

2011 Policy Mix Peer Review Belgium

Final Report

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1. Introduction

This report provides the key points from the 2011 Policy Mix Review of Belgium. A self-reflection report by the collective government bodies of the Belgian regions, communities and the Federal government, summarised a number of critical points that were raised in earlier reviews and analyses of the Belgian Research and Innovation Area (BRIA). On the basis of these key issues, on May 16th-18th six panel sessions were held with a variety of stakeholders from the Belgian research and innovation communities, from policy, public research and the private sector. The programme is shown in Annex B of this report. We would like to thank the organisers for the well organised panel discussions and the hospitality during these three days.

The panel was able to draw up this report on the basis of a self reflection report outlined by the Belgian policy makers (Annex A), a background report with basic features of the BRIA (Annex B) and the discussions with the stakeholders during the panel meetings, we came to a number of observations, conclusions and recommendations that are summarised in this short report. An overview of the peer review programme is provided in Annex C.

The Belgian authorities suggested to organise the self-assessment exercise around the following six themes:

- The innovation scoreboard in order to evaluate the general performance and progress in the performance of the Belgian science system;
- Federal versus regional policies: to shed some new light on policy making in the fragmented Belgian research and innovation landscape;
- The link between research policies and innovation policies. This is taken into account in the governance chapter as well as the chapter on linkages between academia and industry
- The broader economic policies and the regulatory framework
- Internationalisation of research and innovation
- Human resources and the science base

In our reflections we have taken account of these themes in the self-assessment tool as provided by the Innovation Union. In Annex D we also provide a short reflection on the use of this tool and the processes of this Policy Mix Peer Review. As Belgium has volunteered to be the first user of this tool this would be a useful for other Member States that will have similar Policy Mix Reviews. Chapter 2 in a nutshell provides some features of the Belgian system. Chapter 3 reviews the governance in the Belgian Research and Innovation Area (BRIA). Chapter 4 describes the implementation of policies. The performance of research and education is featured in Chapter 5. Research and Innovation in the private sector is subsequently discussed in Chapter 6 including the framework conditions for doing business in Belgium. A separate Chapter 7 is dedicated to internationalisation of Research and Innovation. Finally Chapter 8 sums up our major recommendations.

2. The Research and Innovation System in Belgium

The Research and Innovation System (RIS) in Belgium has key features that makes the country stand out from most other national systems in Europe. To understand the dynamics and governance of the system, a short description of these features is necessary to set the scene for this policy mix assessment exercise. A more comprehensive description of BRIA is provided in the Background Document that was provided to the international peers before the panel discussions (See Annex B) and the so called BRISTI Report.¹

A first key feature of the Belgian system is the fact that in the Federal structure of the country, the major part of the responsibility for science, research, education and innovation is delegated to the regions and communities. The Belgian research and innovation system is a composition of two major and one minor Research and Innovation systems, competing and co-operating through a six-level public governance with both federal and con-federal elements. Consequently, there is not one Belgian research and innovation system since all regions (and the communities) have close to full autonomy in managing their own system. The Federal government of Belgium has authority for specific policy domains such as space, nuclear power and metrology research, all fiscal policies and general economic framework policies. It is estimated that around 75% of public funding for research and development (including innovation) is allocated by the regions and communities and only 25% comes from the Federal government level. This balance is changing due to the fiscal Research and Development (R&D) incentive schemes. Innovation policies are exclusively the competence of the regions and communities so in this domain the expenditures are solely with the communities and regions.

For us, the peer reviewers, the three-day panel sessions revealed clearly how independent the research and innovation sub-systems in Belgium are in terms of their governance, their strategy development and implementation of policies.

In constitutional terms, the Walloon Region and the French Community are distinct and therefore have their own government and administrations. Since 2009 their research and innovation policy strategies are closely intertwined. The Flemish Government (which is the Community and Region together) has had active research and innovation strategies since the 1980s and has a comprehensive set of policy actors and instruments in the past three decades. The Brussels Capital Region is the youngest of the three in this policy domain and has only recently established dedicated organisations to develop and implement research and innovation strategies for the capital city area.

This decentralised and decoupled set of research and innovation systems in Belgium provided an additional layer of complexity to the peer review and assessment. The reviewers in fact were asked to look at quite dissimilar sub-systems, while it was difficult to grasp how to assess Belgium as a whole. To learn the lessons on the application of the Innovation Union Self-assessment Tool, this complex context has to be taken into account. How these key features affect the governance of BRIA and consequently the policy implementation will be described in the following sections.

¹ Belspo, Belgian Report on Science, Technology and Innovation 2010, Brussels, June 2010.

3. Governance of the research and innovation system

The Innovation Union Self-assessment tool proposed by the EU2020 strategy consists of number of features related to the governance of the RIS. The first key feature is that promoting research and innovation is considered as a key policy instrument to enhance competitiveness and job creation, address major societal challenges and improve quality of life and is communicated as such to the public.

We noted some positive developments in the Belgian system:

- In the Brussels Capital Region the key responsibilities for Research and Innovation policy is with one Minister who can oversee both policy domains. In principle this would reduce the risks of a lack of coordination between the research and innovation domains;
- In each of the regions and communities research and innovation is high on the policy agenda. The regional governments have set ambitious goals, each in their own long terms strategic plans;
- In a recent one-off overall budget increase of the Flemish government, a considerable share was allocated to R&D policy and will be used to support strategic medium to long-term support. The positive aspect of this budget allocation is that it shows that R&D are considered as key policy tools to address the growth strategy in times of financial budget control;
- The Brussels capital Region has doubled its R&D budget in the last five years;
- The renewed tax credit scheme introduced on the federal level is widely used. Its value in terms of tax credits was close to 500 million for 2009 and a growth of the scheme is foreseen for 2010 and beyond;
- Wallonia has invited the OECD to review its regional innovation system with the aim to learn from this exercise and improve its policies. Its Marshall Plan illustrates the increased ambition and public expenditures for R&D;
- The Belgian EU Presidency showed that a good collaboration between the different government bodies is possible and seems to have found a good pragmatic way of getting things done if needed.

However, there are also a number of critical notes to be made on the research and innovation governance of Belgium.

We had a strong sense that the **Research and Innovation System is underfinanced**. A strong indicator for that is that the Belgian Government Expenditures on R&D are 0.85%, which is below the 1% Barcelona target. Despite the fact that the Flemish government has announced an increase in its government spending for R&D in the next few years, the overall Belgian public and private R&D expenditures remain low. Given also a stagnation of the share of private R&D, we believe that it is unlikely that the Barcelona target is met by 2020, if expenditures for R&D are not stepped up considerably in the coming years.

The long-term outlook for the Federal government is hampered by the **political impasse** and the lack of an elected federal government. The uncertainty concerning the future of Belgium and the failure to form a new government for over a year, prevent the federal government level to develop new policy plans and to make major decisions on budget spending. Nevertheless, the NRP EU2020 was submitted to the Commission in due time, including targets for the objectives (i.e.: 3% R&D-intensity by 2020).

The Belgian Research and Innovation Area (BRIA) is **complex and fragmented** as described in the previous section. The eagerness, interest and sense of urgency of the separate governments to collaborate more closely with each other within the Belgian

system did not seem very strong. In broad lines collaboration with the counterparts in the Belgian system was not regarded differently than a general willingness to cooperate more closely with foreign partner countries and regions.

The Inter-Ministerial Conference on Science Policy (CIMPS-IMCWB), the coordination instrument between the Federal State, the Communities and the Regions, composed of those members of respective governments having responsibilities in science policy matters meets with a low frequency. The last meeting was in May 2010.

The administrative International Co-operation Commission (CIS) for international matters and its sub-committees, meet more often, and they deal with for instance issues related to the European Framework Programme. These committees work on an ad-hoc basis when there is a need to coordinate, particularly for European matters. The European Presidency showed that this type of ad hoc and more pragmatic cooperation can work quite well in Belgium. A parallel Federal Co-operation Commission (CFS) for overall national matters did not work well and has not been active for a while. A similar but more broadly represented commission exists for economic affairs: the Inter-Ministerial Economic Commission CEI-IEC. The CEI-IEC can deal with any technical interdepartmental coordination related to economic affairs in the broad meaning of the word. In this context, the IEC has created a workgroup on Innovation which coordinates the Belgian positions on several items related to economic, industrial, innovation and science policies, especially with regard to normalisation, public procurements and intellectual property. It also presently coordinates concrete actions such as training for innovative procurements. However the latter does not coordinate matters with the other inter-ministerial committees on innovation matters. We strongly suggest that mechanisms for systematic and frequent coordination between the different government bodies and policy domains in the BRIA should be reinforced.

From the **viewpoint of the stakeholders** and particularly industry, the fragmentation of the Belgian system, and lack of coordination was considered a problematic issue. For those companies that operate solely in the confinement of one of the regions, access to public funding and transparency of the Research and Innovation System does not seem a major issue. But for those companies operating in more than one region or wanting to collaborate with a Belgian partner outside their region, the compartmentalisation of research and innovation policy can be an important bottleneck, depending the number and location of branches and their activity.

For companies with their headquarters in the Brussels Capital Region more opportunities for innovation support would be welcome and acquiring funding for subsidiaries outside the capital is cumbersome. From a customer perspective the fragmentation in the system is a larger issue than policy makers seem to acknowledge. A greater harmonisation across the regions of the rules governing access to public finance would be welcomed.

Given the small size of Belgium as a country, let alone the separate regions, the **compartmentalisation** hampers the creation of critical mass, particularly in areas where all regions have strengths, such as for instance in the highly internationalised pharmaceutical sector. Another point of criticism raised by the stakeholders was that the fragmentation has a negative effect on the position of Belgium in Europe. In order to make an impact at European level a clearer common position is needed more often. This takes time and because of the multiple representations, ample human resources. The panel also heard of experiences where 'speaking with a common voice' did work well, for instance in ESFRI, while on the other hand some actors state that stronger regional authority on this issue would avoid 'deadlock' situations when only one of the regions is interested in a particular research infrastructure.

There are clear benefits from a more coherent and converging vision and strategy and an alignment of instruments between the different governing levels. With at this moment, an absence of top level political support for closer cooperation, a pragmatic

bottom up approach between practitioners is surely a good starting point, but not the end point for an efficient system at a given geographic location. The reality of industry is much broader than the scattered policy spheres in Belgium.

Prioritisation of public spending to favour specific technology areas or sectors (smart specialization) is done in individual regions and communities. The Walloon and Flemish regions have defined a set of priority clusters, the Walloon in its Marshall Plan and Flanders with its Flanders in Action Plan and the six priority clusters defined by the Flemish Council for Science and Innovation. The Brussels region has a number of focus areas in its Innovation Plan. Nevertheless, this is a topic where the Belgian participants to the discussion sessions felt more could be done, as few linkages and coordination exists between different initiatives.

Belgium's evaluation culture has been well established and developed, yet focused on programmes, instruments and institutions. More systemic evaluations could be matched to gain a better strategic view, monitoring the opportunities and challenges of research and innovation in Belgium. A systemic review of Belgium would benefit from a holistic analysis of the whole national system and not the accumulation of the sub-systems.

We have heard that a key bottleneck for all regions and communities is the **shortage of available human capacity** in the research and innovation policy making bodies. It is a too high burden on the small workforce, to manage the internal activities and on top of that deal with the cross-regional interaction and consultation with international bodies such as the European Community. This is one reason why interregional dialogue and communication does not get high priority. The lack of skilled staff to deal with BRIA at various levels forms a strong argument for a better coordination and division of labour between the different policy entities. A better division of labour can free up government staff to focus on a smaller number of dossiers.

The sub-critical size of the Brussels Capital Region is a specific aspect of this shortage of capacity. Given the economic and R&D potential of this geographically small area this could lead to missed opportunities for entire Belgium. This could be prevented, for instance by the opening up research and innovation programmes across the regional borders, so that companies with locations (e.g. headquarters) in Brussels and in the other regions do not have to apply for funding with multiple government agencies. The wider Brussels socio-economic area is much bigger than its formal administrative boundaries. The Brussels area should be able to grow in socio-economic terms. Belgium should make better use of the attraction of a Brussels city region with a strong international image. The economic growth areas around Zaventem, Leuven and Charleroi can together act as attraction poles for foreign investments. A more coherent approach to providing the framework conditions for economic growth and innovation requires the alignment of policy approaches between the various government layers involved.

4. The implementation of Research and Innovation Policy Instruments

Belgium has a comprehensive and **rich set of research and innovation policy instruments** that in broad lines covers all aspects of what can be called a systemic policy portfolio. There are no major gaps in the policy mix, the key issues are about the balance of measures, the transparency for the users and the alignment of instruments between the government levels. Some stakeholders reported that there are too many instruments (old instruments are rarely terminated) rather than too few.

The governance of research and innovation as described in the previous sections also reflects on the policy mix in Belgium: in fact there are four different sets of policy mixes, with the majority of instruments in the regions of Flanders and Wallonia. The Federal level of policy does not function as an umbrella or coordinating body, but as an additional system alongside the other systems. Given the high level of independency of the regions in setting their policy agendas, there is de facto **no coordination of policy mixes** for the country as a whole. The roles of the federal government in research and innovation are clearly defined, mostly focused on general economics and fiscal policies and research in certain domains (e.g. space research, nuclear energy). The balance between indirect measures (e.g. fiscal policies, the use of regulation) and direct measures is not explicitly made or discussed between the various levels of government, due to the fact that each entity acts within its own institutional competencies. From the viewpoint of the customers this leads to a plethora of available instruments, to which they can only access those that are in their region of location. Although there are ad hoc activities to align programmes across the communities or regional borders, there is **no general open access** for customers across all regions. In some cases open access is arranged in a similar manner as with foreign partners: participation is possible if funding is not leaving the region. It was also reported that the requirement to demonstrate socio-economic impact within one region is an obstacle for companies with business sites in more than one region. In the view of the peer review panel more should be done to streamline the many policy instruments and to align them better across the regions and between the regions and the federal government.

The renewed fiscal schemes aimed to reduce the costs of investments (notional interest scheme) and labour costs for R&D (dedicated schemes to acquit employers advance labour taxes) were warmly welcomed by the business (and research) sector. This has made a considerable improvement to the R&D investment climate in Belgium.

Some further critical points that were raised by stakeholders in the panel sessions:

- A considerable share of public funding is allocated to public sector research organisations, with little consultation from industry on the broad research agendas. A stronger stakeholder dialogue and involvement in the design phases of programmes seems to be needed;
- In Flanders most research and innovation instruments are focused on individual organisations, there are too few schemes focused on medium to long term collaboration between companies (e.g. clusters) or between companies and research organisations;
- Besides the IUAPs there are no instruments geared to cross-regional collaboration;
- Some stakeholders reported a co-ordination gap between innovation and science/research, reinforced by the political competence division (e.g. science, universities and university colleges that are a competence of the communities, and innovation centered at the regional economic departments). The silo issues have

been moderated somewhat by the institutional merger of community and regional functions in Flanders and for research also between Wallonia and the French Community. Nevertheless, across Belgium as a country, regardless of the present division of administrative bodies in the different communities and regions, more can be done, for instance by a merger of administrations dealing with science and innovation, as well as innovation and general economics policies. This would also tackle the issue of sub-critical administrations.

5. Higher Education and Skills

One of Belgium's strong points is the quality of its research and the education of its workforce. Universities in Belgium do have a relatively high academic output. The average number of publications per 10,000 inhabitants is 13.0, which is well above EU27 (7.4), the USA (9.9) or Japan (6.1). Belgian research shows relatively large international co-operation, as about 54% of the publications is an international co-publication. Moreover, these international co-publications have relatively high impact scores (150% of the global average). Also the direct citation impact for Belgium is high. KU Leuven is the 14th largest client of the EU Framework Programme funding (see also the Background Report as Annex B). There was a general consensus that excellence in research should remain a priority and that support for investigator-driven research was an essential component of support.

We heard during the review that for the business sector the high quality of researchers is an important asset and reason to locate their business (and R&D functions) in Belgium. Belgium has a number of examples of international excellence such as for instance the nano-electronics research centre IMEC. We also noted that there is a strong policy support to maintain the levels of basic and curiosity driven research.

The Flemish Community, the Brussels Capital Region, as well as the French Community have each established a brain gain programme to (re)attract researchers to their respective institutes (Odysseus, Brains Back to Brussels and Ullysé, respectively).

