations for R&D in Belgium were €2,344m in 2008. A total of €552m was awarded to non-oriented research, representing 23.5% of total GBAORD: a decline compared to 2007 (24.8%), but an increase over the longer run (2004: 21.1%) (CICW/CCPS, 2008).

As noted in section 2.2.1, BERD is 1.32% of GDP in 2007<sup>20</sup>. In 2007, 10.7% of BERD was financed by capital from abroad (10.6% in EU27). In recent years, a number of R&D-intensive foreign firms have reduced their activities in Belgium with a noticeable impact on the economy and the research intensity. The relative importance of BERD in GERD combined with the dependence on R&D activities undertaken by foreign-owned enterprises need a competitive policy mix. The global

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<sup>17</sup> About 16-19% of the GBOARD in Flanders is now invested in eco-innovation (EWI, 2010b)

<sup>18</sup> See Flanders in Action (Flanders in Action, 2010) and the Pact 2020 (Pact 2020, 2010)

<sup>19</sup> <http://www.in-ham.be/index.cfm?n01=default&lang=en>

<sup>20</sup> Provisional Eurostat data for 2008 and 2009

economic crisis and the earlier commodity and oil price shocks have hit the small and open economy hard in the last years, forcing government interventions in major institutions. High tax burdens and high labour costs remain a negative element for private parties to conduct research in Belgium. The wage and social security taxes that employers pay for their employees are amongst the highest in Europe; and take-home pay of qualified employees is lower than in competing countries. In order to counteract these disadvantages, Federal tax incentives for R&D were launched in 2003. However, a benchmark study of R&D tax incentives (Boekholt, 2011) argued that the incentives are still lower than those in competitor countries and do not fully compensate the high tax burden.

The 'Policy Mix Project' identified six 'routes' to stimulate R&D investment. A number of 'systemic' measures, such as the large Flemish strategic research centres and the Walloon competitiveness poles play a central role in the policy mix. Table 1 provides a concise assessment of the policy routes since 2009.

**Table 1: Assessment of the Belgian Policy Mix – assessing six routes**

Route	Relative importance	Recent policy change since 2009
Route 1: Promoting the establishment of new indigenous R&D performing firms	Moderate, but increasing	<ul style="list-style-type: none"> <li>• SOWALFIN invests in innovative SME projects (Wallonia)</li> <li>• Continued economic injection VC fund (Flanders)</li> <li>• Increased ease of use of set of measures (Flanders)</li> </ul>
Route 2: Stimulating greater R&D investment in R&D performing firms	Moderately important	<ul style="list-style-type: none"> <li>• Launch of a number of initiatives in the framework of the Structural Funds (Wallonia)</li> <li>• Increased ease of use of set of measures (Flanders)</li> </ul>
Route 3: Stimulating firms that do not perform R&D yet	Moderate, but increasing	<ul style="list-style-type: none"> <li>• A Flemish policy note (Lieten, 2009) announced reinforced communication and easier procedures</li> </ul>
Route 4: Attracting R&D-performing firms from abroad	Moderate importance	<ul style="list-style-type: none"> <li>• Set up of foreign investment offices attached to the competitiveness poles (Wallonia)</li> <li>• Attract research-related investments from abroad, e.g. through the technology attachés (Flanders)</li> </ul>
Route 5: Increasing extramural R&D carried out in cooperation with the public sector	High importance	<ul style="list-style-type: none"> <li>• Set up of technological innovation partnerships (Wallonia)</li> <li>• Set up of strategic research centres (Brussels Capital)</li> </ul>
Route 6: Increasing R&D in the public sector	Major importance	<ul style="list-style-type: none"> <li>• Set up of new research institutes (Flanders, Wallonia)</li> <li>• Growth path of public R&amp;D expenditures approved Spring 2011 (Flanders) (more details in the 2011 ERAWATCH report)</li> </ul>

The regional policy mixes are by nature a reflection of their economic and institutional context. Both the Flemish and Walloon systems place an emphasis on measures encouraging increased research-industry co-operation. In Wallonia, the focus is on knowledge diffusion through researchers mobility between universities and companies. In Flanders, this type of action is part of more general industrial R&D measures. Public procurement for innovation is (xxxx, 2007) did not have a major role in the R&D policy-mix. However, in xxxx the Flemish IWT agency launched a large public procurement measure, stimulating public procurement of innovation by

all departments and agencies in various policy fields. To date, 10 projects for sector specific knowledge investments were started in Flanders <sup>21</sup>.

### 2.2.3 Providing qualified human resources

The level of education of the population is relatively high with 33.4% of the employed population aged 25-64 having a tertiary education level in 2009 (EU27: 25.1%). Belgium has also a relatively high share of S&T employees within the tertiary educated population aged 15-74 in 2008 with 47.3%. In 2007, Belgium counted more than 58.000 FTE researchers. More than 60% of them were located in Flanders, 23% in Wallonia and 16% in Brussels-Capital. Almost 60% of the R&D personnel was active in the business sector (EU27: 52%) and 35% in the higher education sector. Nevertheless, Belgium faces a relative weakness in the area of human resources for science and technology. Even if the number of S&T workers is also relatively high and growing (47.3% in 2008 of the labour force against 42% in 2002), new S&T graduates are decreasing with 15.8% of the new tertiary education graduates in 2008 (EU27: 21.9%) against 17.7% in 2007. The incentive to become a researcher in Belgium is low due to poor career perspectives and low net salaries. Another issue is the low, and continuously declining since 2004, level of participation in life-long learning (6.8% of the population aged 15-64 in 2008; against 9.6% at EU27 level)..

In **Flanders**, the share of R&D personnel is relatively high<sup>22</sup>. Companies and universities seem to experience problems in finding high quality human capital despite the recent recession. At the beginning of 2008, there was a growing scarcity of skilled workers and vacancies (De Standaard, 2008a, 2008b), and the recession only had a temporary effect. In 2008 the ratio between total unemployed active people and vacancies was 2.9, it rose to 4.0 in 2009 but dropped again to 3.7 in October 2010 (VDAB, 2010). Particularly in highly specialised areas where shortages existed previously, the effect of the crisis has been marginal<sup>23</sup>. Human potential in research remains one of the main policy issues in S&T policy<sup>24</sup>. Furthermore, the Flemish Minister of Innovation and the Minister of Education jointly developed the Action Plan for Researchers (EWI, 2010). The main missions of the Action Plan for Researchers are: (i) to make research an attractive career opportunity for youngsters; (ii) to support and appreciate the professionals researchers; and (iii) to attract and maintain researchers in the open international realm of research in which research mobility and exchange of knowledge play an important role. The Flemish policy is well aligned with policy issues in the Flemish system, such as brain circulation and supply of HRST. The set of missions resulted in 20 actions that will be taken from 2010 onwards, aimed at opening the recruitment of researchers in the EU context; improving the social security and work conditions of researchers; and improvement of the training and skills of researchers. Several policy measures have been taken to improve the supply of students in sciences, such as science communication activities<sup>25</sup>. Although the attribution to policy measures is uncertain, the number of science students has increased over time and Flemish policy seems to deal with this issue effectively.

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<sup>21</sup> This Public Technology Procurement (PTP) is a follow-up of the Flemish participation as project leader in this area in a EU funded OMC project

<sup>22</sup> 1.25% of personnel works in R&D; BE: 1.18%, EU-25: 0.97

<sup>23</sup> Ibid, Using this indicator, the effects of the downfall in 2009 were small compared to the downfall in 2003 (7.3)

<sup>24</sup> e.g. "the learning Fleming" in the Flanders in Action plan (2010), and attention to this topic in the Policy notes and Policy Letters of the Flemish Minister for Economy, Science and Innovation

<sup>25</sup> e.g. the FTI programme

Discussions have taken place since 2009 in the **French Community** on the future of the higher education system. A first step was the decree of 19 July 2010 on the non-indexation of university registration fees until 2014-15, reduced fees for low income students and no charges for academic materials. In addition, the Walloon government adopted the plan Creative Wallonia in 2010, an umbrella programme that aims to improve creativity and innovativeness. This plan is aimed at a broad set of actors, including universities, businesses, students, etc. through promoting new working methods and support new practices, notably through education actions.

### **2.3 Knowledge demand**

The Belgian economy is dominated by intermediate goods and medium-tech sectors, and highly dependent on the decisions of a handful of large foreign-owned enterprises. The sectors receiving the most public support tend to be the best-developed ones (e.g. pharmaceuticals, chemicals). Belgium hosts a number of large R&D facilities concentrating on pharmaceuticals and biotechnology, IT, machinery and transport. More than three quarters of BERD was performed in the manufacturing sector in 2008; 28% by the pharmaceutical sector (2007 data), 9% by chemicals and 9% by radio, TV and communication. Foreign direct investments (FDI) intensity in Belgium increased from 5.7% in 2002 to 20.4% of GDP in 2008, which is considerably above the EU27 average (1.6% in 2008). In 2007, 10.8% of BERD came from foreign sources (14.2% in the Brussels-Capital Region, 10.9% in Flanders and 9.1% in Wallonia). As argued in the OMC Policy mix review for Belgium (2007), policies in the country are tend to be mainly reactive and bottom-up leading to a limited focus on strategic research.

Since 2000, GBAORD has grown 20 % in constant terms and 37 % in nominal terms to 0.68% of GDP in 2008, i.e. €2.344m (0.6% in 2007), which is still below the EU27 average of 0.71%. The federal government has recently reinforced fiscal incentives, which however are not included in the 3% calculations. A further increase of public funding occurred in all regions: in Flanders from €507m in 2006 to €742m in 2009; in Wallonia from €136m in 2005 to €322m in 2009; while in Brussels-Capital the R&D budget stagnated between 2008-9 at €37m. Not surprisingly, given the relative importance of business R&D, GBAORD supporting technological objectives has increased most rapidly (from 37.9% in 1997 to 48% in 2008), so that Belgium invests more in this field than any other OECD country (CICW/CCPS, 2008). The distribution of GBAORD by socio-economic objectives (NABS) shows an increase in Production and industrial technologies which was already the biggest sector supported (33.7% of GBAORD in 2008), followed by R&D financed by General University Funds (15.7%) and Exploration and exploitation of space (11.8%).

### **2.4 Knowledge production**

The production of scientific and technological knowledge is the core function of a research system. The assessment focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

#### **2.4.1 Quality and excellence of knowledge production**

Universities and strategic inter-university research centres in Belgium do have a relatively high academic output. In 2008, their publication share was 1.6% of the total world publication output. The average number of publications per 10,000 inhabitants is 13.0, which is well above EU27 average (7.4), the USA (9.9) or Japan (6.1).

Belgian research shows a relatively large international co-operation pattern, as about 54% of the publications are international co-publications. Moreover, these international co-publications have relatively high impact scores (150% of the global average). Also the direct citation impact for Belgium is high (the field normalised impact is 1.27 for 2005–08). The impact scores are particularly high in Health and Agriculture (Tijssen et al., 2010). In the [Academic Ranking of World Universities 2010](#), only Ghent University is ranked in the top 100 at the 90<sup>th</sup> place. The lack of competitive funding for universities is an impediment to excellence in knowledge production. Funding is largely allocated based on the number of students and full-time equivalents researchers.

