

# ERAWATCH Country Report 2009

Analysis of policy mixes to foster R&D investment  
and to contribute to the ERA

## Belgium

Nelly Bruno, Jon van Til and Geert van der Veen



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ERAWATCH Network – Technopolis Group

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## Executive Summary

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As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs. This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. This report aims at supporting the mutual learning process and the monitoring of Member States efforts. Its main objective is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The report builds on the analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

Belgium is characterised by a multi-level governance of research policy as the federal government and the three regional and three language community governments all have competence for certain matters relevant to science. The Federal Government has responsibility for a limited set of matters related to science policy; the communities are competent for matters related to persons including higher education research; the regional governments support applied and industrial research as well as technology guidance and funding for university interfaces, etc. Hence, there is not a 'Belgian research system' since the Federal Government does not decide on a national policy framework; on the contrary, the regions/communities have full autonomy in managing their 'regional research systems'.

Belgian gross expenditure on R&D (GERD) as a share of GDP was 1.87% in 2007, slightly below EU15 average (1.91%) but above EU27 value (1.83%). However, after a steady increase from 1995, the ratio has declined from a peak of 2.08% in 2001. The low level of public funding of research is an important point of concern raised in many recent reports. Government budget appropriations for R&D (GBAORD) have been more or less stagnating since the beginning of the century, representing 0.6% of GDP in 2007; far below the EU27 average of 0.71%. Although, an increase of public funding occurred in all three regions since 2006, this increase has been accompanied by a decrease in business expenditure on R&D (BERD), which has traditionally accounted for a significant share of GERD, from 1.51% of GDP in 2001 to 1.24% in 2007.

According to the National Reform Plan (NRP) for Belgium for 2008-2010, to comply with the recommendation to spend 3% of GDP on R&D, Belgian public authorities will commit themselves to make a greater effort to reach 1% of GDP by 2010. The NRP also highlights the necessity to better disseminate knowledge among economic actors. In order to achieve the 3% objective a coherent strategy involving all Belgian government agencies and the private sector has been developed. In addition, the "Research and Innovation Forum" has also been revived. The efforts provided by each of the authorities are intended to increase public and private R&D investment, to create and/or enhance competitiveness poles, to support knowledge transfers by promoting partnerships, to improve the market value of research activities, to

promote available human resources for R&D, and to foster the dissemination and use of ICT.

Although there is a broad consensus on the need to invest more in R&D, current rates of growth of R&D investment remain insufficient to attain political objectives. Belgium's research performance is characterised by relatively high but decreasing share of activity by the business sector off-setting a growing but still relatively small public sector investment.

<b>Barriers to R&amp;D investment</b>	<b>Opportunities and Risks generated by the policy mix</b>
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 will affect capacity of public sector	The various Belgian 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 will place a strain, along with the current financial crisis and growing unemployment, etc. on public budgets available for research.
Low competitiveness of salaries for researchers and insufficient number of internationally prestigious research infrastructures	A range of measures have been taken concerning salary costs, etc. as documented in this report. 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 being made to strengthen and coordinate Belgium efforts to develop and attract European level research infrastructures. Investments such as in polar research can also be considered to be internationally visible.

ERA and ERA related policies are becoming increasingly important both in the public discourse as well as in the practical implementation of Belgian research policies. On the one hand, this 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). A large chunk of Belgian (federal) research funding has always been allocated to a European level instrument, namely the European Space Agency. Actors from all three regions have been active in the ERA-NET type actions and the basis for opening of programmes or joint actions has begun to be developed. Recently there is increased attention for Article 169 and 171. Academic reform was already on the agenda, however internationalisation (especially the linguistic question) is a sensitive issue and therefore changes are slow. Joint programming will be on the agenda in 2009.

The regions are now increasingly focusing on issues related to maximising the participation in the Framework Programme, improving living-working conditions of researchers and attracting or retaining researchers (supported by Federal tax measures), and developing a policy to create new or develop existing research infrastructures of European or international quality.

Although, so far, little specific action has been taken in Belgium to secure large-scale (European level) research infrastructure, a new co-ordinated effort is being made to improve the situation. Moreover, Flanders has a reasonable (€20m/annum) programme for research infrastructures: the Hercules fund; and in Wallonia, regional and Structural Fund support is being given to the structuring of research capacity and building new institutes and infrastructures.

	<b>Short assessment of its importance in the ERA policy mix</b>	<b>Key characteristics of policies</b>
Labour market for researchers	<ul style="list-style-type: none"> <li>• Supported in all regions and at the federal level, with relative importance, adapted to each regional situation</li> </ul>	<ul style="list-style-type: none"> <li>• All regions have launched programmes to attract researchers settled abroad</li> </ul>
Governance of research infrastructures	<ul style="list-style-type: none"> <li>• The implementation of the Bologna process is an important step in the country to try reaching a critical mass</li> </ul>	<ul style="list-style-type: none"> <li>• Merger of HEI into academies (French-speaking community) or associations (Flemish community)</li> </ul>
Autonomy of research institutions	<ul style="list-style-type: none"> <li>• No specific change recently - full autonomy of HEIs</li> </ul>	<ul style="list-style-type: none"> <li>• Block funding based on the number of students + research grants</li> </ul>
Opening up of national research programmes	<ul style="list-style-type: none"> <li>• Less of a priority at the regional level but a number of actions have been taken.</li> </ul>	<ul style="list-style-type: none"> <li>• All federal research programmes open to non-nationals</li> </ul>



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## 1 Introduction

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As highlighted by the Lisbon Strategy, knowledge accumulated through investment in R&D, innovation and education is a key driver of long-term growth. Research-related policies aimed at increasing investment in knowledge and strengthening the innovation capacity of the EU economy are thus at the heart of the Lisbon Strategy. This is reflected in guideline No. 7 of the Integrated Guidelines for Growth and Jobs.<sup>1</sup> This advocates increasing and improving investment in research and development (R&D), with a particular focus on the private sector. For the period 2008 to 2010, this focus is confirmed as main policy challenge and the need for more rapid progress towards establishing the European Research Area, including meeting the collective EU target of raising research investment to 3% of GDP, is emphasised.

A central task of ERAWATCH is the production of analytical country reports to support the mutual learning process and the monitoring of Member States' efforts in the context of the Lisbon Strategy and the ambition to develop the European Research Area (ERA). The first series of these reports was produced in 2008 and focused on characterising and assessing the performance of national research systems and related policies in a comparable manner. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures which a research system has to cope with. The analysis of the ERA dimension still remained exploratory.

The country reports 2009 build and extend on this analysis by focusing on policy mixes. Research policies can be a lever for economic growth, if they are tailored to the needs of a knowledge-based economy suited to the country and appropriately co-ordinated with other knowledge triangle policies. The policy focus is threefold:

- An updated analysis and assessment of recent research policies
- An analysis and assessment of the evolution of national policy mixes towards Lisbon R&D investment goals. Particular attention is paid to policies fostering private R&D and addressing its barriers.
- An analysis and assessment of the contribution of national policies to the realisation of the ERA. Beyond contributing to national policy goals, which remains an important policy context, ERA-related policies can contribute to a better European level performance by fostering, in various ways, efficient resource allocation in Europe.

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<sup>1</sup> COM(2007) 803 final, "INTEGRATED GUIDELINES FOR GROWTH AND JOBS (2008-2010)", [http://ec.europa.eu/growthandjobs/pdf/european-dimension-200712-annual-progress-report/200712-annual-report-integrated-guidelines\\_en.pdf](http://ec.europa.eu/growthandjobs/pdf/european-dimension-200712-annual-progress-report/200712-annual-report-integrated-guidelines_en.pdf)

## 2 Characteristics of the national research system and assessment of recent policy changes

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

Belgium is a densely populated federal State (10.5m inhabitants in 2007, 2.1% of the population of the EU27), divided into three regions: Flanders (6.1m inhabitants), Wallonia (3.4m) and Brussels-Capital (1m); and three language communities: the Flemish (7.1m speakers), the French (4.3m) and the German (74,000). Gross domestic product (GDP) was €311b (in PPS) in 2007 (2.4% of the EU27)<sup>2</sup>. GDP/capita was 1.18 of the EU27 average in 2007 (in PPS), however, there are significant regional differences with Wallonia lying well below the EU15 average (77.6% in 2005<sup>3</sup>), Flanders slightly above (106.6%) and the region of Brussels-Capital an outlier (213.4%)<sup>4</sup>. Belgian gross expenditure on R&D (GERD) as a share of GDP was 1.87% in 2007, slightly below EU15 average (1.91%) but above EU27 value (1.83%). However, after a steady increase from 1995, the ratio has declined from a peak of 2.08% in 2001.

Belgium is characterised by a multi-level governance of research policy as the federal government and the three regional and three language community governments all have competence for certain matters relevant to science. The Federal Government has responsibility for a limited set of matters related to science policy<sup>5</sup>; the communities are competent for matters related to persons including higher education research; the regional governments support applied and industrial research as well as technology guidance and funding for university interfaces, etc. Hence, there is not a 'Belgian research system' since the Federal Government does not decide on a national policy framework; on the contrary, the regions/communities have full autonomy in managing their 'regional research systems'.

Each entity has a Minister responsible for science, however, generally only as one element of a broader portfolio. In the Federal Government, the Minister for SMEs, Agriculture and Science Policy; in Brussels-Capital, the Minister of Economy, Employment and Science Policy; Flanders has a Minister for Economy, Enterprise, Science, Innovation and Foreign Trade. Although, the French-speaking Community and the Walloon Region remain separate entities, the same person is Minister for Higher Education, scientific research and international relations for the community and Minister for Research, new technologies and foreign affairs at regional level.

The Ministerial cabinets, more or less in consultation with the administrations, are responsible for policy development. A counter-weight to the influence of the cabinets is provided by science policy councils at Federal level (FRWB-CFPS: Federal Science Policy Council) and in the three regions (the Science Policy Council of the Brussels-Capital Region, [Flemish Council for Science Policy \(VRWB\)](#), [Walloon](#)

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<sup>2</sup> All data provided in this report is sourced from Eurostat for the latest available year at the time of writing this report, unless explicitly stated otherwise.

<sup>3</sup> Data at regional level is available only for the year 2005 (Eurostat or Federal Planning Bureau)

<sup>4</sup> Data from Eurostat and Federal Planning Bureau

<sup>5</sup> The federal science institutes (essentially national libraries, scientific collections and museums), defence and space research, intellectual property law, corporate taxation, employment legislation and social security measures for research.

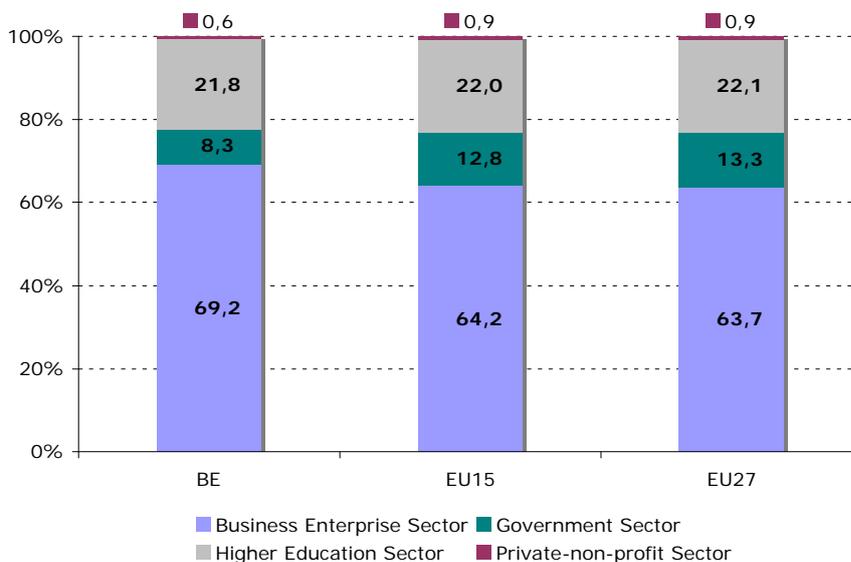
[Science Policy Council \(CWPS\)](#). The councils advise their respective governments on science policy strategies and on funding mechanisms (design and evaluation).

The [Federal Science Policy Office](#) is responsible for coordinating science policy at federal level, the design and implementation of research programmes and networks; the management of Belgium's participation in European and international organisations and the supervision of ten federal scientific establishments. In the region of Brussels-Capital, the [IRSIB/IWOIB](#) (Institute for the support of Scientific Research and Innovation of Brussels) manages the implementation of research funding. In Flanders, the [EWI](#) is principally focused on policy design and management, while two agencies are responsible for implementation, namely: the [Research Funding Council \(FWO\)](#), and the [Institute for the promotion of Innovation by Science and Technology \(IWT\)](#). The Ministry of the French-speaking Community funds fundamental research through the [National Scientific Research Fund \(FNRS\)](#). Industrial research funding and funding for academic, public or not-for-profit research centres is managed by the recently created General Operational Directorate for Economy, Employment and Research, called DGO6 of the Walloon Public Service (merger in 2009 of the [Directorate General for Technologies, Research and Energy \(DGTRE\)](#) and the Directorate General for Economy and Employment (DGEE)).

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). Co-ordination tends to focus on practical issues such as carrying out harmonised statistical surveys (R&D, Community Innovation Survey (CIS), etc.) and submission to the European Commission, Eurostat, OECD, etc. of statistics or policy surveys.

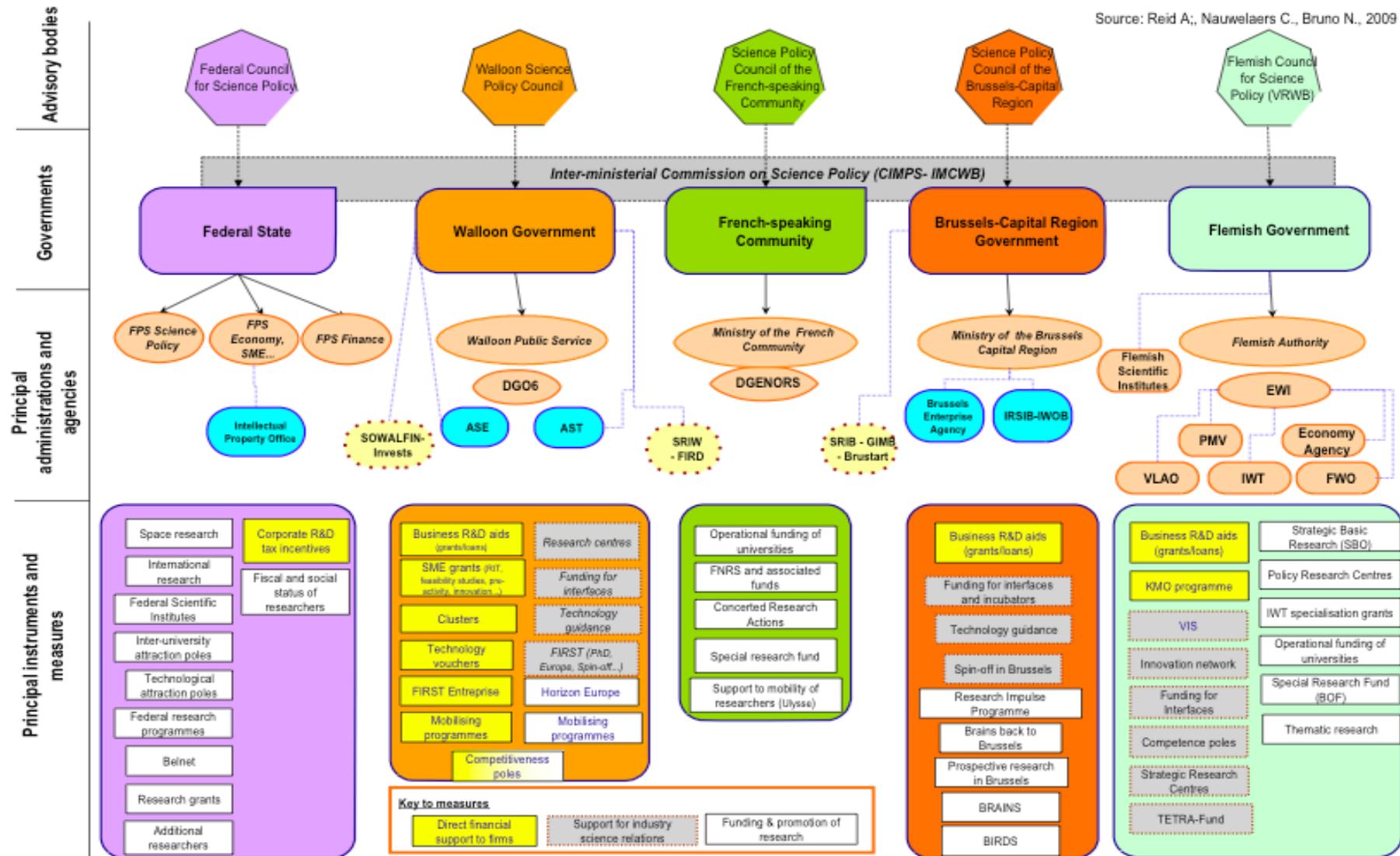
Although decreasing, in 2007, approximately two-thirds of research was performed in the business sector (EU27: 63.7%); and 21.8% in the higher education sector (EU27: 22.1%). The share of research performed in the government sector (8.3%), while increasing, remains below the EU27 average (13.3%); while the share performed by the private non-profit sector is low (0.6%) and below the EU27 average.