A number of critical issues were raised in the discussion with stakeholders from research and industry:

- Language restrictions in the regions (higher education courses in French or Dutch) hamper the internationalisation of the higher education sector. English as an additional language should be supported in the relevant courses in higher education;
- It is not easy to offer globally attractive labour conditions for researchers both in the public and private sector; Industry stakeholders complain that the total costs of employment for researchers are not competitive despite the fiscal incentives for research staff. The forthcoming evaluation of the R&D fiscal incentives should take a broader view on how salary costs of Belgian researchers compare with those of neighbouring countries and in how far the fiscal incentives can really offset this;
- The (future) skills shortage, particularly in the engineering, sciences and technology domains, is reported as a concern by many stakeholders. The policy discussion on education seems to have a strong focus on the higher education curriculum, whereas the interest for science and entrepreneurship needs to be addressed the younger age categories as well;
- In addition, the discussion on alternative routes for formation (e.g. vocational training) could be strengthened;

6. Framework conditions for private sector innovation

6.1 Overall conditions for doing business and investing in R&D

A mixed picture emerged in terms of the overall framework conditions for business in relation to R&D and innovation. This is reflected in a relatively high position in the IMD World Competitiveness Report and the World Economic Forum rankings but with specific weaknesses in employment, public finance, fiscal policy, the labour market and attitudes and values. Market size is not surprisingly also an issue although much industry is predicated on the entire European market.

In many cases an accommodation has been reached around perceived weaknesses. Previous peer review reports have pointed out that the fiscal climate in Belgium is not conducive to (private) investment in R&D and in R&D related labour. Particularly the dual situation of low wages for researchers and high costs for employers was seen as a threat to the Belgian RESEARCH AND INNOVATION system, leading to brain drain and relatively low attraction for researchers from abroad. As mentioned above, this situation has been mitigated by the introduction of a generous fiscal scheme to reduce the employment costs of researchers both in the private and public sector organisations who employ researchers.

Government performance on the ease of doing business, reducing regulation and seems to have improved in recent years. For example, the Operational Programme 2011 states that Belgium will adhere to the Think Small First principles. The European Small Business Act Review suggests that Belgium has made quite some progress in making business easier for small businesses. Belgium is one of only a few Member States which have integrated an SME Test into their national decision making approach. It is also one of only five Member States that comply with the recommendation 49 to complete all legal procedures to wind up a business in the case of non-fraudulent bankruptcy within a year.

6.2 Entrepreneurship and start-up companies

A general concern was expressed that the Belgian economy has an insufficient number of innovative start-up companies and that this was underpinned by attitudes towards entrepreneurship. This issue is an inhibitor for a shift in industrial structure away from medium tech specialisation and towards high-tech.

It is clear that this issue is already recognised in existing policies. According to the Operation Plan 2011 and the Reform Programme 2020, Flanders is aiming at supporting an entrepreneurship culture. Several Action Plans have been launched one for Entrepreneurship (2010) and for entrepreneurial education. The portfolio for SMEs policies has been expanded including support for potential company starters. In Wallonia the emphasis has been in providing support to financing of start-ups and encouragement of entrepreneurship. The Brussels Capital Region also focuses on supporting companies to become more active on export markets and to help foreign companies to invest in the Brussels Capital Region.

However, the evidence we heard was that more needs to be done. At the root is the question of attitude – we heard that people prefer to be secure about the future and that there is a structural problem in the education system which places no focus on this issue. Entrepreneurship is in general not seen to be high up in the political agenda. There would be clear benefits from encouraging entrepreneurship at an early stage of education.

On the specific issue of university spin-offs there is evidence of good practice, notably at K.U. Leuven and the university of Liege, but spreading this more widely requires both a change of culture in universities and a certain amount of time for technology transfer offices to develop effective capacity. As elsewhere, in most cases the scientists providing the inventions are not the right people to take forward the companies and hence there is a need to develop business leaders with the requisite skills and experience. The review panel was told that there is a big discrepancy between universities, posing a challenge to have a general policy approach to the issue.

The venture capital market in general seems to be functioning well but it appears to be not large enough and in particular there is a deficit in the availability of proof-of-concept funding and other support at the seed and start-up phase.

One way forward in this issue would be to utilise the skills latent in larger firms through public-private partnerships to provide the development measures needed to support translation of knowledge into activities of economic and social benefit. This should go beyond the commercialisation of intellectual property from R&D and also support the emergence of service companies and those in the cultural sectors.

6.3 IP, standardisation, and other framework conditions

A mixed assessment was given to the panel on the fitness for purpose of Belgian IP legislation. Whereas some industrial representatives did not see a major threat in existing IP regulations, other stakeholders criticised fragmentation concerning IP information and promotion and advocated simplification and interregional solutions. With regard to dispute settlement, the case was also put for a Federal IP Code to deal with the centralised EU code, which will exist when the EU patent is active.

The importance of regulation and standards in creating framework conditions was recognised but no obvious bottlenecks were pointed out. We heard welcome evidence of a change in approach to measurement standards, which involved higher engagement of scientists with industry through the development of instruments and test measures for nanoscale activity.

6.4 The public sector as driver for innovation – demand-side innovation policy

Demand-side innovation policy is a strongly emergent theme at both European and Member State levels. It involves the use of public procurement of innovative goods and services (or the R&D that precedes their development); and the use of regulation and standards to push forward the boundaries of the solutions that business is asked to provide.

In terms of such demand-led innovation policies the Flemish government and particularly its technology agency IWT has been a leader in developing tools for innovation procurement. After its coordination of the OMC-Net Pre-Commercial Technology Procurement (PTP), the agency developed a new policy instrument based on pre- Commercial procurement concepts used also by the European Commission. The current budget for the instrument is approximately €10 million.

Nonetheless, the evidence we heard was that more needs to be done on demand-side policy and that supply-demand interaction is lacking in Belgium. Progress would require the federal and regional levels to work together more closely. A very specific obstacle lies in the current procurement legislation (Art.78) whereby those who work on the prototype for a public purchaser are excluded from bidding to supply that purchaser with the resulting innovative products. The occasion of the current review of European legislation should be used to modernise Belgian law in favour of innovation.

The dynamics of innovation emphasises the need for reforms in the public sector and policy development. The public players' own innovation activities and the actions that aim at the intense exploitation of innovations and the creation of new markets for innovations could be developed in a focused manner. New initiatives and operations model are needed. Such measures include more action on public procurement,

regulation and standardisation. For example, regulation could be enacted in a way that increases demand in the market for innovations (e.g. increasing energy efficiency). Thus, the increasing role of the public sector as a driver and facilitator for innovation should be highlighted (this item was mentioned only very rarely during the peer review sessions).

A way forward would be to draw up an action plan for demand and user-driven innovation policy. To improve the effectiveness of research and innovation policies, new opportunities for innovation originating from the needs of users should be exploited more effectively. Clients' and users' experience and knowledge should be better linked to innovation processes as well as to the reform of public services. The public sector could take a larger role in generating demand and facilitate the functioning of innovation-friendly markets. The regions and federal authorities could ensure that the regulatory environment and steering systems support multi-actor platforms of interaction, pooling of various fields of expertise and experimentation. In this way, it would be possible to promote new forms of research and innovation and a better division of labour between different sectors and actors in innovation.

Demand-led innovation policies require a joined-up approach across government and hence there is an additional challenge for Belgium to overcome to ensure that these solutions lead to market pull through which is not confined to the regions.

7. The linkages between research actors

Inter-regional linkages are discussed elsewhere in this report so in this chapter the focus is on linkages between firms and on the relationship between industry and academia. The starting point in terms of benchmarking is reasonably good – by comparison with the EU-27 average the Innovation Scoreboard shows Belgium well above the average on linkage indicators, indexed at 199 on innovative SMEs collaborating with others and 170 on public-private co-publications. We also note the OECD Outlook 2010 which highlighted as strengths the strong innovation linkages in Belgium. "Patents with foreign co-inventors" and "firms collaborating" (on innovation) as a % of all firms were the indicators of this strength.

Nonetheless on several occasions it was expressed to the panel that this was an area where more could be achieved. At a macro-level panel members observed that interregional barriers prevented researchers, institutions and companies from collaborating on equal terms across the regions. While this issue is dealt with in earlier chapters it may be stressed again that such barriers reduce the choice set for collaboration and hence make successful partnering less likely. This problem has been mitigated by personal and pragmatic approaches.

There was an impression that industry-academic links could be more systematic and more stable over time. Links were good with the large firms but much less so with smaller ones. This is a problem in most countries, driven in part by limited absorptive capacity in SMEs. However, if the natural ecosystem of those large firms which are the main customers of the small was engaged more, a route for improvement could be found.

Following this, within the regions agencies have been active in promoting linkages but there seems to be a gap in provision for collaborative research – most support is for single organisations. There are also issues around sharing IPR in collaborative working and mobility of researchers between sectors. Joint public-private partnerships could be used to generate social capital by creating conditions for informal networks to grow, accompanied by streamlining federal and regional regulatory frameworks to favour multi-actor cooperation and generation of platforms for high quality research, development and innovation.

It is also important not to confine such linkages to those forms involved in the creation of new technology. For example, in the urban Brussels Capital Region the space for

industries is limited, yet the potential for a more knowledge-intensive services sector is high. The region's relatively high unemployment, limited tax revenue and also a relatively small academic sector, is juxtaposed by the creative treasure of a culturally diverse population and the needs of a EU capital. This mix, together with IUS findings about Belgian underperformance in non-science based innovation suggests that Brussels should also foster non-R&D based forms of innovation in their specialisation strategy (eg. education, services and social innovation, and the creative industries). These sectors also should be engaged with universities, supported by policies to foster such relationships.

8. Internationalisation of the Belgian Research and Innovation System

Belgium has a strong international openness for research and innovation in both the public and private sector. Its excellent research has attracted R&D investments from abroad and has been at the basis for the growth of a number of indigenous R&D intensive companies, for instance in the life sciences and pharmaceutical sectors. The increase of the number of patents with international co-inventors is remarkable. This shows the international vocation of the Belgian industry and the high level of its research projects.

We strongly suggest the need to capitalise on the best opportunities emerging from the open and highly internationalised economy and the BRIA. The high level of internationalisation of the economy and society is one of Belgium's particular strengths. Further steps in internationalisation are an objective that covers the entire BRIA. Continuous measures are needed in order to enhance the openness of the research and innovation environment and nurture an open-minded attitude. Internationalisation is vital for small countries because they are dependent on development elsewhere in many respects. The openness creates new opportunities since domestic resources are relatively limited and a bulk of the knowledge and skills the small players need are produced abroad.

Belgium has the confidence of large multinational research companies highly active in R&D. This allows Belgium to be in a privileged position in the European rankings on intensity in research investment versus GDP. Moreover, the presence of big multinational companies with a strong innovation character acts as a catalyst for the research activity of universities, research centers and technological SMEs. Nevertheless the risk of relocation should be kept in mind and drives towards a customer oriented research and innovation policy.

In previous chapters the negative effects of not being able to speak with one voice in European matters has already been discussed. Particularly as the European Initiatives such as Joint programming and Joint Technology Undertakings ask for a more strategic approach from the Member States it is vital for a small country such as Belgium to be well prepared in these debates and seek collaboration with other Member States with similar interests. The lack of a common strategy on how to approach international collaboration with 'Third Countries' (particularly non-EU countries) was brought up by various participants in the panel debates.

9. Recommendations

From the analysis in the previous chapters we formulate the following recommendations for the Belgian authorities:

Overall

1. Belgium is a complex and unique Research and Innovation Area with multifaceted governance layers. While respecting the autonomy and competences attributed to the respective authorities as constitutionally defined in Belgium, we believe that closer collaboration between the regions, communities and the Federal policy levels will be advantageous to:
 - Create a more streamlined and transparent set of policies for the customers of these policies, thus terminating obsolete and duplicated instruments;
 - Provide opportunities to create critical mass in areas where Belgium wants to make a difference in a global market;
 - Contribute to tackling the sub-critical size of some of the administrations dealing with research and innovation;
2. In order to achieve the Barcelona target of 3% R&D expenditure of the GDP, all Belgian authorities (regions, communities, the federal government) should **increase their public R&D expenditures** and provide adequate incentives to keep **R&D investments** by the private sector attractive. All Belgian administrations should at least aim for an R&D spending of 1% of Gross Domestic Product.

Towards critical mass, cooperation and coordination

3. Belgium should **remove interregional innovation barriers** that prevent researchers, institutions and companies to operate and collaborate on equal terms across the regions. A bold measure would be to open all research and innovation support schemes to participation from any team or company in Belgium with the region in which they operate required to meet to the cost. A minimal option is to open up programmes in those cases where organisations from different Belgian sub-systems collaborate together.
4. A coherent interplay between institutional funding, direct measures as well as indirect measures (innovation procurement, fiscal policies, regulation, standardization) for technological and non-technological innovations would be necessary. A systemic review of Belgium would benefit from a holistic analysis of the whole national system and not the accumulation of the sub-systems. There is need for at least one platform or body that constantly assesses the **coherence of the policy mix** in Belgium;
5. Ministers responsible for the knowledge and innovation system (secondary and tertiary education, science, research, economy and *finance*) should personally meet at least twice a year for a Research and Innovation summit to mobilise political will and funds for a **common strategic research and innovation agenda** across all layers of governance. CFS, CIS and CEI should jointly prepare these spring and autumn summits, involving key stakeholders (universities, industry and business, ...) and also the advisory bodies that exist for all governments.

6. There should be close cooperation between and revitalisation of the CFS, CIS and CEI, thus increasing the degree of high level **coordination** while allowing the original committees to maintain their original remits. There is a need for a mechanism that can monitor and act as pacemaker of a pan-Belgian Research and Innovation path. Regular meetings and taking the advice of key stakeholders, science boards etc could be helpful. The coordination could take the form of a Belgian Research and Innovation Area Committee (BRIAC). In the view of the panel this would add value to all governments by preparing a common client orientation (internal value) and global competitiveness (external value) agenda.
7. Belgian authorities need to cooperate more closely to develop a **common strategy and approach towards the European research** and innovation agendas as well as a strategy towards collaboration with 'Third Countries'. The approach taken regarding ESFRI could be an example. The potential of a stalemate situation or a sub-critical participation if only one region wants to take part in for instance Joint Programming, needs to be addressed.

Streamlining and refocusing policies

8. **Strict client solution orientation** should help to overcome complex governance structures and trigger simplification of policy and funding instruments. A clear customer-oriented strategy, grouping institutions and companies along their needs (client solutions like key account management and one-stop-shops) could help to cut the red tape for customers, helping to guide them through the variety of instruments and thereby reporting potential for simplification, for synergies and the removal of barriers. Particularly SME and smaller institutions but also industries willing to settle in Belgium could be addressees.
9. Meeting the needs of users will also lead naturally to support for innovation that does not necessarily come directly from the science base but rather from the **configuration of existing technologies, from the service sector and from the creative sector**. This will also allow Brussels to play a more effective role in the innovation system.
10. Draw up an action plan for demand and **user-driven innovation policy**. To improve the effectiveness of research and innovation policies, new opportunities for innovation originating from the needs of users should be exploited more effectively. The barrier to innovation in procurement legislation (art.78) should be removed. A stronger **dialogue with the stakeholders** in the design phase of policy programmes should be developed to ensure that policies are geared to the users.
11. Focused support for **young innovative companies** and multinational companies that choose Belgium for their R&D headquarters could broaden the business base and reduce the dependence on strategic decisions taken by multinational companies abroad. Developing the local and national ecosystem will help to ensure that the existing multinationals remain rooted in their present location. Current policies for young innovative companies remain small scale and require a closer interaction between economic, financial, fiscal, education, innovation and research policy domains. The fragmentation of the system prevents a coherent approach for young start-ups. In the upcoming review of the fiscal incentives schemes, take a broader view of the competitiveness of Belgium in terms of costs, productivity and overall fiscal performance. The recent drop in the ranking of the world competitiveness report should be analysed in each region and even across the regions and communities to have a full picture. All parts of government should conduct a fundamental review of the barriers to entrepreneurship and take early steps to remove these.

A more effective system

12. A specific focus of action could be to raise average practice in university and research organisation **technology transfer offices** to the levels achieved by the best in Belgium and beyond. This process would be helped by a modernization of the terminology to “knowledge exchange” to emphasise the two-way flows involved. The cost of operating such offices can be high so every opportunity for shared services between institutions should be explored.
13. Policy measures could make better use of the skills latent in larger firms, for example by using **public-private partnerships** to provide the development measures needed to support translation of knowledge into activities of economic and social benefit. This should go beyond the commercialisation of intellectual property from R&D and also support the emergence of service companies and those in the cultural sectors. An additional benefit here would be to drive wider benefit from the service and cultural concentrations in the Brussels region.
14. The current and future **skills shortage and lack of mobility between universities and between universities, industry** and the non-for profit sectors, needs serious attention by all actors involved.

2011 Policy Mix Peer Review Belgium

Final Report

ANNEXES

Annex A: Rationale for the Belgian Review

Annex B: Background Report

Annex C: Participants to the Peer Review

Annex D: The process of the Policy Mix Review using the new self-assessment tool

ANNEX A

Focus of the Self-assessment exercise in Belgium

Introduction : the focus

Belgium will participate in the next round of peer reviews (self-assessments). That was the decision of the CIS-CFS (the body where all Belgian authorities meet to discuss science policies) taken on the 1st of February.

In 2007 Belgium did participate in the previous round of peer reviews organised by CREST (now ERAC). The focus of these peer reviews was of course different from what is described right now in the self-assessment tool. The "Innovation Union" was not written yet; so the focus was rather limited to science policy issues. The report of the previous peer review is available at the web-site of BELSPO¹.