Patenting activity has increased since 2000 and in 2009, 142 EPO patent and 166 USPTO applications per million inhabitants were recorded. Both figures are well above the EU average of 117 and 122 respectively. There are however strong regional disparities ranging from low levels in the service-oriented Brussels-Capital region to very high levels in Flanders; Wallonia falling just below EU average. The main patenting field is chemistry, which accounts for more than 30% of the applications. Despite this strong patenting activity, Belgium does not fully exploit its technological strengths. For instance, Belgians have the lowest propensity to become entrepreneurs, and particularly to develop knowledge-intensive firms, in the innovation-driven EU economies (Lepoutre et al. 2009). Moreover, the absorptive capacity in industry is rather low due to the high share of SMEs (Verbeek, 2007) as 97.2% of Belgian companies had less than 50 employees in 2008, and only 0.4% have more than 200 (Union Wallonne des Entreprises, 2010).

#### 2.4.2 Policy to improve the quality and excellence of knowledge production

Research-programme evaluation practices vary across the Belgian government entities and according to the types of R&D measures being utilised. Evaluations of R&D policy measures and structures are becoming more frequent, most notably in Flanders; however evaluations are not yet systemic. At national level, **BELSPO** has commissioned external evaluations, by independent experts, of the inter-university attraction poles programme as well as the R&D tax incentives .

The major Flemish research centres (IMEC, VIB, VITO, IBBT) are regularly evaluated, by independent international experts and peers, as part of multi-annual management agreements with the Flemish government. Various R&D measures managed by IWT have been evaluated since 2007 such as the SME programme, SBO programme and the VIS scheme. Studies on the added value of R&D subsidies have been carried out by Flemish university departments or consulting companies. In general, the aforementioned evaluations have led to the redefinition of the institutes funding agreements or the specific measures. IWT has established a 'Monitoring and Analysis' department, building on a previous observatory, to study various aspects of the Flemish innovation system. The evaluations and studies feed into strategic policy thinking and improve the design of new measures.

During the last decade, the Walloon Council for Science Policy (CWPS) has taken an active role in fostering debate on R&D and innovation policy in **Wallonia and the French Community**, for instance with [reports](#) on their policies. The new legal frameworks covering R&D activities in Wallonia and Brussels-Capital should foster a culture of evaluation and monitoring and allow for better information and understanding of the potential impact of the implemented measures. The CWPS remarked in its 2010 report that this is however not yet fully implemented and

recommended the Walloon Region to acquire the necessary tools for implementation. Furthermore, CWPS advocated the ex-post assessments of impacts of basic research on knowledge development. The Walloon competitiveness poles were evaluated in 2008 and its regional policy framework, the Marshall Plan, was evaluated at the beginning of 2009, both by [IWEPS](#). 'Special delegates' of the government monitored the development of implemented measures. These exercises have however a limited scope due to time limitations.

## **2.5 Knowledge circulation**

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

### **2.5.1 Knowledge circulation between the universities, PROs and business sectors**

While manufacturing industries and high-tech services such as pharmaceuticals or ICT activities are of high importance in the Belgian industrial system, the added value of these sectors is relatively low. Gross value-added of the industry in 2009 was 16.3%, which is below the EU27 average (18%) and below the level of 2000 (22.3%). Considering the low number of Belgian community trademarks and designs and the low technology balance of payments flows, R&D and innovation efforts do not seem to lead to significant economic outputs when compared to the EU27 averages.

According to Eurostat, 11.1% of HERD was funded by the business sector in 2007 in comparison to 6.4% in the EU27. There is a need to create incentives to exploit accumulated knowledge by foreign-owned subsidiaries in Belgium, when considering that 89% of BERD was performed by companies with more than 50 employees in 2007 and 44% with more than 1000 employees. Moreover, GOVERD was financed for 9.7% by the business sector, which is well above the EU27 average of 8.9% (2007). Associated with the high share of R&D performed in a few large foreign companies, the specific industrial structure of the country has favoured the emergence of 'islands' of innovation (see section 2.3), which are not necessarily linked to the surrounding economy. This impedes the diffusion of know-how in the economic fabric mainly composed by SMEs.

All three regions have a diverse set of measures promoting science-industry linkages. The measures include funding for interface services at universities; funding for incubators; research centres with links to universities and the business sector; competence poles (with various different modes of public-private interaction) and various network support programmes.

Since 2001, a number of Flemish initiatives at the interface between science and industry appeared have been developed through the creation of knowledge platforms (so-called excellence centres or 'competence poles'). The platforms are industry-led and therefore mainly demand-driven. The excellence centres/competence poles have however not yet succeeded to become self-sufficient and are still heavily depending

on public support. The Strategic Research Centres (SRC, mainly IMEC, VIB, VITO and IBBT) show large interfaces with the private sector. They raise significant industrial research funds, which indicates their relevance to industry. This may be fostered due to the SRCs' close connections to universities (three of the SRCs are inter-university organisations), and thus their constant inflow of basic knowledge. In the STI-policy for 2009-14, the Minister announced to use 'grands projets' in order to address societal problems; PPP is mentioned as a promising measure to stimulate those. Funding of universities has become partially dependent on the industrial relevant output of universities as well as additional facilities (e.g. Industrial Research Fund). Other measures include technology transfer and university interfacing facilities. Moreover, nearly all measures of IWT involve interaction between universities, PROs and industry via joint-projects or user-committees.

In order to facilitate knowledge circulation between the R&D stakeholders, the **Walloon** region has implemented a whole set of measures under the FIRST label, directed towards researchers in universities creating a company, or researchers working in a company. A similar scheme for spin-off exists in the Brussels-Capital region. Following an evaluation of the networks of intermediaries and in order to tighten the links within and between the three families of scientific and technical intermediaries that exist in Wallonia, the Walloon region has set up the AST in 2006 (Technological Stimulation Agency). AST is in charge of improving the coherence of the system by exploiting the complementarities between the different actors. Also the creation of competitiveness clusters in Wallonia span across the research, technology and economic policy areas. Wallonia also works with excellence poles funded in large part with EU Structural Funds, in order to enhance public private partnerships. However, industrial participation and ownership still lags behind expectations according to the evaluation of these poles. In 2009, the Walloon Government launched the Technological innovation partnership (PIT), associating companies and public entities to conduct research that contributes to the scientific, technological and economic development of the region. It is implemented through calls for projects<sup>26</sup>. In 2009 the Government approved a pilot project aimed at creating venture capital funds for results of university research, managed by the three university academies. These funds should enable spin-offs or licensing agreements. Lastly, the Walloon region co-finances new support schemes for SMEs with ERDF (see 3.4.2).

Since 2010, three strategic platforms were developed in **Brussels-Capital**. Based on an analysis of R&D of Brussels ICT companies, INNOVIRIS selected three ICT domains for strategic platform with high industrial importance or potential. The strategic platforms target academic research with a clear focus on industrial applications in the region. INNOVIRIS launched the first call for proposals for problem-oriented research projects in 2010. Research must be carried out by at least two research units belonging to higher education institutions within the region.

### 2.5.2 Cross-border knowledge circulation

Knowledge circulation is primarily stimulated at regional level, using the following routes:

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<sup>26</sup> Through the launch in 2010 of a PIT called Euro Green IT, the Walloon Government has decided to contribute to the establishment of an 'accelerator centre' for research and market launch of new digital technologies solutions with the general objective of sustainable development & energy efficiency.

- Increasing the participation to European R&D programmes and networks. This happens for instance by provision of information to local companies and researchers as well as brokerage events, organised both in Flanders<sup>27</sup> and Wallonia<sup>28</sup>. The regional performance at EU level is monitored closely.
- Facilities that foster research mobility, both inward and outward.

Section 3.1 provides more information on the attractiveness of Belgium for researchers, as well as a number of facilities to foster inward mobility. Section 3.5 and 3.6 provide more on mobility schemes in respectively ERA (3.5) and third countries (3.6).

### 2.5.3 Main societal challenges

Societal challenges are high on the Belgian policy agenda in (see section 2.2.1). Consequently, all regions have specific strategies for research policies to deal with these challenges, also related to knowledge circulation.

One objective of the **Walloon** Marshall Plan 2.Green is to establish a strategy for R&D and investment defining cross-cutting strategic themes such as sustainable development. This should be implemented through stakeholder consultation and prospective analysis, and the launch of two common research programmes. To reinforce the concept of sustainable development across the competitiveness clusters, a specific call for projects 'Sustainable Development' will be launched. Out of the six priority areas defined by the new Marshall Plan 2.Green, one is fully devoted to employment-environment alliances. In addition to training actions on environmental jobs, another aim is to develop innovation in the environmental sector with the economic exploitation of research projects and financing of Technological Innovation Partnerships in the domain of eco-buildings. On the health side, the CMMI (Centre for Microscopy and Molecular Imaging) was launched in 2010. It brings together expertise of researchers and academics to provide an integrated and efficient pre-clinical imaging platform for the scientific community (budget of €14m).

In 2009, the government continued the **Flemish** Environment and Energy Technology Platform (MIP) established in 2005 with €5m that should support research institutes and companies to develop sustainable technologies and products. Furthermore all programmes of the IWT offer a 10% higher support for projects with a sustainability aim. In Flanders, especially the seed and venture capital for green innovation strongly developed in 2009 with increased investments in the so-called Ecology premium Fund and the participation of the Flemish Investment Fund in the Cleantech Fund (€10m). Since 2009, the challenge in the health care sector is also put on the agenda. In the field of health care, the Centre for Medical Innovation is starting up its translational research activities, closely involving industry and universities. In 2010, the Flanders' Care innovation platform was setup where stakeholders meet each other in a platform and match the industry with the care sector. Moreover, the In-HAM Foundation stimulates technology transfer and joint activities of academia and industry on the topic of assistive technologies.

In **Brussels-Capital**, the R&D policy focus over 2007-13 is on three key sectors: ICT, health and environment. According to the Governmental agreement for 2009-14, the targeted support to these sectors will be coupled with increased efforts to structure research and innovation support: direct support to companies, to sectoral centres,

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<sup>27</sup> E.g. via the IWT and Flanders Investment and Trade; for instance via the foundation of the Enterprise Europe Network

<sup>28</sup> Prime Horizon-Europe, National Contact Point

fostering of university grants, and impulse research programmes in these priority sectors. In particular, the project 'Greenbiz' related to the hosting and support of green companies starting their activities will be put in practice.

## **2.6 Overall assessment**

Belgium is a Federal country in which the regional (territorial) and (linguistic) community governments have full autonomy. This means that, in practice, research and innovation policy is formulated and implemented by five different governments. While there are regular consultations between policy-makers of each of the entities on specific issues (such as production of harmonised STI statistics, to some extent on space policy, fiscal incentives for R&D, etc.), structured co-operation between the regions and communities is less frequent. Indeed, in 2010, an Inter-ministerial Science Policy Conference was held just before the EU presidency of Belgium started. This was the first such meeting in nine years since the previous Belgian EU presidency (in 2001). However, the 2009, joint Government policy declaration for Wallonia and the French Community emphasised the need to enhance cooperation with the Brussels-Capital; and similarly, the Flemish Government mentioned bilateral cooperation with other Belgian entities in its 2009 policy note. Pending the approval of a joint Walloon-French Community-Brussels-Capital strategy expected in 2011, some specific actions have been taken, such as the co-operation agreement between the Walloon and Brussels-Capital green construction clusters. In addition, since 2010, the Walloon competitiveness poles are open to participants located in Brussels'. The fragmentation of the research efforts by the many universities at community level can lead to sub-optimal levels of research but the recent enforcement of the Bologna Process is adding consistency to the system.