**Figure 1: Total intramural R&D expenditures (GERD) by sectors of performance (provisional data for 2007)**



Source: Eurostat

Figure 2: Overview of the governance structure of the Belgian research system



Source: Reid A., Nauwelaers C., Bruno N., (2009)

In terms of research performers, there are two separate university systems. Flanders has six universities (of which two in Brussels), four large research centres (IBBT, IMEC, VIB, VITO) and a number of smaller competence poles for knowledge development. Recently due to the Bologna reform process, the nine French-speaking universities (including two in Brussels) and higher education institutes ('*hautes écoles*') have been structured into three academies (Louvain, Wallonie-Bruxelles and Wallonie-Europe). Similarly in Flanders, the universities and '*Hogeschole*n' have been grouped in five associations (Leuven, Antwerpen, Gent, Hasselt, Brussel). An aim of these changes is to facilitate students shifting between different types of courses at various levels of higher education and to create more critical mass and sharing of resources.

Funding of the former Federal network of public-private sectoral research centres has now been regionalised, while continuing to serve firms of their industrial sector irrespective of location. In Wallonia, although a number of research centres have been funded through the Structural Funds, there is nothing comparable in scale to the Flemish strategic research centres; however the 'competitiveness poles' have a role in structuring public/academic and enterprise research efforts.

## ***2.2 Summary of strengths and weaknesses of the research system***

The analysis in this section is based on the ERAWATCH Analytical Country Reports 2008 which characterised and assessed the performance of the national research systems. In order to do so, the system analysis focused on key processes relevant for system performance. Four policy-relevant domains of the research system have been distinguished, namely resource mobilisation, knowledge demand, knowledge production and knowledge circulation. The analysis within each domain has been guided by a set of generic "challenges", common to all research systems, which reflect possible bottlenecks, system failures and market failures a research system has to cope with. The Analytical Country Report for the specific country can be found in the [ERAWATCH web site](#).

In terms of **resource mobilisation**, and despite the commitment of the authorities at Federal and regional level to meet the 3% GERD/GDP target, research intensity in the economy is actually declining or stable. In particular, the importance of BERD in GERD and the fact that a large part of the BERD activity is undertaken by enterprises under foreign control, raises the threat of a long-term decline in R&D intensity if foreign enterprises are not encouraged to maintain their R&D operations in Belgium.

The Federal and regional (& related language community) governments are all committed to raising public expenditure on R&D. Additional appropriations for research funding have been made by all authorities since 2005: essentially through fiscal instruments at Federal level and through new specific funding allocations to research programmes or infrastructures at regional level. Nevertheless, the level of government budget appropriations is not sufficient to obtain the targets set in the National Lisbon Reform programme. At least in the case of Wallonia, without the support of EU's Structural Fund (SF) budgets, it is doubtful that current levels of research funding would have been attained. This raises the question of the budgetary consequences that will arise in the post 2013 period. On the other hand, the Belgian research organisations (public and private) seem to have become effective in obtaining funding from the EU's Framework Programme (FP) for research.

Human resources for research are a crucial issue in Belgium despite a relatively strong performance in terms of human resources for science and technology in the workforce. The rate of new graduates in these fields is well below the EU25 average. The national and the regional authorities have put in place incentives for researchers returning from abroad, while the Federal authorities are using reduction in social security charges to improve salary cost competitiveness for scientific personnel.

**Table 1: summary assessment of strengths and weaknesses of the national research system**

Domain	Challenge	Assessment of strengths and weaknesses
Resource mobilisation	Justifying resource provision for research activities	A large consensus exists on the need to increase public expenditure for research and all the Belgian authorities have committed more funds (including via fiscal measures)
	Securing long term investment in research	Importance of publicly funded research is significantly below EU27 average despite commitments to increase funding and inflows of Structural Funds and RTD FP.
	Dealing with barriers to private R&D investment	Belgium is generally well-placed in terms of the share of GERD funded and performed by the private sector. However, BERD is concentrated in a few large, foreign owned firms; and the trends are negative
	Providing qualified human resources	Belgium HSRT rates are good; but a high share do not work in science and the salary conditions in Belgium increase the risk of a brain drain despite measures taken.
Knowledge demand	Identifying the drivers of knowledge demand	Knowledge demand in Belgium is largely driven by business interests (foreign owned) and there are few formal mechanisms such as foresight exercises, or technology assessment, etc. which help to structure a broader societal demand.
	Co-ordination and channelling knowledge demands	The main methods used to channel knowledge demand are R&D programmes and funding for strategic research centres and 'competitiveness poles. Flanders is examining pre-competitive public procurement as a tool. A main element of the co-ordination of knowledge demand is Belgian involvement in the ESA. The Belgian authorities are also relatively active in ERA-NET and Open Method of Coordination (OMC) type activities
	Monitoring of demand fulfilment	Evaluation of the quality and relevance of scientific research and research funding policies could be improved further.
Knowledge production	Ensuring quality and excellence of knowledge production	A strong share of competitive as opposed to baseline funding at universities would improve the quality of Belgian research
	Ensuring exploitability of knowledge	Lack of absorptive capacities in SME sector allied to low (high-tech) entrepreneurial propensity are a major weakness There is a disconnection between technological specialisation and economic tissue.
Knowledge circulation	Facilitating circulation between university, PRO and business sectors	Relatively wide-ranging and extensive set of measures already in place to promote knowledge transfer.
	Profiting from international knowledge	Belgian participation rates in EU or international programmes are improving, including for SMEs A range of measures exist to encourage research mobility, etc.
	Enhancing absorptive capacity of knowledge users	Collective research centres and other transfer mechanisms in existence for many decades. Rates of participation and investment in life-long learning remain a key weakness of Belgium.

Structured efforts to chart and monitor **demand for knowledge** are still largely insufficient in Belgium. In Flanders, the structuring of knowledge demand is largely through four large strategic research centres, while in Brussels and Wallonia, the approach is structured around clusters or competitiveness poles (bringing together higher education and industrial research). The Flemish authorities have invested more in technology assessment/foresight on a continuous basis; in Wallonia a regional foresight was carried out at the turn of the century but has not been updated.

Even if Belgium, on average, performs well in terms of **knowledge production**, there are still shortcomings in the exploitation of the rather strong science base. The research carried out in higher education is rather distant from the 'real' economy and there is a disconnection between scientific and technological specialisations. A significant number of measures to promote **knowledge circulation** seek to create stronger academic-enterprise partnerships and enhance commercial exploitation, and especially in areas where science base and industrial needs are in line there are examples of successful knowledge exploitation.

### ***2.3 Analysis of recent policy changes since 2008***

The contribution of research and research policies to Lisbon goals (as well as to other societal objectives) goes beyond the fostering of R&D investment. It is therefore important to also analyse how other remaining shortcomings or weaknesses of the research system are addressed by the research policy mix. The focus of the section is on the analysis of main recent policy changes, which may have a relevant impact on the four policy-related domains.

Regional elections in June 2009 will lead to changes in the composition in all regional governments. In Wallonia the Green Party (Ecolo) will probably participate in the regional government, in Flanders the Liberal Party (Open VLD) will probably be ousted. Although the importance of science and innovation is shared by all parties there are differences in focus, and therefore further policy changes are foreseen in the near future.

#### **Changes in National Reform Programme regarding the role of research in the broader economic growth strategy**

According to the [NRP for Belgium for 2008-2010](#), to comply with the recommendation to spend 3% of GDP on R&D, all Belgian public authorities commit themselves to make a greater effort to reach 1% of GDP by 2010.

The Flemish government has developed its own Flemish Reform Programme 2008-2010. This programme continues the implementation of the objectives and measures introduced in the first Flemish Reform Programme 2005-2008, namely an innovative economy which requires additional investment in research and innovation, encouraging entrepreneurship through the simplification of public regulations and administrative procedures, a strong stimulation policy to get more people into the workforce, and investment in skills development (primarily through the accelerated implementation of the skills agenda). All of this will be implemented while also ensuring that the public finances remain healthy and that sufficient attention is paid to sustainable development. The goals of Flanders reflect policies related to the development of the research system. At the core of these goals is the mission to increase R&D expenditures to the 3% norm. Flemish policies that contribute to the Lisbon Strategy are especially the Special Research Fund (BOF), the Fund for Scientific Research (FWO) and the Methusalem and Odysseus

programme, for generic fundamental research funding. For strategic research, the SBO-programme and the Industrial research fund are of importance.

According to the NRP for Wallonia and the French-speaking Community for 2008-2010, both authorities agree on the quantified objective of 3% of the GDP invested in R&D by 2010, out of which 2% from the private sector. The challenge is to secure the business R&D investments while increasing the public R&D investments. To this purpose, the Walloon Region, which has authority on research policy for economic development purposes, thus encompassing technological development and applied research, is continuing its Priority Action Plan which foresees a "research" budget of €270m for 2006-2009. A new decree for the support of R&D and innovation in Wallonia was adopted in July 2008, which implements new actions adapted to changes in the global economy and technology, the Belgian institutional landscape and changes to European support aid in this area. Five competitiveness poles were created in Wallonia, which combine companies, training centres and public and private research units involved in partnerships and targeting global excellence in productive sectors. The clustering policy is also intended to support the development of (trans-) sectoral company networks. In addition, the Walloon government is pursuing the launch of mobilising programmes and excellence programmes and has recently launched (2008) the START programme with the goal to enable universities to hire new international-calibre academic staff.

The French speaking Community, responsible for education and fundamental research at universities and higher education establishments, increased its research budget by 25.6% for 2005-2008. Most notably the budget of the FNRS has been increased to enable it to fulfil its development plan. As a result, the number of researchers paid by the FNRS and associated funds has increased and new programmes have been started up, as the "Scientific Impulse Mandate-Ulysses Mobility".

The Brussels-Capital Region is implementing the measures contained in its Regional Plan for Innovation 2006-2013. The Region launched impulse programmes which aim at strengthening the Region's technology potential in sectors which have been identified as innovative for the Region by fostering cooperation between research units and financing multi-year research programmes with medium-term market applicability. The Region is also implementing infrastructure and services suitable to attract R&D activities from the outside and enable the development of innovative activities (e.g. Brains back to Brussels).

### 2.3.1 Resource mobilisation

At the Federal level, in order to support human resources for R&D, beyond long-standing tax deductions, recent efforts have resulted in the establishment of a range of new exemptions for the advanced payment on wages for researchers in both public and private sectors. In addition to increased funds for the 2007-11 [Interuniversity Attraction Poles programme](#), the Federal Government reaffirmed its intention to intensify Belgian scientific research in the Antarctic through an increase in its financial participation to the [Princess Elisabeth Antarctica station](#) (in total €8m for the construction and €1m for research activities).

In Flanders, several important policy changes have taken place since 2008, especially in the justification of resource provision and the mobilisation of resources (see table 2). In 2009, renewed attention to the public discourse on the justification of

resource provision was provided by the launch of the renewed Flanders in Action (Vlaanderen in Actie) initiative. In this initiative many stakeholders join forces in order to boost the Flemish economy. It is one of the main input documents for the formation of a new government after the elections in June 2009. The Pact of Flanders, signed by a range of public-private stakeholders, underlying this initiative, identifies 20 goals to meet, in order to place Flanders amongst the top EU regions. In line with earlier public declarations, Flemish stakeholders again commit to attaining the 3% Barcelona target.

Moreover, the Minister announced an increase of public R&D expenses in her policy plan for 2009. After the structural increase of €75m for STI budgets and an incidental €45m in 2008, in 2009 another €29m will be structurally invested in STI. The largest part of this investment will be allocated to actions of technological innovation on the initiative of the Flemish government and the [Special Research Fund \(BOF\)](#), in particular the [Methusalem programme](#), the newly established Tenure Track System and Independent Academic Personnel (ZAP) mandate. The actions of technological innovation on initiative of the Flemish government will be used to deal with uncertain returns or other financial risks, which are an inherent part of the risks of technological innovation. These resources will be used to invest in certain technological innovations that are too risky to be carried out by market parties only. Furthermore, the increase of the budgets in the BOF aim at securing qualified human resources, especially at providing a financial base to prevent the Flemish academic system from *brain drain* and to attract excellent researchers from abroad.

In Wallonia, the 2009 budget for research in higher education institutes (HEI), research centres and enterprises has increased by 43% in comparison to 2008 to reach €310m. The regional minister called this level 'historic'<sup>6</sup> and underlined that the Government wanted to give a clear signal in the context of the economic crisis: 'the region has to position itself at the top of innovation to ensure its economic development'. In particular, the decision has been taken to refinance the French-speaking universities as of 2010 by €30m over eight years in order to reduce the gap of public financing of higher education with other EU countries. The other higher education institutes (hautes-ecoles) received an additional allocation of €4m as of 2009 (1% of their global envelope). In 2009, for each project selected under the '[FIRST Higher-education institutes](#)', the HEI receive an additional €25,000 in order to replace the professor in charge of the research project.

In addition, the Minister in charge of research in Wallonia and in the French-speaking Community launched a 'Consultation on research' ([Assises de la Recherche](#)) in the first quarter of 2009, opening notably the debate on the future of research with all stakeholders (researchers, companies, public authorities).<sup>7</sup> In budgetary terms, the French speaking Community, has increased its research budget by 25.9% between 2005-2009 and in 2009, this is reflected in an increase of €5.4m of the FNRS budget.

There has been no change in the region of Brussels-Capital since 2008 however the budget dedicated to research increased from €25m in 2005 to €50m in 2008. The

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<sup>6</sup> Communiqué de Presse de M-D Simonet, La recherche en Région Wallonne et en Communauté Française, 12 décembre 2008

<sup>7</sup> A synthesis including recommendations for future actions is under preparation.

region remains committed to a 2% GERD/GDP target and aims to become one of the 10 most innovative regions and to be fully integrated in the Lisbon Strategy<sup>8</sup>.

**Table 2: Main policy changes in the resource mobilisation domain**

Challenges	Main Policy Changes
Justifying resource provision for research activities	<ul style="list-style-type: none"> <li>No specific change. A large consensus still exists on the need to raise public expenditures on R&amp;D and all Belgian authorities have committed more funds</li> </ul>
Securing long term investments in research	<ul style="list-style-type: none"> <li>Publicly funded research is still below EU27 average despite new commitments to increase public funding in particular in the French-speaking Community</li> </ul>
Dealing with uncertain returns and other barriers	<ul style="list-style-type: none"> <li>No change. BERD is still depending on a small number of large firms, trends are still negative</li> </ul>
Providing qualified human resources	<ul style="list-style-type: none"> <li>In Flanders: Upgrade of the Methusalem programme, as well as the launch of the Independent Academic Personnel Mandate (Zelfstandig Academisch Personeel) and the tenure track system</li> <li>Brussels-Capital: launch of 'Brains Back to Brussels' end 2007</li> </ul>

### 2.3.2 Knowledge demand

There is little to report in terms of changes in the way demand for knowledge is assessed and how it affects research funding priorities. In Flanders, there have been no major changes since 2008. However, the VRWB is looking at knowledge demand, as an input to new cluster and competence centre studies. The VRWB is looking for interesting matches between knowledge demand and potential economic results, in order to develop competence poles. To do so, the VRWB carries out foresight studies in Flanders, which are subsequently benchmarked with European foresight studies, in order to identify interesting potential innovation hot spots. Together with the IWT, feasibility studies are conducted to assess the viability of potential clusters on these themes. As a consequence the Flemish Government has decided to start up additional Strategic Research Centres in the areas of Translational Biomedical Research and Materials Research.

Under the 2008 decree covering research and innovation, the Walloon Government will implement a system of ex-post evaluation of the results of the research financed by the Region. The decree does not provide many details on the way the evaluation will be conducted, except the creation of an interdepartmental steering committee in charge of supervising the set of measures relative to strategic management and evaluation, and an evaluation, every five years, of the research and innovation policy by an external body. A first study to define the strategic objectives, priority axes and indicators will be completed by November 2009<sup>9</sup>.

<sup>8</sup> Discourse of Benoit Cerexhe (Minister in charge of scientific research in the region of Brussels Capital), 13 March 2009

<sup>9</sup> Press release 'Evaluer les resultants de la recherche pour mieux soutenir les opérateurs', Marie-Dominique Simonet (Minister in charge of scientific research in the region of Wallonia and in the French-speaking community), 15 January 2009

**Table 3: Main policy changes in the knowledge demand domain**

Challenges	Main Policy Changes
Identifying the drivers of knowledge demand	<ul style="list-style-type: none"> <li>• Incremental change in Flanders: assessment of VRWB for potential Competence Poles.</li> <li>• The Flemish strategic research centres and Walloon competitiveness poles remain the main instruments used to identify drivers of knowledge demand. Two new Flemish strategic research centres will be set up in 2009.</li> </ul>
Co-ordinating and channelling knowledge demands	<ul style="list-style-type: none"> <li>• No significant change</li> </ul>
Monitoring demand fulfilment	<ul style="list-style-type: none"> <li>• Since 2008, implementation of a system of ex-post evaluation of research results financed by the Walloon Region and evaluation every 5 years of the regional research and innovation policy</li> </ul>

### 2.3.3 Knowledge production

Since 2009, with the view to restructure the higher-education landscape in Wallonia, the university faculty of agrosociences of Gembloux has been integrated into the University of Liège and the University of Mons has been created out of the merger of the University of Mons-Hainaut and the Polytechnic Faculty of Mons (FPMs). This is in line with the general move in the region to improve the coherence and excellence of the HEI system after the creation of three university academies gathering the nine universities of the French-speaking Community.

In Flanders the universities and 'hogescholen' have been grouped in 5 associations:

- 'Associatie KU Leuven', with KU Leuven and 13 'hogescholen' from all over Flanders
- 'Associatie van Universiteit en Hogescholen Antwerpen', with UAntwerpen and 4 'hogescholen' from Antwerp
- 'Associatie Universiteit Gent' of UGent and three 'hogescholen' in the neighbourhood of Ghent
- 'Associatie Universiteit Hasselt' of UHasselt and two 'hogescholen' from the province of Limburg
- 'Universitaire Associatie Brussel' of the VUB and the Erasmushogeschool Brussels, in cooperation with the Royal Military Academy

This grouping will increase the interaction between 'hogescholen' and universities and should, apart from educational alignment, result in improved quality and excellence of knowledge production, including better exploitability of knowledge, since research at the 'hogescholen' is more application oriented.