The team of coordinators of the actual self-assessment decided that the new peer review should not duplicate the work which was done in 2007. Rather it could revisit the conclusions and see if they are still valid. Besides this, the new peer review should take account of some of the strengths and weaknesses identified in this and other papers on science and innovation policies in Belgium. Work has also been done on issues like the lack of an internationalisation strategy in Belgium. There is also the new broadened focus of the self-assessment tool (integrating innovation) that has to be taken into account.

Last but not least it would be good if the self-assessment could discuss the different ERA initiatives, since the delineation of the ERA framework will be one of the major tasks in the coming years (with possibly consequences not only for our future policy making, but maybe also for our legislation).

Regarding the possibility of having separate regional self-assessments there was no support by the Belgian authorities. This does not mean that the issue was not welcomed as interesting. It should rather be part of the discussions in each of the sessions elaborated below.

What came out of the previous reviews of Belgian science policies ?

In the last decade a number of studies have been undertaken on the Belgian science and innovation policies. Mostly the focus was on the

1

http://www.belspo.be/belspo/stat/papers/pdf/Rapport_PEER_REVIEW_EN.pdf

science part; innovation aspects were only covered when there was a link with research. These studies were being commissioned by either the federal or the regional authorities. Some EU-studies also contributed to the assessment of the strengths and weaknesses of the Belgian policies. The Innovation Union Scoreboard is particularly useful in this respect. In what follows we will address three of these studies : the report of the high level group 3%; the report of the peer review 2007 and finally the Innovation Union Scoreboard 2010 and the OECD outlook note on Belgium 2010.

The "high level group 3 %" report² of 2003

The "high level group 3 %" was the first major attempt to analyse the strengths and weaknesses of Belgium in the last decade. It was set up immediately after the EU decision on the Barcelona Target of investing 3 % of GDP in research by the year 2010. The aim was to analyse what elements could hamper Belgium in this strive and secondly to identify the main policies necessary to reach that goal.

Through an analyses of Belgian statistics and testimonies of the main Belgian stakeholders the following significant aspects were identified :

1. In terms of RTD inputs, Belgium can rely on a highly educated labour force. The availability of human resources seems appropriate, even though some mismatches occur in the short and medium term for specific research fields important for R&D.
2. There are major efforts needed in making the career of academic researcher less precarious and more attractive; mobility between R&D institutions, public or private, is hampered by the lack of career prospects and opportunities.
3. Scientific output production appears good, but is increasingly threatened by low public R&D expenditures. There is a significant underfunding of university and public research more generally.
4. There are major bottlenecks in the use of knowledge in the private sector, due to various mismatches: between areas of scientific

² http://www.belspo.be/belspo/home/publ/pub_ostc/ind/ind07_en.pdf

excellence and economic specialization; in innovative performance, often stronger in the medium to low-tech sectors, and between foreign linked large firms and domestic SMEs. Other areas of concern relate to the uneven presence of entrepreneurial, strategic and commercial skills, in order to turn new knowledge into commercial opportunities.

5. The dual problem of low wages for researchers and high R&D labour costs for employers represents a time bomb under Belgium's innovation system. (...) at the same time the high labour costs are likely to further induce the large R&D intensive firms to offshore or relocate their R&D activities to other countries.
6. Belgium's good performance in terms of labour productivity is not related to a strong RTD position in high tech sectors.
7. Finance for innovation seems at first to be less problematic than in other EU countries, though Belgium remains far from the leading countries. Some failures and bottlenecks do appear.
8. At the institutional level, STI policy is more fragmented in Belgium than in other countries, posing specific challenges when trying to improve the dynamics and in particular the linkages and synergies between the various components of the innovation system.
9. Lack of relevant data on several key aspects (i.e. incidence of policies, vintage charts, relations between the needed knowledge for subsidized research programs and the knowledge taught in universities, relation between basic research and new industrial activities) of the Belgian NIS is not without consequence on the assessment one can make of it. Key aspects of the NIS are insufficiently documented.

Overall, it could be argued that the Belgian national innovation system is characterized by 'atomization'. Weaknesses of knowledge flows between the public science sector and businesses, moderate degrees of co-operation amongst businesses, insufficient integration of foreign subsidiaries into the domestic innovation system (with the danger of repatriation of R&D benefits out of the country), spatial concentrations with limited diffusion effects, fragmentation of STI policy setting, are all points of attention.

In order to address these points 10 recommendations were being suggested in 6 policy fields.

1. The need for a major public funding injection in Belgium's public research infrastructure.
2. Financial conditions for private R&D investments should be radically improved.
3. Strengthen the diffusion of knowledge. This goes through different channels : more chances for an adequate financing to innovative projects; the creation of a status for young innovative companies; enforce existing mechanisms and institutions like the collective centres; enhance mobility;....
4. Foster attractiveness of R&D for human resources. Careers in the public sector need to become more attractive through qualitative, as well as quantitative, measures. Shift the current brain drain into a brain gain.
5. Establish a "Belgian research area" (motivated by the European research area) to diminish the redundancy of research efforts, to reinforcing the requirement for world class research by merging forces, while keeping in mind that companies are active on either side of the regional borders.
6. Improve the regulatory framework for research and innovation.

The Policy mix peer review of 2007³

The Peer review of 2007 was the second attempt by the Belgian authorities to assess the strengths and weaknesses of the Belgian Innovation system in the last decade. This "peer review" took place in the spring of 2007. The modalities were more or less the same as the ones which will be practised this year. A few colleagues (of CREST and other meetings) were invited to Brussels to interview a number of Belgian stakeholders active in the field of research and science policy. The focus was limited to science and research policies. The peer

³ http://www.belspo.be/belspo/stat/papers/pdf/Rapport_PEER_REVIEW_EN.pdf

review was organised according to a scheme suggested by the European Commission focusing on 4 themes : (1) the Belgian policy mix (priority definition, actors involved, cooperation platforms); (2) R&D in the universities (fundamental research, mobility, career plans,...); (3) private R&D (investment climate, cost vs quality, SME's vs MNE's...); (4) Knowledge transfer and science industry links

A background report was produced that identified the following critical issues for discussion. These were grouped around 4 topics.

1. Coherence and cohesion of the various decision making bodies (main message : 'Policy orchestration' between and among the various federated entities and the federal authority today is 'marginal' and in many cases 'formal' in nature rather than 'content-driven')
2. Belgian mechanisms for policy development. The review looked to what extent the different steps in the 'policy cycle' (from articulation and prioritisation of needs to evaluation and reformulation of priorities) are really available in Belgian policy making at the different levels. It has been observed that 'real' evaluation is not equally embedded at all levels.
3. Human Capital - more and better qualified researchers. How can a country like Belgium increase its attractiveness and thus excellence ? The issue was raised of 'internationalisation and rejuvenation' of the R&D system as well as the mobility between science and industry in general and in the context of the ERA and the broader globalisation in particular.
4. Valorising research and technology transfer (is the policy mix right ? the alleged 'mismatch' between scientific/technological excellence and economic valorisation; the dependence on the R&D strategies of large (international) R&D players in Belgium which in many cases are decided abroad; the role of open innovation)

The peers concluded in a set of 27 recommendations for action for the Belgian policymakers.

- The general recommendations focused on the importance of setting the issue of the internationalisation of research higher on the agenda. Hence, framework conditions to attract and keep international companies located in Belgium, are crucial.

- A second set of recommendations focused on the need for more policy orchestration and the use of a true 'systemic' view including all stakeholders involved at both the federated entities and the federal authority. Some actions were suggested like e.g. : develop a common vision on the policy mix within the institutional setup; review the current formal co-operation and advisory mechanisms; establish task forces in order to analyse specific issues hampering the effectiveness of the policy mix; establish special ad-hoc panels to address international challenges, etc.
- Priority setting and policy development were dealt with in the third chapter (the role of evaluation, futur studies etc.)
- Under the heading of "Excellence in public research" different issues were discussed like : funding mechanisms for universities; the need for the cross-funding of trans-community/regional co-operation among research teams and finally the increase of public funding of research and research infrastructure.
- In the next chapter suggestions were being done to improve training, careers and mobility of researchers.
- In order to increase the private sector research, it was suggested to focus on excellence of university research; to consider the height of taxes; to consider the policy mix for SME's (direct and indirect support mechanisms); and a few more;
- The last set of recommendations focused on a few specific ideas to enhance the commercialisation of research and technology transfer

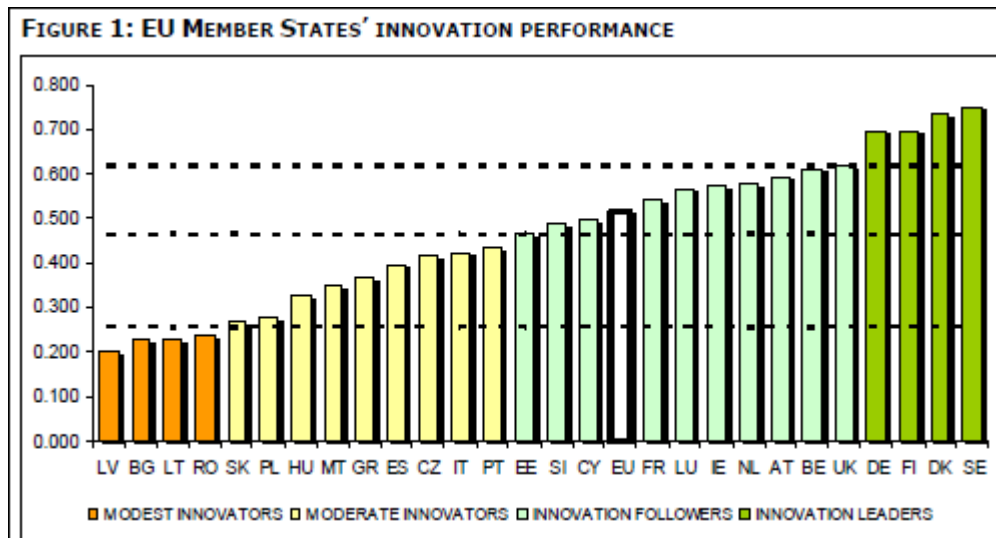
The innovation union scoreboard 2010⁴

Based on a set of 24 quantitative indicators the Innovation Union scoreboard summarizes the Belgian performance in an international context. So it is the position towards the European average that counts, rather than the absolute performance in itself for each given indicator.

The indicators used cover aspects like : human resources; the openness of research systems based on publications and mobility; public finance and support; firm investments (R&D and non-R&D investments); cooperation between firms; intellectual assets (patents, trademarks); innovation and economic effects.

⁴ http://ec.europa.eu/research/innovation-union/pdf/iu-scoreboard-2010_en.pdf

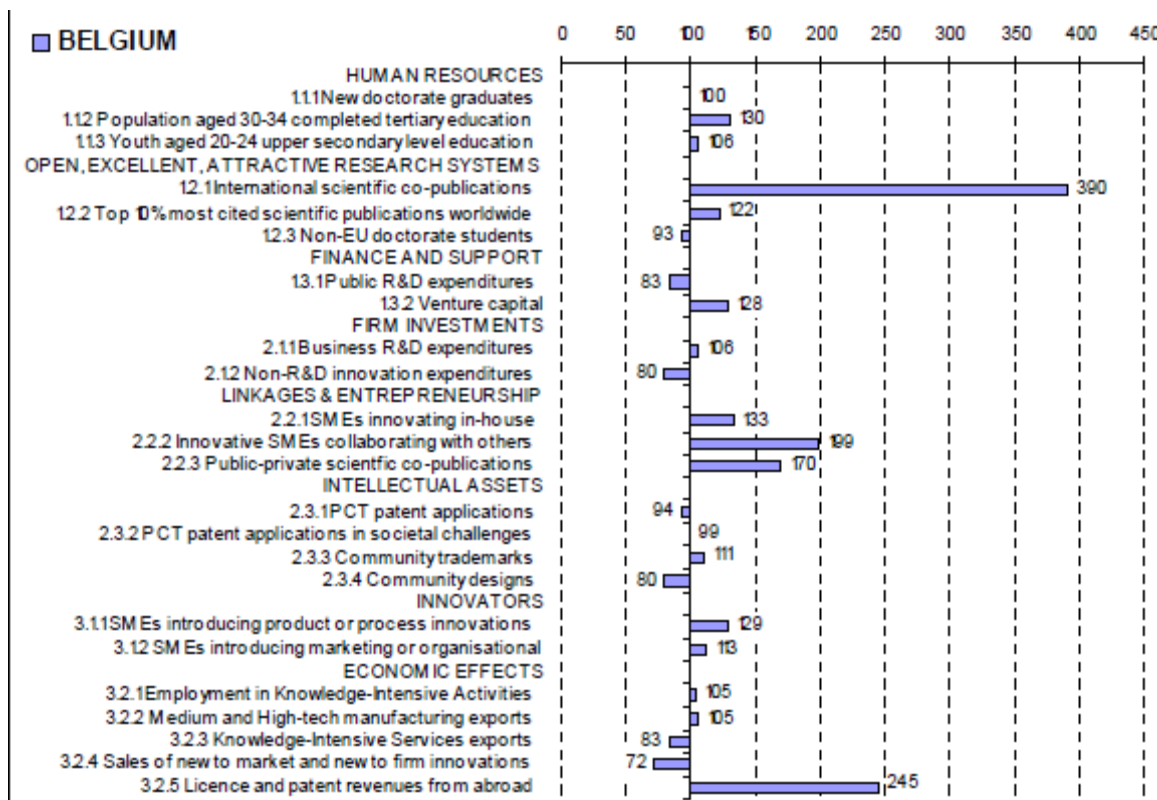
Based on the Summary Innovation Index, where all these indicators are synthesised, the Member States of the European Union fall into four groups : from modest innovators to innovation leaders. The Scandinavian countries and Germany are the innovation leaders, followed by the UK and Belgium. So Belgium performs quite well. If Switzerland would be added it would rank number one.



When considering the annual improvement (the growth of the performance), Belgium falls into the category of moderate growers together with countries like Austria, France, Ireland and the Netherlands (though still above the EU-27 average).

The report (p. 25) analyses the Belgian performance per indicator relative to the EU27 (EU27 = 100). One gets the following table :

Figure 2 : Belgium compared to the EU27-average (EU27 = 100)



According to this table Belgian strengths are in Human resources, the openness of the research system and in linkages and cooperation. Weaknesses are in public R&D expenditures, intellectual assets and certain economic effects.

Recent progress has been highest for Venture capital and Community trademarks. A strong decline is observed for Non-R&D innovation expenditure, Community designs and Sales of new products. Growth performance in Human resources, Open, excellent and attractive research systems, Finance and support, Linkages & entrepreneurship and Intellectual assets is above average. In the other dimensions it is below average.

The OECD outlook⁵2010 : country note for Belgium

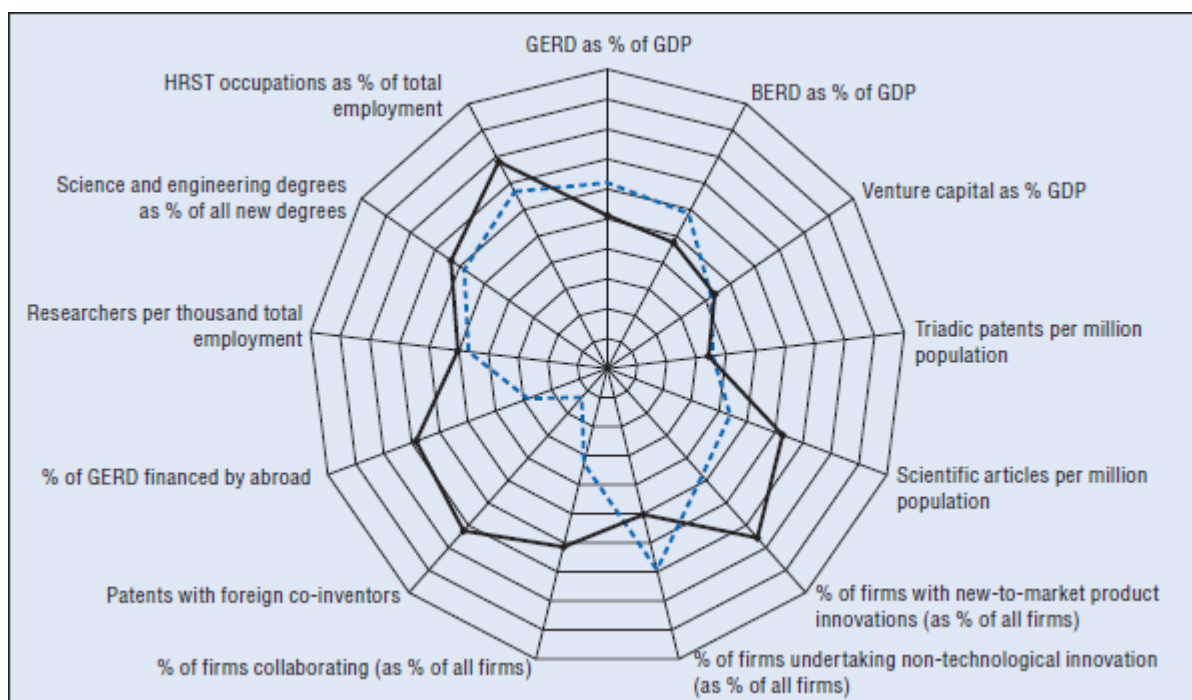
Similar analyses were done by the OECD (see the OECD outlook; the chapter on country notes. The dotted line in the radar graph below refers to the OECD average; the black line is Belgium). The Belgian performance is a little bit different than the one measured by the

⁵ <http://www.oecd.org/dataoecd/30/62/46663679.pdf>

European Innovation Union Scoreboard. This can be explained by the different list of countries with whom the bench-marking is being done. In the list of OECD members, we find very research active countries like the US, Japan, Korea, Canada, etc.