Despite a general political commitment and growing government budgets for R&D, Belgian research intensity is not converging towards the GERD/GDP 3% target. The public measures are not sufficient to reach the 3% target as BERD is stagnating. Wallonia relies heavily on Structural Funds for its research funding. The region would need to source other types of financing to keep R&D at the current level, as this type of funding is phased out post 2013. At an aggregate Belgium level, the low public expenditure on R&D together with stagnating levels of BERD and a high level of public debt leaves little room for manoeuvre, particularly in the context of the global financial crisis. BERD is dependent on on a few big players, with decisions centres often abroad. In the last decade, many firms downsized their research activities; further downsizing will have strong negative impacts on the Belgian research performance. The R&D and innovation efforts have yet to bring sufficient new activities capable of ensuring economic development. All regions have extensive public support systems with a large variety of measures focusing on R&D cooperation and promoting entrepreneurship. The structuring of public-private research efforts is a good step towards embedding and attracting force for the large foreign R&D players.

While predominantly traditional industries are of high importance in the Belgian industrial system, the added value of these sectors is relatively low. There is a need to provide incentives to foster innovation efforts by limiting the tax burden and administrative red tape. The industrial structure of the country has actually favoured the emergence of 'islands' of innovation, which are not necessarily linked to the external world, thus impeding the diffusion of know-how in the economic fabric mainly composed by SMEs. Support to new indigenous R&D performing firms does receive and has received growing support over the last decade (especially in Flanders) but

remains relatively 'marginal' compared to the large share of funding channelled to the existing 'champions' of R&D expenditure. Top-down initiatives focused on promising domains that mobilise a higher number of smaller firms could be one answer. For instance, in Wallonia, over 80% of support provided through the competitiveness poles has been allocated to firms with less than 250 employees; and out of 205 firms supported through the poles, 43% had not received an R&D support previously.

In terms of knowledge production, refinancing of university research, structuring of research activities in public-private partnerships absorb a significant share of funds. In the French Community, the implementation of the development plan of the F.R.S-FNRS and its refinancing are good signs of a pro-active policy towards the improvement of the status of the researcher and the eventual refinancing of basic research. Attention for human resources is in general growing (see 3.1.2). Despite a relatively strong performance in terms of HRST in the workforce, the rate of new S&T graduates is well below the EU average and the number of researchers is low. When additional funding for research is realised the shortage of researchers will even increase. Apart from policies to improve the comparatively poor labour conditions for researchers, raising the number of candidates (by e.g. awareness and image campaigns), improving the success rate in S&T domains and easier access to the labour market for foreign graduates are areas for improvement.

Policy initiatives in favour of stimulating knowledge demand remain relatively limited; foresights, technology assessment and evaluations of policy measures could improve the articulation and strategic value of knowledge demand.

Societal challenges are increasingly targeted by research policy since the regional elections in 2009. The main evolution is the focus put on broad societal challenges similar to the Grand Challenges in Flanders and on environmental and health concerns in all regions and the willingness to increase collaborations between research actors in the academic and industrial sectors through the continuation of now well-established policies (competitiveness poles, 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 environment or health issues. In Wallonia, in addition to sustainable development and energy, health and ageing/quality of life are also priority themes.

**Table 2: Summary of main policy related opportunities and risks**

Domain	Main policy opportunities	Main policy-related risks
Resource mobilisation	<ul style="list-style-type: none"> <li>• Strong and coordinated effort to increase funding with explicit and public commitments to raise funds.</li> </ul>	<ul style="list-style-type: none"> <li>• End of significant Structural Fund support from 2013 onwards (Wallonia);</li> <li>• Risk of relocation of R&amp;D activities of the key foreign investors;</li> <li>• Under financing of basic research.</li> </ul>
Knowledge demand	<ul style="list-style-type: none"> <li>• Initial steps to explore pre-competitive procurement (Flanders);</li> <li>• Increased focus on society driven research.</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of structured foresight or long-term planning.</li> </ul>
Knowledge production	<ul style="list-style-type: none"> <li>• Structuring of research effort in strategic research centres (Flanders) and competitiveness poles (Wallonia).</li> </ul>	<ul style="list-style-type: none"> <li>• Non-attractive salaries &amp; prospect careers for researchers &amp; system fragmentation;</li> <li>• Lack of S&amp;T graduates, under utilisation of life long learning.</li> </ul>
Knowledge circulation	<ul style="list-style-type: none"> <li>• Additional measures that favour IPR;</li> <li>• Policy to attract &amp; retain researchers;</li> <li>• Enhanced participation in European R&amp;D programmes;</li> <li>• Enhanced support to SME-research collaboration.</li> </ul>	<ul style="list-style-type: none"> <li>• On-going under-investment in training and technology diffusion;</li> <li>• R&amp;D support focussed on R&amp;D champions;</li> <li>• Low S&amp;T diffusion in the economy mainly composed of SMEs.</li> </ul>

**Table 3: Main barriers to R&D investments and policy opportunities and risks**

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Institutional fragmentation and instability	First attempts are taken to strengthen synergies between Brussels-Capital, Wallonia and the French Community. However, given the current political situation and the institutional settings it is not foreseen that fragmentation will be dealt with to a large extent. On the opposite, a further regionalisation of research policies is likely to happen.
Strong reliance on a few large & foreign R&D players	The structuring of public-private research efforts in the form of strategic research centres, competitiveness poles, etc. is a good step towards an embedding and attracting force for the large foreign R&D players. The high tax burden and relatively high labour costs remain a negative element for conducting research in Belgium.
High public debt and financial crisis affect capacity of public sector	The various Belgium authorities have all increased public spending on R&D and are committed to continuing to do so. However, the public debt is increasing again after several years of political uncertainty at Federal level and this places a strain, along with the financial crisis and growing unemployment, etc. on public budgets available for research.
Low competitiveness of salaries for researchers & insufficient number of internationally prestigious research infrastructures	A range of measures is taken concerning researcher's conditions. However, there is no evidence yet that this is paying off in terms of reversing brain drain or attracting more HRST to work in research careers. Initial efforts are made to strengthen and coordinate Belgium efforts to develop and attract European level research infrastructures.

## 3 Interactions between national policies and the European Research Area

### 3.1 Towards a European labour market for researchers

The [Communication Better careers and more mobility: A European Partnership for Researchers](#) proposed by EC in 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;

- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of [EURAXESS – Researchers in Motion](#). Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

### 3.1.1 Stocks and mobility flows of researchers

With respect to human resources, section 2.2.3 provides recent data on the national labour market for researchers. Belgium shows a strong relative performance with a high level of education of the population and investments in higher education superior to the EU average. There is an imbalance in the demand and supply of qualified personnel in Belgium, notably in a context of increased specialisation. In 2008, 8% of the HRST was non-national. There are no statistics available on the total inward and outward flows of researchers in Belgium. When looking at the share of HRST in Belgian active population, the share of HRST is higher among the national citizens in the country (45.9%) than amongst the foreign population (39.9%). Looking at the share of foreign students at tertiary level, Belgium stands above EU27 average with 10.5% in 2007 (Eurostat). In Flanders, a recent survey of junior researchers (doctorates) and data of Flemish universities show that 17% of researchers are foreign; half of which comes from an EU country. The share of foreign researchers declines strongly with increased seniority. Only 5% of the professors are foreign, against about 30% of the postdoctoral researchers. Statistics are not available on the outward flow of researchers. Public discourse suggests that especially young talented researchers pursue their career in foreign countries due to a shortage of junior research positions exist (De Standaard, 2010a)

More general issues threatening the labour market as a whole are ageing and the phasing out of the ‘baby boom’ generation. To keep track with retirement rates, education will need to triple its output in 10 years (De Standaard, 2010b). Belgians stop working at a low age: less than 50% of the Flemish still work at the age of 55+. This will in time lead to severe lack of personnel, primarily in high-tech domains such as ICT (Herremans & Sels, 2010).

### 3.1.2 Providing attractive employment and working conditions

Belgium does not offer the best working conditions for researchers; but puts efforts in improving this by new policies and dedicated budgets. Belgium has 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. Given their high autonomy, the research institutions play a pivotal role in the implementation of the Charter. The main institutions signed the Charter, including the F.R.S-FNRS and the Rector’s Conference of the French Community, the Flemish universities and the Flemish Research Foundation FWO. The actions of the French and Flemish Communities are in line with the Charter and aim to improve the objectivity and transparency of decision making on recruitment and researchers career paths, including equal opportunities.

Uncertainty over a researcher's career concerns principally the first two steps in a researcher's life cycle, i.e. the PhD preparation and the post-doctoral training. Belgian researchers are particularly exposed to the risk of not being able to pursue or complete their training, since they depend on numerous short-term contracts, before being given a permanent position. Harmonising these types of career paths is complex, since the competence for various policies supporting researchers' careers is spread across the different authorities<sup>29</sup>. Certain measures have been taken; for instance, the F.R.S-FNRS obtained the necessary budget for a substantial increase in the number of grants. But even if the share of doctorates in the French Community would increase, the number of posts in the academic sector cannot be easily increased beyond the 400 permanent researchers of the F.R.S-FNRS in addition to academic posts in universities; this depends on the retirement rate. The Communities have also sought to simplify the administrative procedures related to the recruitment of researchers, via the Partnership for Researchers action plan drafted in 2010.

### Remuneration policies

The level of salaries of academic staff in research organisations are established by law for the federal scientific institutes (FOD Justice 2008), for the F.R.S-FNRS and for the Flemish research institutions. According to the report [Remuneration of Researchers in the Public and Private sectors](#) (EC, 2007) the total yearly salary average of researchers in Belgium is relatively high. Nonetheless, since tax levels in Belgium are amongst the highest in Europe, take-home pay of qualified employees is relatively compared to competing countries. Similar to the EC remuneration report, the Flemish government investigated the international attractiveness from the perspective of social security and working conditions. It appeared that Flanders was ranking average amidst other countries with high standards<sup>30</sup>, but especially in the private sector, wages were comparatively low. Remuneration is increasingly recognised as a barrier to retaining and attracting skilled labour. Therefore, a number of tax incentives were set up to decrease loan costs recently, specifically aiming at R&D knowledge workers. In the beginning, 65% of advance wage taxes for researchers at universities were reimbursed and the reimbursement (about €70m/year) was reinvested in research. Recently, a similar tax credit was introduced for researchers in the non-profit sector (50% reimbursement) and the for-profit sector (25% reimbursement for certain PhDs and 25% for masters in technical and applied sciences). The total effect of these measures is estimated to be about €70m as well.

As of 2007, part of the social taxes paid by public research institutions (about €31m in 2007) is reimbursed to the regional funds for scientific research (F.R.S-FNRS, FWO) in order to create new research mandates. In a memorandum addressed to the federal government in July 2010, the F.R.S-FNRS and the Council of Rectors of the French Community advocated for the extension of this support to technicians and for an increased rate of 100%.

### Equal opportunities

According to [She Figures 2009](#), Belgium ranks among the five worst performing countries for equal opportunities: there are only 38% of female Ph.D. graduates (EU27 average: 45%), 11% of Grade A positions were filled with women (EU27 19%) while at Grade B (for researchers higher than newly qualified PhD holders) only 25% are women against 36% in the EU27 average. Women in science tend to have a 32%

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<sup>29</sup> e.g. tax and pension are the responsibility of the Federal Government; training of the Communities.