At the end of 2008, the Walloon Government created a new institute for excellence research in the areas of life science and biotechnologies called WILL (Walloon Institute for Life Sciences Lead) with a budget of €30m. The objective of this institute will be the development and valorisation of excellent non-oriented research in areas that can have applications in all fields of medical, pharmaceutical and veterinary biotechnology. Results that could generate intellectual property will be protected through patents or exploited through the creation of spin-offs and/or partnerships with Walloon industries, out of which companies involved in the two Walloon

competitiveness poles BLOWIN (Health Cluster of Wallonia) and WAGRALIM (Agro-industries cluster of Wallonia). The institute will be autonomous (ASBL) but under contract with the Walloon Region and will function in partnership with the university academies. The programme is made up of two elements:

- excellence groups: after selection, each group receives a budget between €400,000 and €800,000 per year.
- technological platforms: the institute will have the mission to ensure the exploitation of the research results.

Another recent initiative in the Walloon Region is the launch of the START programme in July 2008. The objective of this programme is to enable universities to hire new international-calibre academic staff by providing them with financing for their research project from the outset. Following the adoption of the 2008 decree on research and innovation, the Walloon Government launched in January 2009 a new measure Technological innovation partnership (PIT). The first PIT will be in the domain of sustainable construction (new materials, energy savings and renewables). This new kind of partnership associates several companies and several public entities (research centres, universities, other higher-education institutions) to carry out or coordinate research that contributes to the scientific, technological and economic development of the region. It is implemented through calls for projects.

The increased focus on strategic research centres in Flanders is also aimed at creating focus and mass in knowledge production in specific areas that are relevant for industry.

**Table 4: Main policy changes in the knowledge production domain**

Challenges	Main Policy Changes
Improving quality and excellence of knowledge production	<ul style="list-style-type: none"> <li>• Merger of several HEI in Wallonia</li> <li>• Creation of university associations in Flanders</li> <li>• Creation of the WILL institute for excellent research in Wallonia on life sciences and biotechnologies</li> </ul>
Ensuring exploitability of knowledge production	<ul style="list-style-type: none"> <li>• Launch in Wallonia of the Technological innovation partnerships and START programme</li> <li>• Increased focus on strategic research centres in Flanders</li> </ul>

### 2.3.4 Knowledge circulation

The 2008 Walloon research and innovation decree aims to foster partnerships between enterprises and with other research actors by applying an increased rate of intervention to the projects carried out in collaboration (competitiveness poles or other schemes) and by offering in this case the possibility to chose between a subsidy or a reimbursable loan for the activities of experimental development.

In order to support the diffusion of knowledge into the economy, the Walloon region cofinances with the ERDF, new support schemes for SMEs as of 2009:

- the technological service vouchers (budget of €16m) aimed at bringing companies to an innovation process by showing them the interest of a collaboration with a competent partner, either through technological diagnosis or a first technological service;
- ACQUITECH to support the external acquisition of patents, licenses and know-how through reimbursable advances;

- STIMULE to foster SMEs to exploit research results within 24 months after the end of a research project supported through a reimbursable advance;
- for the province of Hainaut (Objective 1): FIRST Enterprise Doctor to enable SMEs to hire research staff in order to carry out a research project developed by the company (50% of the salary of the researcher covered during two years).

In terms of the exploitation of the strong knowledge production, some important steps have been taken in Belgium. Most notably, some recent measures taken at the federal level could boost IPR efforts in Belgium like a tax deduction on patent incomes as of 2008 tax year. Since 2008, the federal level has as well taken some measures to foster patents applications by SMEs.

With respect to the initiatives taken to attract researchers settled abroad, several measures do already exist: return mandates from the federal level, scientific impulse mandates - ULYSSE from the French-speaking Community (FNRS) and Odysseus in Flanders as well as measures in the Brussels-Capital region (Research in Brussels, Brains back to Brussels). No new measure has been launched since 2008. Opportunities to improve the quality of living will be proposed in the European partnership for researchers in 2009 to which Belgium will participate.

**Table 5: Main policy changes in the knowledge circulation domain**

Challenges	Main Policy Changes
Facilitating knowledge circulation between university, PRO and business sectors	<ul style="list-style-type: none"> <li>• Wallonia: increased rate of intervention for projects carried out in collaboration (enterprises and research centres)</li> </ul>
Profiting from access to international knowledge	<ul style="list-style-type: none"> <li>• No specific change recently</li> </ul>
Absorptive capacity of knowledge users	<ul style="list-style-type: none"> <li>• Launch of several measures directed towards SMEs</li> <li>• in Wallonia</li> </ul>

## ***2.4 Policy opportunities and risks related to knowledge demand and knowledge production: an assessment***

As has been summarised above, there have been few significant changes or major new policy initiatives since 2008 in the policies or priorities of the Belgian authorities. In general, what can be observed is a reaffirmation of the current priorities at each level.

There is a strong emphasis on resource mobilisation essentially expressed in operational terms by a commitment to continue to increase public budgets on R&D, so far at least, despite the economic crisis.

Policy initiatives in favour of stimulating knowledge demand remain relatively limited and more could be done to invest in foresight or technological assessment.

In terms of knowledge production, refinancing of university research, structuring of research activities in public-private partnership (competitiveness poles, strategic research centres) absorb a significant share of funds. Equally, measures to make or to keep Belgium an attractive place for researchers and other knowledge workers are maintained (see section 4.1).

Knowledge circulation is also viewed as important and is pursued through a number of channels such as clusters, specific programmes for research-industry co-operation, etc (see section 3.3.2).

**Table 6: Summary of main policy related opportunities and risks**

Domain	Main policy related 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 (notably for Walloon research effort)</li> <li>• Risk of relocation of R&amp;D activities of the key foreign investors</li> </ul>
Knowledge demand	<ul style="list-style-type: none"> <li>• Initial steps to explore pre-competitive procurement (Flanders)</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of structured foresight or long-term planning</li> <li>• Little emphasis on knowledge intensive services related R&amp;D</li> <li>• Little focus on society driven research</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 for researchers and fragmentation of system</li> </ul>
Knowledge circulation	<ul style="list-style-type: none"> <li>• Additional measures supporting Intellectual Property rights (IPR)</li> <li>• Increased support to attract and retain researchers</li> </ul>	<ul style="list-style-type: none"> <li>• On-going under-investment in training and technology diffusion</li> </ul>

### 3 National policy mixes towards R&D investment goals

The aim of this chapter is to deepen the analysis of national policy mixes with a focus on public and in particular **private R&D investment**. The Lisbon strategy emphasises an EU overall **resource mobilisation objective** for 2010 of 3% of GDP of which two thirds should come from private investment. R&D investment is seen as important yardstick for the capacity of an economy to turn the results of science and research into the commercially viable production of goods and services and hence knowledge into growth. Corresponding investment policies are mainly pursued at national level and determined with a national focus.

The chapter is structured around five questions:

1. What are the specific barriers in the country that prevent reaching the Lisbon goal? What barriers exist in the country to prevent reaching the specific targets, particularly related to the private sector R&D investments?
2. Given the above, what are the policy objectives and goals of the government that aim to tackle these barriers?
3. What Policy Mix routes are chosen to address the barriers and which specific instruments and programmes are in operation to implement these policies?
4. What have been the achievements in reaching the above mentioned R&D investment objectives and goals?
5. What are the reasons for not reaching the objectives, adaptation of the goals?

The chapter aims to capture the main dimensions of the national policies with an emphasis on private R&D investment. The chosen perspective of looking at investments in R&D is the concept of Policy Mixes. The analysis and assessment follows a stepwise approach following the five questions mentioned above.

### **3.1 Barriers in the research system for the achievement of R&D investment objectives**

Gross domestic expenditure on R&D (GERD) stood at 1.87% of the GDP in 2007, a share that has decreased constantly since 2001, the year in which a peak value of 2.08% was reached after a steady increase since 1995. This trend is present as well in Flanders which is traditionally closer to the Lisbon targets. Even if initially, the main concern in Flanders was to raise the public R&D investments, as the private funding was relatively high, BERD has been decreasing rapidly (from 1.72% of GDP in 2003 to 1.46% in 2008).

The challenge to mobilise and secure investments in research which only pay-off in the long term, such as fundamental research and generic research infrastructures, is usually a task of government or not-for profit actors. In 2005, 0.45% of GDP was spent as publicly funded GERD, as a proxy for long-term investments in R&D; this is significantly lower than EU27 average (0.65%). The latest Eurostat figures indicate that the percentage of GERD financed by government has increased slightly since 2001 (22%) to reach 24.7% of GERD in 2005 (EU27: 34.2%); while the public sector as a performer is particularly weak<sup>10</sup>. According to the Federal Office for Science Policy, institutional support for universities represented 24% of the total public funding for R&D (€1,960m) in 2006, funding for scientific institutions 14% and project based funding 12%; allocated to universities by way of the research funding agencies. According to Eurostat data, in 2006, R&D intensity of the higher education sector lies around EU 27 average (0.4% of GDP) whereas the government sector is below EU27 average (0.16% against 0.25% in 2006).

In Belgium, a wide range of measures exists (fiscal at Federal level, and direct State Aid at regional level) to boost business expenditure on R&D. Yet, the business enterprise sector, which is the main contributor to R&D expenditure in Belgium, saw its share shrink from 1.51% of GDP in 2001 to 1.24% in 2007. In absolute figures, businesses spent €4,337m in 2007. Out of the business expenditures on R&D, 10.9% came from foreign sources in 2006 (19.2% in the Brussels-Capital Region, 9.1% in Flanders and 12.8% in Wallonia)<sup>11</sup>. The reduction in the share of business expenditure on R&D is partly explained by an increase in public investment (from a low level). However, it is also a reflection of structural factors: the economy is dominated by intermediate goods and medium-tech sectors, and highly dependent and sensitive to the decisions of a handful of large (foreign-owned) enterprises<sup>12</sup>. Business is the main driver of knowledge demand in Belgium. More than three quarters of BERD was performed in the manufacturing sector in 2006: a quarter by the pharmaceutical sector, 12% by chemicals and 10% by radio, TV and communication.

A second issue is that R&D activity is highly concentrated and under foreign control: the top 10 R&D spender companies<sup>13</sup> represented 32% of internal expenses in 2005

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<sup>10</sup> A report from the Walloon Scientific Council highlights in particular the low importance of the public sector in performing R&D in Wallonia: 1% in 2005, whereas it represents 10% in Flanders and 16% in EU15. Conseil de la Politique Scientifique, Evaluation de la politique scientifique de la Région Wallonne et de la Communauté Française en 2006 et 2007, Mai 2008

<sup>11</sup> Federal Planning Office, Tableau de bord de l'innovation en Wallonie, last update in April 2009

<sup>12</sup> In 2005, 42.86% of BERD was performed by companies with more than 1000 employees.

<sup>13</sup> Agfa-Gevaert, Alcatel Bell, Glaxosmithkline Beecham Biologicals, Janssen Pharmaceutica, Philips Innovative Applications, Procter & Gamble Eurocor, Society For Worldwide Interbank Financial Telecommunication (SWIFT), Techspace Aero, Total Petrochemicals Research Feluy, UCB

(36% in 2000) and eight of them are under foreign control. In 2006, 59.3% of R&D spending by businesses in Belgium is by foreign-owned subsidiaries (of which, 44.4% by companies from the United States and 50.3% by companies from the EU15)<sup>14</sup>. In addition, 11% of BERD was financed by capital from abroad in 2006 (as high as 19.8% in Brussels-Capital compared to 10.68% in EU27)<sup>15</sup>. During recent years, a number of these R&D intensive foreign firms have reduced their activity or sold units in Belgium with an impact in both economic (jobs, etc.) and research intensity terms. The introduction of additional tax measures and in particular, the deduction for notional interests is clearly designed to arrest this outflow.

Another important barrier to achieving R&D investment objectives is the low propensity to create and develop knowledge intensive firms. As highlighted in the OMC peer review for Belgium (2007), there is a lack of absorptive capacity in industry, composed by a small share of high tech industries and a large share of SMEs, which are per se not always capable of applying state-of-the-art knowledge from universities. The efforts of the Federal and regional authorities to improve the business environment (reducing red tape, tax advantages for young innovative firms) and specific regional support measures (incubators, business innovation centres and direct support) have not led to significant improvements. Moreover, seed and start-up capital in Belgium was well below EU15 average in 2006 (7.1% of the total venture capital investment against 28.49%)<sup>16</sup>. Recent efforts by the authorities to boost creation of research-intensive firms (e.g. young innovative company tax status at Federal level and the regional venture fund Arkimedes in Flanders) may take time to pay off.

A final barrier concerns a relative weakness in the area of human resources for science and technology. On the one hand, the level of education of the population is relatively high and investments in higher education are superior to the EU average. In 2006, 52.5% of the employed population had a tertiary education level (EU-27: 39.5%) which puts Belgium in third position after Cyprus and Spain. Belgium is in the first position in EU27 for the share of tertiary educated people employed in high-tech-sectors in 2006 (38%). Nevertheless, even if the number of science and technology workers is also relatively high and growing (46.6% in 2006 of the labour force against 42% in 2002 (EU-27 average of 38.6%)), new graduates in these areas are less numerous with 17.74% of the new tertiary education graduates in 2005 (EU-25 average: 22.79%) against 18.8% in 2002<sup>17</sup>. Moreover, in 2006, around 31% of the HRST with third level education were not working in an S&T occupation (EU-27: 22%). It is argued in many recent reports that the incentives to become a researcher in Belgium are low due to poor career perspectives, the low levels of salaries of

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<sup>14</sup> Belgian Science Policy, Teirlinck P., 'Foreign direct investment in business R&D in Belgium in comparison with other EU Member States: statistical overview and policy-making', February 2009

<sup>15</sup> 12.4% of total R&D spending in Belgium was funded by capital from abroad, which is well above the EU27 average of 8.9%.

<sup>16</sup> Other interesting results come from a study carried out in 2006 by the Walloon Federation of Enterprises (Union Wallonne des Entreprises, Rapport sur la situation de l'entreprise en Wallonie, 2006). It showed that Walloon high-growth companies, which account for almost two jobs out of three created finance themselves more through loans than venture capital, increasing their financial risk. The majority of companies experiencing a strong growth were active in the sector of utilities, health or in traditional sectors, or were companies oriented towards the internal market. Only a minority were active in sectors with high growth potential (ICT, medical, biotech).

<sup>17</sup> Tableau de bord de l'innovation, <http://indicators.plan.be>

researchers and engineers, the complexity of the financing system and the low level of public financing<sup>18</sup>.

To sum up, Belgium's research and innovation performance is characterised by relatively high investment by the business sector off-setting an under-investment by the public sector. However this investment is precarious due to the dominance of a few large and foreign firms in the total expenditure. Belgium has a relatively well-educated population but is losing ground in the area of new science and technology graduates; a situation is worsened by the uncompetitive net wages paid to researchers and engineers.

### ***3.2 Policy objectives addressing R&D investment and barriers***

According to the European Commission assessment of the Lisbon Strategy implementation (2008)<sup>19</sup>, Belgium needs to increase substantially R&D spending and its impact through an improved and more coordinated policy mix, including between the various levels of government. According to the Belgium NRP for 2008-2010, to comply with the recommendation to spend 3% of GDP on R&D, the Belgian authorities commit themselves to make a greater effort to reach 1% of GDP by 2010. The NRP also highlights the necessity to better disseminate knowledge among economic actors. In order to achieve the 3% objective a coherent strategy involving all Belgian government agencies and the private sector has been developed. In addition, the "Research and Innovation Forum" has also been revived. The efforts of the authorities are intended to increase public and private R&D investment, to create and/or enhance competitiveness poles, to support knowledge transfers by promoting partnerships, to improve the market value of research activities, to promote available human resources for R&D, and to foster the dissemination and use of ICT.

The Flemish government has developed its own Flemish Reform Programme 2008-2010. This programme continues the implementation of the objectives and measures introduced in the first Flemish Reform Programme 2005-2008, namely an innovative economy which requires additional investment in research and innovation, encouraging entrepreneurship through the simplification of public regulations and administrative procedures, a strong stimulation policy to get more people into the workforce, and investment in skills development (primarily through the accelerated implementation of the skills agenda). All of this will be implemented while also ensuring that the public finances remain healthy and that sufficient attention is paid to sustainable development. The goals of Flanders are typically policies related to the development of the Flemish research systems. At the core of the reinforcement of the Research and Development policy is the mission to increase the R&D expenditures to the 3% norm. At this moment Flanders' rate for the Barcelona norm is 2.09; which is higher than the Belgium and EU average. However, the 2009 Policy Letter of the Minister of Economy, Science, Innovation, and International Trade concludes that it will require hard efforts to reach the 3% goal. If the norm of two-third private financing versus one-third public financing is taken into account, it can be concluded that there is a long way to go: both private financing (1.48%) and public financing (0.61%) are still far below the norm. The current decrease of the private expenditures makes it even more unlikely the goal will be met. The instruments for science and innovation

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<sup>18</sup> For a broader overview see the demands of the research actors in Parlement de la Communauté Française, 2007.