When we look at the details of the table, the following is striking. First of all there is the remarkable openness to the world, measured by "% of GERD financed by abroad" and "patents with foreign co-inventors". It is well above the OECD average. The same goes for "Human resources" and their output (measured by publications). There is room for improvement in the field of R&D expenditures. Total R&D expenditures (GERD) as well as Business R&D expenditures are below the OECD average. Non-technological innovation in firms does not seem a strong point either of Belgian performance. With 39 triadic patents per million population, Belgian stands marginally below the European average and lower than a decade earlier. A particular note is being written on the strong innovation linkages in Belgium. "Patents with foreign co-inventors" and "firms collaborating" (on innovation) as a % of all firms show this strength.

Figure 3 : Belgium compared to the OECD average (centre = 0 ; border = 100)



dotted line = OECD average; black line = Belgium

Some conclusions : towards a self-assessment by the Belgian authorities

When considering all of the above mentioned documents, one observes that the list of strengths and weaknesses changes over time. Some points which were considered particular weaknesses in the beginning of the decade are not any more on the black list. Belgium has undoubtedly improved its performance. Though in some other fields one does not observe any strong evolution.

Human resources have always been mentioned as a strong point in the Belgian research landscape, independent of the choice of the indicator. The work force is highly educated and the number of researchers per thousand employment is high. But there are several other aspects linked to the problematic of human resources, where the picture might not look as positive:

- What about the attractiveness of the careers. The 2003 report as well as the 2007 report seems to think there is an unsolved problem here.
- Mobility of researchers between different sectors was raised as a problematic issue in the 2003 reports since it was supposed to hamper knowledge transfers. Since then mobility has a lot increased nationally and internationally. Can it still be considered problematic ?
- The 2003 report analysed the lack of attractiveness of research careers in Belgium leading to an insufficient inflow of non-Belgian researchers.
- The 2003 report stated that the dual problem of low wages for researchers and high R&D labour costs constituted a time bomb. However meanwhile the tax concessions were set up, leading to a major reduction of labour cost. But are the wages for researchers still to low ?
- What about the inflow of youngsters ? the gender question ? or some specific mismatches in certain areas where not enough graduates are available.

Investment in research, measured by total research (GERD) and business research (BERD), has always been fluctuating around the EU average, which is well below the OECD average. Sometimes business research exceeded the EU-average, but not the OECD average. The

2003 and 2007 report as well the Innovation Union Scoreboard and OECD outlook cover this item.

This is often (at least partially) explained by the relative underinvestment by the different Belgian governments (as well as the Belgian economic structure). Indicators still reveal this underinvestment. Meanwhile efforts have been undertaken by all Belgian authorities (regional as well as federal) to remediate this public underinvestment. The tax credit system at the federal level led to a substantial inflow of new money, while the regional innovation plans foresee in several cases a long term growth path. While the 2003 report suggested some ways to improve the availability of venture capital, the 2010 Innovation Union Scoreboard at least suggests that there is no longer a major problem.

The bulk of private research is still very concentrated in a limited number of firms, this might be critical.

Knowledge flows take an important part in the 2003 report. Several mismatches were being identified like those between areas of scientific excellence and economic specialisation, in innovative performance often stronger in low-tech sectors, etc. Some of these mismatches might still exist. But on other aspects the situation looks less gloomy:

- All indicators measuring linkages show a remarkable Belgian strength. Belgian companies collaborate a lot with scientific institutions as well as with other companies or institutions abroad. International scientific co-publications are well above EU-average. Patents with international co-inventors reveal the same tendency.
- Belgian companies are highly internationalised but private research is being dominated by foreign affiliates. The 2003 spoke about high-tech islands, suggesting these companies were not having sufficient spill-overs to the rest of the economy. This seems in contradiction with the indicators on linkages.

Innovation does only seem a problem when looking at specific indicators. In general the surveys show Belgium as a highly innovative country. The % of firms with new-to-market product innovations is well above the OECD average. SME's innovate a lot, well above the EU-level. They innovate in house, they collaborate a lot, etc. But some indicators like those on non-R&D innovation expenditures, or on sales of new-to-firm innovations give a somewhat divergent picture.

Scientific output in Belgium has never been considered a problem. The 2003 report feared a deterioration if the public spending would not increase. But according to recent statistics the fear was not justified. The number of scientific articles per million population is well above the OECD average. Some Belgian universities perform excellent when looking at the amount of FP6 funding awarded (KULeuven comes at the 14th place according to the FP7 mid-term review); they perform less when looking at university rankings. Intellectual assets (patents, trademarks) show Belgium as an average player in Europe.

Priority setting and policy making: both the 2003 report and the 2007 report formulated number of recommendations to improve priority setting and policy making. The 2003 highlighted the lack of studies and data on the STI landscape in Belgium; while the 2007 report insisted on the necessity to make a new step forward regarding a more important use of evaluations, forward studies, etc.

When considering the events of the last decade, this is probably a field where significant progress has been made. All of the three regions formulated elaborated STI-strategies with targets and regular evaluations (e.g. Flanders in Action; Marshall plan; Brussels innovation plan). Evaluations have become standard practice in STI policy making.

Only the 2003 report mentioned the need to improve the regulatory framework. It is unclear to what degree progress has been significant. Every observer will of course notice the tax credits which have probably made Belgium a more attractive place to perform research. These tax credits exist on several levels. In the first place there are those linked to research. Secondly there are those tax credits favouring investments in general with own capital (the so-called "notional interest deduction"). The regulatory environment is foreseen to evolve in the coming years, as it is linked to the debates on the institutional reforms of the country.

The Institutional landscape has been discussed in both the 2003 and the 2007 report. The 2003 report took note of the "fragmented" STI-policies in Belgium and suggested to establish a "Belgian research area" to diminish the redundancy of research efforts, to merge forces while keeping in mind that companies are active on both sides of the regional borders. The 2007 report even went further by suggesting to develop a common vision on the policy mix within the institutional set-up, to review co-operation mechanisms and bodies. It observed the need for trans-regional cross-funding instruments or mechanisms, etc. The ideas formulated were quite precise.

The focus of the 2010 peer review (with the self-assessment tool)

When considering the elements described above, the Belgian authorities would advise to organise the self-assessment exercise around the following 6 themes :

- the innovation scoreboard : in order to evaluate the general performance and progress in the performance of the Belgian science system;
- federal vs regional policies : to shed some new light on policy making in the fragmented Belgian STI-landscape;
- the link between research policies and innovation policies : this is a new topic brought in by the larger focus of the innovation union which has not been studied in the past;
- the broader economic policies : to come back on the regulatory framework
- internationalisation : both reports asked to put this issue high on the agenda
- human resources and the science base : in order to review the progress in this field

These 6 themes can be broadened by taking specific ERA-related preoccupations on board. Of course the different elements of the self-assessment tool must be integrated in each of these sessions.

So the following six issues could be tackled:

Monday May 16 2011 Session 1: 9h30-12h30

The Innovation union scoreboard: the scoreboard is integrated now in the innovation union. It will be part of the monitoring exercise used to assess countries progress. So it would make sense to start the self-assessment by evaluating what progress has been achieved between 2003 (the first report described above) and 2011 on the basis of this scoreboard. An international bench-mark with those countries that did succeed in making significant progress in the 3%-target (like for example Austria) and are quite similar to Belgium in economic structure, would be useful.

The second chapter of the self-asessement tool (3rd point) argues that an effective monitoring and review system should be in place, with full

use of output indicators, international bench-marking and ex-post evaluation tools.

Session 2: 14:00-17:00

Federal versus regional policies: a big part of the self-assessment tool deals with governance issues. Two big themes of this chapter are "policy strategy and decision making" and secondly the implementation through dedicated programs, the existence of evaluation schemes and the importance of a transparent and simple funding system. *The second chapter (and part of the first chapter) of the self-assessment tool deal with strategies and the need to address societal challenges, while the 9th chapter deals with the existence of simple easy to access public policies.*

The first part of this session could be devoted to the existing strategies in the different regions (VIA, Marshall plan2.vert, Brussels innovation plan) and the instruments used for their implementation. This would also give an idea about the importance of STI-policies on the political agenda. *This is also what Chapter 4 of the self-assessment is about. It deals with "adequate and predictable public investment in research and innovation focused in particular on stimulating private assessment".*

The other part of the second session could be devoted - as this is the Belgian specificity - to the existence (or lack of) of synergies and complementarities between the different (regional) strategies on one hand and the instruments (of all levels of authority) on the other hand. A particular question could be the discussion of the (regional) subsidies vs. the (federal) tax policies in support of research.

In this session could be explored to what degree the recommendations of the 2003 report and the 2007 report made sense (or did not make sense).

Tuesday May 17 2011 Session 3: 9h30-12h30

The link between research policies and innovation policies: at the regional level most of the administrations are responsible for both policies. This is not the case at the federal level. It is however not clear to what degree bridges are built between the two types of policies. Nor is it clear how these bridges should look like. One should not exclude the possibility of remaining silos between the two types of policies. So, questions are: are there programs that integrate both research and innovation aspects? How can bridges best be built without running the risk to go back to the "linear view on innovation"? Etc. This is the place where the ERA initiative on knowledge transfer could be discussed.

Chapter 3 of the self-assessment tool deals with the following issue : "Innovation policy is pursued in a broad sense going beyond technological research and its applications". This seems the session where this can be discussed.

Chapter 7 deals with partnerships between science and industry. Part of this issue will be discussed in session 2 when dealing with the innovation plans; but it can also be discussed here.

Session 4: 14h00-17h00

Broader economic policies: under this heading we will discuss how the broader socio-economic framework can stimulate innovation. Innovation policies have to a large degree been regionalised and been integrated in the regional departments for research and/or economics. Nevertheless there are some relevant competencies in other departments (and other levels of authority). On one hand we can refer to the specific federal competencies like public procurement, intellectual property rights and standardization which are particularly important in the context of innovation. On the other hand there are competencies of other departments outside research or innovation at the regional and federal level. In this respect we could consider the instruments and competencies shared by departments responsible for environment (including eco-innovation), social policies, energy, etc.. Venture capital and entrepreneurship could also be discussed here.

Chapter 8 of the self-assessment tool (on framework conditions) and some aspects of chapter 10 dealing with the public sector as a driver of innovation can be integrated in this session.

Wednesday May 18 2011 Session 5: 9h30-12h30

Internationalisation: for a small open economy like the Belgian one, international issues are very important. About 60 % of the research in the private sector is being executed by affiliates of (foreign) multinational companies. There is a very big inflow of doctoral students, mainly in the south of Belgium. On the other hand outward mobility of Belgian doctoral students and researchers is also significant.

The discussion could dwell on the existence of programs to attract foreign direct investments in general and in the field of research in particular. Competitive framework conditions can convince multinationals to keep on considering Belgium an attractive place to do research: is that the case ? Another important issue is the knowledge transfer between these multinationals and the rest of the Belgian innovation landscape. In one of the recommendations of the past peer review Belgium was advised to make sure that these companies would be no high-tech islands.

Policies regarding international mobility of researchers could be tackled here or in the chapter on the science base. The other ERA initiatives dealing with international cooperation (joint programming, etc.) could also be addressed here.

This refers to the international component of the partnerships treated in chapter 7 of the Self-assessment tool.

Session 6: 14h-17h

The science base and human resources : in Belgium these are primarily taken care of by the linguistic communities. The availability of human resources was not considered critical in the past peer reviews. But certain aspects related to human resources are critical (see the conclusions of the previous peer reviews above). *Chapters 5 and 6 of the self-assessment tool will be discussed in this session. "Legal, financial and social frameworks for research careers" (the 3rd indent of chapter 5) are probably most critical. The same goes for the "sufficient supply of (post)graduates on the long term" (chapter 6).*

The integration in ERA could also be discussed. We should also consider the necessity of discussing the role of the Belgian research institutes as well as the Belgian integration in ESFRI. The other ERA initiatives (mobility and universities) could be discussed here.

Operational

- The Brussels Region hosts the event at the conference center Domain Latour de Freins (<http://www.latourdefreins.be>).
- Each session will be composed of stakeholders of all parts of Belgian (all regions and authorities). The choice of participants will of course depend on the issue discussed.
- The following peers have accepted to take part in the exercise : Christian Seisser (Austria), Patrick Vock (Switzerland), Carlos Martinez Riera (Spain) and Kai Husso (Finland).
- Xabier Goenaga of the IPTS will also participate.
- The consultants will be Patries Boekholt from Technopolis and Luke Georghiou from Manchester University.
- All discussions will be in English.

ANNEX B

**Background Report
Belgian Peer Review 2011**

May 11th 2011

Compiled by Patries Boekholt (rapporteur)

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1. Introduction

This short background report aims to summarise the existing analyses on the Belgian research and innovation system. The background report follows the main lines of the Self Assessment Tool that was published together with the Innovation Union. Its aim is to provide a systemic view on the current performance, policies and governance of national and regional research and innovation systems in the European Community.

The peer review of Belgium is the first time the structure of the self-assessment tool has been applied to analyse a countries performance. The Belgian group of policymakers have in addition to following the self-assessment tool decided to highlight on a number of issues that have been recurring topics in previous reviews and benchmarks:

- Federal vs community/regional policies: to shed some new light on policy making in the fragmented Belgian STI-landscape;
- The link between research policies and innovation policies: this is a new topic brought in by the larger focus of the innovation union which has not been studied in the past;
- The broader economic policies: to come back on the regulatory framework
- Internationalisation: both reports asked to put this issue high on the agenda
- Human resources and the science base: in order to review the progress in this field

It is suggested to start the peer review with the Innovation Scoreboard in order to evaluate the general performance and progress in the performance of the Belgian innovation and research system.

This background document is written to give the peers an overview of the highlights how the Belgian R&I system works. It is based on existing documents such as the Belgian Report on Science, Technology and Innovation (BRISTI) 2010 and the second volume with Key S&T Indicators, the ERAWATCH Belgian Country report 2010 and various other reports. In the final chapter we summarise some of the key issues that the Belgian self-assessment has flagged as important topics for further reflection.

2. Key features of the Belgian national and regional research and innovation system

2.1 How R&I policy is organised in Belgium?⁶

The Belgian research and innovation system is highly decentralised, which has a profound influence on the governance of research policy. There is not a Belgian research and innovation system since all regions (and the Communities) have close to full autonomy in managing their own system. Figure 1 provides a graphic overview of the Belgian research and innovation system governance structure. The main responsibility for innovation and research policy and funding lies with the three regions and the three communities, while the federal state retains only some competences⁷. The mandates with regard to STI are distributed as follows: the federal level controls a limited number of fields such as scientific research in the federal science institutes, intellectual property rights (IPR), corporate taxation, employment legislation and social security; the communities are competent for matters *related to persons* including scientific research and education (including the universities and university colleges); the regions are competent for issues *related to territorial matters* such as energy, environment, and economic support, thus including innovation, applied and industrial research, technology transfer, public research organisations, etc. As a result, Belgium has the world's highest percentage of sub-national share of R&D and related spending. Indeed, the new OECD study on Regions and Innovation Policy (May 2010) states that 79% is spend by the Communities and the Regions (p.121).

Each entity has a Minister responsible for science as one element of a broader portfolio. At the federal level, the Minister for SMEs, Agriculture and Science Policy. In Brussels-Capital, the Minister in charge of Economy, External trade, Employment and Scientific Research is competent for R&D issues. In Flanders, research and innovation belong to a ministerial portfolio of Innovation, Public Investment, Media and Poverty Reduction, which includes fundamental research, strategic and policy oriented research, technological innovation and science popularisation. As regards Wallonia and the French Community, since 2004, scientific research is part of the portfolio of a single minister, dealing with both regional and community aspects. Similarly, since 2009, the Minister in charge of higher education at community level is also responsible for business support and ICT policy at regional level. Other ministers from either government are autonomously responsible for funding research in their specific fields of competence (agriculture, environment, energy, health). A counterweight to the influence of the cabinets is provided by science policy councils at all governance levels (except the French Community, where the Decree is not implemented).

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 some European and international organisations and the supervision of ten federal scientific establishments (see below for more detail). 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).