<sup>30</sup> Benchmarks were Germany, the Netherlands, United Kingdom, USA and Slovenia

lower salary (EC, 2007). The only non-gender bias can be found for the propensity to be employed for highly qualified women and men. While in Flanders and in the French Community, more than 50% of the university students were women in 2008, only 22% of the academic staff was female in the French-speaking universities and only 15% in Flanders (CREF, 2010). In Flanders, the career progress for women seems to be particularly precarious with only 19.6% of female senior researchers against 53% of female junior researchers (VLIR, 2009).<sup>31</sup>

Measures aiming at a better reconciliation of work and life and thus may impact also the gender balance in research do exist: at Federal institutions, scientists can work part-time (50 or 80%), even if they are only temporarily employed<sup>32</sup>. Within the biggest university in the French Community (UCL) researchers can now define an 'individual academic project' adjusting their objectives (e.g. research vs. teaching) in accordance with their family situation. The Royal Belgian Institute of Natural Sciences has its own day-care centre that enables mothers to breastfeed during work time. An additional positive action is the [Sophia network](#), which sets up links between researchers who work in university and other centres, and links the women's movement with the scientific and academic spheres, also providing general information about women and gender. In Flanders, gender issues are on the policy agenda but are dealt with at institute level given their autonomy. Flanders adopted the OMC approach; the university council [VLIR](#) has set up an equality policy and working group to improve the position of women in science. Career breaks such as maternity leave do not impose a regulatory thread to the women's career. In the Collective Labour Agreement for universities several agreements have been made to reduce the negative effects of career breaks on women's research careers<sup>33</sup>. Nevertheless, pregnancy is still identified as a 'competitive disadvantage' (VLIR, 2008). Other gender issues identified are internal male-oriented systems and processes, due to the low transparency of the selection processes in universities.

### 3.1.3 Open recruitment and portability of grants

Academic staff in Belgium is employed by universities, which have large autonomy in their HRM policies. There is no national legislation that regulates the (access to) permanent research positions and that helps or hinders the openness towards non-nationals, but at Community level the following actions are planned with regard to the European Partnership for researchers such as simplification of procedures and better use of EURAXESS by opening job offers and improving the Belgian site. With a view to opening up recruitment, Belgian research 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. [EURAXESS Belgium](#) is a contact point for foreign researchers that potentially want to come to Belgium. The web portal offers information on funding opportunities, job offers, immigration procedures, social security and tax issues and other topics related to inward mobility

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<sup>31</sup> Sources: Wallonia (CREF, 2010), Flanders (VLIR, 2009); analysis by Technopolis Group

<sup>32</sup> Several studies have however identified the part-time job as the main barrier for career development. Part-time is typically taken by women.

<sup>33</sup> It is forbidden to terminate a permanent employment contract and prematurely terminate a fixed term employment contract during pregnancy or during the period in which the employee is on maternity leave, or during a period of six weeks after resuming work or a period of incapacity for work as a result of the birth or the preceding pregnancy following maternity leave.

The FRS-FNRS and FWO are 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. The grant shall be continued at the new research institution within the original terms and objectives. The objective of this scheme is to improve the starting conditions of researchers who accept a position at a research institution in a different country and to safeguard and validate investments that participating funding organisations have made for the work of these researchers. Grants of the IWT cannot be footloose: as it is the goal of IWT to strengthen innovation performance of Flanders, the research is principally done in Flanders. Only EU inhabitants are eligible for IWT grants.

### **3.1.4 Meeting the social security and supplementary pension needs of mobile researchers**

Several measures are taken in Belgium to improve the social security conditions of mobile researchers.

The general coordination of European social security system applies also to researchers. Thus other EU nationals can accrue pension rights when they are employed in Belgium. When the researcher retires inside the European Economic Area (EEA)<sup>34</sup>, every Member State where a person was insured for at least one year will have to contribute the accrued share. The transfer of accrued pensions for non-EU nationals will only be made if the person is a citizen of that country and if the country has a bilateral social security treaty with Belgium<sup>35</sup>.

Belgium offers social security to researchers that are employed by Belgian institutes or that have a grant from a Belgian institute: researchers working for a foreign institute or having a foreign grant are subject to the rules of that country. Foreign researchers participate in several (compulsory) insurance schemes, which provide for all people living or working in Belgium with a legal residence status. Researchers from an EEA or laterally connected country<sup>36</sup> are part of the normal employee insurance schemes, which are paid directly from the gross salary; both the employee (about 13% of the gross wage) and the employer (about 25%) contribute to this (Federal Public Service Social Security, 2008). As a result, those researchers do also benefit from the normal social security standards in Belgium, i.e. security for pensions, sickness and invalidity, unemployment, family benefits, accidents at work and occupational diseases. Researchers coming from other countries can only partially profit from social security rights. They pay a smaller social security contribution (4.7% of gross wage) but do not built up rights for unemployment or pensions. Other researchers thus loose all their accumulated rights for social security when going back to their own country.

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<sup>34</sup> According to EC Regulation 1408/71, which also applies to non – EEA nationals since Regulation 859/2003 entered into force.

<sup>35</sup> Algeria, Australia, Canada, Chile, Israel, Croatia, Morocco, the Philippines, San Marino, Tunisia, Turkey, the United States and the independent states that used to form the former Yugoslavia

<sup>36</sup> Social security treaties are signed with: Algeria, Australia, Canada, Chile, Japan, Philippines, India, Israel, Bosnia-Herzegovina, Kosovo, Croatia, Macedonia, Montenegro, Serbia, Congo, Morocco, San Marino, Tunisia, Turkey, Uruguay, USA, and South-Korea.

### 3.1.5 Enhancing the training, skills and experience of European researchers

Belgium has changed its training system to increase compatibility with other European systems. Reforms are made according to the Bologna process. The main barrier to a complete compatibility is the language; it is indeed regulated by law that PhD courses are offered in the community language only.

In the **French Community** Action plan in support of the European Partnership for Researchers, it is planned to perform a first evaluation of the doctoral schools system in 2010. The Community currently gathers 21 doctoral schools which span several universities and university academies. A common goal of the Doctorate Schools is to provide PhD students with additional training and courses. In Wallonia, the community decides on the list of Graduate Colleges based on a proposal of the F.R.S-FNRS. The F.R.S-FNRS promotes the development of inter-university, interdisciplinary and international graduate schools. Flanders also has a number of Doctorate Schools. The universities are responsible for these doctorate schools.

Enhanced training and building-up of capacity is a main theme of the **Flemish** Action Plan for Researchers. It includes 20 actions to be taken after 2010, aimed at opening the recruitment of researchers in EU context; improving the social security and work conditions of researchers; and improvement the training and skills of researchers.

Mobility schemes of the F.R.S-FNRS allow researchers of the French Community to move to a foreign country during his/her mandate and foreign researchers to stay for a limited term in the French Community. As highlighted in the F.R.S-FNRS strategic plan for 2010-14, a post-doctoral stay of a year abroad is becoming almost a prerequisite to get a permanent position in a research institution or university. A preliminary analysis based on the 291 post-doctoral fellows funded by the F.R.S-FNRS<sup>37</sup> showed however, that only 31% of them achieved a stay abroad of at least three months (37% for men, 24% for women) over the past three years (2006-08). The age and gender were factors influencing the mobility of postdocs. The F.R.S-FNRS therefore proposes to set up a new measure to stimulate the mobility of postdocs (additional salary), to help finance the maintenance of family life. The scheme would represent a budget of €400k per year.

Due to the lack of data, it is not known how many researchers (at various career stages) are temporarily mobile for career development purposes.

## 3.2 Research infrastructures

Research infrastructures (RIs) are a key measure in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so-called National Roadmaps for Research Infrastructures. This section assesses the RI national landscape, focusing on the national RI roadmap and national participation in ESFRI.

### 3.2.1 National Research Infrastructures roadmap

**Research infrastructures presented in the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI)**

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<sup>37</sup> Status as of December 31, 2007

Belgium takes part to RIs presented in the ESFRI roadmap at several levels, such as the Pan-European Research Infrastructure for NanoStructures (PRINS). This is the RI arm of the European Technology Platform ENIAC in the field of microelectronics. RI in this field are mainly in Germany, France and Belgium because of the strengths of particular institutes (IMEC in Belgium).

The coordination of RI lies with the federal government, but regional authorities are involved to increase the support, and decisions on participation seems to be a balancing act. In December 2008, the Federal Council for Science Policy (CFPS) decided to publish its opinion on the possibility for the Federal authority to take part to a restricted number of RI mentioned in the ESFRI. The Walloon F.R.S-NRS and Flemish FWO have organised a consultation in the academic sector in the Communities. The Federal Council is currently discussing the outcomes of this exercise and is looking for convergence between the proposals received. No information on its outcome is available yet. In its 2008 opinion, the CFPS however recognised the Nuclear Research Centre CEN-SCK and the nuclear research reactor MYRRHA, while the Accelerator Driven System mentioned in the ESFRI roadmap is under development in Belgium.

Flanders is co-operating on two ESFRI projects<sup>38</sup> and the Government is developing a priority list to select new co-operation opportunities (see 3.2.2). Flemish RI investments are significant: the Hercules Fund for large infrastructures; the Finance Fund for Paying of Debts and Investments (FFEU)<sup>39</sup> covers RI and invested €45m in the marine (VLIZ), energy and environment (VITO), ICT (Flemish Supercomputer Centre), medical (VRWB) and educational infrastructure.

According to the European portal on RI<sup>40</sup>, the Belgian RI provide essential resources, at a high cost. They are open to external researchers and have a clear European dimension and added value. Table 5 gives an overview of Belgian RIs.

**Table 4: Main Belgian research infrastructures**

Name	Main scientific domain	Category	Main institution
BEgrid	ICT, Mathematics	GRID computing facilities	BELNET, Brussels
Micro-nano experimental facility of the CeRMiN	Material Sciences, Chemistry & Nanotech.	UCL	Université catholique de Louvain, Louvain-la-Neuve (Wallonia)
Time resolved pico- and femtosecond emission and absorption spectroscopy	Life Sciences	Mass spectroscopy and other analytical facilities for life sciences	Division of Molecular & Nanomaterials, Chemistry Department K.U.Leuven (Flanders)
VAR - Veterinary and Agrochemical Research centre	Life Sciences	Animal quarantine stations & experimental farms	Veterinary and Agrochemical Research centre, Brussels
HADES	Physics and Astronomy	Underground labs	EIG EURIDICE, Mol (Flanders)
European Anglers' Alliance	Environmental, Marine & Earth Sciences	Other Marine RI	European Anglers' Alliance, Brussels
The BR1 Research Reactor	Energy	Nuclear energy RI	SCK-CEN, Mol (Flanders)

<sup>38</sup> i.e. LIFEWATCH and CLARIN

<sup>39</sup> Financieringsfonds voor de Schuldaafbouw en Eenmalige Investeringsuitgaven (FFEU)

<sup>40</sup> <http://www.riportal.eu/public/index.cfm?fuseaction=ri.result>

Name	Main scientific domain	Category	Main institution
VENUS: Zero Power Research Reactor	Energy	Nuclear energy RI	SCK-CEN, Mol (Flanders)
Nanoelectronics Laboratories	Material Sciences, Chemistry & Nanotech.	Micro- and nanotechnology facilities	IMEC, Leuven (Flanders)
Cyclotron Research Centre	Physics and Astronomy	Nuclear Physics accelerators & detectors	UCL, Louvain-la-Neuve (Wallonia)

### 3.2.2 National participation in the *ESFRI roadmap*. Updates 2009-2010

The Federal Council for Science Policy adopted in December 2009 a series of recommendations on the participation of the Federal Authority to 10 projects of ESFRI, including projects led by the EIRO forum members, and infrastructures in the fields of social sciences and humanities, biological and medical sciences, and environmental sciences. This participation will have to be coordinated by the federated entities; they involve federal scientific institutions and will require the financial support of BELSPO and possibly of other federal departments. BELSPO already supports the contribution of Belgium to the upgrade programmes of the European Synchrotron Radiation Facility (ESRF) and the Institute Laue-Langevin (ILL) and has expressed its interest for a limited number of preparatory phase projects funded via the EU FP7. The Belgian Nuclear Research Centre participates in the Jules Horowitz Reactor.