<sup>19</sup> European Commission assessment of Lisbon Strategy implementation, published 28 January 2009

are therefore being reassessed and currently, there is a trend towards simplification of the Flemish innovation policy<sup>20</sup>, so a further streamlining of the measures in Flanders is to be expected in 2009. Even if the Flemish government increased its investments in R&D continuously over the last decade, the gap between the Lisbon guideline of 1% public R&D expenditures is not coming within reach. Simultaneously with the raise of GBOARD also the regional domestic product increased, thus causing that the increase is averaged out by the economic growth. The additional funding will not suffice to reach the 1% norm the government is committed to. The Flemish Council for Science Policy (VRWB) calculated that the upcoming government will need to invest an additional €230m yearly, in order to reach the 1% on the end of its legislature. (2010-2014).<sup>21</sup>

According to the NRP for Wallonia and the French-speaking Community for 2008-2010, both authorities agree on the quantified objective of 3% of the GDP invested in R&D by 2010, out of which 2% from the private sector. The investments of the business sectors represented 73.5% of total R&D expenditures in Wallonia (1.85% of GDP in 2005, this share decreasing constantly since 2001). The challenge is to secure the business R&D investments while increasing the public R&D investments. The priorities of the Walloon-French-speaking authorities are the stimulation of the creation of activities with high added-value through the support to innovation and knowledge transfer and through the reinforcement of the focus of the economic fabric on sectors able to generate an enhanced dynamic of growth. The implementation of these objectives will be done through a set of measures to activate the main competitiveness and attractivity factors of Wallonia: research and commercialisation of research results, innovation in the broad sense, ICT diffusion, investment, internationalisation, networking, promotion of entrepreneurship, infrastructures, energy efficiency, eco-innovation. This will be completed by actions related to training and employment.

Brussels-Capital Region has not committed itself to quantifiable targets in the NRP; however the Government agrees that increased R&D spending is an integral part of further economic development. The Minister in charge of Research recently expressed the intention of the region to reach the 3% target<sup>22</sup>. Furthermore, the region aims to become one of the 10 most innovative regions in Europe.

### ***3.3 Characteristics of the policy mix to foster R&D investment***

This section is about the characterisation and governance of the national policy and instrument mix chosen to foster public and private R&D investment. While policy goals are often stated at a general level, the policy mix has a focus on how these policy goals are implemented in practice. The question is what tools and instruments have been set up and are in operation to achieve the policy goals? The following sections will each try to tackle a number of these dimensions.

At **Federal level**, there has been a move to improve and optimise the fiscal incentives it can allocate to both scientific and industrial research. This effort has

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<sup>20</sup> A review of the Flemish Innovation System by the Expert Committee Soete (Soete et al., 2007) recommended a simplification and streamlining of the innovation policy instruments. This recommendation is influential and thus has its effect on recent policy; the simplification is for instance reflected in the Policy Letter 2009 of Minister Ceysens (Ceysens, 2009).

<sup>21</sup> VRWB, Memorandum 2009-2014. Presentation by Karel Vinck, VRW Chairman.

<sup>22</sup> Discourse of Benoit Cerexhe, 13 March 2009

made some in-roads into reducing the competitiveness gap for undertaking research in Belgium due to high wages and social charges. The most important measures at the Federal level are the various tax reduction schemes for R&D activities, introduced in the last five years. The tax measures are however less generous for companies than for universities, and there is still (even with the tax incentives in place) a major discrepancy between the net income earned by researchers and the gross labour costs for R&D personnel incurred by firms. In addition, in April 2007 a special tax deduction of 80% on the tax base for patent income was introduced in a new programming law. As a result of this deduction, patent income is subject to an effective Belgian tax rate of 6.8% in Belgium (i.e., one-fifth of the Belgian statutory tax rate) as of tax year 2008. Given the limited scope for action in favour of enterprise level investments in innovation of the Federal authorities this orientation is coherent and responds to a long running criticism of the ineffectiveness of fiscal measures for R&D and innovation in Belgium.

Over the last six years, the trends in the priorities of the policy-mix in each of the three Belgian regions have tended to adopt some distinctive feature, due to the specific institutional and economic environments. At the same time, a number of measures or approaches are similar in objectives yet differ in the approach to implementation. A common feature of both the Flemish and Walloon systems is the emphasis on measures aimed at encouraging increased co-operation between the research base and enterprises. A major difference between the two systems has been the strong focus in Wallonia on schemes aimed at encouraging knowledge diffusion through the exchange or temporary assignment of skilled researchers or innovation specialists from the university/research centres to enterprises (and vice-versa), the FIRST family of measures. In Flanders, this type of action is subsumed within more general industrial R&D subsidy schemes.

The regions have all made commitments to invest more in R&D and there is concerted effort to focus this funding on either thematic or sectoral approaches such as the Flemish strategic research centres (IMEC, VIB, etc.) and competence poles, or the Walloon competitiveness poles and the Brussels clusters.

In **Flanders**, an additional €119m has been invested in 2008, making the total initial budget of science and innovation policy (including university basic funding, according to the OECD definitions, excluding the federal tax measures) €1,568m. Of this budget €988m can be classified as R&D.<sup>23</sup> Of this R&D component of government spending about a fifth is direct basic university funding. In 2007 a significant part of the rest of the funding was going to universities and research institutes as well (€553m or 62%), partially based on competition at project level. Finally, subsidies to companies amount to €160m (18% of funding). Apart from these subsidy measures there have also been investments in various funds to provide capital in seed and early start-up phases. In 2007, no additional financial means are invested in these funds since the present available resources seem adequate – for 2008, the balance will be alike.<sup>24</sup> There also exist instruments like the guarantee regulation to support financing of the start-up and/or growth of companies.

A number of new measures in the science field was introduced in the last year: an investment fund for large infrastructure (Hercules Fund), a fund to attract foreign researchers to Flemish institutes (Odysseus), and a measure to promote continuity of

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<sup>23</sup> EWI Speurgids, 2008

<sup>24</sup> EWI Speurgids, 2007

personnel in university groups (Methusalem). Furthermore the TBM programme for Applied Biomedical Research with a primarily societal aim was introduced to support the development of diagnosis and treatment methods that will not be developed by industry or any other party because the number of patients is too small for economic viability.

The evaluation of the Flemish innovation system by the Expert Committee Soete was finalised end November 2007<sup>25</sup>. It concluded that Flanders has a well-developed policy mix for research and innovation support, but that (esp. in the area of innovation support to SMEs) the system should be made more transparent.

Funding in the **Walloon region** for research and innovation increased over the period 2006-2009 (€270m in 2008, €310m in 2009), with a stronger emphasis than in the past on collective actions, but with a remaining dominance of funding being allocated, as in Flanders, for 'research' in universities and to a lesser extent than in Flanders, to industrial research centres. In 2007, the available means to the DGTRE for enterprise funding stood at €103m (40% of the total financial means, Annual Report of the DGTRE 2007) in comparison to €77m in 2006 thanks mainly to the Marshall Plan. Previous studies on the Walloon subsidy system for enterprises suggested that a majority of this budget goes to the reimbursable loans and enterprise subsidy, largely dominated by a few larger manufacturing sector enterprises or research intensive firms. Hence, the budget remaining for actions aimed at innovation support to non-technologically advanced SMEs continues to be no more than a few percentages of the total Walloon budgetary effort.

A new decree for the support of R&D and innovation in Wallonia was adopted in July 2008, which plans new actions adapted to changes in the global economy and technology, the Belgian institutional landscape and changes to European support aid in this area. Five competitiveness poles were created in Wallonia, which combine companies, training centres and public and private research units involved in partnerships and targeting global excellence in productive sectors. The clustering policy is also intended to support the development of (trans-)sectoral company networks. In addition, the Walloon government is pursuing the launch of mobilising programmes and excellence programmes. Through its mobilising programmes, the Region is aiming to improve the scientific potential of its universities and schools of higher education in industrial fields essential to the Region and to bring them into the fabric of Walloon industry. The excellence programmes consist in injecting additional funds into university networks to promote the creation of new long-term fields of excellence that will be productive for the development of the Walloon economy. Since 2008, the Walloon Region support as well universities hiring high-calibre international academic staff to lead research activities through the START programme.

The Region of **Brussels-Capital** has adopted its first regional innovation plan in December 2006. The policy-mix being developed is based on a sectoral/clustering approach complemented by a drive to stimulate creation of new 'high-tech' or knowledge intensive enterprises; an effort to improve the commercialisation of the academic and public sector research base in the region; and the development of infrastructures and services suitable to attract R&D activities from the outside.

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<sup>25</sup> Soete et al., 2007

### 3.3.1 Overall funding mechanisms

#### Funding system

R&D funding in Belgium flows through the various governmental and non-governmental bodies at the federal, regional and community levels, to reach public and private R&D agencies. All state entities independently determine their R&D spending and thus, the federal, Walloon, French Community, Brussels-Capital and Flemish governments all define their own funding system according to their unique needs and rules. The regions distribute funding allocated to their specific support measures through either department of the regional ministries, funding agencies, or special financial organisations or foundation.

The mechanisms for funding fundamental research, which fall under the responsibility of the Belgian communities, adhere to the principle of researcher's initiative and consequently do not incorporate any priorities in terms of sectors or disciplines. According to the Federal Office for Science Policy, institutional support for universities represented 24% of the total public funding for R&D (€1,960m) in 2006, funding for scientific institutions 14% and project based funding 12%; allocated to universities by way of the research funding agencies. Apart from these mechanisms, 17% 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 and 15% is meant for industrial research. 14% of government budget is dedicated to the participation in international research programmes, mainly space research. According to Eurostat data, in 2006, R&D intensity of the higher education sector lies around EU 27 average (0.4% of GDP) whereas the government sector is below EU27 average (0.16% against 0.25% in 2006).

In terms of public credits for research, a total of €465.43m has been awarded to non-oriented research by the Belgian authorities in 2006, which represents 23.9% of total GBAORD. This is an increase in comparison to 2004 (21.1%) but a decrease from the previous year 2005 (24.2%). However, basic research is underfinanced in comparison to applied research.<sup>26</sup> Not surprisingly given the high importance of the business knowledge demand in the country, the technological objectives of the GBAORD are the ones that saw the biggest increase in Belgium since 1997 (from 37.9% to 45.9% in 2006), in such a manner that this share is more important in Belgium than in any other OECD country (CICW/CCPS, 2008). A consideration of the distribution of GBAORD between socio-economic objectives (NABS) at the Belgian level shows a steady decrease in the share of public credits for the NABS "production, distribution and rational use of energy" since 1987, an increase in "production and industrial technologies" which was already the biggest sector supported (33.3% of GBAORD in 2006) and a slow decrease of research financed by the general funds of universities (17.1% in 2006).

#### Thematic priorities

A number of funds and public funding appropriations from Belgian authorities are dedicated to thematic priorities. Involvement at **federal level** is mainly restricted to fiscal measures (because fiscal policy is a federal responsibility and science and

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<sup>26</sup> Parlement de la Communauté Française, Etat des lieux de la recherche scientifique, rapport de commission présenté au nom de la Commission de l'enseignement supérieur et de la recherche scientifique par Mesdames Françoise Fassiaux-Looten et Caroline Persoons, Session 2007-2008, 26 Septembre 2007

innovation policy are regionalised). Federal research policy in Belgium is therefore mainly generic by nature. At the Federal level there are thematic programmes in areas that fall within the competences of the federal level, namely space research and programmes in areas such as information society, national cohesion and normalisation. However, funding levels are relatively marginal even for the well-appreciated Inter-university attraction poles. The main focus of the Federal funding is clearly in the area of space research, alongside the important, if financially smaller, polar research programme. New strategic approaches are developed to activate the fiscal and para-fiscal incentive instruments to promote R&D. This is the case with recent partial exemptions of advance payment on wages in favour of employers who employ researchers, applicable for R&D personnel in universities, research institutions and companies.

The **Flemish** Science and Innovation policy can also be characterised as generic. Most of the budget for research is channelled through the universities that have a great deal of freedom to choose the fields of application. In addition, FWO and IWT, the two most important agencies, primarily use horizontal funding instruments, without thematic priorities. An exception to this generic approach are the so-called Strategic Research Centres. Over the years, four of these centres have been set up to strengthen the research base in microelectronics (IMEC), environment (VITO), biotechnology (VIB) and broadband technologies (IBBT). The government contribution to these initiatives is more than €100m per year (for all four initiatives). These centres do not necessarily align with the Flemish industry. IMEC for instance has built up a strong reputation in micro-electronics, even though there was (and is) no clear-cut industrial knowledge demand in this field in Flanders itself. Currently, feasibility studies for new strategic research centres in the area of materials, technology and translational biomedical research have started. Furthermore, there are sector- or theme-specific "centres of excellence". These are, however, smaller in size, operating on a budget in the range of €1-2m per year, oriented more towards application of knowledge than on developing knowledge and they are financed from a generic programme.

The **Walloon region's** research policy places an emphasis on the exploitation of public research output in the economic sector and the enhancement of technology diffusion in companies. With the recent "Marshall Plan", a reinforced approach to support innovative public-private partnerships in key sectors is emerging with the competitiveness poles, and existing instruments, such as targeted R&D programmes ("mobilising programmes") and industry-science schemes like the FIRST schemes, are being reinforced. Although the support programmes are generic in their set up, the individual competitiveness poles and mobilising programmes have specific subjects. The five competitiveness poles are in the areas of aerospace, agro industry, mechanical engineering, life sciences and health and logistics. The areas of research in the framework of the mobilising programmes for these mobilisation programmes are chosen from amongst the "40 key technologies" in which Wallonia has scientific and industrial expertise<sup>27</sup>. In addition, Marshall programmes of excellence are targeting annually specific areas of research for public institutions. Successive themes have been angiogenesis for cancer treatment in 2006 and nanotechnology, information technology and biomedical applications in 2007. Themes have been decided by the Walloon Government based on a mapping of the

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<sup>27</sup> Under the Marshall Plan for Wallonia, €25m are earmarked each year for mobilising programmes.

excellence areas of the Walloon Region done by the National Fund for Scientific Research cross-checked with regional industrial policies.

Since the adoption of its Regional Innovation Plan in 2006, the **Brussels-Capital region** is targeting its interventions on three priority sectors promising for the Brussels economy through annual impulse programmes: environment was the main funding focus in 2008 after the area of life sciences in 2007 and ICT in 2006.

### 3.3.2 Policy Mix Routes

The "Policy Mix Project" identified the following six 'routes' to stimulate R&D investment:

1. promoting the establishment of new indigenous R&D performing firms;
2. stimulating greater R&D investment in R&D performing firms;
3. stimulating firms that do not perform R&D yet;
4. attracting R&D-performing firms from abroad;
5. increasing extramural R&D carried out in cooperation with the public sector or other firms;
6. increasing R&D in the public sector.

The routes cover the major ways of increasing public and private R&D expenditures in a country. Each route is associated with a different target group, though there are overlaps across routes. The routes are not mutually exclusive as, for example, competitiveness poles of cluster strategies aim to act on several routes at a time. Within one 'route', the policy portfolio varies from country to country and region to region depending to policy traditions, specific needs of the system etc.

Policy documents in Belgium do not express objectives according to all these routes, but they are all covered implicitly. A number of "systemic" instruments, such as the large Flemish strategic research centres and the recent Walloon competitiveness poles have a particular role in the policy mix, since they act on most, if not all, routes. The routes 5 and 6 are covered by a large set of instruments.

#### **Route 1: Promoting the establishment of new indigenous R&D performing firms**

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 three Belgian regions as well as by the Federal authorities. Boosting entrepreneurship is a key element of the National Lisbon Reform programme with a commitment of the Federal Government to reduce the current 34 days it takes to create a company to only 3. A range of measures has been taken over the last decade and particularly since 2000 to make Belgium a more attractive place for enterprises. At the federal level, measures include general tax deductions on labour and in particular tax deductions for hiring researchers. 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), support entrepreneurship (Flemish and Walloon entrepreneurship action plans) and access to finance. However, the promotion of knowledge intensive service sector companies still leaves much to be

desired and the number of spin-offs as such while honourable is hardly enough to regenerate the structure of the economy.

In Flanders, there are several initiatives to promote New Technology Based Firms. By investing in promising SMEs, the PMV (Participatie Maatschappij Vlaanderen) enables SMEs to invest in R&D. With the Vinnof (Flemish Innovation Fund) and ARKimedees<sup>28</sup> projects programmes, PMV opens up options for enabling Flemish SMEs to boost their innovativeness, by increasing the granting additional risk capital with 50% for new ventures (Vinnof) or existing SMEs (ARKimedees). Although this measure is not developed for R&D performing firms solely, R&D performers are eligible and using these measures. IWT invests in the establishment of new performing firms by means of the specialisation bursary for researchers wanting to develop a business. Existing companies are stimulated to conduct R&D by means of grants.

### **Route 2: Stimulating greater R&D investment in R&D performing firms**

Schemes exist in all the regions to stimulate R&D investment in R&D performing firms. These range from direct aid schemes for R&D in companies, support to research of regional relevance (mobilising programmes in Wallonia and impulse programmes in Brussels), support for hiring R&D personnel (FIRST schemes in Wallonia), support to register and to maintain a patent, support for the launch of spin-offs as well as measures do exist to promote risk capital (Brustart, business angels networks). At the federal level, in addition to the importance of the funding of space research, tax measures have been taken to reduce the costs for hiring researchers as well as to support young innovative companies. In addition to the innovation grant directed towards innovative SMEs launched in 2008, in the framework of the new programming period of the European Structural Funds, several schemes have been launched in Wallonia to support innovative SMEs (ACQUITECH in Wallonia to support the external acquisition by SMEs of patents, licenses and know-how through reimbursable advances and STIMULE to foster SMEs to exploit the research results within 24 months after the end of a research programme supported by the Walloon Region through a reimbursable advance).

In Flanders, several programmes stimulate R&D investments. IWT supports companies to perform R&D by granting financial support for R&D company projects (O&O-bedrijfsprojecten). The funding covers for 40% of research costs or 15% of development costs. For SMEs IWT has specific to cover R&D expenses and to support technological feasibility studies. Recently, the SME-scheme has been simplified in order to make it more accessible.

### **Route 3: Stimulating firms that do not perform R&D yet**

The most difficult road to pursue seems to be Route 3, initiating R&D in companies that are not involved in R&D activities yet. Here instruments from economic and industrial policy, but also from the education and training spheres, seem most relevant: given the important challenge identified in this respect in Belgium (due to high concentration of R&D activities in a small number of companies) this is probably where most attention should go in terms of analysing interactions and promoting synergies with non-R&D specific policies.