⁶ From ERAWATCH Report Belgium 2010, Nelly Bruno and Jon van Til, Erawatch network.

⁷ There are formally seven independent Belgian authorities, each carrying out their own policy in the wider field of science, research, technology and innovation. In practice, there are five active entities: the Flemish Region and the Flemish Community have merged into one entity (Flemish Government) with one Parliament, Government, authority and administration, while the German-speaking community does not have a research policy, due to its small size.

Coordination in the CFS 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. While in the CIS coordination focuses on the formulation of a Belgian viewpoint whenever this is demanded for by an international organisation.

In the region of Brussels-Capital, INNOVIRIS⁸ (Institute for the support of Scientific Research and Innovation of Brussels) manages the implementation of research and innovation funding. In Flanders, the department Economy, Science and Innovation (EWI) is principally focused on policy design and management. Agencies are primarily responsible for implementation, including the Research Foundation Flanders (FWO), the agency for Innovation by Science and Technology (IWT), the Hercules Foundation for funding of research infrastructure, or the Flanders Holding Company (PMV). The Ministry of the French Community funds fundamental research through the National Scientific Research Fund (FRS-FNRS). In Wallonia, industrial research funding and funding for academic, public or not-for-profit research centres is managed by the General Operational Directorate for Economy, Employment and Research (DGO6) that was created in 2009 following a reorganisation of the regional administration.

Figure 1 on page 5 gives a schematic overview of the main institutions and policy instruments in Belgium. It illustrates the complexity of the Belgian governance system.

2.2 Some key performance indicators⁹

Belgium performs relatively well in terms of input indicators (notably business expenditure on R&D (BERD) and R&D personnel) as well as on the majority of output indicators (notably publications). As highlighted in a range of recent reports, Belgium's relatively strong position (compared to the EU27 average) in BERD is due to a high level of investment by (a limited number of) foreign affiliates. The dependence on foreign involvement is on the one hand, positive, in an age of 'open innovation' and globalised technology flows, but, also, a threat, making's Belgium's STI performance vulnerable to decisions of multinational firms. This is particularly true, since government budgetary appropriations on R&D (GBAORD) as a % of GDP remains below the EU27 average despite a positive trend upwards in recent years.

In terms of outputs, a strong 'research' productivity performance, in terms of patents (notably in biotechnology, where Belgium is amongst the most productive in the EU27) and scientific publications, does not translate into a direct 'economic or productivity bonus'. This 'under-performance' may be linked to a weak entrepreneurial rate of activity, an issue the Belgian authorities have been seeking to address over the last decade.

These broad conclusions are confirmed by the Innovation Union Scoreboard (IUS)¹⁰ 2010 which positions Belgium amongst the group of innovation followers (along with the United Kingdom, Austria, Cyprus, Estonia, France, Ireland, Luxembourg, the Netherlands and Slovenia) with innovation performance below those of the Innovation leaders (Denmark, Finland, Germany, and Sweden) but close to or above that of the EU27 average.

In terms of trends, the IUS calculated growth in innovation performance using data over a five-year period (2006-2010), based on absolute changes in the indicators. Belgium's rate of improvement (moderate grower) is double that of the EU27 average

⁸ INNOVIRIS was called IRSIB/IWOIB till 2010

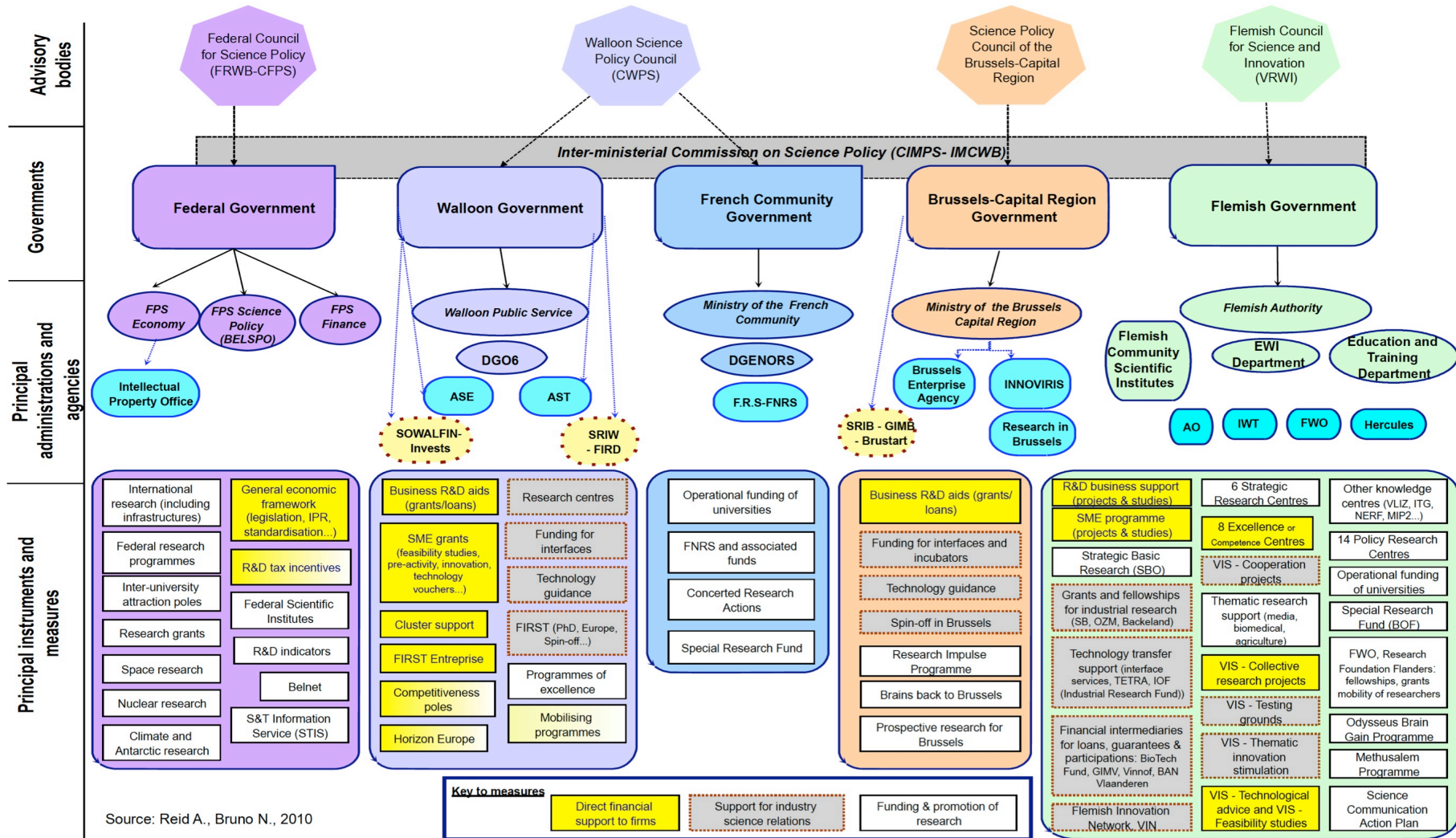
⁹ Mostly based on the BRISTI report

¹⁰ All IUS reports mentioned can be downloaded at: http://ec.europa.eu/research/innovation-union/pdf/iu-scoreboard-2010_en.pdf

(2% versus 1%) and behind that of innovation leaders such as Finland and Germany but faster than that of innovation leaders Sweden and Denmark.

The IUS 2010 identifies Belgium's relative strengths, in Human resources, Open, excellent and attractive research systems and Linkages & entrepreneurship. Relative weaknesses are in Firm investments, Intellectual assets and Outputs. High growth is observed for Venture capital and Community trademarks. A strong decline is observed for Non-R&D innovation expenditure, Community designs and Sales of new products. Growth performance in Human resources, Open, excellent and attractive research systems, Finance and support, Linkages & entrepreneurship and Intellectual assets is above average.

Figure 1 Overview of actors in Belgian R&I system



Considering the effect of the financial crisis between late 2008 and early 2009 on innovation in Belgium, the results from the Innobarometer 2009 (IB2009) are encouraging: as a direct effect of the crisis, 23% of EU27 innovators decreased their innovation expenditures, however Belgian innovative firms had one of the lowest percentages (15%), while only 14% of Belgian innovating firms, the lowest national figure in the EU27, thought their innovation expenditures will decrease in 2009 as compared to 2008, compared to 29% for the EU27.

Figure 2 A snapshot of Belgium's comparative STI performance

	BE	ES	HU	DE	FR	NL	UK	EU-27	US	JP
A. Input Indicators										
GERD in % of GDP	1.90	1.27	0.97	2.53	2.04	1.71	1.82	1.77	2.66	3.44
BERD in % of GDP	1.37	0.54	0.35	1.72	1.41	0.97	1.16	1.11	1.83	2.36
Total R&D personnel per thousand total employment	13.2	9.8	6.2	12.8	14.5	10.3	11.1	10.4	..	14.6
Total researchers (full time equivalent) per thousand total employment	8.3	5.9	4.2	7.3	8.4	5.8	8.1	6.4	9.7 (2006)	11.0
Tertiary graduates in science and technology (per 1000 of population aged 20-29)	14.0	11.2	6.4	11.4	20.7	8.9	17.5	..	10.1	14.4
GBAORD in % of GDP	.68	1.00	.43	.79	.75	.70	.64	.72	.99	.70
B. Output Indicators										
Technology balance of payments (receipts in % of GERD)	79.4	36.3	196.9	53.2	68.1	..	22.2	14.0
Technology balance of payments (payments in % of GERD)	91.3	50.6	276.0	47.2	35.2	..	13.1	4.0
The average publication output per 10,000 inhabitants (period 2004-2008)	13.0	7.7	5.0	9.4	8.8	15.0	13.2	7.4	9.9	6.1
Number of patent applications to the EPO (priority year) per million population	142.3	32.9	16.8	297.0	131.3	213.6	87.5	117.0	112.7	169.3
Number of patent applications to the USPTO (priority year) per million population	166.3	21.5	19.2	287.0	126.2	241.0	150.3	122.4	799.9	616.7
C. Innovation Indicators										
Share of turnover from product innovation (% of total turnover) - manufacturing (2004)	17.8	16.7	9.8	26.1	17.1	13.9	18.5	18.9	..	4.8
Share of turnover from product innovation (% of total turnover) - services (2004)	10.4	12.4	5.4	11.8	7.5	5.2	12.8	10.4	..	4.8

Source: CFS/STAT, OECD MSTI 2009-2, Eurostat, Web of Science

Looking below the national level, the European Commission's EIS Regional Innovation Scoreboard 2009 report places all three Belgian regions in the group of 'medium-high innovators' (Flanders having shifted from high to medium-high between 2004 and 2006 data sets studied in the report). However, while on a European level benchmarking exercise the three regions perform relatively similarly, regional strengths and weaknesses are somewhat different conforming to the socio-economic profile, the sectoral specialisation of the economies, the specialisation of the

research base, the (un)employment rate, entrepreneurial activity rates and propensity to innovate, etc. For instance, the highly urbanised Brussels-Capital region is strongly service sector dominated, while the Flemish region economy is more highly industrialised, in terms of the share of manufacturing in regional value added, than either of the two other regions. In particular, Flanders has a much higher share of employment in high-tech manufacturing than the other two regions.

The BRISTI 'key STI data' report highlights a number of these regional differences. For instance, there is a relative concentration of research activities in Flanders (61% of intramural R&D expenditures in 2007, 64% in 2002) even if Wallonia has improved its share in recent years (26% compared to 23%, an indeed has the highest R&D/GDP share of the Belgian regions), notably thanks to an improved position in terms of BERD (share in Belgium total increasing from 24% to 29% between 2002-2007, an absolute as well as relative increase). Figures for the share of researchers by region are, as would be expected, in line with the R&D expenditure shares.

2.3 Research performers from the public sector

Main research performers in Belgium are HEIs and research centres. There are two separate university systems, seven French-speaking universities (including two in Brussels) and university colleges (*hautes écoles*), and six universities and 22 university colleges ("hogescholen") in Flanders (also including Brussels). Due to the Bologna reform process, the universities have been structured into three academies (Wallonia:) and five associations (Flanders)¹¹. 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 synergies. It is expected that the number of universities in the French Community will be further reduced to four over time, which will absorb other HEIs (21 university colleges) as well.

In addition to the HEIs, a core feature of the Belgian system is the existence of collective research centres. Three types of collective research centres exist: (i) the centre 'De Groote'; (ii) the assimilated collective research centres (CRCs); and (iii) the 'autonomous' collective research centres. The first two operate in all Belgian regions; the latter reflect the regional mandate for S&T policy developed since the 1990s. CRCs are private initiatives in which member firms initiate, often through technical committees, topics for R&D. The private character is reflected by the fact that the majority of funding originates from the private sector. The collective research centres are also recognised as instrument to enhance competitiveness through R&D and technology transfer. Public funding is accordingly also obtained from the regional authorities in which the centre is located. They increasingly provide project/contract funding instead of block funding. Flanders has four fairly large strategic research centres (PROs)¹² (two additional PROs are starting up (Strategic Initiative Materials (SIM) and Centre for Medical Innovation (CMI)), four scientific institutes and a range of knowledge institutes and policy research centres. In Wallonia, a number of research centres are funded through the Structural Funds. The efforts in Wallonia are however fairly small when compared to the scale of PROs in Flanders.

¹¹ Wallonia: Louvain, Wallonie-Bruxelles and Wallonie-Europe; Flanders: Leuven, Antwerpen, Gent, Hasselt, Brussel

¹² i.e. IMEC, VITO, VIB and IBBT

2.4 Research performers from the private sector

The R&D expenditure of foreign affiliates as a percentage of intramural R&D expenditures of enterprises in Belgium is relatively high at almost 60%.¹³ This indicator shows the share of industrial R&D, which is under foreign control over the period 1999-2007. Industrial R&D is the main technological input that can be developed by a firm or parent company in a particular country, or else under the control of the latter it could be developed in various countries via a network of affiliates and R&D centres. There is a concern in Belgium that the decisions on such a high share of private R&D investments are taken abroad, making the country vulnerable to re-location decisions.

According to the 2010 EU Industrial R&D Investment Scoreboard the Belgian Top 10 R&D investors had an R&D spend of €1,976 million in 2009, of which 70% came from the Top 3 R&D spenders (UCB, Solvay and Agfa-Gevaert). However, a Belspo study on foreign direct investment in R&D shows that in 2005, the Top 10 R&D investors in Belgium feature only UCB and Solvay as Belgian companies while the remainder are foreign owned companies. The largest foreign R&D investors are Janssen Pharmaceutica (US), Glaxosmithkline (UK), Alcatel Bell (F), Philips (NL), Procter and Gamble (US) Total (F), Swift (Spain), Techspace Aero (F) and Siemens Atea (D), thus mostly in pharmaceuticals, chemicals and ICT-hardware.¹⁴

The following Figure 3 presents the business enterprise intramural R&D expenditure (BERD) of Belgium per industry. It shows a decline in R&D from the ICT-related sectors and a strong growth of R&D investments in the pharmaceutical sector, which is now by far the sector with largest R&D investments.

¹³ BRISTI Key Indicators, page 32.

¹⁴ Peter Teirlinck, (2009) Foreign direct investment in business R&D in Belgium in comparison with other EU Member States: statistical overview and policy making, R&D and innovation in Belgium, Research series 10, Belspo,

Figure 3 BERD by sector

	1999	2002	2005	2007
MANUFACTURING INDUSTRIES	81.9	79.1	80.7	76.4
HIGH-TECH	36.5	39.7	40.6	42.4
→ Aircraft and spacecraft	1.4	1.6	1.7	1.9
→ Office, accounting and computing machinery	0.2	0.3	0.5	0.6
→ Radio, television and communication equipment and apparatus	15.9	16.2	10.7	9.0
→ Pharmaceuticals	17.8	19.1	24.5	28.3
→ Medical, precision, optical, watches and clocks instruments	1.2	2.5	3.2	2.6
MEDIUM HIGH-TECH	29.1	23.6	24.1	20.2
→ Motor vehicles, trailers and semi-trailers	3.8	2.1	2.6	2.8
→ Electrical machinery and apparatus n.e.c.	2.4	4.0	3.0	2.9
→ Chemicals and chemical products (less pharmaceuticals)	18.1	12.9	12.8	8.8
→ Machinery and equipment, n.e.c.	4.8	4.6	5.7	5.7
MEDIUM LOW-TECH	5.4	5.5	5.1	4.8
LOW-TECH	10.9	10.3	10.9	9.0
OTHER INDUSTRIES	3.2	3.9	2.4	3.2
SERVICES	14.9	17.0	16.9	20.4
HIGH-TECH	7.2	9.2	8.2	9.6
→ Computer and related activities	6.2	6.6	5.3	6.0
→ Research and development	0.3	0.0	0.0	0.0
→ Telecommunications	0.7	2.6	2.9	3.6
MEDIUM-TECH	6.0	6.4	6.4	8.3
LOW-TECH	1.7	1.4	2.3	2.5
TOTAL BERD	100.0	100.0	100.0	100.0

Source: Federal Cooperation Commission, CFS/STAT.