After the decision of the Flemish government to take part in two ESFRI files (see 3.1.1), the EWI department activated a process to follow-up on ESFRI activities in Flanders. An ESFRI committee was composed consisting of representatives from important actors. It shortlisted infrastructures that match Flemish competences in the following domains: humanities and social sciences (CLARIN, ESS, SHARE); nature and technological sciences (PRINS); environmental sciences (ICOS, LIFEWATCH); life sciences (BBMRI) and e-sciences (PRACE). The eventual selection of RI was planned for the end of 2009, but due to delays at several levels (e.g. the delay in the regulation of the European Research Infrastructure Consortium) no public information is available on this yet. The government decided to make use of the accumulated knowledge at the Hercules foundation on RI. The Commission Hercules-Science gave an advice to the Flemish government on 18 November 2009. The Commission recommended taking part to the following five ESFRI infrastructures (ranked on decreasing priority): (i) ICOS, (ii) PRACE, (iii) SHARE, (iv) ESS, and (v) LIFEWATCH. The Commission furthermore advised that the proposal of the other three infrastructures on the short list (BBMRI, CLARIN & PRINS) were not elaborated enough to be suitable for submission. A detailed plan and budget for the five selected infrastructures has been set up mid-2010. With regard to the second round of ESFRI, only two (Bsl4 and Euro-Biolmaging) of the 10 new additions to the roadmap could be of interest to Flanders, according to a survey by FWO. Together with the three less elaborated proposals (BBMRI, CLARIN & PRINS) these will be priorities for the second round of ESFRI (Hercules Foundation, 2010).

### 3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/

research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

### 3.3.1 Quality of National Higher Education System

#### Size and composition

The Communities are responsible for higher education, including institutional funding, competitive funding across universities and support to individual researchers. There are two separate university systems, consisting of (i) seven French Community universities (including two in Brussels) and 21 university colleges (*'hautes écoles'*); and (ii) six universities and 22 university colleges (*"hogescholen"*) of the Flemish Community, in Flanders and in Brussels.<sup>41</sup> Following the Bologna Agreement, linkages and synergies between universities in the Belgian language communities are growing. In order to create more critical mass and to enable students' mobility between universities and university colleges they are now structured into three academies (Wallonia + French Community) and five associations (Flanders)<sup>42</sup>. Since 2007 the French Community is allocating funding directly to academies in the framework of the Concerted research actions and the Special research fund. Academies are responsible of distributing funds through their members and to organise collaboration between them.

Total HERD in Belgium rose by almost 10% between 2002-07 with, however, regional variations: a small decline in Brussels-Capital from €232m to €214m, constant in Wallonia at €305m and a significant increase in Flanders from €519m to €638m (Ziarko et al. 2010). According to Eurostat, 11.1% of HERD was funded by the business sector in 2007 in Belgium, in comparison to 6.4% in the EU27. In 2008, 30.1% of the population aged 20-29 was participating in tertiary education in Belgium (EU27: 29.8%), but only 4.8% in science and engineering fields (7.2% in EU27)<sup>43</sup>.

#### Mission of HEIs

The main aim of the community funding for research at universities is to realise high quality fundamental research and provide tertiary education. HEI policy is not thematically organised. Instead, the communities leave the thematic choices to the researchers and focus on the quality of scientific research to support. There are three further principles to which the communities contribute, namely: promoting inter-university cooperation; promoting international mobility of researchers; and including research in the European Research Area. In Flanders the mission of the HEIs can be summarised as performing scientific education, research and fulfilling a social function<sup>44</sup>. The allocation of funds is done on the basis of the number of students and full-time equivalents researchers. In Flanders, a share of the funding for university is also distributed based on an allocation key, (the so-called BOF key). The lack of competitive funding between universities is nonetheless regarded as a possible impediment to reach a level of excellence in knowledge production.

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<sup>41</sup> It is expected that the number of universities in the French-speaking Community will be further reduced to four over time, which will absorb other HEI as well (e.g. the higher institutes of architecture).

<sup>42</sup> Wallonia: Louvain, Wallonie-Bruxelles and Wallonie-Europe; Flanders: Leuven, Antwerpen, Gent, Hasselt, Brussels

<sup>43</sup> Further information on the higher education system is provided in section 2.2.3.

<sup>44</sup> By decree: Gedr. St. VI. R. 1994-95, 615, nr. 3, 5. Art. 3 of decree (B.S. 31 Augustus 1994)

## Research Performance

The performance of Belgian universities is high: there is a high publication output, often in international collaboration (see Section 2.4.1).

The quality control of Belgian research performed is the responsibility of the Communities. In **Flanders**, systematic reviews are carried out by the NVAO and VLIR, but structural review of universities is however strong focussed on education. Belgian universities have strong autonomy and quality control is followed up by the university management. In the **French Community** parliamentary decrees condition the funding and acknowledgement of research institutions, by a quality evaluation process. Besides self evaluation involving external experts, the decrees add two more steps to the evaluation process: the publication of results and an obligation of follow-up of the recommendations formulated by the external experts. The objective is to improve the teaching practices by highlighting good practices, shortcomings and problems to be solved and by providing policy recommendations in order to increase the global quality of the higher education system in the Community.

## Language issues

The focus on the use of French and Dutch languages in the research grant systems for PhDs can be regarded as a barrier to mobility. The OMC peer-review of Belgium (Verbeek, 2007) highlights that language restrictions hamper 'rejuvenation', as it is a barrier for inward mobility. Therefore the research system is not yet internationally oriented: in Flanders for instance, most jobs are still announced in regional media only; however, increased use of EURAXESS is observed. A review of the Flemish STI system (Soete, 2007) strongly suggested the abolition of the language Flemish Parliament Act; the Flemish Council for Science and Innovation recommended a less strict Flemish Parliament Act. However, using English in education is a sensitive matter in the country, as the language legislation in Belgium is well-defined and of public order, and it is an important cultural discriminating factor between the different Communities.

### 3.3.2 Academic autonomy

Universities are independent organisations and their legal status ensures their autonomy. They are responsible for both their research and education strategy<sup>45</sup>, they hire their own staff and award diplomas independently within the regulatory limits. Rectors of universities have to be full professors and thus fully employed by the university. In the French Community the rector is appointed by the Government for a term of four years based on a list of three full professors presented by the Academic Council. In Flanders, the academic personnel of the university chooses the rectors.

### 3.3.3 Academic funding

According to the Federal Office for Science Policy, institutional support for universities represented 24% (€2,344m) of the total public funding for R&D in 2008, funding for scientific institutions 14% and project based funding 11%. The latter is allocated to universities via the research funding agencies. Apart from these mechanisms, 18% of funding is in the form of research action programmes, which are open to public research and/or private research agencies and include individual grants for researchers. 11% is meant for industrial research. 15% of the government

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<sup>45</sup> However, in Flanders they are not fully autonomous in all decisions of educational matters

budget is dedicated to the participation in international research programmes (mainly space). Both in the French and the Flemish Community, the number of students increased faster than the academic staff. Discussions on the financing of the university system are therefore ongoing.

Almost 100% of budgetary credit allocated directly or indirectly to research by the French Community goes into infrastructures and the personnel in universities. Funding of university research is provided essentially through the basic funding of universities, which is distributed among the academic institutions based on the 'weighted number of students meeting the conditions for granting subsidies'. The share of research activities in the basic operating funds of universities is estimated at 25%, based on an agreed norm for academic institutions. In 2008, €147.4m of the operating funds were spent on research by universities, amounting to 54% of the budgetary appropriations for research in the French Community, not taking into account funds from other Belgian authorities, EU or private sources. Additional competitive funding is channelled through the two main research funds (FWO-Flanders and F.R.S.-FNRS). The budget of the F.R.S.-FNRS is growing (€89.4 in 2008). Since 2007 the French Community is allocating funding directly to academies in the framework of the concerted research actions and the Special research fund. Academies are responsible of distributing funds through their members and to organise collaboration between them.

As of 2010, universities of the French community have received an additional financing of €30m in eight years according to the Minister in charge of scientific research in the French Community (2008a, 2008b). The university colleges were refinanced by €4m as of 2009 (+1% of their budget) and the accredited research centres by €2m to reach a total regional support of €15m per year. Competitive funding can also be obtained through the Walloon programmes of excellence. The most recent programme was launched in the area of bio refinery (TECHNOSE) and will last till 2012.

In the Flemish community, the universities are publicly financed via four flows of funds. The first – the base funding – is connected to operational activities and directly linked to the tuition fees paid by students. It is approximately half of the total university revenue. Each research university receives a formula-based lump sum (block grant) for teaching and research. The lump sum allocation is based on measures of volume (student numbers, diplomas), prices (rates per student) and historical considerations. The allocation consists of a *teaching* component and a *research* component, but this distinction is for calculation purposes only. The 'second' and 'third flow' are direct funding from academic policy. The total funding for the academic policy in Flanders in 2010 was €300m, a gradual decrease after €311m in 2009 and €331m in 2008<sup>46</sup>. The 'second flow' consists of all public funding for fundamental research, including grants and programmes for fundamental research. Most notably are the BOF (€137 million in 2010), FWO (€148 million in 2010) and contributions from the Community-level, and the contribution of the federal level (IUAP). The 'third flow' is funding for applied research, most of which comes directly from the Minister of the Flemish community or from programmes and schemes of the innovation agency IWT (in total about 90 million euros including SBO (strategic basic research), TETRA fund, agriculture research, applied biomedical research, post-doctoral research fellowships), or the industrial research fund IOF (€17m) – as well

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<sup>46</sup> the so-called "Beleidsondersteuning en academisch beleid"

as many smaller measures. The 'fourth flow' of funding consists of a heterogeneous mix of revenues from activities such as contract research, contract teaching, consultancies, research commercialisation, endowments and renting out university facilities. The funding in the Flemish Community is a bit more competitively organised than in the French Community, because of the division of BOF and IOF using a 'division key' based on in- and output indicators.

### **3.4 Knowledge transfer**

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](#) in 2007, the EC Communication "[Improving knowledge transfer between research institutions and industry across Europe](#)" was issued, highlighting the importance of an effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs. This section assesses the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

#### **3.4.1 Intellectual Property Policies**

The Belgian Regions fund knowledge transfer offices (so called interface structures) at universities and other HEI located on their territory. The joint execution of research projects appears to be the most direct method for the transfer of technology between universities and industry, so that the knowledge and expertise present in the universities can be valorised as far as possible for the benefit of the regional economies. Other types of services are also of mutual benefit to universities and companies, like the sharing of equipment, student work in companies, etc. Interface structures have the mission to stimulate such external contacts of universities.

An employee of a Flemish university or research institute is obliged to comply with provisions laid down by the employer with regard to patent rights and copyrights, with due observance of the legal provisions. If the invention is the work of someone employed by a university, college or research institute, the right to apply for a patent falls to the organisation in question. Academic researchers have the duty to report important finding to their employing university. An employee who creates a possibly patentable invention is obliged to report this in writing to the employer and to transfer all rights to the employer in whole or in part if so requested, in order to enable it to make use of them (Flemish Government, 1998). The university may agree to transfer the right to patent to a third party (usually the cooperation partner) beforehand, or apply for the patent itself and only at a later stage transfer the IP rights or grant licences under them. In general, therefore, inventions that are made via the universities belong to the university. Patent applications, and their financing, are the responsibility of the universities. Several universities have set up a patent fund (sometimes a revolving fund). When exploiting a research result, the university has the duty to protect the opportunity to use the results for (further) scientific research and education. The researcher has the right to be informed on the status of exploitation of the research findings and a reasonable share in the exploitation revenues. A lack of knowledge on IPR due to a deficiency of good communication and awareness was signalled in Flanders (VRWB, 1999). However, since the mid-2000s, universities have increased professionalisation of such 'valorisation' activities. Universities have set up Knowledge Transfer Offices (KTO) that provide information and support on all aspects of IPR.

