

OMC Policy Mix Review Report

Country Report Belgium

FINAL REPORT

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This report is prepared by Arnold Verbeek of IDEA Consult (Brussels) as part of the IPTS Specific Contract No. C 150176.XII to support the CREST OMC-3% Policy Mix Peer Reviews.

July 2007

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1 Preface

The “Peer Review of the Belgian Policy Mix regarding science, technology and innovation (STI) policies” has been steered by the Federal Co-operation Commission and the International Co-operation Commission (FCC-ICC). As the chairman in office of FCC-ICC, I would like to summarize the most important reasons why Belgium decided to participate in this CREST OMC exercise.

Belgium is characterized by a complex state structure with a Federal authority, three Regions and three Communities, all competent to a certain degree for R&D and innovation. Besides the competencies, the instruments to steer R&D and innovation are also scattered throughout the different authorities; some instruments (e.g. the tax instrument) being reserved to one authority only. During the years the different Belgian authorities have developed quite a lot of mechanisms to cope with this complex structure. Cooperation agreements were signed, dialogue platforms and procedures created and a certain tradition of policy dialogue emerged.

After more than a decade of experience with these procedures and platforms, the CREST OMC exercise on policy mix offered us the opportunity to get an outside view on the way policy dialogue between the different Belgian authorities takes place. Initially, the discussion was meant to study the complementarities (or lack of) between the relevant policies of education, science and economy. The Belgian institutional specificity added an extra layer: the existence of different authorities involved in STI-policies. For the CREST OMC the basic questions were: *“are the policies and instruments being set up by different ministries (and authorities) reinforcing each other or are they counterproductive? Does the system allow for a mobilization of all the relevant competencies, even when they are placed in ministries not linked to science or innovation?”*

In the preparatory phase a few more questions popped up, like:

- The internationalization of research: is Belgium sufficiently prepared to address the challenges of the increasing globalization of R&D?
- The Human Capital issue: how can we increase the number of researchers in Belgium as well as increase the attractiveness of Belgium for foreign researchers? How can national or international mobility of researchers best be stimulated?

- Commercialization of research and technology results; previous analyses showed that knowledge transfers between universities and business sector are not optimal in Belgium. Is there a problem with the absorptive capacity of Belgian industry?

The peer review took place in May 2007. Experts from four European countries were welcomed in Belgium. Three of them came from federal countries (Switzerland, Spain and Germany); the fourth came from Denmark, a small country with an economic structure comparable to Belgium. We did not seek the opinion of countries doing particularly well like Finland or Sweden, but rather the advice of countries being confronted with similar institutional debates or similar economic problems, though Denmark and Switzerland perform quite well on R&D and innovation. That's why they are "peers". During their visit, the peers met around 40 prominent people in four different sessions:

- in the first session representatives from governments and advisory councils were given the opportunity to give an inside view;
- the second and third sessions were held with representatives of universities and industry and with technology transfer specialists;
- the last session was devoted to industry science links and related aspects.

The fact that so many high level people agreed on a short term notice to participate in this peer review demonstrates the interest there is for this exercise in Belgium. The FCC-ICC met several times to discuss the whole exercise. They discussed the background report on Belgium, the progress made during the different stages and the final report made by the peers with the help of a consultant. However, they point out that the report reflects in the first place the opinions of the peers and the persons interviewed during the process. The process of transforming the lessons learnt into policy improvements has to start now.

Finally, the FCC-ICC are very proud of the work that has been done and wish to express their gratitude to Arnold Verbeek (the consultant who worked on behalf of the European Commission), the peers and the Belgian colleagues who all spent some of their precious time to help this exercise succeed.

Bart Laethem,
Chairman of FCC-ICC

2 Introduction

This report gives a reflection of the views of the experts who have reviewed Belgium in the context of the CREST - Open Method of Coordination (OMC) Policy Mix exercise. The expert review was conducted by the following four experts:

Luis Delgado	Ministry of Education and Science, Spain
Michael Rothgang	Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Germany
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To prepare the experts for their visit to Belgium they were provided with a background report written for the purpose of this policy mix review. The OMC Policy Mix Review Background Report (see Annex 2) on Belgium provides information on the Science Base, Business R&D and Innovation, Economic and Market Development, Human Resources and the overall Innovation System. During their visit, the experts were provided with additional background documents. The extended version of the programme provided additional information on each of the sessions, the background of the guests (interviewees) and some key issues that could be addressed.