3. R&I as a key policy instrument in Belgium

3.1 The integration of Federal and Regional responsibilities for R&I policy

The effectiveness and complementarities of mechanisms in place to coordinate policies Belgium has been a major topic in the previous OMC peer review in 2007.

The federal level controls only a limited number of fields that influence the research and innovation system. The main responsibility for research policy and funding lies with the three regions and the three language communities. Hence, there is not a 'Belgian research and innovation system' in that sense that the Federal Government (or the cooperation body CFS) does not decide on a national policy framework.

In fact, the notion of 'knowledge triangle' is nearly inapplicable to the Belgian situation, as the policy terrain of education is not congruent with the R&I policy domains: the two Communities decide on the universities and university colleges, while the three Regions establish an innovation policy. Hence, several systems co-exist aside each other with relatively few direct interactions of the research actors and the institutional entities of each pillar.

The distributed competence for STI matters across the Belgian authorities implies the need for co-ordination on both a permanent and ad hoc basis.¹⁵ Co-ordination and consultation between the Belgian authorities is organised through a committee that structures dialogue on all matters requiring concerted action at national level. The Inter-Ministerial Conference on Science Policy (CIMPS-IMCWB) is the co-ordination instrument between the Federal State, the Communities and the Regions, composed of those members of respective governments having responsibilities in science policy matters¹⁶.

The CIMPS-IMCWB has established two permanent administrative sub-committees, attended by representatives from each authority: the International Co-operation Commission (CIS) for international matters, and the Federal Co-operation Commission (CFS) for national matters.

Examples of matters dealt by these committees are the permanent inventory of scientific potential in Belgium, or the positioning of Belgium in the EU's Seventh Framework Programme for Research and Technological Development (FP7), or the future FP8 (currently under preparation).

Previous peer review reports have pointed out that the governance of Belgium has the additional complication of the interaction between the different levels of government as described above. The OMC Policy Mix review of 2007 stated that overall speaking, at all governmental levels, we find 'state-of-the-art' measures and instruments based on international practice. Nevertheless, it can be observed (when looking from a systemic perspective) that the policy mixes of the different regions and communities are diverging instead of converging. The 2007 report also observed that 'Policy orchestration' between and among the various federated entities and the federal authority is 'marginal' and in many cases 'formal' in nature, rather than 'content-driven' (cf. the various advisory boards). On the administrative level there is the need for collaboration and orchestration, which suggests that on the tactical/operational level there is a practical need.

The 2011 Review should revisit this issue and discuss whether progress has been made in the orchestration and coordination between the different administrative levels.

The Federal level has a number of R&I responsibilities

¹⁵ BRISTI, 2010, page 12.

¹⁶ A similar Commission exists for economic affairs: the Inter-Ministerial Economic Commission (CEI-IEC).

- Own research policies (space, federal institutes, national research networks,...)
- Infrastructures: broadband networks; support to national and international infrastructure
- Regulatory framework (social security, patent regulation, standardisation, ...) → important for implementation innovation union;
- Tax credits (complements budgets GBAORD);

The three regions and the two communities have responsibility for their respective higher education institutes, research policy and also innovation policy. Most instruments for innovation policy are developed at the regional level. The three regions each have their own strategic framework and policy mixes for these policies. There is hardly any coordination or collaboration between the three regions regarding developing synergies and complementarities. Thus while each of the components of the Belgian system have innovation policies steered at highest level, with multi-annual strategies based on analyses of strengths and weaknesses, Belgium as a whole does not have any joined up R&I strategy. However, the latter does not imply that the separate authorities do not align their respective strategy with the EU R&D&I strategy. In addition in the current FPs the data suggest that these are well integrated into the EU R&D&I programmes. An issue for discussion is whether this can remain strong given the more strategic approach of the European FPs in the future.

3.2 Multi-annual strategies and policy formulation

The main multi-annual policy strategies in Belgium are formulated by the various governments in charge with STI policy: the federal government, the Flemish Government, the Brussels Capital Government, the French Community Government and the Walloon Region Government. There has been considerable progress on strategy development since the last peer review.

3.2.1 Flanders

In Flanders a number of multi-annual strategic plans and targets have been agreed upon by a broad-ranging group of stakeholders from government, civil society and industry. These plans set out a set of targets across a range of policy fields, amongst which STI is assigned a clear priority. The main plans adopted since 2005 are:

- In 2005, the Flemish Innovation policy plan ('Vlaams Innovatiebeleidsplan') was approved based on nine pillars and aimed at a horizontal approach towards innovation throughout the different policy areas and sectors;
- The 2005-2008 and 2008-2010 Flemish Reform Programmes, which transposed into Flemish policy the reorientation of the Lisbon Strategy in 2005 into the EU Growth and Jobs Strategy, based on national reform programmes and annual reports;
- Flanders in Action (Vlaanderen in Actie, ViA), that updates and supersedes the Vilvoorde pact, and the related 2020 Pact.

ViA aims to place Flanders in the top-5 EU regions by 2020 and identifies strategic breakthroughs, crucial for the future wealth and well being of all in Flanders. The breakthroughs are: the open entrepreneur; Flanders learning society; Innovation centre Flanders; Green and dynamic urban region; Europe's smart hub; Caring society; Decisive governance. STI play a transversal role across these various themes and policy initiatives taken in these areas are expected to match the overall goals of the ViA framework. The importance of STI in ViA is reflected by the target to spend 3% of GDP on R&D by 2014. In addition to this

target, the ‘breakthroughs’ of ViA are translated into 20 targets in the Pact 2020, which includes specific targets on innovation by 2020.

A basis for policy priorities in line with these challenges and the EU2020 strategy has been proposed by the Flemish Science and Innovation Policy Council, in short VRWI, a few years ago. Based on a SWOT analysis of Flanders versus the EU, combined with a European foresight study of 15 key areas, an advice of the VRWI describes six strategic clusters. After an expert consultation, these 6 clusters were redefined into the following ‘spearheads’ for technology and innovation:

1. Transportation - Logistics - Services - Supply chain management:
2. ICT and Services in Healthcare (e-health):
3. Healthcare:
4. New Materials - Nanotechnology - Manufacturing industry:
5. ICT for Socio-economic innovation:
6. Energy and Environment:

Regarding innovation and research in the EU 2020 Strategy and the Commission’s communication (“Flagship Innovation-Union”), a number of communications of the Flemish Government (2009 and 2010) set out its points of view. This included:

- The Flemish Government underlines the considerable importance of innovation in the (future) EU2020 strategy, and views a threefold role for innovation:
 - Helping to find an answer to the major societal challenges such as the transformation to a more knowledge-driven, low carbon and closed loop economy, climate change, loss of biodiversity, energy supply and aging;
 - Further strengthen the international competitiveness position;
 - Fine-tuning within the framework of EU2020 on the targets of the establishment of a sustainable societal and economic fabric, and support these regarding social inclusion and sustainability.

To this end, the instruments for innovation and research must further be fine-tuned to better match and serve all of these purposes and targets. At the same time, innovation must be further integrated within government organisations and elaborated horizontally. Also, “open innovation” must be promoted within the overall governance structures of the ERA.

- Flanders notes with satisfaction the Commission’s shift to approaching “innovation” from broad societal tendencies and challenges, not only the technology and research aspect. Yet there remains a need to create links with the other pillars of the EU2020 strategy and more specifically with innovation in the general sense. The anticipation on social inclusion, training, greening of the economy and sustainability requires not only technological innovation, but also the development of innovative applications in other areas such as the social economy, the creative and leisure industries, culture, media, etc.. Hence, there is a need to support process oriented transitions to sustainable production and consumption patterns;

The 2009-14 Flemish Government agreement explicitly restates that Flanders aims to reach the 3% target, reconfirmed as a EU objective in the Europe 2020 strategy in March 2010, and includes the intention to draw up a new Innovation Pact.

The strategic targets for STI listed in the 2009-2014 policy note of the Flemish Minister for Scientific Research and Innovation are:

- From idea to economic commercialisation, market results and societal impact;
- More creative and innovative entrepreneurship;
- Focus on economic clusters, thematic spearheads and large projects;

- Flanders as an international player (e.g. fully-fledged partner in the European research and innovation area);
- Strengthen excellence and dynamism of cutting-edge non-oriented research as a fundament for innovation;
- Increase opportunities for research talents;
- More streamlined and output-driven research policy;
- A top research infrastructure.

3.2.2 STI policy in Wallonia and in the French community

In constitutional terms, the Walloon Region and the French Community are distinct and therefore have their own government and administrations. However cooperation has become more intense. Following the regional elections of June 2009, the formation of the Walloon and French Community governments was based on a common political strategy. The socio-economic priorities of this strategy have been translated into an operational plan called the Marshall Plan_2.Green¹⁷ (Plan Marshall_2.Vert). This plan is a continuation and a reinforcement of the previous plan, adopted in 2005 and implemented during the period 2006-2009. The addition of 'Green' underlines the new orientations to better integrate 'sustainable development' as a cross-cutting priority.

The first Walloon 'Marshall Plan' focussed an additional budgetary appropriation of €1b on five priorities: the development of five competitiveness clusters, the stimulation of the creation of activities, the reduction of taxation on business, the reinforcement of research and innovation support, vocational training and the mobility of workers. The Marshall Plan-2.Green will invest a further €1.6b over five years (2009-2014) to the following six priorities:

- Priority area 1: Develop human capital
- Priority area 2: Continue the policy of competitiveness poles and business networks
- Priority area 3: Strengthen scientific research as an engine of the future
- Priority area 4: Create a favourable framework for creating business and quality jobs
- Priority area 5: Develop 'Employment – Environment' alliances
- Priority area 6: Increase employment and infrastructure in the sector of personal services

The third priority area of the new plan incorporates the main actions to be pursued during the 2009-2014 period as regards STI policy. The Walloon and French authorities are planning to sustain the trend of (re)investment in research and innovation, which began in 2005. These efforts are designed to meet the target set within the framework of the Lisbon European Council, and reiterated in the European Commission's Europe 2020 strategy, to invest at least to 3% of GDP in R&D.

Funds from both authorities will be invested in the implementation of a joint research strategy, which also involves the Brussels-Capital Region, and focuses on strategic cross-cutting themes. Additionally, both authorities intend to pursue the efforts undertaken since 2005, namely:

¹⁷ The use of the term 'Marshall Plan' (a direct nod to the post-second World War economic recovery package) was adopted by the Walloon authorities to underline the need for a significant re-launch and new direction of the Walloon economy.

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

Both authorities also intend to work together to:

- To offer an attractive career to researchers;
- To better integrate French-speaking researchers in international networks;
- To reinforce activities for science awareness in order to encourage young people to pursue scientific and technical careers;
- To implement a technology assessment process as a tool for decision-making in various areas of public action.

The integration of research and innovation in business strategies is a Walloon priority, also continued through the new Marshall Plan, mainly via:

- Measures to improve support for spin-offs,
- Calls for specific projects dedicated to technological innovation partnerships; with a view to encourage partnerships between companies and between research institutions and industry, inside and outside the framework of competitiveness poles.
- Support to ‘proof of concept’ strategies via the dedicated teams within universities supporting research commercialisation and via technology incubators.
- Definition of an integrated strategic plan to stimulate business innovation, particularly innovations with environmental benefits.

Other measures, forming part of the priority areas 2 and 6 of the Marshall Plan_2.Green aim at supporting research and innovation in the specific field of the environment with the creation of a 6th competitiveness cluster dedicated to ‘green’ technologies, the creation of a centre of excellence in the field of sustainable development and funding of research programmes in areas such as renewable energy, sustainable construction and smart technologies for the management of the electricity network.

3.2.3 Brussels Capital region

Created in 1989, Brussels-Capital is a relatively young region, and during the first decade, the region ‘sub-contracted’ most of the policy related to research to the Federal authorities. To understand the specific orientations of the regional STI policy, it is necessary to take account of some specific features of the ‘capital of Europe’. Brussels hosts in a very small territory many universities and colleges of higher education and a number of top-level university hospitals. The region is truly multilingual and hosts many important international, national and regional representative bodies, policy think-tanks and, of course, the EU institution.

A first attempt to structure a regional research and innovation policy was made when the government launched, in the context of a broader 2005 agreement called Contract for Economy & Employment (C2E/CET – 2005 - Contrat pour l’Economie et l’Emploi/Contract Economie en Tewerkstelling), a Regional Plan for Innovation (PRI/GPI - Plan Régional pour l’Innovation/Gewestelijk Plan voor Innovatie).

The representatives of the social partners, the academic community and government parties signed the PRI/GPI on 18 December 2006. The aim was to implement a set of coherent measures intended to improve the capacity for innovation of the Brussels-Capital Region. The six strategic targets of the PRI/GPI are:

- Target 1: Promote the three sectors that bear the most innovation: ICT, health and the environment. It is a matter of strengthening the 'clustering' approach in these sectors;
- Target 2: Increase the rate of innovation through the implementation of specific programmes;
- Target 3: Stimulate the use of innovation through marketing research results and assistance to small enterprises so that they assimilate and use innovations;
- Target 4: Foster the internationalisation of innovation;
- Target 5: Attract and anchor innovative activities;
- Target 6: Create an environment that favours innovation.

These objectives were made operational through the introduction of new instruments of support and the consolidation of existing ones. Moreover, the strategy is focused through the selection of ICT, health and environment as the three priority sectors on which the resources available to the institutions responsible for research support were focused. These sectors were selected because of the identified potential as regards research, innovative content, growth and job creation in Brussels.

3.3 Adequate and predictable public investment in research and innovation

Although the Belgian government strives for the 3% GERD/GDP target, research intensity in Belgium is rather stable over the past decade. In recent years, research intensity has increased from 1.86% in 2006 to 1.90% in 2007 (provisional data of Eurostat show a further increase to 1.96% in 2008 and 2009). On the longer term, research intensity seemed slightly be declining when compared to the level reached in 2001 (2%). But this is explained by the economic downturn in 2003/2004, which was only gradually overcome. As a matter of fact, Belgium's R&D activity seems very sensitive to economic shocks. Belgian research intensity is just above the EU-27 average in 2007 (1.83%) but provisional data show that Belgian research intensity is below EU-27 average in 2009 (EU-27: 2.01%; BE: 1.96%).

Wallonia is the region with the highest R&D intensity with 2.1% in 2007, followed by Flanders (1.99%, but these ratios reached 2.06% and 2.12% in 2008 and 2009 respectively. This is an increasing trend after several years of stagnation) and Brussels-Capital (1.38%). Wallonia's high R&D intensity is also a consequence of its low regional GDP. The low GERD for Brussels is striking, especially in light of the high share of R&D personnel. This may be explained by the tight boundaries of Brussels, leaving its economic hinterland outside its borders.

Belgium has a high and increasing level of public debt (96.2% of GDP in 2009), which has a strong impact on the room of manoeuvre for sustaining increased public investment in R&D. Most notably, according to the ERAWATCH 2010 report, it is unlikely that Walloons would be able to maintain their level of investment in research in the post 2013 period without support from the Structural Funds (Walloon Council for Science Policy, 2010). Political discourse insists on the need to increase R&D cooperation between all Belgian regions and in particular between the region of Brussels-Capital and Wallonia in order to improve scale efficiencies of public investments. Each region has its own structures to support STI, which might turn being suboptimal. This has however not taken significant shape yet.

The share of the **federal** Government in Belgian GBAORD stood at just over 25% in 2008 (€593.2m without tax breaks (estimated at €284m) and the federal contribution

to R&D has strongly increased over the last 10 years. This is reinforced by the contribution of the federal fiscal and parafiscal measures. Indeed, in 2010, despite the difficult economic context, the federal budget for science policy has been further reinforced, reflecting the effort made in 2009 to consolidate and maintain the commitment to supporting R&D (Belgian Science Policy Office, 2010). Confronted to the low level of public expenditures in R&D and in particular to the low share of funds allocated to basic research (5.7% of GERD (Federal Planning Office, 2010) and 25% (Verbeek, 2007) of the public funded research in Belgium in 2007), the Council of Rectors of the French-speaking universities and the F.R.S-FNRS have drafted memorandums¹⁸ in July 2010 towards the federal government in order to request an increase in budget for basic research. The federal subsidies and schemes indeed represent 24% of the funding for basic research in this part of the country. In particular both entities advocate for maintaining and increasing the budget of the Interuniversity Attraction Poles, which are the sole tool in Belgium specifically aimed at promoting cooperation between Belgian researchers across federated entities as well as interdisciplinarity. In addition, they request an extension of the federal tax support schemes for supporting basic research. Note that apart from the IUAP policy tool, also the federated entities provide the possibility to cooperate on a bilateral basis between researchers funded through different authorities (e.g. FWO-FNRS; IWT-BAO-FRIA).