Since 1998, the Walloon government also supports the reinforcement of the university-industry interfaces with specialised personnel in charge of fostering the valorisation of research results in industry. The DGO6 provides financial support to a total of 11 persons in charge of valorisation at the universities and university colleges. These persons usually work within the research management department of their institution. They are in charge of identifying the potential to exploit research results showing a commercial interest as well as to manage the intellectual property strategy. Interface support is since 2006 coordinated as a key action of the technological promotion agency (AST), which is bringing together more than 50 structures acting as intermediaries between the industrial and the academic world.

The Brussels-Capital region supports the technology transfer offices (called “interfaces”) of three universities as well as the [Indutec](#) interface that gathers the four university colleges of the region. Each interface structure receives a contract that defines missions and duties, and reports to the region according to this contract. The regional authority deals with funding application of interface personnel whilst the universities and university colleges themselves carry out the work with interfaces. In terms of IPR, the universities as employers own the rights of any patentable invention coming out of the research of their employees.

### **3.4.2 Other policy measures aiming to promote public-private knowledge transfer**

Since the 2000s, funding in demand-oriented R&D (e.g. SBO-programme) and user-oriented R&D (e.g. VIS-programme) has increased, signalling the increased importance of ‘relevance’ in addition to ‘quality’ of research. Especially programmatic R&D funding of public-private consortia has become a much used policy measure.

#### **Involvement of private sectors in the governance bodies of HEIs and PROs**

According to Eurostat data, 11.1% of HERD was funded by the business sector in 2007 in Belgium, in comparison to 6.4% in the EU27. HEIs are independent bodies. Statutes of universities differ on the involvement of private sector in governance, but in all universities involvement is possible as long as the autonomy is ensured. This type of regulation does exist at any university although slight differences exist. The Governance Boards of the French-speaking universities counts seven representatives from the social, economic or political domain.

#### **Inter-sectoral mobility**

Quantitative evidence is not available on inter-sectoral mobility. Nevertheless, remuneration issues probably hamper mobility from public research institutes to the private sector. The remuneration package of senior academic personnel from public institutes differs significantly from that of the private sector. On average the package of an academic teacher is at 75% of the median of the general market. Professors reach the remuneration ceiling quite quickly; the maximum remuneration is at 85% of the median value of the general market and decreases to 60% for first-class academics. Moreover, trends are negative: the evolution of the wages of researchers did not change significantly over time, while the private market wages increased slightly more than the inflation rates. Inter-sector mobility is stimulated indirectly via the increased usage of programmatic funding for Competitiveness poles in Wallonia and Excellence Centres / Competence poles in Flanders. These poles or centres include public-private interaction to increase inter-sectoral mobility. In order to support inter-sectoral mobility, the Baekeland Mandate in Flanders offers funding for projects at the interface of companies and knowledge institutes. The Policy Note

2009-14 signals mobility as a weakness in research careers in the Flemish system. The Charter for Researchers and the Partnership for Researchers are identified as turning points for the Flemish policy.

### **Promoting research institutions - SME interactions**

The interaction between research institutions and SMEs is a longstanding policy issue. Since the end of the 1990s SMEs receive an ever increasing attention in innovation policy. Especially IWT dedicated a lot of efforts to improve the outreach to SMEs. In the first period this led to the growth of a number of measures such as the SME-programme, the VIS-scheme and the R&D Company projects. The last three years (2007-10) the accessibility of grants - from a user perspective - obtained a new focus. The set of measures was simplified in order to avoid administrative burden keeping SMEs at a distance. A number of facilities for venture and risk capital are also in place in Flanders (see section below). Moreover, intermediary platforms stimulate networking and learning effects. The Policy Note 2009-14 pays – like all policy documents in the last decade – a lot of attention to SMEs. The main message of the policy note is again aiming on simplification of the set of measures.

In Wallonia, the AST was created in 2006 following an evaluation of the network of intermediaries that concluded that the transfer and diffusion of knowledge and technologies did not sufficiently meet the needs of regional businesses. Given the need to improve technology diffusion, the missions of the AST are to lead a successful system of technology transfer in the form of a publicly-funded network, aiming to raise the level of technical innovation among Walloon businesses. It needs to give particular attention to non-innovative firms and contribute in this way to the development of a competitive knowledge-based market-place. The AST managed network is made up of eight organisations, four of which are networks themselves, and all of which existed before the creation of the agency. The AST also manages the technological innovation voucher, which supports SMEs for using the services of research centres.

### **EU cohesion policy**

In order to support the diffusion of knowledge into the economy, the Walloon region co-finances with the help of ERDF support schemes for SMEs since 2009, the most important of which is RETECH, an industrial research grants available to firms that covers between 50%-80% of eligible costs depending on the type of company and the characteristics of the project. Other grants available include: the technological innovation vouchers (budget of €16m) promoting collaboration with a competent partner; ACQUITECH to support the external acquisition of patents, licenses and know-how through reimbursable advances; STIMULE to foster SMEs to exploit research results through a reimbursable advance; and for the province of Hainaut (Objective 1) there is a dedicated measure: FIRST Enterprise Doctor to enable SMEs to hire research staff. 50% of the salary of the researcher is covered for two years.

Among the EFRD projects in Flanders are two substantial projects on renewable energy within the context of the Interreg IVA-programme Flanders-the Netherlands 2007-2013: (1) *Bio Base Europe*: construction of a polyvalent test installation for industrial biotechnology and bio-refining in Ghent, plus a training centre for process operators in Terneuzen – co-financing of €7m; and (2) *Hydrogen region Flanders – Southern Netherlands*: creation of a trans-border hydrogen region, support for technological applications of hydrogen – co financing of some €4m.

### **Spin-offs**

The propensity to launch new businesses in Belgium is particularly low and is associated with a lack of equity and risk capital. The latest indicators highlight an improvement in the use of venture capital in Belgium compared to the low point reached in 2005 (0.10% of GDP in 2008 against 0.04% in 2005) but this is still rather below the EU-15 average (0.13% of GDP in 2008). Nonetheless, the use of early stage venture capital is greater in Belgium than in the EU-15 in 2007 and 2008<sup>47</sup>. The need to boost entrepreneurship, in general, and the rate of creation and growth of high potential knowledge-intensive enterprises is fully recognised by the governments of all Belgian authorities. Initial support for incubators and business innovation centres and financial measures has shifted towards a more strategic emphasis on fostering commercialisation of the academic research base (FIRST schemes in Wallonia, various measures in Flanders), support to entrepreneurship (Flemish and Walloon entrepreneurship action plans) and access to finance.

In addition to the existing KTOs at universities (see 3.4.1), Flanders offers a broad package of stimulation of technology transfer, valorisation and spin-offs. Most of the stimuli are given by the innovation agency, via a variety of measures including TETRA, the Research mandates of IWT. Moreover, primarily PMV facilitates the availability of sources for spin-offs and start-ups. PMV offers a number of measures that grant funds or share risks in innovation, e.g. PMV Innovation Mezzanine, ARKimedea, and the Win-win loan. Also, there is a number of financial intermediaries that source funding for start-ups. [BAN Vlaanderen](#), the Business Angels network in Flanders, is a matchmaking platform between starting or growing entrepreneurs seeking risk capital and informal private investors. The latter offer not only money but also their own know-how, experience and contacts.

### ***3.5 Cooperation, coordination and opening up national research programmes within ERA***

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different measures and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy measures across the EU, all part of the drive to create an integrated ERA.

#### **3.5.1 National participation in intergovernmental organisations and schemes**

The Federal authority is competent for the data exchange networks operating among scientific institutions at national and international level, the research and public service activities of the ten federal scientific institutions, space research and Belgium's participation in the activities of international research infrastructures.

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<sup>47</sup> A study commissioned by the Walloon Federation of Enterprises (UWE) in 2008 highlighted a double weakness in terms of access to finance for innovative companies: on one side, during pre-seed phase (i.e. before the launch) and, on the other side, for big projects requiring the leverage of amounts between €1.5m and €10m. Under this range, business angels and investment funds are present, and above this range, international markets take over. According to this study, Wallonia needs precisely investments between €1.5m and €10m to transform spin-offs into bigger companies.

Belgium is one of the founding member states of the CERN (European Organisation for Nuclear Research) and the European Space Agency (ESA). The Federal Science Policy Office is in charge of a number of intergovernmental research entities<sup>48</sup>. In 2008, €257m from the appropriations for R&D of the federal authority were dedicated to space research programmes and organisations (+€120m compared to 2005), €25m to other Belgian contributions to international organisations, institutions and associations (a stagnating since 10 years) and €61m to other international programmes and projects (constant slow increase since 1997).

The Belgian participation in Framework Programme is very promising. According to the third FP7 monitoring report (EC, 2010) covering the years 2007-2009, Belgium is ranked seventh among EU countries for the number of participants and first for the success rate (30% in 2009). By the end FP6, financing acquired by Belgian organisations stood at €700m (figures from the NCP Wallonie FP6), out of which 50% went to Flanders, 26% to Wallonia and 24% to Brussels-Capital.

The three regions provide subsidies for research projects carried out in international teams, either to support the preparation of such projects through lump-sum grants, or in the form of an augmented subsidy rate for projects with international participation. The Flemish Contact Point (VCP) [now Vlaams Europa Platform], aims at an increased participation to FP7; FWO finances the best 'losing' proposals submitted to the ERC; and FWO and IWT take part in several ERA and OMC networks. The Flemish Government co-finances 'Article 169-initiatives' and two Joint Technology Initiatives (JTI). The Walloon region fosters and finances the participation of labs and research centres to several international programmes such as FP7, EUREKA and COST. Belgium has a particular high participation rate in EUREKA. The total budget of Belgian participations in completed EUREKA projects was €358.3m with 357 organisations participating (127 SMEs, 38 research institutes, 66 universities).

### **3.5.2 Bi- and multilateral agreements with other ERA countries**

The F.R.S-FNRS has bilateral agreements with sister organisations within the ERA in order to facilitate the circulation of researchers, build excellence poles and support the creation of new research areas. These collaborations are not thematically oriented. Almost half of the bilateral agreements also involve Wallonia-Brussels International, the public administration in charge of internal relations for Wallonia-Brussels<sup>49</sup>. A declaration of intention for a strategic alliance between Flanders and the Netherlands in RTD activities was signed in May 2004 and has led to the co-operation on language technology (STEVIN) and nanoelectronics (Holst Centre) (see further in 3.6.1.).

### **3.5.3 Other measures of cooperation and coordination between national R&D programmes**

As of November 2010, the Walloon region takes part in eight ERA-NET projects (incl. one as coordinator), and the F.R.S-FNRS in five projects. Flanders so far takes part

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<sup>48</sup> Princess Elisabeth Antarctica, European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), European Synchrotron Radiation Facility (ESRF), European Organisation for Astronomical Research in the Southern Hemisphere (ESO), European Molecular Biology Laboratory/Conference (EMBL/EMBO/EMBC).