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<sup>28</sup> “ARK” stands for “Activering van RisicoKapitaal”, literally “activation of risk-bearing capital”.

In order to stimulate companies that do not perform R&D yet, several measures have been launched in the last years, most notably the innovation premium at the federal level or the pre-activity and the innovation grants in the Walloon region. In addition, firms can make use of the different schemes existing to get technological advice (Technological innovation manager and technological service vouchers in Wallonia, subsidy for technical feasibility study in Brussels-Capital). In the framework of the ERDF programming period, SMEs in the province of Hainaut in Wallonia can apply to the FIRST enterprise Doctor to hire research staff in order to carry out a research programme developed by the company.

In order to improve the qualifications in companies, there is an obligation in Belgium for companies to invest a specific percentage of the salary mass into training actions. In addition, in Wallonia the e-learning platform and the competence centres are useful tools to improve the qualifications of the staff.

The measures of the IWT mentioned by route 2 are for all companies that perform R&D, regardless whether they performed R&D in the past. To a lesser extent, they are therefore also applicable to firms that do not perform R&D yet. More focused on these companies are the Innovation centres of the IWT, which are the local antennas of the IWT. These Innovation centres are part of the Flemish Innovation Network that stimulates innovation. The actions of Flanders DC (FDC) stimulate the creativity of firms and the innovative capacity. FDC carries out activities to help companies in being creative by stimulating the consciousness of innovation. Also, it tries to make the broader public sensible to creativity in companies, etc. Furthermore, FDC offers some possibilities to jointly work on a certain innovation project with other actors.

#### **Route 4: Attracting R&D-performing firms from abroad**

Attract R&D-performing firms from abroad is logically important for a small open economy dominated by multinational companies. Route 4 is the most heavily influenced by instruments from outside the traditional R&D portfolio, like the availability of industrial estates or general taxation and macroeconomic framework.

The tax measures set up at the federal level explicitly aim at attracting knowledge based companies (tax measure on patent incomes, on hiring researchers and reduction of the social charges on labour in general) as well as the reduction of the administrative burdens is clearly instrumental in improving the framework conditions for newly established companies. Nonetheless, apart from the different instruments available for new indigenous R&D firms which also apply to firms deciding to get established in the country (see Route 1), there are no specific measures in the regions for this purpose. Most of the measures do focus on attracting researchers but not specifically companies, if one excepts the launch of the competitiveness poles in Wallonia which aims notably at increasing the international visibility of the regional excellence.

The socio-economic plan for Flanders “Flanders in action” states explicitly that “For Flanders it is important to attract both export-oriented and high-tech knowledge-oriented investors”. Flanders Investment and Trade (F.I.T.) is the most important body to attract R&D-performing firms from abroad. F.I.T. This is done by means of attaché’s in foreign countries, as well as more general informative representative functions. Moreover, the large Strategic Research Centres – e.g. IMEC, VIB- might appeal to foreign R&D performers, as they perform world-class research.

### **Route 5: Increasing extramural R&D carried out in cooperation with the public sector**

The Route 5 (increasing extramural R&D carried out in cooperation with public sector): corresponds to the dominant objective of improving science-industry relationships. In addition to the tax measures reducing the costs for the industry to hire a researcher, many programmes in the regions focus on this aspect. For example the 2008 research and innovation decree in Wallonia activities aims at further stimulating the synergies and partnerships between enterprises, between enterprises and university units, HEI units and research centres, notably in the framework of technological innovation partnerships. The first partnership of this kind was launched at the end of January 2009 in the area of sustainable building. In addition, in Wallonia and Brussels-Capital, many other schemes do promote the collaboration between actors, in particular the cluster and competitiveness poles policies and the mobilising and impulse programmes. In addition to the FIRST programmes consisting in the transfer of personnel between academia and industry, the interfaces and intermediaries are as well highly supported by the authorities to help linking actors. Technological advisors are also present in the collective research centres in Wallonia.

In Flanders, several public-private initiatives increase the extramural R&D. The competence poles and the strategic research are the most apparent way to increase extramural R&D. The Flemish government is reinforcing this policy. In 2008, IMEC for instance, received an additional €4.4m on funding; VITO received an additional €4m. The Flemish Council for Science Policy (VRWB) is currently exploring the possibility to set up more competence poles. Currently studies are carried out to assess the opportunities in the realms of materials and translational biomedical research.

### **Route 6: Increasing R&D in the public sector**

Increase R&D in the public sector is a major priority in the country. In the last years, the institutional funding for universities has increased. Basic funding for research at universities is provided by FWO-Flanders and FNRS-French speaking Community. In addition, increased funds are awarded to university research through the Special Research Funds and the Concerted research actions in the French-speaking Community. At the federal level, in addition to the federal research programmes and the support of federal scientific institutes, funds are awarded through the Inter-university attraction poles in order to foster the collaboration between excellent research teams belonging to the different linguistic communities of the country.

In Wallonia, in addition to the launch of the competitiveness poles involving research organisations recognised for their excellence, the excellence programmes consist in injecting additional funds into university networks to promote the creation of new long-term fields of excellence that will be productive for the development of the Walloon economy. The START programme launched recently aims at enabling universities hiring new international-calibre academic staff by providing them with financing for their research project from the outset. In the region of Brussels-Capital, the research impulse programmes have as their objective to finance new research projects in areas that are considered as priority for the economic development of the region, the last one being environment.

In Wallonia, a new institute called WILL has been created in 2009 for excellent research in life sciences and biotechnologies. In addition, a research funds for the other higher education institutes has been created in 2009 with a subsidy of

€250,000 per year. For each project selected under the scheme 'FIRST Higher-education institutes', the HEI will receive an additional amount of €25,000 in order to replace the professor promoting the research project.

Many instruments in Flanders aim at increasing R&D in the public sector. For 2009, a new boost is given to R&D of an additional €75m. The largest part of Route 6 is the funding of universities. Furthermore, the special research fund increased R&D funding with €1.7m to €103m in 2008. For a more in depth analysis of the public funding, see the [Erawatch Country Report 2008](#).

### **The importance of education and innovation policies**

The role and influence of education policy on research policies and research performance in Belgium has been alluded to widely throughout the rest of this report. A range of initiatives has been taken or have begun recently to stimulate research at higher education level (e.g. grant for industrial doctorates in Wallonia, etc.) and to attract and retain post-graduate students and researchers. However, a main difficulty appears to be at primary and secondary levels of education and perhaps also the overall image of research and researchers in society. Again this is not due to inaction, since at all levels of government there has been a raft of actions taken to promote science, and indeed creativity and innovation, amongst schoolchildren. However, the effects of these efforts are not apparent and perhaps the sporadic and ad hoc nature (aside from the permanent science education centres in Flanders, Technopolis in Mechelen, and Wallonia, the PASS centre near Mons) of much of what is done is failing to create a real drive towards popularisation of science education. A major programme like the UK's Science and Engineering Ambassadors initiatives might be called for as well as the need for improved teacher training in science for primary and secondary school teachers.

Innovation policy in Belgium is present, at regional level, but in general in an implicit manner, or as part of a broader research-innovation policy mix, and the emphasis of most funding initiatives remains heavily focused on technological innovation related to the commercialisation of university research or industrial research funding. However, there is a recent emphasis given to other forms of non-technological innovation such as support for design, pilot actions in favour of open innovation, and some shift towards innovation in services through specific clusters or competitiveness poles.

As highlighted in the [TrendChart report 2008](#), one important challenge for the Belgian innovation system remains indeed the structural mismatch in the labour market increasingly identified as a bottleneck in the system, notably by enterprises and their representative federations. The labour market is characterised by a relatively high level of unemployment (with localised pockets of very high unemployment) and relatively low overall employment rates. Yet, employers report that they face increasing difficulties to fill places for qualified and skilled workers. A report by one of the main Belgian universities highlighted that these mismatch problems are as common in 'science' based jobs as in technical or manual sectors (construction and mechanical engineering)<sup>29</sup>. This issue clearly links to the afore-mentioned problem of low-numbers entering science education and remaining in scientific or technical

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<sup>29</sup> The technology industry federation (the largest multi-sector employers federation) AGORIA noted in May 2008 that there was a shortfall of some 14,000 ICT experts. Research by Vlerick Management School finds that 72% of Belgian companies sees personnel shortage as the main barrier for future growth (De Standaard, 19 June, 2008)

careers. It also underlines another weakness of the Belgian innovation system, namely insufficient attention to and investment in life-long-learning. Debate is going on, both in the Flemish as in the French-speaking community to develop specific industrial training initiatives to provide shorter-term solutions. Another point, raised in the [2008 TrendChart report](#), is the low relative rate of 'innovative start-ups' in Belgium remains below that of other key competitor countries<sup>30</sup>. This slower growth is essentially due to slower growth across all sectors, however, in knowledge based services this is made worse by a specialisation in sub-sectors which have shown slower growth in all industrialised countries. The 2007 evaluation of the Flemish Innovation Policy Mix<sup>31</sup> concluded that there was a need for a clearer policy in support of SMEs and start-ups. Similarly, a report on the Walloon innovation system highlights weak entrepreneurial propensities<sup>32</sup>.

In general as noted above, research and innovation policies are not clearly distinguished between and the same regional administrations and agencies manage both technological and non-technological support measures. Hence, co-ordination per se is not an issue, rather getting the balance right between a focus on 'hard R&D' support (the majority of the support provided) and the need to boost design and marketing related innovation (e.g. to help companies working in intermediate goods to develop own brand products), entrepreneurial capacities, innovation management in companies, etc. is more of a challenge.

Other policy areas in Belgium tend to have little direct influence on research policy: environmental issues are certainly growing in importance, transport and mobility constraints in a densely populated country should be receiving greater attention, etc., however there is little in the way of a structured analysis of needs or demand for research from other policy fields.

### **Assessment of the importance of policy mix routes and their balance**

In Belgium, in general, the most important 'routes' in the policy mix are clearly route 2: support to stimulate greater R&D investments in R&D performing firms; route 5, increasing extramural R&D carried out in co-operation with the public sector; and route 6 increased R&D in the public sector. This conclusion is based on an understanding that the 'public sector' includes publicly funded research in the higher education sector, since government performed R&D in Belgium is relatively unimportant.

For **Flanders**, by far the most important route is Route 6, this route comprises all traditional R&D expenditures, including university funding. Also route 5 is important, in terms of budgets, a large share of funding through the strategic research centres. In **Wallonia**, similarly, route 5 has grown in importance with the competitiveness poles programme and an increasing emphasis on partnerships between universities, research centres and enterprises. In the region of **Brussels-Capital** the main route currently supported is the route 2. Nonetheless, the legal framework is presently reviewed and new forms of R&D support are being developed. In particular, following the adoption of this decree, specific support should be made available for

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<sup>30</sup> Review of available statistics and surveys on entrepreneurship demographics by the Walloon Ministry's Department of Economy and is available at: <http://economie.wallonie.be/02PolEco/EconomieWallonne/evolutionEconomie/d%E9mographie%20-%20nov06.pdf>

<sup>31</sup> Soete et al, 2007

<sup>32</sup> Bernadette Biatour, Christel Chatelain and Chantal Kegels, Le système d'innovation en Wallonie, Federal Planning Office, November 2007

young innovative companies, as well as innovation in processes and in services will be promoted and the use of external innovation support and the temporary hiring of highly qualified personnel will be supported<sup>33</sup>.

Support to new indigenous R&D performing firms does receive and has received growing support over the last decade but remains relatively 'marginal' compared to the large share of funding channelled to the existing "champions" of R&D expenditure. Attracting, or rather retaining, foreign owned R&D performing firms is an issue of growing importance and both Federal tax incentive and regional actions to structure research activities in visible clusters or poles of excellence are seeking to support this route.

**Table 7: Importance of routes in the national policy and recent changes**

Route	Short assessment of the importance of the route in the national policy	Main policy changes since 2008
1	Increasing importance	No specific change
2	Moderate importance	Wallonia: support to innovative SMEs through ERDF cofinanced measures Flanders: restructuring of the instruments, esp. for instruments aiming at SMEs, and additional resources for SME programme of IWT (+€3m).
3	Increasing importance	Wallonia: pre-activity grant, technological innovation vouchers
4	Low importance, but increased attention because of the decrease in R&D expenditures	No specific change
5	High importance	Wallonia: launch of Technological innovation partnerships Flanders: increased budgets, development of ideas for more competence poles
6	High importance	Increased public budgets for public R&D; Wallonia: START programmes, creation of the excellence research centre WILL

### **3.4 Progress towards national R&D investment targets**

Although there is a broad consensus on the need to invest more in R&D, current rates of growth of R&D investment remain insufficient to attain political objectives. Belgium's research performance is characterised by relatively high but decreasing share of activity by the business sector off-setting a growing but still relatively small public sector investment. Due to the dominance of a few large and foreign firms in the total business expenditures, this investment is precarious.

The low level of public funding of research is an important point of concern in the country raised in many recent publications<sup>34</sup>. Government budget appropriations for R&D (GBAORD) have been more or less stagnating (in relative terms compared to GDP) since the beginning of the century, represented 0.6% of GDP in 2007; far below the EU27 average of 0.71%. The distribution between the different authorities was in 2006<sup>35</sup>: Federal level: 26.3%; French-speaking Community: 12.63%;

<sup>33</sup> Discourse of B.Cexerhe, Minister in charge of Scientific Research in the region of Brussels-Capital, 23 March 2009

<sup>34</sup> OMC peer review, Policy-Mix project, Federal Planning Office, 2007; TrendChart, CWPS or Belspo, 2008

<sup>35</sup> Latest available data at regional level is from 2006, as GBAORD as a share of GDP lied at 0.61% in Belgium

Flanders: 49.74%; Walloon Region: 10.28%; Brussels-Capital: 1.07%. However, the Federal Government has recently boosted fiscal incentives for R&D, which 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 the Walloon region from €136m in 2005 to €310m in 2009. In Brussels-Capital region the research budget increased by €11.5m in 2008 (+€23.5m in comparison to 2004) to reach €48.5m in 2008.

This slight increase in public funding (from a low level) is accompanied by a decrease in business expenditure on R&D (BERD), which has traditionally accounted for a significant share of Gross Expenditures on R&D (GERD), from 1.51% of GDP in 2001 to 1.24% in 2007<sup>36</sup>. An increase in BERD seems increasingly unlikely to occur as strategic ownership of the last of the large 'Belgian' firms is increasingly frittered away and the economic structure of the country becomes increasingly service sector dominated. Indeed, an important risk for the Belgian research system comes from its reliance on a few big players, with decisions centres often abroad. Further closures and downsizing of the activities of these companies would have strong negative impacts on the Belgian research performance. The introduction of additional tax measures and in particular, the concept of notional interests is clearly designed to arrest this outflow. More top-down initiatives focusing on promising domains and increased support of smaller players could be decisive for a sustainable R&D policy.

**Figure 3: recent trends in expenditure on R&D**

<u>Belgium</u>	2005	2006	2007	EU-27 (latest year)
				Average
GERD (euro million)	5552	5967	6263	226120
R&D intensity (GERD as % of GDP)	1,84	1,88	1,87	1,83
GERD financed by government as % of total GERD	24,7	na	na	34,2
GERD financed by business enterprise as % of total GERD	59,7	na	na	54,5
GERD financed by abroad as % of total GERD	12,4	na	na	9,0
GBAORD (euro million)	1788	1946	2005	87639
GBAORD as % of general government expenditure	1,14	1,26	1,24	1,55
BERD (euro million)	3776	4129	4337	144089
Business sector R&D intensity (BERD as % of GDP)	1,25	1,30	1,29	1,17
BERD financed by government as % of total BERD	6,2	6,2	na	7,2

Public expenditure on R&D; together with the decreasing levels in BERD make reaching the 3%GERD/GDP Barcelona objective hard, and the high level of public debt in Belgium makes room for manoeuvre small, particularly in the context of the current global financial crisis. The Structural Funds are a mechanism to increase the budget allocated to R&D activities at least in Wallonia. The total amount dedicated to R&D activities from the Structural Funds for the period 2007-2013 represents €250m (ERDF and regional contribution), which is an increase of 30% in comparison to the previous period (25% of these funds are dedicated to SMEs). The period until funding is phased out post 2013 should be used to increase the sustainability and the self-financing capabilities of the Walloon region in another way.

The number of researchers is however also low, and when additional funding is realised the shortage of capable researchers will increase. Apart from policies to improve the comparatively poor labour conditions for researchers (salary, career

<sup>36</sup> More analysis of support measures in favour of enterprise level R&D can be found in the Inno-Policy [TrendChart reports on Belgium](#).

perspectives, financing)<sup>37</sup> raising the number of candidates (by e.g. awareness and image campaigns), improving the success rate in the S&T domains and easier access to the labour market for an increased number of foreign graduates are options for improvement

Finally, the political instability in the country can also represent a risk in terms of financing and management of research activities. An enhanced co-operation, if not coordination, between the regional/community strategies supporting research is needed. The fragmentation of the research efforts in many universities can lead to sub-optimal levels of research but the recent enforcement of the Bologna Process is adding some more consistency to the system (merger of several HEI).

As regards the impacts of the financial crisis, because of a weakening external demand and subdued domestic demand largely related to associated high inflation, GDP growth in Belgium slowed noticeably to 1.3% in 2008 and a public finance deficit of around 0.9% of GDP is expected for 2008<sup>38</sup>. In response to the crisis, Belgium has adopted financial sector support measures to stabilise the banking sector, which should also help improve access to finance and thus support the wider economy, and underpin macro-economic stability. In addition, Belgium recently announced measures, including financial support for SMEs and an adaptation of the existing R&D support schemes and their implementation processes making them more flexible in order to fit with the economic downturn.