In 2010, public R&D funding was cut in **Flanders** due to the economic downturn. After a period of strong growth in R&D funds (averagely +€300m in the period 2004-2009) the budget has been decreased with €64m to €1.07b in 2010. While R&D funds grew in the period 2004-2009, the strong growth in regional GDP levelled out the incline in relative terms. The budget cuts in 2010 are exceeding the economic decline: R&D funds decrease faster than the regional GDP (2009: 0.69%; 2010: 0.65%).. Despite the cuts in budgets, new initiatives were set up in a response to the Flanders in Action Plan, such as the *Centre for Medical Innovation* (CMI) that became operational in 2010¹⁹ and the Strategic Initiative on materials (SIM), or certain renewable energy initiatives such as Energyville, iCleantech, BioBase Europe, and Hydrogen Region.

Early May 2011, the Flemish Government decided on a number of budgetary increases:

- The 2011 R&D&I budget increases with 65 million euros. As a result, the total Flemish public STI budget reaches 1.9 billion euros, of which 1.23 billion euros R&D;
- The IWT receives an additional 97 million euro one-off budget allocation to pursue engagements towards businesses in Flanders;
- A growth path is agreed upon whereby from 2012 to 2014 a cumulative increase of at least 60 resp. 70 million euros will be allocated, totalling 390 million euros extra compared to the (upwardly revised) budget of 2011.

During the first half of 2000, budget appropriations for science policy of the **French Community** stagnated in real terms, but since then, the authority has significantly increased its contribution to research funding. In 2009, the FRS-FNRS filed a new strategic plan for the period 2010 to 2014. This is based on four main areas that would require an increase in the Fund's annual budget of €47m in 2014 from its 2007 level (an increase of 34%)²⁰. In addition, the FRS-FNRS will develop new tools to evaluate

¹⁸ i.e. the Memorandum du F.R.S-FNRS à l'attention du Gouvernement Fédéral, 1 July 2010 and the Memorandum du Conseil des Recteurs (CRef) à l'attention du Gouvernement Fédéral, 13 July 2010

¹⁹ CMI is a virtual research centre that aims to stimulate joint translational research based on biobanks; it received €8m (+€1.5m from IWT) for the initial phase in 2010-2011.

²⁰ (i) researchers and research teams: attract, select and promote the best researchers and enable them to develop new teams (+€18.7m); (ii) strategic research, society-oriented: take into account societal challenges, support research in humanities and disseminate research to other players (+€14.3m); (iii)

programmes and instruments of scientific production of researchers from the French Community (+€0.8m). The implementation of this plan will depend, however, on political priorities and the availability of budgetary resources at the level of the French Community.

In **Brussels-Capital** budgets dedicated to research in the region have increased in nominal value of 47 % between 2005 and 2009, although the amount in 2009 was lower than in 2008 (€26m against €29m) notably because of the economic downturn and the budgetary constraints. The 2011 approved budget for research and innovation foresees a major increase to 43 m euro.

3.4 Effective monitoring and review

The Erawatch 2010 Report concludes that the evaluation culture is weak in Belgium in general, but strongly emerging in Flanders. Nevertheless, the federal and regional governments have a number of initiatives to evaluate and monitor progress in R&D.

On the Federal level the 2010 BRISTI report (Belgian Report on Science, Technology and Innovation) and the 2010 key data on Science, Technology and Innovation in Belgium give an overview of the R&I system and its performance.

The Federal Planning Bureau provides studies on the Innovation system in Wallonia including analyses on public and private R&D expenditures, human resources, valorisation and the absorptive capacity in Wallonia.²¹

The Walloon regional policy framework, the Marshall Plan, has been evaluated at the beginning of 2009 by the IWEPS whereas the monitoring of the measures implemented during the Marshall Plan has been carried out by 'special delegates' of the Government. The timeframe for this exercise has nonetheless been rather reduced (study commissioned in November 2008 and completed in March 2009), which limited its scope. The Walloon competitiveness poles have also been evaluated end 2008 by the IWEPS.

Flanders conducts a systematic evaluation of its policy instruments and its main research centres and is moving towards a more systemic evaluation approach of its policy portfolio. Its key public research centres (IMEC, VIB, VITO, IBBT) are evaluated every 5 years on the basis of a performance contract with the Flemish government. Other knowledge institutes with a management agreement are evaluated likewise.

On a bi-annual basis Flanders publishes its R&I Indicator Report, which assesses the achievements of the entire research system. It includes an assessment of human resources in science and technology, the R&I performance of the business sector, public R&I expenditures, a bibliometric and patent analysis of the Flemish science domains, as well as an analysis how Flemish actors perform in European R&I activities.

means of the researcher: equipment and operation (+€4.6m); (iv) national and international collaborations (+€9m).

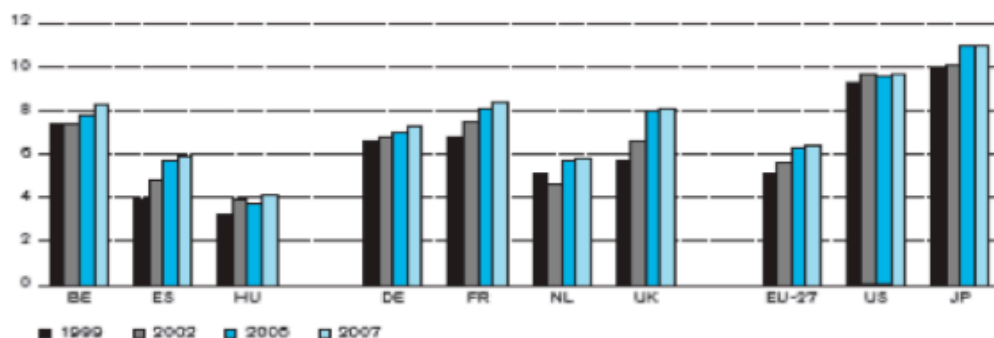
²¹ Bureau fédéral du Plan, La système d'innovation en Wallonie, February 2010, Brussels.

4. Public research and public-private R&I collaboration

4.1 Research careers, HEI performance and education

As the rationale paper has stated, human resources have always been mentioned as a strong point in the Belgian research landscape, independent of the choice of the indicator. The following Figure 4 shows that Belgium performs relatively well in terms of researchers as share of the total employment.

Figure 4 Total researchers (FTE) per thousand total employment



		1999	2002	2005	2007
Belgium	BE	7.4	7.4	7.8	8.3
Spain	ES	3.9	4.8	5.7	5.9
Hungary	HU	3.3	3.9	3.8	4.2
Germany	DE	6.6	6.8	7.0	7.3
France	FR	6.8	7.5	8.1	8.4
Netherlands	NL	5.1	4.6	5.7	5.8
United Kingdom	UK	5.7	6.6	8.0	8.1
EU-27	EU-27	5.1	5.6	6.3	6.4
United States	US	9.3	9.7	9.6	9.7*
Japan	JP	10.0	10.1	11.0	11.0

Source: OECD, *Main Science and Technology Indicators 2009-2*.
Note: *figure of 2006.

Universities in Belgium do have a relatively high academic output. In 2008, the publication output was about 17,000, which is 1.6% of the total world publication output. The average number of publications per 10,000 inhabitants is 13.0, which is well above EU27 (7.4), the USA (9.9) or Japan (6.1). Belgian research shows relatively large international co-operation, as about 54% of the publications is an international co-publication. Moreover, these international co-publications have relatively high impact scores (150% of the global average). Also the direct citation impact for Belgium is high (the field normalised impact is 1.27 for 2005–2008). The impact scores are particularly high in Nature, Health and Agriculture (Tijssen et al., 2010). In the Academic Ranking of World Universities 2010, only Ghent University makes it to the top-100 taking the 90th place. At the same time, KU Leuven is the 14th largest client if the EU Framework Programme funding.

An issue for discussion in the 2011 peer review is whether the level of competitive funding for universities could be a possible impediment to reach a level of excellence

in knowledge production. The allocation of funds tends to be done on the basis of the number of students and full-time equivalents researchers.²²

High quality and output of knowledge production are stimulated, specifically in the regions. In Flanders, funding is partially allocated via the BOF and IOF; the shares for institutes are based on output indicators such as publication indicators. In both Wallonia and Flanders, scientific excellence and valorisation criteria are among the selection criteria for several programmes.

The 2010 Erawatch report Belgium discusses the research mobility issue. There are no statistics available on the total inward and outward flows of researchers in Belgium. In 2008, 8% 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 (45.9%) than amongst the foreign population (39.9%). Looking at the share of foreign students among the total student population at tertiary level, Belgium stands above EU27 average with 10.5% in 2007 (Eurostat).

In Flanders, recent survey of junior researchers (doctorates) of three universities showed that 16.8% of researchers are foreigners; half of which comes from a EU country. The personnel records of the Flemish universities and research institutes give a similar picture; 17% of their total pool of researchers are foreigners. The share of foreign researchers declines strongly with increased seniority. Only 5% of the professors are foreign, against about 30% of the postdocs. As regards junior researchers, 12% of the Flemish researchers has had foreign research experience in their work. No statistical indications are available of the total outward flow. Discourse on brain drain suggests that especially the most talented researchers pursue their career in foreign countries (De Standaard, 2010a). This is supported by input indicators: whereas the number of students willing to pursue their career in research has increased, the budgets for young researchers has not, ultimately leading them to search for research positions abroad.

The regions of Flanders and Wallonia have the main responsibility to initiate actions to attract researchers. According to the 2007 EC report Remuneration of Researchers in the Public and Private sectors (EC, 2007) the total yearly salary average of researchers in Belgium is relatively high. The 2007 and earlier peer review reports observed that tax levels in Belgium were amongst the highest in Europe, and wage and social security taxes that employers pay for their employees are amongst the highest in Europe. In addition it was stated that take-home pay of qualified employees is relatively lower than what they can expect to earn if located in competing countries. This issue has been flagged by many previous review reports as a potential 'time bomb' under the Belgian system, but so far it does not seem to have affected the research system in a significant manner. The newly introduced fiscal incentive schemes at the Federal level have addressed these issues and made a considerable difference to the situation in 2007. These tax incentives reduce the employer's costs of the wages of researchers, both in the private and in the public sector.

4.2 R&I collaboration between public and private sectors

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

²² 2010 Erawatch Report Belgium, Nelly Bruno and Jon van Til, Erawatch Network.

A recent wave of initiatives appeared in Flanders with the creation of knowledge platforms (so-called 'competence poles') at the interface between science and industry. The industrial world lies at the basis of these platforms, so that their activities are more demand-driven than research-driven as was the case in the first wave of the set up of competence poles. A transparent policy framework for selection and operation of these platforms has been established in 2005. The Strategic Research Centres (mainly IMEC, VIB and IBBT) also show large interfacing with the private sector. IMEC's roadmap is for instance aligned with industrial roadmaps; at VIB the research topics are determined by the research leaders, but an impressive valorisation track record has been set and within IBBT most funds are spend on co-operative projects between universities and companies, and valorisation is an important activity. In the STI-policy for 2009-2014, the Minister announces to use 'grands projets' in order to address societal problems; PPP is mentioned as a promising instrument to stimulate these grands projets. Funding of universities has become partially dependent on the industrial relevant output of universities as well by additional facilities (e.g. Industrial Research Fund). The R&D survey shows that 15% of the R&D spending in universities (HERD) is supported through private sources (in case: contracts with businesses). This is the highest rate in Europe, which demonstrates that there exists an intense cooperation between knowledge institutes and private companies.

In order to facilitate knowledge circulation between the R&D stakeholders, the Walloon region has implemented a whole set of measures under the FIRST label, directed towards researchers in universities creating a company, or researchers working in a company. A similar scheme for spin-off exists in the Brussels-Capital region. Following an evaluation of the networks of intermediaries and in order to tight up the links within and between the three families of scientific and technical intermediaries that exist in Wallonia, the Walloon region has set up the AST in 2006 (Technological Stimulation Agency), in charge of improving the coherence of the system by exploiting fully the complementarities between the different actors.

The creation of competitiveness clusters in Wallonia span across the research, technology and economic policy areas. The main aim with these structures is to create partnerships and networks across enterprises, involving the knowledge centres. Wallonia also works with excellence poles funded in large part with EU Structural Funds, in order to enhance public private partnerships. According to the evaluation of these poles presented in the evaluation of the Structural Fund programmes, industrial participation and ownership still lag behind expectations. The Walloon Government launched also in 2009 a new measure called Technological innovation partnership (PIT), associating companies and public entities to carry out or coordinate research that contributes to the scientific, technological and economic development of the region. It is implemented through calls for projects²³. In 2009 the Walloon Government has also approved a pilot project aimed at creating maturation funds for results of university research, managed by the three university academies, allowing them to achieve the proof of concept, downstream of evidence results and upstream of the proposed economic exploitation project, either through the launch of a spin-off, or through the granting of a license to an industrialist. In order to support the diffusion of knowledge into the economy, the Walloon region also co finances with the ERDF, new support schemes for SMEs as of 2009.

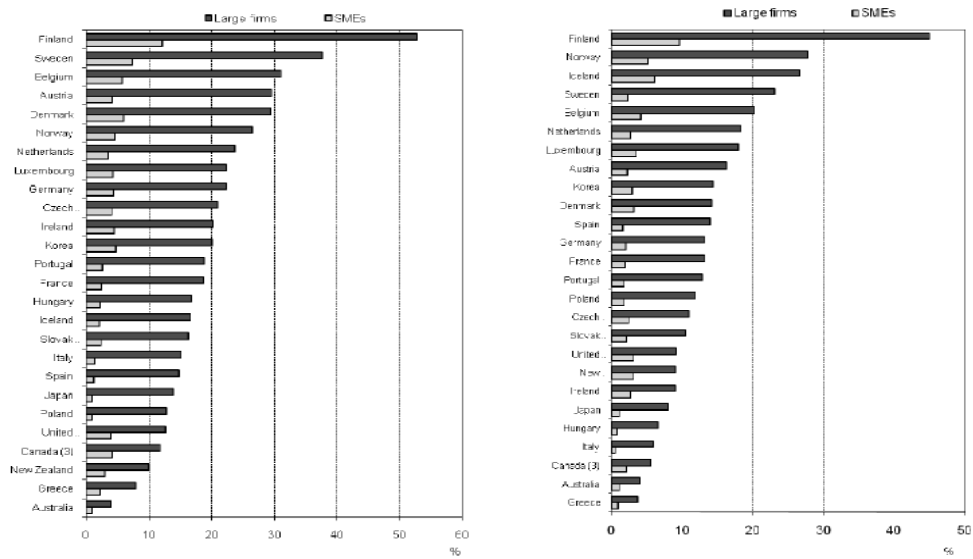
In 2010, an action for the creation of strategic platforms has been established in three ICT areas in the Brussels-Capital region. Based on an analysis of research projects presented by the R&D performing Brussels ICT companies, INNOVIRIS selected three ICT domains as strategic platform themes which are of great importance for the

²³ Through the launch in 2010 of a first public-private partnership called Euro Green IT, the Walloon Government has decided to contribute to the establishment of an 'accelerator centre' for research and market launch of new digital technologies solutions with the general objective of sustainable development and energy efficiency.

industrial sector in the region on a short/mid-long term: Mobile Computing Applications, 2D/3D Imaging and Knowledge Management. The strategic platforms will cover the field of academic research with a clear focus on industrial applications for the region. INNOVIRIS launched the first call for proposals for problem-oriented research projects in summer 2010. Research must be carried out by at least two research units belonging to higher education institutions within the region.

According to an OECD report Belgium performs quite well in terms of firm cooperation with universities (see Figure 5). Thus the inter-linkages between the public and private sector do not seem to form a major bottleneck in the Belgian R&I system.

Figure 5 Share of large and small firms cooperating with higher education (left graph) public research institutes (right graph)



Source: OECD 2008 Globalisation and Open Innovation

5. Framework conditions for private sector innovation

On the well-known IMD World Competitiveness Report and the World Economic Forum rankings Belgium has a relatively high position, however on indicators relating to the general business climate, Belgium does not perform good in comparison with other comparable industrialised countries. Figure 6 from the IMD World Competitiveness Report shows that relative weak point are Employment, Public Finance, Fiscal Policy, Labour market and Attitudes and Values.

In the 2010 World Economic Forum Report Belgium ranks 19th in the world (below Finland, The Netherlands, Denmark and Austria, but above Luxembourg, Spain and Rep of Korea) on global competitiveness, one place down from their ranking in 2009. On 'efficiency enhancers' the country has a relative weak position related to Labour market efficiency, financial market development and market size. The country scores very well on Higher Education and Training (7th place) and 'technological readiness' (13th place).

On 'Innovation and Sophistication Factors' Belgium has an even higher ranking of 15th in the world (above for instance Norway and France).

Previous peer review reports have pointed out that the fiscal climate in Belgium is not conducive to (private) investment in R&D and in R&D related labour. Particularly the dual situation of low wages for researchers and high costs for employers was seen as a threat to the Belgian R&I system, leading to brain drain and relatively low attraction for researchers from abroad. As abovementioned, this situation has been improved by the introduction of a generous fiscal scheme to reduce the employment costs of researchers both in the private and public sector organisations who employ researchers.