<sup>49</sup> Bulgaria: Bulgarian Academy of Sciences; France: French Ministry of Foreign Affairs; United Kingdom: British Academy – BA; Royal Society – RS; British Council; Hungary: Hungarian Academy of Sciences – HAS; Italy: Italian Ministry of Foreign Affairs; Luxembourg: National Research Fund – FNR; Poland: Polish Academy of Sciences – PAN; Romania: Romanian Ministry of Science and Technology; Romanian Academy of Sciences; Czech Republic: Academy of Sciences of the Czech Republic – ASRT.

in 24 ERA-NET projects, through the EWI department, IWT, FWO, and several other entities. These projects are at different development stages but globally enter the third level of cooperation and coordination (elaboration of joint activities). Projects are financed based on calls for proposals open to universities, accredited research centres and companies. The Walloon government agreed in 2008 upon its participation in the EUROSTARS research programme to dedicate up to €1.5m to Walloon SMEs. Flanders is also participating in EUROSTARS: project subsidies for participating in the EUROSTARS programme can be obtained from IWT.

With respect to Joint Technology Initiatives (JTIs), Belgium takes part to ARTEMIS (IMEC, DSP Leuven) and ENIAC<sup>50</sup>. Moreover, Belgian actors are involved in the JTI Clean Sky, as well as member of the European Technology Platform ISI (The Integral Satcom Initiative).

### 3.5.4 Opening up of national R&D programmes

Opening up of R&D programmes is slowly emerging in Belgium, though most R&D programmes are still relatively closed. Opening up of programmes is mainly visible at Federal level since the international dimension of research is its responsibility. In addition to the federal programme in space research and a few other programmes, which are international by nature and together account for more than half of federal R&D budgetary spending, all federal research programmes are open for participation of research teams of other Member States (with a limit of 50% funding). All regions provide subsidies for research projects carried out in international teams, either to support preparation of such projects through lump-sum grants, or in the form of an augmented subsidy rate for projects with international participation.

In Flanders, the programmes for talented researchers provided by FWO are open for foreign researchers. Furthermore, several R&D programmes of IWT such as SBO (up to 20% of the funding) and the excellence centres/competence poles are open to foreign co-operation. Given IWT's mission to strengthen innovation performance of Flanders, the research needs to be performed in Flanders, unless there is a Flemish benefit of including a foreign partner. The fund for financing of non-oriented research in universities (BOF) can be used for participation in international research projects.

In Wallonia, two existing subsidy schemes – RIT-Europe for companies and FIRST-Europe – have been broadened in order to incorporate the possibility for researchers in companies to work on projects in cooperation with EU partners. Nonetheless most of the Walloon programmes remain open to Walloon stakeholders only. There is only a recent trend to open some programmes to partners of other Belgian regions.

## 3.6 International science and technology cooperation

In 2008, the European Commission proposed the [Strategic European Framework for International Science and Technology Cooperation](#) to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies

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<sup>50</sup> ENIAC is a large scale, applied-research initiative mobilising European efforts in the technology-intensive electronics sector. The main goal is to define the research and innovation priorities to ensure a truly competitive nanoelectronics industry in Europe

worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

### 3.6.1 International cooperation

The Federal Science Policy Office is responsible for coordinating the preparation and the follow-up of the scientific part of the bilateral agreements for economic, industrial, scientific and technological cooperation that Belgium concluded with a number of third countries (China, Russia, and Vietnam). Since 1997, Belgium concluded an agreement with Argentina in the space activities area. The S&T cooperation can take various forms: information exchange, exploratory expert mission, common research and demonstration or projects for economic exploitation of results. The federal level (Belgian Development cooperation and BELSPO) also supports the Belgian Congolese research consortium forming the [Congo Biodiversity Initiative](#). This initiative is largely thought as capacity building and research. It brings together three national Belgian research institutes and the University of Kisangani of the D.R. Congo.

The Walloon region's external relations are articulated together with the Brussels-Capital region and the French Community under Wallonia-Brussels International (WBI), a public administration in charge of supporting the regions' development with international partners. Mainly oriented towards exporting the goods produced in the Walloon and Brussels regions, it has also activities in the research and higher education sector. It has signed a series of bilateral agreements for scientific cooperation. The main trend is to sign agreements with geographically close and French-speaking countries, but Canada is an important partner as well as China, Japan, Chile, Russia or Brazil, which are equally Walloon scientific partners.

In the French Community, the F.R.S-FNRS has established a number of bilateral agreements with Taiwan, Mexico, Japan, United States, Korea, China, Brazil, and Argentina

In Flanders, public international cooperation is being executed via various channels. First, Flanders organises international programmes, structural or ad hoc policy initiatives with (priority) partners, especially bilaterally with The Netherlands and the Grand-Duchy of Luxemburg; with specific EU countries or regions (direct link or indirectly, e.g. through EU Interreg IV initiatives). Second, bilateral research cooperation exist with Vietnam, Québec, Ecuador, China and South-Africa. Third, cooperation projects were set up for researchers with China, France, Taiwan, South Korea, Japan, Bulgaria, Poland, Brazil, Argentina. Fourth, there is Flemish public support to initiatives of / access for Flemish STI-actors: e.g. Big Science projects: CERN-CMS & CERN-ISOLDE (Genève); ESRF-DUBBLE (Grenoble); EMBO (Heidelberg); ESO, (Munich-Santiago); Mercator telescope (La Palma), etc. Fifth, there are technological Attachés in important cities (Tokyo, New York, Peking, Los Angeles, New Delhi, etc.) that focus on 5 STI-fields such as energy, nano-material.

### 3.6.2 Mobility schemes for researchers from third countries

To improve inward mobility, the scientific visa directive<sup>51</sup> for third country researchers is implemented at federal level. At the federal level, BELSPO offers since 1991 postdoc fellowships for highly qualified researchers from a dedicated group of countries outside the EU and other industrialised countries for 18 months. From 1991

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<sup>51</sup> Cf. Com guideline 2005/71

to 2005, this programme targeted researchers from Central and Eastern Europe, since 2006, newly industrialised countries as well as African and Caribbean countries were added. The latest additions were India and Vietnam in 2009 and China in 2010. These fellowships are co-funded by the Marie-Curie Actions within FP7. The number of granted fellowships varies between 20 (1991), 41 (2000), and 29 (2010). In Flanders, the Odysseus programme is the 'brain gain programme' to bring excellent researchers to Flanders – from no matter what country. The reward is a research grant of up to €1.5m per year.

## 4 Conclusions

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### 4.1 Effectiveness of the knowledge triangle

Belgium is home to three knowledge triangles:

- In Flanders, the policy domains of research, innovation and education have been gathered with the merger in 1980 of the Flemish Region and the Flemish Community at their setup and following the split of higher education policy in Belgium towards the Communities following the 3<sup>rd</sup> state reform of 1988; other policies at federal level influence this triangle;
- Industrial research & innovation policy in **Wallonia** and education and basic research within the **French Community**; other policies at federal level influence this triangle;
- Industrial research & innovation policy in **Brussels-capital** and education and basic research within the **French and Flemish Communities**; other policies at federal level influence this triangle.

The Belgian decentralisation of R&D&I policy and the allocation of education to an incongruent entity challenge the functioning of the knowledge triangle(s). The coordination between the communities and regions is low, especially between the Flemish and French Communities (see 2.1). Since 2009, coordination between Wallonia and Brussels Capital intensified. Given the fragmentation, synergies at regional level tend to be moderately high, most notably in Flemish innovation and research policy, as those policy fields are governed in one policy field (EWI) with the EWI department, and the IWT, FWO, PMV and Hercules agencies. Education policy is to a large extent aligned with research, and – to a lesser extent – with innovation policy. Other policy domains that fund research activities have connections, but are aligned to a smaller extent. As highlighted in a recent report from the CWPS (2010), the division of responsibilities renders it difficult to fund interdisciplinary projects, since the different authorities within the same region have different criteria for selecting and evaluating applications. In addition, the CWPS highlighted that the separate funding authorities for basic and applied research is not consistent with the increasingly porous border between these two types of research.

The policy agenda in **Flanders** is quite comprehensive and rather clear and stable for the longer term. An agenda with broad societal challenges has been drafted in the Flanders in Action initiative (Pact 2020). STI policy agendas are aligned to the Pact and will also lead to the alignment of different policy domains. HEI policy is linked to strategic research initiatives which are in turn linked to R&D and valorisation schemes. A challenge is still the weak link between research and the business sector. Thus, R&D policy is flanked by policy initiatives aiming at technology transfer,

the stimulation of entrepreneurial activities, etc. Higher education is partially a separate policy domain. In the coming years the Flemish HEI will be thoroughly restructured following a 2010 decision of the Flemish government. The academic curricula of the university colleges will be merged into six universities and five associations. .

Following regional elections in 2009, the **Walloon and French Community** governments were formed on the basis of a common political strategy. The strategy is translated in operational terms by the Marshall Plan 2.Green with a budget of €1.6b for the period 2009-14. The plan retained the 3% objective and aims to improve business competitiveness by greater integration of research and industry. The plan extends and reinforces the plan implemented during 2006-09. The addition of 'Green' underlines the new orientation to better integrate 'sustainable development' as a cross-cutting 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. 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 cross-cutting themes e.g. sustainable development, renewable energy, new technologies, longer life, etc.

The Brussels-Capital [Regional Innovation Plan](#) covers the period 2007-13. The objective is to increase the regional R&D capacities by focusing efforts on three promising sectors: ICT, health and environment. A 2009 ordinance adapted the legal basis for regional R&D and innovation measures to the EU's State Aid Framework for research and innovation.

Quality control of higher education institutions is performed by the Communities. Limited competitive funding for universities impedes research excellence as funding is allocated mainly as block grants on the basis of the number of students and FTE researchers. On the other hand, regional grants are awarded to research organisations or enterprises on a competitive basis through calls for projects..

**Table 5: Effectiveness of knowledge triangle policies**

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	Refinancing of F.R.S FNRS & new development plan Implementation of European Partnership for Researchers Launch of research centres (e.g. CMI in Flanders, WELBIO in Wallonia)	Strong policy commitments and participation in European initiatives. The implementation of the European Partnership for Researchers makes it easier to attract human resources. Low funding for researchers is a weakness. Low public funding for research is a weakness; Flanders has by far the largest share. . BERD is at an adequate level, but it is largely depending on a few big foreign players. The opening up of new research centres leads to competences in several areas, assumingly attracting both researchers and companies. Other spearheads, such as 3 of the 4 Flemish PROs (IMEC, VIB, IBBT) faced a smaller public budget in 2010 compared to 2009.
Innovation policy	Increased funding for SMEs & set of measures tailored for SMEs Strengthening of research industry collaboration (Wallonia: Technology innovation partnerships; Brussels: Strategic platform; Flanders: Spear head policy) Renewal of Flemish Innovation Pact & alignment with a mid-term innovation policy (2009-14) Launch of the programme	SMEs are a driving force of the Belgian economy, but their level of innovativeness is still under pressure (CIS survey 2009). Particularly Flanders puts a lot of efforts in policies to increase innovation in the sector in an attempt to link R&D&I policy to the actual economic structure. However, still not many SMEs use this support. R&D policy remains focussed on R&D champions. In order to strengthen its innovativeness Belgium keeps initialising initiatives on the verge of academia and industry. This resulted in the start of partnerships and platforms in 2010. In Flanders, the Flanders in Action (ViA) plan is being implemented with a focus on Flemish strengths in innovation and societal challenges, similar to Grand Challenges. One of the seven breakthroughs of the ViA future plan is oriented towards

	Creative Wallonia	innovation: "Innovatiecentrum Vlaanderen". Strengths of ViA is alignment of all policy domains on several goals
Education policy	Further implementation of the Bologna process Continuation of merger of HEIs Drafting of a joint action plan of the ministers of research and education in Flanders. Main missions are now aligned with the European Partnership.	The further implementation of the Bologna process leads to higher compatibility with other EU countries and thus to lower barriers for mobility. The joint action plan for research and education also aims at removing barriers for mobility. However, language restrictions in the regions and remuneration levels of researchers are de-facto barriers. Because of coordination issues between research and education, there is slightly more attention paid to the current skills mismatch in Belgium. The deficit in life long learning is not adequately tackled by policies neither is the relative low share of S&T graduates.
Other policies	Since regional elections: strong focus on environment	Strong focus on environmental issues in all policies in Wallonia and Brussels-Capital; strong focus on societal challenges (e.g. health, energy, eco-innovation) in Flanders. Ministries (other than those in the previous mentioned policy domains) also fund research in domains with relevance to them. There is however little coordination between these policy entities.