**Table 8: Main barriers to R&D investments and respective policy opportunities and risks**

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
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 will 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 will place a strain, along with the current financial crisis and growing unemployment, etc. on public budgets available for research.
Low competitiveness of salaries for researchers and insufficient number of internationally prestigious research infrastructures	A range of measures have been taken concerning salary costs, etc. as documented in this report. However, there is no evidence yet that this is paying off in terms of reversing brain drain or attracting more HRSTE to work in research careers. Initial efforts are being made to strengthen and coordinate Belgium efforts to develop and attract European level research infrastructures. Investments such as in polar research can also be considered to be internationally visible.

<sup>37</sup> In order to enhance the attractiveness of the career of researcher, the Walloon Council for Science Policy recommends a rigorous implementation of the principles of the European charter of the researcher (2008)

<sup>38</sup> Council recommendation, 2009

## 4 Contributions of national policies to the European Research Area

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ERAWATCH country reports 2008 provide a succinct and concise analysis of the ERA dimension in the national R&D system of the country. This chapter further develops this analysis and provides a more thorough discussion of the national contributions to the realisation of the ERA. An important background policy document is the Green paper on ERA<sup>39</sup> which comprises six policy dimensions, the so-called six pillars. Based on the Green Paper and complementing other ongoing studies and activities, this chapter investigates the main national policy activities contributing to the following four dimensions/pillars of ERA:

- Developing a European labour market of researchers facilitating mobility and promoting researcher careers
- Building world-class infrastructures accessible to research teams from across Europe and the world
- Modernising research organisations, in particular universities, with the aim to promote scientific excellence and effective knowledge sharing
- Opening up and co-ordination of national research programmes

In the ERA dimension, the *wider context of internationalisation of R&D policies* is also an issue related to all policy pillars and is normally present in the dynamics of national ERA-relevant policies in many countries.

### 4.1 Towards a European labour market for researchers

#### Demand for and supply of qualified personnel

Demand for qualified science, engineering and technical employees is high in Belgium. In overall terms, the number of science and technology workers is relatively high and growing (46.6% in 2006 of the labour force against 42% in 2002 (EU27 average of 38.6%). In Flanders, in particular, the share of R&D personnel is relatively high (1.25% of all personnel works in R&D positions; BE: 1.18%, EU25: 0.97), however, on the supply side, companies and universities experience problems in finding human capital. At the beginning of 2008, there was a large scarcity of skilled ICT workers<sup>40</sup>, and the number of vacancies rose by 2,500 per month<sup>41</sup>. Despite the current economic recession, the problem persists. The economic downturn did not affect, so far, the thousands of extra engineers and technicians, needed to respond to the scarcity of knowledge workers.<sup>42</sup>

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<sup>39</sup> Commission of the European Communities: Green paper: The European Research Area: New perspectives. Brussels 4.4.2007, COM(2007) 161final (see [http://ec.europa.eu/research/era/pdf/era\\_gp\\_final\\_en.pdf](http://ec.europa.eu/research/era/pdf/era_gp_final_en.pdf)).

<sup>40</sup> De Standaard, 22 May, 2008. Bijna 15.000 vacatures voor informatici

<sup>41</sup> De Standaard, 14 May, 2008. Niemand te vinden voor 50.000 jobs

<sup>42</sup> De Standaard, 10 March, 2009. Eén op de vier jobs raakt niet ingevuld

In terms of the supply of qualified researchers, Belgium has a relatively well-educated population in comparison to the EU average<sup>43</sup> but is losing ground in the area of new science and technology graduates; accounting for 17.74% of new tertiary education graduates in 2005 (EU25 average: 22.79%)<sup>44</sup> against 18.8% in 2002<sup>45</sup>. In terms of doctorates, 1.1 per 1000 persons between 25-34 years obtain a doctorate, which is below the OECD average; the number of S&T doctorates (0.6 per 1000) is however the average OECD level.<sup>46</sup> In particular in the universities of the French-speaking Community the number of doctorates is stagnating in the last ten years, notably in sciences. Similarly, in Flanders problems are expected, especially in the medium term as the number of third-level students in the faculties of sciences, applied sciences and applied biological sciences has declined by 5.1% from 2000-2008. The courses in industrial science and technology, applied informatics showed a decline of 1.3% for professional bachelors (hoge scholen) and a 25% decrease on the academic level in that same period.<sup>47</sup>

In short, there is an imbalance in the demand and supply of qualified personnel in Belgium able to develop and implement new technologies stemming from research in enterprises and other actors of the economy, notably in a context of an increased specialisation. Certain observers consider that there is a real risk that the research potential will decrease over the time<sup>48</sup>, due to such issues.

This situation is aggravated by the uncompetitive net wages paid to researchers and engineers, poor career perspectives, low number of research excellence poles, the low level of public financing and the complexity of the funding system. Various tax measures at federal level have however decreased the relative, to main competitor countries, disadvantage of hiring researcher and of net salaries (reduction of social security chargers, etc.) in recent years. Nevertheless, in the context of increased international mobility, there remain incentives for researchers to move to other countries.<sup>49</sup>

### **Actions to match supply and demand of personnel**

However, in order to resolve the deficit of researchers and technical personnel there is a need to: 1) increase the number of young people selecting STE disciplines in third-level education; 2) improve the success rate in these disciplines; 3) retain a higher share of graduates in research. It appears in particular necessary to make available to researchers improved equipment and support personnel to allow them to

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<sup>43</sup> In 2006, 52.5% of the employed population had a tertiary education level (EU-27: 39.5%) which puts Belgium in third position after Cyprus and Spain. Belgium is first in EU27 for the share of tertiary educated people employed in high-tech-sectors in 2006 (38%). The potential Human Resources in Science and Technology (HRST) lies at 38% of the working population in 2006, which is well above the EU27 average of 32% but below the Nordic countries and the Netherlands (42-45%)<sup>43</sup>.

<sup>44</sup> In terms of graduate output across OECD countries, the performance of Belgium is lower than the OECD average in science, where the number of people with a higher education degree per 100,000 employed 25-to-34-year-olds was 816 compared with 1,295 on average across OECD countries in 2007. Only Austria, Hungary and Turkey ranked lower than Belgium.

<sup>45</sup> Tableau de bord de l'innovation, <http://indicators.plan.be>

<sup>46</sup> NOWT (2008) Wetenschaps- en Technologie-indicatoren 2008 (A publication for OCW), The Hague, March 2008.

<sup>47</sup> Delta, September 2008. Higher Education Magazine

<sup>48</sup> Conseil de la Politique Scientifique, Evaluation de la politique scientifique de la Région Wallonne et de la Communauté Française en 2006 et 2007, Mai 2008

<sup>49</sup> For a broader overview see the demands of the research actors in Parlement de la Communauté Française, 2007.

develop quality of research. Another problem to be tackled is the excessive insecurity of researcher's employment posts.<sup>50</sup>

For instance, the redeployment plan of the FNRS, for the French-speaking Community, which started officially in 1996 was not put into practice until 2004 and will only reach its targets in 2009 through a new increase of €5.375m of the FNRS budget and its associated funds (total funds have risen from €61.78m in 2005 to €86.65m in 2009). In line with the objectives of the plan<sup>51</sup>, the total number of mandates supported has increased from 1450 in 2000 to 2000 in 2008. The new budget increase will in particular be used to strengthen new attraction programmes (Scientific Impulse mandates, Ulysse Mandates, Clinician Mandates), which are necessary in the context of international competition for researchers. Equally, a four-year plan aimed at increasing the number of FRIA (fund for research and education within industry and agriculture) researchers from 480 to 600 was launched and, in 2009, the objective of 600 FRIA researchers will be reached. Nonetheless, even if the share of doctorates in the French-speaking Community would increase, the number of posts in the academic sector cannot be easily increased (beyond the 400 permanent researchers of the FNRS in addition to academic posts in universities) as it depends on the retirement rate<sup>52</sup>.

## Research quality

As regards the quality of research carried out in Belgium, the research output of the Belgian universities is good (14.34 publications per 10.000 inhabitants (Flanders 17.27), SCI expanded database, 2007), and the share of Belgian publications in the world increased from 0.88% in 1992 to 1.39% in 2007 (Vlaams Indicatorenboek 2009). There is however a large quality difference between a small cadre of top performing academic staff the broader mass of personnel; and few incentives to stimulate better-performance. In various university rankings a number of Belgian Universities are considered to be among the top-100 in Europe, but not in the top 10. Rankings however, vary a lot, but the following universities are generally mentioned (in alphabetical order): Antwerp, Ghent, Leuven, Liege, Louvain-la-Neuve, ULB, VUB.

### 4.1.1 Policies for opening up the national labour market for researchers

In Belgium, in 2006, 7.9% of the HRST was non-national. When looking at the share of active HRST in countries' active populations, in Belgium, the share of HRST is higher amongst the national citizens in the country than amongst the foreign population (41.4% for EU citizens, 33.8% for non-EU citizen). Looking at the share of foreign students among the total student population at tertiary level, Belgium stands above EU27 average with 9.6% in 2006 (Eurostat).

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<sup>50</sup> Conseil de la Politique Scientifique, Evaluation de la politique scientifique de la Région Wallonne et de la Communauté Française en 2006 et 2007, Mai 2008

<sup>51</sup> The objectives of this plan were to: increase the number of new mandates of doctorates from 80 to 100 per year; increase the number of new post-docs from 35 to 60 per year and to extend their mandate from 3 to 4 years; increase to 400 the number of permanent researchers; take measures in favour of research quality, in particular the acquisition of high-tech material and the development of international attractivity.

<sup>52</sup> Parlement de la Communauté Française, Etat des lieux de la recherche scientifique, rapport de commission présenté au nom de la Commission de l'enseignement supérieur et de la recherche scientifique par Mesdames Françoise Fassiaux-Looten et Caroline Persoons, Session 2007-2008, 26 Septembre 2007

## Language issues

The focus on the use of the Belgian languages in the research grant systems for PhDs can be regarded as a barrier to European mobility as means of sourcing qualified human resources. The OMC peer-review of Belgium (2007) highlights in particular that universities in Belgium lack of “rejuvenation” most notably, because of the language regulations in the higher education institutions, impeding moves of students and researchers from and to the country. The research system is not yet internationally oriented: in Flanders for instance, most jobs are only announced on national media (IWT, FWO and most Universities); furthermore the education and science system is focussed on Dutch, thus hindering international researchers. There is debate on the language issue; the Expert Group Soete strongly suggested the abolition of the language decree, the Flemish Council of Science Policy recommend a less strict decree. However, using English in education is a sensitive matter in Flanders, and the whole of Belgium, as language is one of the most important cultural discriminating factors.

## Attracting researchers

Several measures have been taken to attract Belgian researchers who settled abroad: return mandates from the federal level, scientific impulse mandates - ULYSSE from the French-speaking Community (FNRS) and Odysseus in Flanders as well as measures in the Brussels-Capital region ('Brains Back to Brussels', 'Research in Brussels').

In the **Flemish community**, foreign partners are rewarded up to 20% of the budget within the Strategic Basic Research programme. The fund for financing of non-oriented research in universities (BOF) can be used for participation in international research projects. Furthermore, a declaration of intention for a strategic alliance between Flanders and the Netherlands in RTD activities was signed in May 2004. In 2008 the Flemish universities on the 'quality of living' of foreign researchers in Flanders performed a study. Opportunities to improve the quality of living will be proposed in the European partnership for researchers in 2009 in which Belgium will participate. IWT, FWO and Euraxes all offer mobility grants. Programmes of the FWO are the most prominent. The Odysseus programme is a 'brain gain programme' to bring excellent researchers to Flanders. The Methusalem programme is funding to prevent 'brain drain'. These programmes are aimed at keeping research with proven quality in Flanders. Many of the other instruments are relatively unknown and thus not used. With regard to the instruments, there is no need for more or larger instruments in Flanders. The Flemish Science Council advises to give more attention to the existing instruments, which are not used maximally.<sup>53</sup>

An interesting programme in the **Walloon Region** is the START programme, launched in July 2008, responds to the will of reinforcing excellence in the universities of the French-speaking Community allowing them to fully integrate the European Research Area. It aims at fostering the hiring academic staff of a high international level in these universities by putting at their disposal financial means allowing new hired professors financing their research project during a period of three years. This measure is cofinanced equally by the university, a sponsor and the Walloon Region. The budget (€300,000 in total for each project) is dedicated to the financing of the research project (hiring of PHD students and post-doc students,

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<sup>53</sup> VRWB, 2008. Advies 125, Europees partnerschap voor onderzoekers.

acquisition of scientific equipment and documentary material, covering of functioning costs, participation to scientific meetings, etc.). The university pays for the salary of the professor.

In 2008, a new grant programme has been set up by Wallonia-Brussels International (WBI), which sets out to reflect the themes of the competitiveness clusters designated by the Marshall plan of the Walloon Region (transport and logistics; mechanical engineering; life sciences; agri-food industry; aeronautics - aerospace). It is designed to allow universities of the region to host university students from institutions of excellence abroad, whatever countries. An identical programme exists for graduates from Wallonia and Brussels who wish to study in a university of excellence abroad. Applicants should hold a higher education diploma of Master's level delivered by a recognised foreign institution that is deemed to be equivalent to the Master's level by the Competent Authorities of Wallonia-Brussels. Research grants can be awarded for a duration of at least 1 year at doctorate or post-doctorate level and short-term research grants are as well awarded of a duration of 1 to 3 months. At the end of 2008, the budget of this scheme has been increased of €450,000.

### **Opening up labour markets for researchers**

Flanders put some efforts in opening up the labour market for researchers. Social security, compatibility and pension schemes are well arranged, as long as the inward researcher comes from another member state. Eligibility for many of the programmes is also an issue for non-EU researchers. Schemes of FWO and IWT are for instance open for EU-members only; and the funding is portable, as long as close cooperation with the Flemish research institute is ensured. Pensions are also dealt with in a European context.

It is also noteworthy that the European directive related to the scientific visa has been transposed to the Belgian law in 2007. As a consequence the procedure to obtain a visa and a residence permit for any researcher from a third country hosted by a chartered organisation in Belgium is simplified.

Researchers hired by the FRS-FNRS carry out their researches within the university institutions of the French-speaking Community. The FRS-FNRS has put in place a specific carrier plan for researchers (pre-doctoral students, doctoral students, post-doctoral researchers and researchers with an employment contract). Since 2009, apart from 400 mandates of permanent researchers, 100 new mandates of doctorates are awarded per year as well as 60 new mandates of post-docs students. Since 1974, 529 permanent researchers have been nominated, out of which more than 30% have integrated the scientific and academic corpus of universities. Representing only 6% of the research personnel in the French-speaking Community of Belgium, they account for 20% of the scientific publications from the 'Science citation index'. With the exception of the FRIA grant, researchers from foreign countries can apply to these mandates, but only if their diploma has been recognised as equivalent by a university institution of the French-speaking Community.

According to Belgian law, fellowships awarded to foreign researchers are exempt from taxes if they are provided by authorized institutions and they meet a series of conditions<sup>54</sup>.

A practical guide for mobile researchers coming to Belgium has been published on the Belgian EURAXESS portal<sup>55</sup>. It contains information to mobile researchers on visa and residence permit, social security, taxes and bringing along family members. The category to which the researcher belongs determines the specific applicable rules which apply. In particular, during their research stay in Belgium, researchers build up pension or retirement rights through the social security contributions, which are deducted directly from their wage. When the researcher retires inside the European Economic Area home, according to EC Regulation 1408/71, which also applies to non – EEA nationals since Regulation 859/2003 entered into force, every Member State where a person was insured for at least one year will have to pay a proportional old age pension, corresponding to the insurance period completed in that country. However, the pension of this country will only be paid if the retirement age of that country has been reached (age of 65 in Belgium). If the researcher retires in a country outside the European Economic Area, the Belgian pension will be exported only if he/she is a national of a country with which Belgium concluded a bilateral social security treaty (Algeria, Australia, Canada, Chile, Israel, Croatia, Morocco, Poland, the Philippines, San Marino, Tunisia, Turkey, the United States and the independent states that used to form the former Yugoslavia). If not a national of one of these countries, the researcher will normally only receive a pension if he stays in Belgium.

As regards the researchers with an employment contract, in the field of social security there are no special provisions for highly qualified knowledge workers. All workers who are subject to the Belgian social security system have the same rights and obligations. The foreign researcher's wage will be subject to the Belgian statutory system of compulsory contributions to social security. The researchers are covered for health care, incapacity for work, retirement and unemployment and are also entitled to child allowances.

As regards researchers from non-EU countries and Switzerland with an employment contract, in principle, the social security rights that were accrued by paying these contributions cannot be exported. However, Belgium has concluded bilateral social security treaties with the following countries: Algeria, Australia, Canada, Chile, Israel, Croatia, Bosnia- Herzegovina, Macedonia, Morocco, Poland, the Philippines, San Marino, Tunisia, Turkey, the United States, Japan and the independent states that used to form the former Yugoslavia. The rules featured in these treaties are similar to those in the EU regulations, and adopt the principle whereby the person concerned is subject to the social security legislation of the country where the employment is exercised, Belgium. For nationals of these countries the accrued social security rights can be exported: the Belgian insurance periods can be taken into account in the worker's own country, a (pro rata) Belgian pension can be paid abroad, and they are

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<sup>54</sup> The conditions are the following: The fellowship facilitates extraordinary contributions to scientific research; it is awarded in circumstances which allow personal initiative by the fellowship holder in continuing his studies or conducting his research; it is granted free of charge, i.e. every dependency towards the grantor is excluded; it is directly nor indirectly financed by Belgian or foreign industrial, trading or agricultural companies, which may benefit, in one way or another, from the subsidized research activities.

<sup>55</sup> <http://www.era-careers-belgium.be/docs/guide.pdf>

entitled to family benefits for children that are raised in the country of origin.