According the Operation Plan 2011 Flanders is aiming at supporting an entrepreneurship culture. Several Action Plans have been launched one for Entrepreneurship (2010) and for entrepreneurial education. The portfolio for SMEs policies has been expanded including support for potential company starters. In Wallonia the emphasis has been in providing support to financing of start-ups and encouragement of entrepreneurship. The Brussels Capital Region focuses on supporting companies to become more active on export markets and to help foreign companies (particularly in the ICT sector) to invest in the Brussels Capital Region.

Figure 6 Ranking of Belgium in the IMD World Competitiveness Report 2011



6. The public sector as innovator

Government performance on the ease of doing business, reducing regulation and seems to have improved in recent years. The Operational Programme 2011 states that Belgium will adhere to the Think Small First principles.

The European Small Business Act Review²⁴ suggests that Belgium has made quite some progress in making business easier for small businesses.

- Only a few Member States (**Belgium, Denmark, Finland, Luxembourg, Germany, Poland, Slovenia, Sweden and the United Kingdom**) have integrated an SME Test into their national decision making approach
- Only five Member States (**Belgium, Finland, Ireland, Spain and the United Kingdom**) comply with the recommendation⁴⁹ to complete all legal procedures to wind up a business in the case of non-fraudulent bankruptcy within a year
- A few Member States have taken action to tackle **late payments**, anticipating the recast of the late payments Directive and, in some cases, going beyond its scope (**Belgium, France, Germany, Portugal and the United Kingdom**).

Although this is not directly related to innovation it shows that the public sector itself is innovating its services.

In terms of demand led innovation policies the Flemish government and particularly its technology agency IWT has been active in developing tools for innovation procurement. After its coordination of the OMC-Net Pre-Commercial Technology Procurement (PTP), the agency developed a new policy instrument based on pre-Commercial procurement concepts used also by the European Commission. The current budget for the instrument is approximately €10 million.²⁵

²⁴ European Commission, Review of the “Small Business Act” for Europe, COM(2011) 78 final, 23.2.2011.

²⁵ Christophe Veys, IWT, Public Procurement of Innovation, The Flemish Concept, presentation, SBIR conference The Hague, 20 & 21 January 2011.

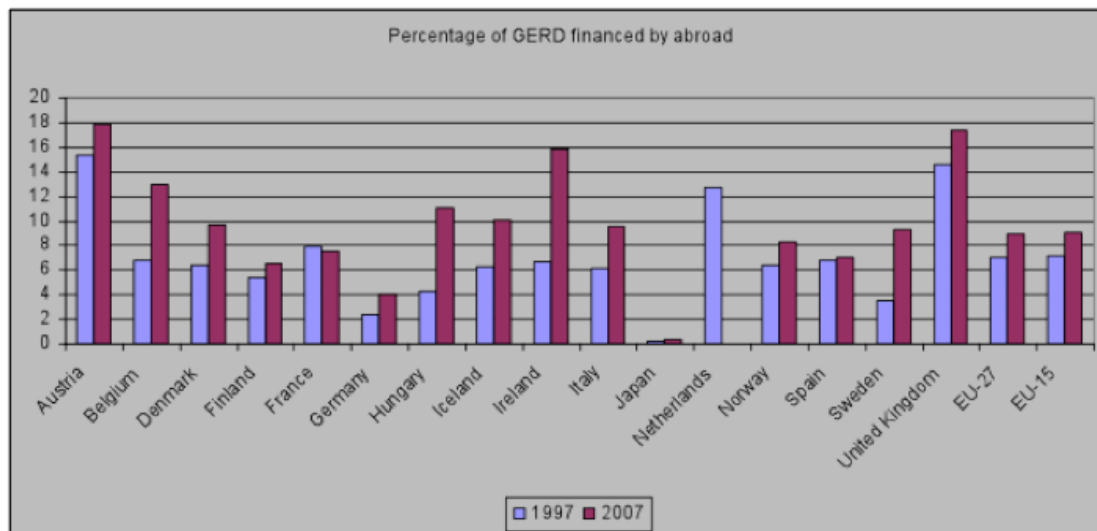
7. Internationalisation of the Belgian RDI system

The messages regarding Belgium's performance on internationalisation in R&I are mixed. As the rationale paper shows the previous Peer Review in 2007 stated that internationalisation of R&D needs more attention.

There are a number of indicators that would suggest that the internationalisation of the Belgian R&I system is relatively strong:

- The percentage of GERD financed by abroad is relatively high compared with other OECD countries
- In 2006 the share of foreign doctoral students (Phds) as a percentage of total doctoral enrolment is quite high (20,5%) and Belgium is on 6th place after Switzerland, UK, New Zealand, Canada and France. However the share of foreign doctoral students used to be higher (nearly 40%) in 1996.

Figure 7 Percentage of GERD financed by abroad



While each of the regional and community authorities establishes an active STI internationalisation policy within its own competencies, there is no overall policy strategy for internationalisation of R&D across the regions and communities, nor on the federal level. In addition due to the responsibility of R&I at mainly the regional level, Belgium is increasingly facing a challenge in strategic EU initiatives that require national co-funding or top-ups such as the Joint Technology Undertakings and Joint Programming. This issue thus features as one important topic on the agenda of the peer review.

8. Issues and questions for the peer review

The Rationale Note that has been prepared by the Belgian stakeholders on behalf of this peer review, has identified six key topics for debate in the 2011 peer review:

- Federal vs regional policies: in how far have recent developments improved the policy making in the fragmented Belgian STI-landscape?
- The link between research policies and innovation policies: is a coherent and well-integrated policy strategy for research and innovation been put in place in the quite complex Belgian R&I system?
- The broader economic policies: how does the current regulatory framework support business investment and R&D investment in particular?
- Internationalisation: has progress been made on this issue since the last peer Review 2007 and in how far is this a major challenge for Belgium?
- Human resources and the science base: despite its strong position has progress been made in this field? What challenges remain or could be expected in the future?

A number of questions are could be put forward for the various sessions as organised in the 2011 review:

Session 1 the Innovation Union Scoreboard

- What were major changes – positive and negative - in performance in the last 5-7years?
- There are items where Belgium performs below average (e.g. Public R&D expenditures) what is the story behind this? Are they really a bottleneck/challenge for Belgium?
- What are the main reasons for Belgium not to achieve the 3% target? Was there something policy could have done better? Can you make a distinction between the public and the private sector?
- Is there an effective monitoring and review system of the Belgian STI performance?

Session 2 federal vs regional policies

- Are S&T-policies considered a key policy issue in Belgium?
- How are STI-strategies being built in Belgium at the different levels of authority?
- Are the current coordination bodies appropriate and sufficient to develop a strategic approach for Belgium in the ERA?
- Could Belgium achieve more critical mass, focus and synergy in their research efforts and achievements if the regions work together more closely in their research policy programming and funding?
- Does the fragmentation of policy strategy development between the different levels hamper the international visibility of R&D strengths in Belgium?
- Are the instruments of the federal level and the regional/community level well-coordinated?

Session 3 the link between research policies and innovation policies

- To what degree are research and innovation policies being coordinated in Belgium at the different levels of authority? Are research efforts being accompanied by instruments to support the commercialisation of innovative ideas?
- Given that innovation policy is mainly a regional responsibility and science policy at all levels (regional and federal) is an integrated approach of science and innovation policy seriously hampered by the Belgian governance structure?
- Is Belgium too much focused on technological innovation and not enough on non-technological and/or social innovation? Is innovation in the service sector targeted sufficiently?

Session 4 the broader economic policies

- Has Belgium become a better place for industry to do business and to invest in R&D in the last 5-7 years?
- Are the fiscal instruments on behalf of R&D (and investment in general) a sufficient counterbalance to the overall unfavourable fiscal climate?
- Is the Belgium government doing enough on demand led policies?
- Are policies to promote innovation, entrepreneurship and other policies like procurement, standardisation and intellectual property rights well designed and interconnected?
- And what about the other competencies outside research and innovation (social policies, eco-innovation, energy,...) ?

Session 5 internationalisation

- Belgium is an open economy with a highly internationalised science and research base : is this a problem ?
- In how far is the fragmented funding and policy formulation process in Belgium hampering the research actors in the ERA? (e.g. a lack of strategic approach towards big European initiatives, European infrastructure (ESFRI), joint programming (JP),...?)
- Is Belgium doing enough to attract foreign direct investment, which has an R&D component?
- Can and should the lack of an overall Belgian R&D internationalisation strategy be overcome and how could this be achieved?

Session 6 human resources and the science base

- Is the relatively strong position in human resources in R&D sustainable in the future? What are the challenges and threats?
- Is there a stronger need for better framework condition for research careers across all regions and within specific regions?
- Is the share of competitive funding for universities at an appropriate level?
- Does the (higher) education system sufficiently geared to entrepreneurship and commercialisation of research results?
- Is the fragmented IP-policy in Belgian in need of a more coherent approach?

ANNEX C
Participants to Peer Review

Participation Self-assessment

The Innovation union scoreboard: May 16th, 2011 morning session

Chairman: Bogdan Van Doninck, Director General, BELSPO - Belgian Science Policy Office, vdon@belspo.be			
Chantal Kegels	The Federal Planning Bureau	Taskholder	ck@plan.be
Dominique Graitson	CESRW - Socio-Economic Council of the Walloon Region	Secretary	dominique.graitson@cesrw.be
Pascale Dengis	EWI - Flemish Government Department of Economy, Science and Innovation	Head of division, Knowledge Management Division, dept. Economy, Science and Innovation	pascale.dengis@ewi.vlaanderen.be
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Stijn Kelchtermans	HUB - High School-University Brussels	Assistant Professor	Stijn.Kelchtermans@econ.kuleuven.be
Ward Ziarko	BELSPO - Belgian Science Policy Office	Head of Unit of R&D Indicators	ziar@belspo.be

Federal versus regional policies: May 16th, 2011 - afternoon session

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The link between research policies and innovation policies : May 17th morning session

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Broader economic policies: May 17th, 2011 afternoon session

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Internationalisation: May 18th, 2011 morning session

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The science base and human resources : May 18th, 2011 afternoon session

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ANNEX D

Lessons on the Policy Mix Review Process using the Innovation Union Self-assessment Tool

1. Introduction

The Belgian Policy Mix Peer Review was a pilot case for using the Innovation Union Self Assessment Tool (SAT). This Appendix reflects on the process of the peer review and the use of the SAT in that process. The main purpose of this is for other countries that will undergo such a peer review can learn from the experiences of this first pilot. This paper is divided in three parts: a section on the preparatory phase or the period before the panel meetings; a section on the actual visit of the peers for the review panel meetings and its aftermath and a section on the contents of the SAT.

2. Before the Panel Meetings

The SAT has a number of categories of topics that together form a systemic approach to the aspects of the knowledge triangle.

The topics in the IU SAT did not serve as the main guidance for the Belgian authorities to organise the peer review exercise. More important as guidance were:

- Previous (OMC) country reviews and studies describing strengths and weaknesses and the assessment whether improvement was made on issues raised
- The performance of Belgium in the Innovation Union Scoreboard
- Pressing issues on today's R&I policy agenda in Belgium

Thus the identification of main topics on which the 2011 review was based, were mostly focused on the current Belgian situation, rather than the quite broad set of systemic issues as listed in the self-assessment tool. As a principle it is positive that peer review exercises are geared to the national situation. However, this could result in certain topics not being addressed.

It was only at a relatively late stage – a good month before the panel meeting - that a discussion took place between the European Commission and the Belgian authorities on the function of the Self-Assessment tool in the process.

In the intention of the European Commission it should be considered as an instrument for policy makers from the knowledge triangle make a critical assessment of their own performance, prior to the peer review panel.

While the Commission and the peer reviewers understood this as an exercise that should be completed and reported on in the preparatory stages of the review, the Belgian authorities had interpreted this as an exercise that would be conducted during the visits of the peers. This raised some confusion on the exact role and objective of the peer review visit; was it to validate /comment on a prior assessment, was it the main assessment moment or was it another assessment in addition to what had been done by the hosts?

The solution found in the preparation was that the Belgian authorities – and in particular the organising Federal government Agency Belspo - wrote a rationale paper explaining why the exercise was conducted and what topics should be addressed by the peer review. Each sub-part of the Belgian system subsequently organised one of the six panel sessions.

As the Belgian system consists of a multiple of sub-systems, each with their independent authority for RDI policy, a collective self-assessment on an aggregated national level, did not take place. Therefore, the panel review was a useful mirror to reflect on the drawbacks of the current fragmented governance situation in Belgium. The fact that there was not one Belgian 'owner' to the exercise also left the peers with an uncertainty what the real goals of this exercise were and what they expected from the review. Given the many authorities involved in the exercise, it was difficult to assess who were strongly committed to the exercise and who were not. For future exercises it would be important to give some guidelines how to conduct this self-assessment.

The lessons learned on the preparation of the exercise is:

- Start in an early phase with organising the **self-assessment** with the policymakers from the knowledge triangle. In order to capture all aspects of the Innovation Union this would mean the involvement of policy makers and experts from all policy domains from economic and fiscal policy, education, innovation and research;
- There are no previous experiences how such a process could be organised. Perhaps some workshops sessions with policy makers from the specific policy domains followed by a number of more systemic workshops where the policy domains are linked with each other could be taken as a format.
- A simple format should be developed how this self-assessment is written down concisely and communicated to the external peers. A small number of key performance indicators could be used but it also needs qualitative discussions to understand why certain targets are not met. A questions that could be asked is what benchmark countries are used to compare own performance;
- It could be envisaged that the external peers receive the self-assessment one or two months prior to the peer review panel, together with the programme and the foreseen list of stakeholders to be invited. This would allow the external peers to give some suggestions of type of people that could be invited to certain sessions or topics that are missing from the programme;
- A background document providing factual information about the organisation and governance of the country, the performance on a number of indicators was considered useful by the external peers to prepare for their review;
- The peers felt that they were provided little information on the programme and the type of questions that were going to be discussed in each session. Involve the peers / consultants earlier in the process of developing the themes and questions for the panel meetings and the profile of people to be invited for such a meeting;

3. The actual peer review visit

The Belgian peer review started on Sunday evening with a dinner for those that were able to travel to Brussels in the early evening. The three working days for the panel visit were divided in morning and afternoon sessions organised around a particular topic. For each topic a number of stakeholder and policymakers were invited. Every session started with a short oral presentation of the invitees.

In the Belgian context all regions and communities were to be represented in the meetings. This meant that quite some time was used for short oral presentations. In the Belgian case the programme was set up by the preparation group of Belgian authorities, each with a responsibility for one of these morning or afternoon sessions. The atmosphere of discussion was frank and open and in some cases rivalry between the regions could be felt.

In principle it was very useful to have the views of so many stakeholders. The view from industry and research representatives was very enlightening to have a customer perspective on the system. A mix of representatives from SMEs as well as larger companies would have been welcome.

A very appreciated aspect of the review was the hospitality shown by the host country and the opportunities provided to have more informal discussions with various representatives over dinner on the first and second evening of the review.

Some suggestions on an improvement of the peer review programme for future exercises are:

- More interaction between the organisers of the peer review and the peers/consultants on the structure of the programme, the type of people to be invited for each topic/session would be useful to ensure that the key issues are well addressed;
- Sufficient time should be built in at the start of the programme for the peers only to agree on the approach for the exercise, the division of labour;
- The programme should also include time at the end of each day for the peers only to wrap up, write down first impressions and conclusions and open issues to be covered in later sessions.
- Particularly on the last day of the review 1-2 hours should be built in for the peers to reflect on the main findings and for them to have a short feedback session with the organisers to give first impressions. In this session the panel can also agree on what inputs will be given to the end report, the timing of this and so on;

4. The SAT and its appropriateness for the review

As stated in the second session, in Belgium the SAT as such was not strictly used as the guidance for designing the review and its topics. In principle it is good to focus each country review on particular topics, but this should be done on the basis of a broad range self-assessment first, and then subsequently a choice can be made for the most urgent issues.

In principle the SAT covers all key themes that are needed for a systemic review of a country. What is missing in the SAT is an explicit discussion on internationalisation of R&I as a specific topic. For Belgium for instance this is considered a key challenge.

What this review also showed that certain topics that are outside the direct domain of science, research and innovation are not well covered in the review: general framework conditions to promote business investment in R&D, the public sector as customer and driver of innovation, education and skills beyond higher education. This would need input from authorities and stakeholders outside the core RTDI policy domains. These should not necessarily be included in all reviews, but in those countries where main bottleneck are in these framework conditions it would be important to include interviews and background material on these topics. An example from the Belgian case is the fiscal situation. All stakeholders in the meetings were very positive about the fiscal incentives for R&D while at the same time many international reports on the competitiveness of countries give Belgium a very bad rating for their

overall fiscal system. Without this broader view it was difficult for the peers to put the fiscal R&D scheme in a wider perspective.

A topic difficult to tackle in a review is the question whether innovation and research policy are well linked and integrated. Given the situation that in most countries these responsibilities are divided in one or more ministries, agencies and departments, some additional thoughts have to be developed on how peer reviews can determine whether this linkage is really working.