#### 4.2 ERA 2020 objectives - a summary

Research and innovation policy in Belgium is largely driven by regional priorities and ERA 2020 objectives do not play a pivotal role, although their importance is growing. A significant number of measures support the ERA objectives (see the table below) and all three regions have made progress on mobilising research addressing societal challenges, such as environmental and health issues.

The attention given to EU A and the 3% objective is not surprising given the central location and relatively small, and hence often sub-critical, size of the research system (further dis-aggregated by the regionalisation that has taken place over the last two decades). Indeed, Belgium is an active player in ERA level actions with, for instance, a significant share of federal research funding allocated to the ESA and European cooperation programmes. In addition, at federal level, several large-scale facilities were developed in the context of the ESFRI roadmap. Actors from all three regions have been active in ERA-NETs, JTIs, ETPs, JPIs and have developed the basis for opening of programmes or joint actions.

Existing internationalisation policy aims at developing a competitive advantage (infrastructures, tenure track, etc.) to attract top researchers and research organisations. In all regions, inward mobility is made easier, but disincentives still exist such as the remuneration and language barriers. As regards the higher education system, Belgian universities have a very high degree of autonomy, also with respect to ERA-related issues, but the Bologna Reform has been implemented nonetheless. The development of a higher international profile remains a challenge for Belgian universities (partly due to linguistic issues).

**Table 6: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)**

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
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1	Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers	<ul style="list-style-type: none"> <li>• Launch of the programme Creative Wallonia;</li> <li>• Adoption of the Action Plan for Researchers in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>• Relative weakness in HRST, high demand for qualified science, engineering &amp; technical employees;</li> <li>• Relatively high share of S&amp;T employees; but S&amp;T graduates below average (BE: 15.8%, EU27: 21.9%);</li> <li>• Low participation in life-long learning;</li> <li>• Low incentives to become researcher in Belgium due to low career perspectives.</li> </ul>
2	Increase public support for research	<ul style="list-style-type: none"> <li>• Public support for R&amp;D increased in all entities, except for Flanders;</li> <li>• Launch of several public research institutes.</li> </ul>	<ul style="list-style-type: none"> <li>• A relatively low but increasing level of public R&amp;D funding in Wallonia and Brussels-Capital</li> <li>• R&amp;D funding and R&amp;D intensity were relatively high in Flanders, but are now decreasing, due to the economic crisis.</li> </ul>
3	Increase European coordination and integration of research funding	<ul style="list-style-type: none"> <li>• No policy changes since 2009;</li> <li>• Re-continuation of ERA-NETs (e.g. MNT II and MATERA+).</li> </ul>	<ul style="list-style-type: none"> <li>• Active involvement in COST, EUREKA and FP7 and participation in inter-governmental research infrastructures;</li> <li>• Involvement in ERA-NETs, Art.185 initiatives, JTI, ETPs &amp; JP. Research programmes are opening up to foreign researchers.</li> </ul>
4	Enhance research capacity across Europe	<ul style="list-style-type: none"> <li>• Adoption of a joint Action Plan for Researchers;</li> <li>• Further implementation of Bologna process;</li> <li>• Decrease of budgets in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased international recruitment;</li> <li>• Non-directed research: small decrease of FWO budget (Flanders) but increase in F.R.S-FNRS budget (French Community);</li> <li>• Increased female participation in research</li> </ul>
5	Develop world-class research infra-structures & ensure access to them	<ul style="list-style-type: none"> <li>• Growing participation to ESFRI (Flanders).</li> </ul>	<ul style="list-style-type: none"> <li>• A few world-class infrastructures (in Flanders) and participation in several ESFRI infrastructures.</li> </ul>
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> <li>• Further implementation of the Bologna process.</li> </ul>	<ul style="list-style-type: none"> <li>• Total HERD in Belgium rose with 10% in the period 2002-2007. Number of students increasing faster than the personnel at HEIs. Further implementation of Bologna process leads to increased synergies in the HEI sector. High academic autonomy.</li> </ul>
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> <li>• No policy changes since 2009.</li> </ul>	<ul style="list-style-type: none"> <li>• Dependence on few large foreign firms putting stability of BERD at risk. High tax burden and relatively high labour costs are a negative element for conducting research in Belgium (even if R&amp;D tax incentives at federal level). Political instability may make Belgium less attractive for investors (incl. R&amp;D).</li> </ul>
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> <li>• Launch of strategic partnerships in Brussels and Wallonia;</li> <li>• Development of 'Grand Projects' in Flanders.</li> <li>• Launch of centres with valorisation component in Flanders &amp; Wallonia.</li> </ul>	<ul style="list-style-type: none"> <li>• Many programmes stimulating public-private cooperation and knowledge transfer. Level of interaction between SMEs and universities is, however, relatively low. 'Valorisation' of knowledge is explicitly recognised as part of the mission of universities &amp; increasing professionalisation of valorisation.</li> </ul>
9	Enhance knowledge circulation across Europe and beyond	<ul style="list-style-type: none"> <li>• Adoption of the Action Plan for researchers with focus on 'brain circulation' instead of 'brain gain/drain';</li> <li>• Termination of the START programme.</li> </ul>	<ul style="list-style-type: none"> <li>• Rich portfolio aimed at circulation of knowledge workers, grants for international activities, etc.;</li> <li>• High co-publication rate with foreign partners;</li> <li>• Insufficiently attractive as a location for talented researchers &amp; knowledge intensive firms from abroad.</li> </ul>

10	Strengthen international cooperation in S&T & the role and attractiveness of European research in the world	<ul style="list-style-type: none"> <li>No changes since 2009.</li> </ul>	<ul style="list-style-type: none"> <li>Belgian participation rates are relatively good in FP7; as well as in ERA-NETs and joint programming, etc.</li> </ul>
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> <li>Ministerial portfolio of Economy has been separated from portfolio of Science and Innovation in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>Coordination between policy levels is a weak, due to the highly decentralised governance structure;</li> <li>Strong integrated governance in Flanders; distribution of responsibilities within regions &amp; communities hampers coordination.</li> </ul>
12	Develop & sustain excellence and overall quality of European research	<ul style="list-style-type: none"> <li>Increasing budgets in Wallonia &amp; French community, decreasing budgets in Flanders.</li> </ul>	<ul style="list-style-type: none"> <li>Relatively high academic output;</li> <li>Lack of competitive funding for universities impediment to excellence in knowledge production.</li> </ul>
13	Promote structural change and specialisation towards a more knowledge - intensive economy	<ul style="list-style-type: none"> <li>Implementation of fiscal incentives for R&amp;D.</li> </ul>	<ul style="list-style-type: none"> <li>Economy dominated by intermediate goods and medium-tech sectors, and highly dependent and R&amp;D is dominated by a small number of large (foreign-owned) enterprises;</li> <li>Flemish policy has substantial focus on strategic research.</li> </ul>
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> <li>Increased attention to sustainability issues (e.g Marshall Plan 2.Green);</li> <li>Implementation of the Pact 2020 in the Flemish long-term innovation strategy;</li> <li>Increased attention for aging and health care (Flanders Medical Centre).</li> </ul>	<ul style="list-style-type: none"> <li>The Flanders in Action (ViA) Future Plan identifies important needs (e.g. greening of society, better health care adapted to aging, entrepreneurship, more innovation, improved mobility) and an agenda for action oriented towards these needs;</li> <li>Strong focus of Walloon policy on sustainability. Other societal challenges are addressed to a lesser extent.</li> </ul>
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> <li>Implementation of the policy note 2009-2014;</li> <li>No major policy changes.</li> </ul>	<ul style="list-style-type: none"> <li>Long-term agenda (Pact2020) set up in Flanders with broad stakeholder involvement (annual update with a policy letter);</li> <li>Number of policy expertise &amp; science centres;</li> <li>Weak evaluation culture in Belgium in general, but strongly emerging in Flanders.</li> </ul>

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## List of Abbreviations

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AO	Enterprise Agency Flanders
ARKimedes	Flemish fund for Activating Research Capital
ASE	Walloon Economic Stimulation Agency
AST	Walloon Technological Stimulation Agency
Ba-Ma-system	Bachelor-Master system, in accordance with the Bologna process
BBMRI	Biobanking and Biomolecular Resources Research Infrastructure
BELSPO	Belgian Federal Science Policy Office
BERD	Business Expenditures on Research and Development
BOF	Special Research Fund
Bsi4	European High Security Bsi4 Laboratories
CEN-SCK	Nuclear Energy Research Centre
CERN	European Organisation for Nuclear Research
CIMPS/IMCWB	Inter-Ministerial Conference for Science Policy
CIS	Community Innovation Survey
CLARIN	Common Language Resources and Technology Infrastructure
CMI	Centre for Medical Innovation
COST	European Cooperation in Science and Technology
CTLO	Centre Traditio Litterarum Occidentalium
CWPS	Walloon Council of Science Policy
DGENORS	Directorate-General for non-obligatory education and scientific research of the French Community
DGO6	Walloon Operational Directorate General for Economy, Employment and Research
EGEE	Enabling Grids for E-science
EIG	Economic Interest Grouping
EIROforum	European Intergovernmental Research Organisations Forum
EMBL/EMBC	European Molecular Biology Laboratory/Conference
ENIAC	European Nanoelectronics Initiative Advisory Council
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
EU27	European Union including 27 Member States
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUROHORC	European Heads Of Research Councils
EWI	Flemish Department for Economy, Science and Innovation
F.R.S-FNRS	National Scientific Research Funds
FDC	Flanders District of Creativity
FDI	Foreign Direct Investments
FFEU	Finance Fund for Paying of Debts and Investments

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
FWO	Flemish Research Funding Council
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
IBBT	Interdisciplinary Institute for Broadband Technology
ICC-INFRA	International Cooperation Commission/ Infrastructure
ICOS	Integrated Carbon Observation System
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
IWT	Flemish Institute for the promotion of Innovation by Science and Technology
JRC	Joint Research Centre
JTI	Joint Technology Initiative
KUL	Leuven University
NABS	Nomenclature for Analysis and Comparison of Scientific Programmes and Budgets
NCP	National Contact Point
NVAO	Accreditation Organisation of The Netherlands and Flanders
OECD	Organisation for Economic Cooperation and Development
OMC	Open Method of Coordination
PASS	Scientific Adventure Park
PMV	Participatie Maatschappij Vlaanderen
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
TBM	Programme for Applied Biomedical Research (Flanders)
T-EMAT	Electron Microscopy for Materials Science, University of Antwerp

TTO	Technology Transfer Office
UCL	Catholic University of Louvain
VC	Venture Capital
VIB	Flemish Interuniversity Institute for Biotechnology
VINNOF	Flemish Innovation Fund
VITO	Flemish Institute for Technological Research
VLIR	Flemish University Council
VLIZ	Flanders Marine Institute
VRWB	Flemish Council for Science Policy
VUB	Free University Brussels
WBI	Wallonia-Brussels International
WELBIO	Walloon Institute for Life Sciences