#### **4.1.2 Policies enhancing the attractiveness of research careers in Europe**

##### **European Charter for researchers**

The European Charter for Researchers is a set of general principles and requirements, which specifies the roles, responsibilities, and entitlements of researchers as well as of employers and/or funders of researchers. The aim of the Charter is to ensure that the nature of the relationship between researchers and employers or funders is conducive to successful performance in generating, transferring, sharing and disseminating knowledge and technological development, and to the career development of researchers. The Charter also recognises the value of all forms of mobility as a means for enhancing the professional development of researchers. The European Charter for researchers has been signed by most of the important research organisations in the country, including:

- The National Funds for Scientific Research (FNRS)
- The Rectors' Conference of the French-speaking Community (CRef)
- The Research Foundation Flanders (FWO)
- Several Flemish universities

##### **Remuneration policies**

The level of salaries of academic staff in research organisations are established by law for the federal scientific institutes<sup>56</sup> and for the FNRS<sup>57</sup>. Nonetheless, since tax and social security levels in Belgium are amongst the highest in Europe, take-home pay of qualified employees is relatively lower than what they can expect to earn if located in competing countries. Increasingly, there has been recognition that this prevents Belgium from retaining and attracting skilled labour. In the last few years, a number of (federal) tax incentives were therefore set up to decrease taxation and therefore loan costs, specifically for knowledge workers in the field of science and innovation. At first 65% of advance wage taxes for researchers at universities, research funds and technical colleges were reimbursed to the universities and the reimbursement (approximately. €70m/year) was reinvested in research. Recently this tax credit was also introduced for other researchers in the non-profit sector (50% reimbursement) and the profit-sector (25% reimbursement for certain PhDgroups and 25% for masters in the technical and applied sciences). The total effect of these measures is estimated to be some €70m as well.

As of January 2007, part of the social taxes paid by public research institutions (representing an amount of €31m in 2007) is reimbursed to the regional funds for scientific research ("Fonds de la Recherche scientifique" and "Fonds voor Wetenschappelijk Onderzoek") in order to create new research mandates.

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<sup>56</sup> [http://reflex.raadvst-consetat.be/reflex/index.reflex?page=chrono&c=detail\\_get&d=detail&docid=109073&tab=articles](http://reflex.raadvst-consetat.be/reflex/index.reflex?page=chrono&c=detail_get&d=detail&docid=109073&tab=articles)

<sup>57</sup> <http://www2.frs-fnrs.be/3-financement/1-carriere.html#>

Interestingly, after the 'life quality of foreign researchers' was finished in the beginning of 2009<sup>58</sup>, the VLIR is now performing a study to give insight in the competitiveness of the wages of researchers in Flanders.

### Promotion of women

According to the She Figures 2006, 9% of those at the highest level of research and academia in Belgium (Grade A) were female in 2004. This share of females in decision-making positions is lower than in all other countries in the EU27, except Malta. At a grade lower (Grade B) which is for researchers not in the highest positions but higher than newly qualified PhD holders, only 16.2% are women (in Belgium). This is again considerably lower than the majority of the EU27. Moreover the percentage of women graduating at the level of PhD/Doctorate or equivalent in 2003 stood at 36%, which is lower than EU average (43%) and which puts Belgium in the last 4 worst performing countries. This is nonetheless an improvement of 9% on the situation in 1999 (EU25: +7%). These figures however are for all disciplines, and consequently mask significant gender variations across subject groupings. The picture of the share of women scientists and engineers in the labour force in 2004 is a bit better for Belgium than in the EU as a whole. Belgium ranks indeed at the second place of EU countries and shows a situation close to parity (3.7% for women, 4% for men, 2004). The 2003 snapshot of the proportion of researchers who are women shows a clear female under-representation in Belgium, which is performing lower than EU-25 average (28% against 29%), even if the growth rate of female researchers between 1999-2003 had been of 2% (stagnation for males). The proportion of women in the business enterprise sector (BES) is particularly low (18%, 2004) while higher in the government sector (33%) and in the higher education sector (36%).

Both in Flanders and in the French-speaking Community, more than 50% of the university students are women in 2008<sup>59</sup>. Nevertheless, in 2008, only 22% of the academic staff is female in the French-speaking universities and 15% in Flanders. Flanders adopted in particular an OMC approach towards the emancipation of women, known as "equal chances policy"<sup>60</sup>. One of the goals is to strive for equity in higher positions, such as professorships. In 2004, about 35% of the doctoral students, 15% of the assistant professors, and less than 5% of the professors were female<sup>61</sup>. Gender balance in academic positions is a long way to go. Although Flanders is still far from gender balance, recent reporting show a positive trend. The KU Leuven – a university that had one of the weakest balances – showed a rise of 13.5% to 19.1% researchers from 2002 to 2008. 35% of the new academic lecturers are female (23% in 2002) and 45 of the master graduates are female (35% in 2002).<sup>62</sup>

According to the report prepared by the WIRDEM working group (2008)<sup>63</sup>, universities in Belgium are increasingly concerned about their international rankings

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<sup>58</sup> Unfortunately, at the moment of writing the report is not yet made public

<sup>59</sup> Data for the French-speaking Community universities coming from CREF (Council of Rectors of the French-speaking universities of Belgium), [www.cref.be](http://www.cref.be)

<sup>60</sup> Flemish: Gelijke kansen beleid

<sup>61</sup> De Standaard, 26<sup>th</sup> of March, 2004. KU Leuven telt weinig vrouwelijke professoren

<sup>62</sup> Karen Maex, 2008. Vice Rector of the KU Leuven in the Campuskrant, the monthly magazine of the KUL.

<sup>63</sup> European Commission, WIRDEM working group, 'Mapping the maze, Getting more women to the top in research', 2008

mainly determined by the numbers of publications, numbers of patents, post-doctoral fellows, etc, but not by gender equality. This is therefore a minor issue for the universities.

Interesting measures implemented in the country to promote the employability of women in the research labour market do nonetheless exist: at the Federal institutions in Belgium, scientists can work part-time (50 or 80%) if they desire so, even if they are only temporarily employed. One of Belgium's main universities in the French-speaking community (UCL) can now benefit from a new measure: Individual Academic Project (PAI), which means that researchers can now modify their objectives (e.g. research vs. teaching) in accordance with their family situation. For example, this measure would permit a woman researcher's career to evolve with the age of her children: from working more from home at the start to spending more time in the laboratory later on. The Royal Belgian Institute of Natural Sciences has its own day-care centre which also means that mothers can return to work while still breastfeeding. An additional positive action is the creation of the Sophia network ([www.sophia.be](http://www.sophia.be)), 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 Belgium.

Another noteworthy initiative is BeWiSe, a not-for profit organisation created in 2003 to support the position of women in science, both in public and private sectors in Belgium; to make it more feasible for women and men to combine a scientific career with family life; to improve communication among women in the Belgian and European scientific community. BeWiSe is open to all women working or having worked at all levels in the sciences and engineering (technology, industry, research, education) in the public and private sector and to those women and men who promote equal participation of women in science. As of 2008, BeWiSe counts more than 50 members, coming from all parts of the country and various public and private institutions, such as UCL, KUL, VUB, Royal Belgian Institution of Natural Sciences, Belgian Geological Service, The Royal Observatory and Belgacom. BeWiSe will work towards achieving these objectives by creating a network for support and exchange of information, experience and knowledge; providing an electronic meeting place with easy access for everybody; organising meetings, seminars and workshops and setting up contacts with similar European and international associations.

## **4.2 Governing research infrastructures**

The ERA green paper aims at world-class research infrastructures, integrated, networked and accessible to research teams from across Europe and the world, notably thanks to new generations of electronic communication infrastructures. Major infrastructures should be built and exploited in the form of joint European ventures. They should be accessible to research teams from across Europe and the world. The term Research Infrastructures refers to tools that provide essential services to the scientific community for basic or applied research. They may concern the whole range of scientific and technological fields, from social sciences to astronomy, going through genomics or nanotechnologies. Examples include libraries, databases, biological archives, clean rooms, communication networks, research vessels, satellite and aircraft observation facilities, coastal observatories, telescopes, synchrotrons, accelerators. They may be "single-sited", "distributed", or "virtual".

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. Belgium is one of the founding member states of the CERN (European Organisation for Nuclear Research) and of the European Space Agency (ESA) back in 1975. The management of the national and international research infrastructures is shared between two public services. The Federal Science policy Office is in charge of the polar basis Princess Elisabeth Antarctica, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), of the European Synchrotron Radiation Facility (ESRF), the European Organisation for Astronomical Research in the Southern Hemisphere (ESO), the European Molecular Biology Laboratory/Conference (EMBL/EMBO/EMBC). As for the federal contribution to the European Council for Nuclear Research (CERN), the Nuclear Energy Research Centre (CEN-SCK) is managed by the Federal Public Service in charge of Economy, SMEs, Middle class and Energy. The Federal Science Policy is as well amongst the Scientific Member countries of the ILL (Institut Laue-Langevin). With its international funding and expertise the ILL offers scientists and industry the world's leading facility in neutron science and technology.

In 2007, €84m from the appropriations for R&D of the federal authority were dedicated to the federal scientific institutes (same level as in 2000 after a decrease till 2003), €200m to space research programmes and organisations (+€60m since 2003), €25m to other Belgian contributions to international organisations, institutions and associations (stagnating since 10 years) and €60m to other international programmes and projects (constant slow increase since 1997).

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

As regards the research infrastructures presented in the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI), Belgium takes part to the Pan-European Research Infrastructure for NanoStructures (PRINS), which is the research infrastructure arm of a broader initiative, the ENIAC European Technology Platform. It has been conceived as a distributed infrastructure based essentially in three European countries (Belgium, France and Germany) that should bridge the area between research and market driven applications and provide Europe with the ability to master the transition from microelectronics to nano-electronics. Academic access to three pre-existing centres of excellence (IMEC, CEA-LETI and Fraunhofer Microelectronics Alliance, respectively) will be put under a common umbrella. These three scientific and technical integration centres will be supported by a complementary network of flexible rapid-prototyping laboratories.

The national authority driving the ESFRI decision process is the International Cooperation Commission/ Infrastructure" (ICC/INFRA). In its October 2007 meeting the CIS/INFRA recognised the need for a better coordinated and voluntaristic approach between the Federal and federated authorities in support of Belgian participation in the EU large infrastructures. So far, a mix of approaches has been envisaged for the development of a national roadmap. In December 2008, the Federal Council for Science Policy decided to publish its opinion on the possibility for the Federal authority to take part to a restricted number of research infrastructures mentioned in the ESFRI. The FNRS and the FWO have organised a consultation on this subject amongst the academic sector in both the French and Flemish-speaking communities. The Federal Council is currently discussing the outcomes of this exercise and is looking for convergences between the proposals received. A possible

participation of the Federal Government in these new research infrastructures is considered as instrumental in ensuring an efficient use of these facilities and to ensure that researchers receive an additional financial support from their respective managing authorities. In the document published in December 2008, the CFPS provides in particular its opinion on the CEN-SCK (Nuclear Energy Research Centre) and in particular MYRRHA (Multi-purpose hybrid Research Reactor for high-tech applications), one of the research infrastructures presented in the ESFRI roadmap, an Accelerator Driven System (ADS) under development in Mol, in Belgium. The goal of this facility is to provide protons and neutrons for various R&D applications and in particular to serve as a fast spectrum irradiation facility after having demonstrated ADS feasibility. It has been estimated that the total investment necessary between 2008 and 2020 to develop and build the research infrastructure MYRRHA will be around €700m. According to the CEN-SCK, 2/3 of this amount could come from foreign investors and the infrastructure can develop to become a European research infrastructure. At least 1/3 of this amount should come from the Federal authorities. The Federal Council for Science policy supports the MYRRHA project and asked the Federal Government to include a clear budgetary line for this institution and its future. Furthermore, the Council insists on the risk that the scientific expertise gathered by the institution would be under exploited and used only for energy policy matters, in case no clear orientation or consensus is agreed on the need to make fundamental and applied research prevail in this institution.

In **Flanders**, considerable investments are made in research infrastructures. First of all, the Hercules Fund is assigned to fund large infrastructures. The fund provides support to medium large investments (< €1.5m) and for large investments (> €1.5m) in infrastructure. In 2007-2008 a total €20m was reserved for the medium large investments; the budget for the large investments was €10m, for a next call in early 2009 a total amount of €10m is budgeted. The demand for budget is however larger than the supply. For the call for large infrastructural investments, applications were made for a total of more than €20m, while the budget was €10m.

Secondly, investments in research infrastructure can be covered with the Finance Fund for Paying of Debts and Investments (FFEU)<sup>64</sup>. The FFEU invested €45m in research infrastructures in the following areas: marine (VLIZ), energy and environment (VITO), digital (Flemish Supercomputer Centre), medical (VRWB) and educational infrastructure. Thirdly, the funding for the strategic research centres is also used in part for research infrastructure. IMEC for instance, has large clean rooms; the IBBT has a testbed, etc.

With regard to pan-European cooperation, Flanders decided to cooperate on two ESFRI files, i.e. LIFEWATCH and CLARIN. Furthermore, the Flemish government is developing a priority list to select new opportunities for cooperation.

While, the Flemish competence poles are mainly operating regionally and are generally not pursuing ERA goals; the **Walloon** competitiveness poles programme is clearly designed to increase co-operation between a structured research capacity regionally and European partners. Similarly, the larger strategic research centres in Flanders are often participating in EU and other international projects and are significant actors in the ERA (e.g. IMEC, VIB, VITO), as is the Walloon Space research pole (Liège) or the bio-medical pole (Brussels-Charleroi).

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<sup>64</sup> Free translation of the Financieringsfonds voor de Schuldaafbouw en Eenmalige Investeringsuitgaven (FFEU)

## Main Belgian research infrastructures

According to the European portal on research infrastructures<sup>65</sup>, the Belgian research infrastructures presented in the table below share the following characteristics:

- They provide resources, facilities and services essential to the scientific community;
- They have high construction and operation costs compared to research costs in their respective fields;
- They are open to external researchers and;
- They have a clear European dimension and added value.

**Table 9: 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 (UCL Research centre in micro and nanoscopic materials and electronics devices)	Material Sciences, Chemistry & Nanotechnologies	Micro- and nanotechnology facilities	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 and Earth Sciences	Other Marine RI	European Anglers' Alliance, Brussels
The BR1 Research Reactor	Energy	Nuclear energy RI	SCK-CEN, Mol (Flanders)
VENUS: Zero Power Research Reactor	Energy	Nuclear energy RI	SCK-CEN, Mol (Flanders)
Nanoelectronics Laboratories	Material Sciences, Chemistry & Nanotechnologies	Micro- and nanotechnology facilities	IMEC, Leuven (Flanders)
Cyclotron Research Centre	Physics and Astronomy	Nuclear Physics accelerators & detectors	Université catholique de Louvain, Louvain-la-Neuve (Wallonia)

As a complement of the BEGrid project, Enabling Grids for E-science (EGEE) is a project to which BELNET takes part that aims to integrate current national, regional and thematic Grid efforts, in order to create a seamless Grid infrastructure for the support of scientific research. Further research infrastructures existing in the country are listed below. The "T" before some of the Research Infrastructures indicates that these research infrastructures had a transnational Access contract with the European Commission under the Sixth Research Framework programme:

<sup>65</sup> <http://www.riportal.eu/public/index.cfm?fuseaction=ri.result>

- Engineering :
  - *Wind tunnels*: Aeronautics & Aerospace Department, von Karman Institute for Fluid Dynamics, Rhode-Saint-Genese
- Material Sciences
  - *Electron Microscopy facilities*: T - EMAT (Electron Microscopy for Materials Science), University of Antwerp
  - *Surface science facilities, Ion and Molecular Beam Laboratory*: Instituut voor Kern- en Stralingsfysics, K.U.Leuven
  - *High Power magnets labs*: T - EuroMagNET project, INPAC-Institute for Nanoscale Physics and Chemistry, University of Leuven
- Humanities
  - *Archaeology and anthropology databases/collections/repositories*: T - Royal Museum for Central Africa, Tervuren
  - *Literature and text archives*: CTLO (Centre Traditio Litterarum Occidentalium)
- Environmental, Marine and Earth Sciences
  - *Natural History collections*: T - Royal Belgian Institute of Natural Sciences (RBINS), Brussels
  - *Research Vessels*: T - RV Zeeleeuw, Flanders Marine Institute - VLIZ, Oostende
- Biomedical and Life Sciences
  - *Mass spectroscopy and other analytical facilities for life sciences*: Division of Molecular & Nanomaterials, Chemistry Department K.U.Leuven

### 4.3 Research organisations

#### Universities

In Belgium, funding for basic research is the responsibility of the linguistic communities. This includes both institutional funding, competitive funding across universities and support to individual researchers. There are 15 universities in Belgium, six of which are in the Flemish-speaking community and nine within the French-speaking community.

Following the Bologna Agreement, linkages and synergies between universities in the same-language community are growing. Three academies have been created in the French-speaking community in 2004 (Louvain, Wallonie-Bruxelles and Wallonie-Europe) regrouping the universities and other higher education institutes (hautes écoles). Similarly in Flanders, the universities and Hogescholen have been regrouped in five associations (K.U.Leuven, Universiteit en Hogescholen Antwerpen, Universiteit Gent, Universiteit Hasselt, Universitaire Associatie Brussel). This should give each partner the opportunity to share their human and material resources, to develop new synergies and to reinforce the current collaborations in which the member Universities are already involved: development of research activities, creation of several R&D centres and the joint organisation of educational programmes. Since March 2007 the French-Speaking 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.

The main aim of the funding for basic university research in both communities (French and Flemish) is to finance fundamental research of high quality and to guarantee an excellent level of education for researchers. The 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 subscribe, namely: promoting inter-university cooperation; promoting international mobility of researchers; and including research in the European Research Area.

In many recent reports (Policy-mix, OMC peer review, Federal Planning Office, 2007) the lack of competitive funding between universities is nonetheless regarded as a possible impediment to reach a level of excellence in knowledge production. The allocation of funds is done on the basis of the number of students and full-time equivalents researchers.

Each university of the French-speaking Community has its own legal status ensuring its autonomy. They are responsible of the products and training they offer, they hire their staff, award diplomas independently within the regulatory limits. Furthermore, since historically and politically, each type of organisation tries to be present in each study field, the whole set of the research organisations are competing on an open market. Nonetheless, till recently, the results of each study field and network were not evaluated, or, if they were, were not known or published. In line as well with the Bologna process a new decree adopted on 12 February 2008 by the Parliament of the French-speaking Community conditions the acknowledgement of studies and the subsidy of institutions organising them to their enrolment in a quality evaluation process. After three years of functioning it appeared indeed necessary to make the Agency for the evaluation of the quality of research subsidised or organised by the French-speaking Community<sup>66</sup> recognised at the European level, to make its structure evolve, to give more responsibility to the institutions, to inform the beneficiaries on the quality of higher education in the Community and to give the Agency the means and independence needed to ensure a regular evaluation of the implemented programmes. Most notably, besides the self evaluation by the institution organising the programme and the evaluation carried out by 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 the good practices, the shortcomings and the problems to be solved and by providing policy recommendations in order to increase the global quality of the higher education system in the French-speaking Community.

According to the Federal Office for Science Policy, institutional support for universities represented 24% of the total public funding for R&D (€1,960m) in 2006, funding for scientific institutions 14% and project based funding 12%; allocated to universities by way of the research funding agencies. Apart from these mechanisms, 17% 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 and 15% is meant for industrial research. 14% of government budget is dedicated to the participation in international research programmes, mainly space research. In addition, the Walloon programmes of excellence targeted towards universities focus important financial means during five years on activities of the academic labs recognised for their scientific excellence and their capacity to valorise research results. The most recent programme has been launched in the area of bio refinery (TECHNOSE) and will last till 2012.

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<sup>66</sup> <http://www.aeges.be>

Both in the French and the Flemish Community numbers of students have increased faster than number of academic staff. Discussions on the financing of the university system are therefore going on.

The French-speaking Community funds academic research mainly through its basic allocation to universities; financial means stood at €118.5m in 2008, that is, an increase of 7% compared to 2007. Additional funding for researchers and research teams, based on competition, is channelled through the 'national' research funds (FWO-Flanders and FNRS in the French-speaking community). The budget of the FNRS is currently increasing (budget of €81.3m in 2008, €86.65m in 2009). The number of researchers and PhD students supported by the Fund has been increased (100 PhD students per year as of 2009), and new programmes have been launched. As of 2010, universities of the French-speaking community<sup>67</sup> should be refinanced by €30m in 8 years. The other higher-education institutes will be refinanced by €4m as of 2009 (+1% of their budget) and the chartered research centres by €2m to reach a total regional support of €15m per year.

In the Flemish community, the university funding comes mainly from BOF and FWO, organisations that support fundamental research. There is also structural finance available, as well as finance for specific sectors or projects and various smaller funds. In February 2008 the Flemish Government decided to base institutional university financing largely on the number of new students and the number of university graduates. The research part of basic funding is, in the new system, in total 35% of total university institutional funding. The distribution of this 35% over the universities will be (for 50%) based on output figures (mainly relating to scientific output). In addition to regular funding of universities, Flanders has two programmes for non-specific research and knowledge development<sup>68</sup>.

## Research Centres

Funding for applied and technological research with the view of raising value added in the economy is the responsibility of the regions. This includes both direct funding to companies and funding of research centres and technology diffusion activities. Organisations with mixed funding include collective research centres, which exist in all regions. The centres date from the 1950s and are financed partly by industry. The centres are funded by the regions on the basis of projects and missions. The federal government contributes to pre-normative activities in these centres (normalisation is a federal competence). The research centres were originally devoted to specific sectors according to the traditional industrial specialisation structure – metalworking, textile, glass, ceramics, road construction, materials, etc. They aim at developing and diffusing new technology applications into all industrial sectors. Because of the shift in industrial structure, additional centres focusing on new technologies and sectors have been created. This has led to large budgetary allocations, especially in Flanders, to specific technologies: micro-electronics for IMEC; biology for VIB; environment and energy for VITO and broadband technologies for IBBT. These centres have public ownership, but do contract research for industrial parties (esp. IMEC). In addition, the two regions host smaller-size specialised research institutes, either of academic, government or of industrial origin. The federal state is responsible

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<sup>67</sup> Press release of the Minister in charge of scientific research in the French-speaking community, 2 October and 7 November 2008

<sup>68</sup> i.e. the Special Research Fund (BOF), aiming at intrauniversital research and knowledge development; and the Fund for Scientific Research (FWO), aiming at interuniversital research.

for a number of research institutes on matters of federal importance (e.g. RBINS: Royal Belgian Institute of Natural Sciences).

According to the Federal Office for Science Policy, institutional support for universities is 24% of the total public for R&D (€459,711 in 2006). Public financing represents 75% of the resources in the higher education in the French-speaking Community, which is above Belgian average but lower than EU15 average (82%). Project based funding from the government is for 12% (€223.993 in 2006, Federal Office for Science Policy) allocated towards universities by way of the research funding agencies.

#### ***4.4 Opening up national research programmes***

In terms of the openness of the research activities on the European level, the various Belgian authorities have introduced changes recently. This orientation is mainly visible at the **Federal level** since the international dimension of research is one of its key responsibilities. In addition, to the main federal programme in space research and a few other programmes, which are international in nature and together account for more than half of federal R&D budgetary spending, all federal research programmes have been opened for participation of research teams of other Member States (with a limit of 50% funding). The new measure of withholding taxes for private researchers active in cooperative research projects with public research institutions has also been granted in the case of partnerships with universities located in the ERA.

The three 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 the **Flemish community**, foreign partners are rewarded up to 20% of the budget within the Strategic Basic Research programme. The fund for financing of non-oriented research in universities (BOF) can be used for participation in international research projects. The Flemish Contact Point (VCP) for the 7<sup>th</sup> Research Framework Programme aims at a further improvement of cooperation between Flemish actors and other European partners. They do so by taking part in European discussions, as well as in monitoring all European developments. To stimulate Flemish partners to apply for ERC starting grants, the FWO supports the five best Flemish nominees that did not succeed in getting a grant by own means. FWO and IWT take part in several ERA and OMC networks and the Flemish Government co-finances Article 169-initiatives and two JTI's.

The **French-speaking community** takes part in international scientific cooperation agreements. In Wallonia, two existing subsidy schemes – RIT-Europe for companies and FIRST-Europe for universities – have been broadened in order to incorporate the possibility for researchers in the companies to work on projects in cooperation with EU partners. The region has also launched a “mobilising programme” devoted specifically to the support of lead scientists involved in EU Networks of Excellence.

The Walloon government agreed in April 2008 upon the participation of the Region in the **EUROSTARS**<sup>69</sup> research programme. Up to €1.5m (DGTRE budget) is exclusively directed towards Walloon SMEs. Flanders is also participating in EUROSTARS: project subsidies for participating in the EUROSTARS programme can be obtained from IWT.

The Walloon region fosters and finances the participation of labs and research centres to several international programmes, as the framework programme for R&D of the EU, the EUREKA and COST programmes and takes part as well to the **ERA-NET** programme. As of May 2008 (CPS, 2008), the Walloon region was taking part to 6 ERA-NET projects: ERA-STAR regions: GALILEO, GMEs and space technologies (the Walloon region coordinates this project); CORNET, COMPERA, MATERA, MNT, HY-CO. These projects are at different development stages but globally enter the third level of cooperation and coordination (elaboration of joint activities). Projects are financed on the basis of calls for proposals open to universities, chartered research centres and companies. In the framework of the EUREKA initiative, five projects have been financed between 2006 and 2007 for a total amount of €1.7m. Furthermore, around 70 Walloon research teams take part to COST actions cofinanced by the region.

With respect to **Joint technology Initiatives** (JTIs), Belgium takes part to ARTEMIS (IMEC, DSP Leuven) and ENIAC. 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. Moreover, KU Leuven (university), LMS International (industry) and Micromega Dynamics (SME) are associates to the Clean Sky JTI, which is located in Brussels, They commit to perform and complete the work package in the integrated technology demonstrator IGOR (International Group on Rotoracoustics). Finally, Belgium is as well as member of the European technology platform ISI (The Integral Satcom Initiative).

The FRS-FNRS and FWO are amongst the participating organisations of the initiative **EUROHORCS**. In view of the importance of the ERA and hence the importance of removing barriers in the mobility of European researchers, EUROHORCS partners agreed on authorising researchers moving into the other organisation's country 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 participant funding organisations have made into the work of these researchers.

The agreement includes individual grant schemes, as well as coordinated research programmes and individual grants that can be detached from them. While the components may vary from one granting organisation to another, a grant will typically include personnel costs, research equipment, apparatus and expendables as well as travel funds. The possibility of a transfer of major investment has to be considered case-by-case taking account of the position of the relinquishing institution and the question of a transfer fee.

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<sup>69</sup> EUROSTARS is a joint programme gathering the EU and the intergovernmental initiative EUREKA. Dedicated to SMEs carrying out research and innovation activities, it will start its financing activities in 2008 with a total budget of €800m over the six first years. Thanks to this programme, the participating countries can put in common their national programmes and investments dedicated to SMEs research activities.

#### **4.5 National ERA-related policies - a summary**

With the exception of Brussels-Capital<sup>70</sup>, all Belgian authorities active in R&D policy have explicitly endorsed the Barcelona Objective within their strategic policy guidelines. They are all promoting and informing RTD agencies on possibilities for participation in European research programmes (National Contact Points) and supporting international technological partnerships through the action of the Innovation Relay Centres in the three regions. Furthermore, creating excellence centres is seen as a way to become an important player within the ERA. Nonetheless, the ERA dimension is mainly important as a source of additional funding: the ERA dimensions while debated are done from a relatively unstructured view point and tackled in an opportunistic manner when a specific element of the ERA debate is relevant (e.g. researchers mobility, space research, university academies). The most effort has been put into encouraging the European mobility of researchers with a relatively wide range of programmes, both for EU researchers and for returning researchers. In addition, in the last years emphasis has been given to university reforms in line with the Bologna process through the setting-up of university academies (Wallonia) and associations (Flanders).

In addition to the main federal programme in space research and a few other programmes, which are international in nature and together account for more than half of federal R&D budgetary spending, all Federal research programmes have been opened for participation of research teams of other Member States. Furthermore, the Federal Government has introduced measures to favour mobility of researchers: grants for Belgian researchers returning to the home country and grants for researchers from Central and Eastern Europe to come to Belgium.

The three 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.

Overall, in Flanders there is a relatively balanced policy attention towards ERA. Recently there is increased attention for Article 169 and 171. Academic reforming already was on the agenda, however the internationalisation (esp. the lingual issue) is a sensitive case and therefore changes are slow. Joint programming will be on the agenda in 2009.

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<sup>70</sup> Nonetheless, in his political speeches, the Minister in charge of research in the region of Brussels-Capital mentions the Barcelona target as an objective for the region.

**Table 10: Importance of the ERA pillars in the ERA policy mix and key characteristics**

	Short assessment of its importance in the ERA policy mix	Key characteristics of policies
Labour market for researchers	<ul style="list-style-type: none"> <li>Supported in all regions and at the federal level, with relative importance, adapted to each regional situation</li> </ul>	<ul style="list-style-type: none"> <li>All regions have launched programmes to attract researchers settled abroad</li> </ul>
Governance of research infrastructures	<ul style="list-style-type: none"> <li>The implementation of the Bologna process is an important step in the country to try reaching a critical mass</li> </ul>	<ul style="list-style-type: none"> <li>Merger of HEI into academies (French-speaking community) or associations (Flemish community)</li> </ul>
Autonomy of research institutions	<ul style="list-style-type: none"> <li>No specific change recently - full autonomy of HEIs</li> </ul>	<ul style="list-style-type: none"> <li>Block funding based on the number of students + research grants</li> </ul>
Opening up of national research programmes	<ul style="list-style-type: none"> <li>Less of a priority at the regional level but a number of actions have been taken.</li> </ul>	<ul style="list-style-type: none"> <li>All federal research programmes open to non-nationals</li> </ul>

## 5 Conclusions and open questions

### 5.1 Policy mix towards national R&D investment goals

Although there is a broad consensus on the need to invest more in R&D, current rates of growth of R&D investment remain insufficient to attain political objectives. Belgium's research performance is characterised by relatively high but decreasing share of activity by the business sector off-setting a growing but still relatively small public sector investment. As outlined in section 3.4, the three main barriers to achieving national R&D investment goals are:

- 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. However, the high tax burden and relatively high labour costs remain a negative element for conducting research in Belgium.
- High public debt and financial crisis will affect capacity of public sector. The Belgian 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 will place a strain, along with the current financial crisis and growing unemployment, etc. on public budgets available for research.
- Low competitiveness of salaries for researchers and insufficient number of internationally prestigious research infrastructures. A range of measures have been taken concerning salary costs, etc. as documented in this report. 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 being made to strengthen and coordinate Belgium efforts to develop and attract European level research infrastructures. Investments such as in polar research can also be considered to be internationally visible.

## **5.2 ERA-related policies**

ERA and ERA related policies are becoming increasingly important both in the public discourse as well as in the practical implementation of Belgian research policies. On the one hand, this 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). A large chunk of Belgian (federal) research funding has always been allocated to a European level instrument, namely the European Space Agency. Actors from all three regions have been active in the ERA-NET type actions and the basis for opening of programmes or joint actions has begun to be developed. Recently there is increased attention for Article 169 and 171. Academic reform was already on the agenda, however internationalisation (especially the linguistic question) is a sensitive issue and therefore changes are slow. Joint programming will be on the agenda in 2009.

The regions are now increasingly focusing on issues related to maximising the participation in the Framework Programme, improving living-working conditions of researchers and attracting or retaining researchers (supported by Federal tax measures), and developing a policy to create new or develop existing research infrastructures of European or international quality.

Although, so far, little specific action has been taken in Belgium to secure large-scale (European level) research infrastructure, a new co-ordinated effort is being made to improve the situation. Moreover, Flanders has a reasonable (€20m/annum) programme for research infrastructures: the Hercules fund; and in Wallonia, regional and Structural Fund support is being given to the structuring of research capacity and building new institutes and infrastructures.

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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
BERD	Business Expenditures on Research and Development
BOF	Special Research Fund
CEN-SCK	Nuclear Energy Research Centre
CERN	European Organisation for Nuclear Research
CIMPS/IMCWB	Inter-Ministerial Conference for Science Policy
CIP	Competitiveness and Innovation framework Programme 2007-2013
CIS	Community Innovation Survey
CTLO	Centre Traditio Litterarum Occidentalium
CWPS	Walloon Council of Science Policy
DGTRE	Walloon Directorate General for Technologies, Research and Energy
DGEE	Walloon Directorate General for Economy and Employment
DGO6	Walloon Operationnal Directorate General for Economy, Employment and Research
EGEE	Enabling Grids for E-science
EIG	Economic Interest Grouping
EMBL/EMBO/EMBC	European Molecular Biology Laboratory/Conference
ENIAC	European Nanoelectrics Initiative Advisory Council
EPO	European Patent Office

ERA	European Research Area
ERDF	European Regional Development Fund
ESA	European Space Agency
ESF	European Social Fund
ESFRI	European Strategy Forum on Research Infrastructures
ESO	European Standards Organisation
ESO	European Organisation for Astronomical Research in the Southern Hemisphere
ESRF	European Synchrotron Radiation Facility
EU	European Union
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EUROHORC	European Heads Of Research Councils
EWI	Flemish Department for Economy, Science and Innovation
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
FNRS-FWO	National Scientific Research Funds
FP	Research Framework programme
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 for R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditures on Research and Development
GNP	Gross National Product
GOVERD	Government expenditures on Research and Development
HEI	Higher Education Institution
HRST	Human Resources in Science and Technology
IBBT	Interdisciplinary Institute for Broadband Technology
ICC-INFRA	International Cooperation Commission/ Infrastructure
ICT	Information and Communication Technologies
ILL	Institut Laue-Langevin
IMEC	Interuniversity Micro Electronics Centre
INPAC	Institute for Nanoscale Physics and Chemistry, University of Leuven
IPR	Intellectual Property Rights
IRSIB-IWOIB	Institute for the support of Scientific Research and Innovation of Brussels

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 the 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
PAI	Inter-university Attraction Pole
PASS	Scientific Adventure Park
PMV	Participatie Maatschappij Vlaanderen
PRINS	Pan-European Research Infrastructure for NanoStructures
PRO	Public Research Organisation
R&D	Research & Development
RBINS	Royal Belgian Institute of Natural Sciences
RTD	Research, Technology and Development
RTDI	Research, Technology, Development and Innovation
SCI	Science Citation Index
SF	Structural Funds
SME	Small- and Medium-sized Enterprises
TBM	Programme for Applied Biomedical Research (Flanders)
T-EMAT	Electron Microscopy for Materials Science, University of Antwerp
UCL	Liege Catholic University
VA	Value-added
VIB	Flemish Interuniversity Institute for Biotechnology
VINNOF	Flemish Innovation Fund
VITO	Flemish Institute for Technological Research
VLIZ	Flanders Marine Institute
VRWB	Flemish Council for Science Policy
VUB	Free University Brussels
WBI	Wallonia-Brussels International
WILL	Walloon Institute for Life Sciences

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### **Abstract**

The main objective of the ERAWATCH Policy Mix Country reports 2009 is to characterise and assess in a structured manner the evolution of the national policy mixes in the perspective of the Lisbon goals, with a particular focus on the national R&D investments targets and on the realisation and better governance of the European Research Area. The reports were produced for all EU Member State and six Associated States to support the mutual learning process and the monitoring of Member and Associated States' efforts by DG-RTD in the context of the Lisbon Strategy and the European Research Area. The country reports 2009 build and extend on the analysis provided by analytical country reports 2008 and on a synthesis of information from the ERAWATCH Research Inventory and other important available information sources.

This report encompasses an analysis of the research system and policies in Belgium.

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