The visit of the experts took place on 9, 10 and 11 May 2007 in Brussels (hosted by the Inter-ministerial Conference on Science Policy and its two permanent sub-committees: International Co-operation Commission (CIS) and the Federal Co-operation Commission (CFS). The programme (see Annex A) included representatives from many stakeholders involved in Science, Technology and Innovation from the public and private sector, and the Belgian Regions and Communities. The CREST-OMC examination took place on June the 13th in Brussels and led to extensive discussion with the OMC Policy Mix Group. Shortly after that, a second feedback mission to the CFS/CIS committees took place.

The following report summarises the observations of the experts, synthesised on the basis of themes. It should be mentioned that this is neither an evaluation nor a full-scale review of the Belgian S&T system. However, it provides suggestions and recommendations for Belgium based on the experience of the peers and the discussions between them and the local experts. The report reflects the situation at the time of the review.

Sections 2 and 3, respectively, provide a summary of the Belgian R&D system, the key elements of the Policy Mix, and a concise overview of the main challenges and issues discussed during the peer review. Section 4 presents the commentary by the reviewers and the lessons to be learned.

3 The Belgian R&D and Innovation System and Policy Mix

Belgium is a rich, well-located, service-oriented and densely populated country with high labour productivity rates (although slightly decreasing over time). Belgium is also an extremely open economy (export shares exceeding 70% of GDP) dominated by a small number of multinational companies. The social security system is well developed but at the same time has become quite expensive with the ageing of the population. As a result this translates into high salary costs¹ putting pressure on the competitive position of Belgium.

Belgian Authorities at federal and federated level² are fully committed to the Lisbon objectives. R&D policy is given a high status in the National Reform Programme. The regions put their own emphasis on various objectives and policy dimensions in relation to the 3% goal. The progress report 2006 indicates that Belgium is on the right track in achieving its longer term objectives (confirmed by the positive evaluation in the OECD Economic Survey of Belgium 2007). Belgium's overall innovation performance (based on the Summary Innovation Index for 2004³) is relatively positive with a position on average above both the EU25 and EU15. However, when looking at the traditional indicators, Belgium seems unable to fully benefit from the high levels of BERD, the high level and quality of scientific performance in specific fields, and the available technological strengths. Mismatches and underlying collaboration shortcomings between the various innovation players (and federated entities) are suggested. As such, diffusion and spillovers between actors need to be stimulated.

Gross domestic expenditure on R&D is declining since 2001 and has reached a level of 1.9% in 2004 (slightly above the EU mean). However, enterprise expenditure (BERD) is higher than the EU average. Projections show that, if the current trend is remained, the explicitly supported 3% target by the Federal government will not be reached (including the 1% public R&D investment target). A skewed industrial landscape (a few large firms and many medium to small size companies) and a subsequent skewed private R&D expenditure pattern (large companies being the main spenders) make the overall R&D profile quite fragile.

Despite relatively strong performances with respect to the quality of human resources (well-educated population, high investments in higher education, high number of S&T workers) several challenges remain. Examples are, lifelong learning, labour costs, improved career perspectives for researchers and (intersectoral) mobility, and stimulation of entrepreneurial spirit throughout various education levels. Especially the mutual openness of the regions and communities deserves further attention. Framework conditions are also of major importance, especially removal of administrative barriers, innovation impact of regulations and the promotion or establishment of suitable risk capital. Quite some work is carried out in this respect on both the regional and federal authority levels.

¹ In 2003, fiscal and para-fiscal pressure on labour costs amounted to 43.2% of salary costs in Belgium, compared to 38.4% in neighbouring countries (Prime Minister Chancery Office 2005).

² In this text, following definitions are used:

- Federated entities: meaning all governmental entities on the regional or community level
- Federal government = federal authority: one or more departments at the federal level
- Defederalised competencies: the competencies transferred from the federal level to the community and/or regional level

³ European Innovation Scoreboard, 2005.

The distribution of responsibilities in the STI system across the various authorities in Belgium is based on a continuous federalisation process, resulting into a division of competencies among autonomous entities. Namely, Belgium is a federal country composed of three communities (Dutch, French, and German-speaking) and three regions (Flanders, Brussels Capital, and Wallonia), as well as the federal government level. Each entity has exclusive powers and competencies in a number of areas, as well as its own elected parliament, government, administration, legislation, and advisory bodies. There is no hierarchy between the entities regarding their competencies.

Communities are in charge of matters linked to “people” such as culture, media, health policy, and education. Regions are charged with issues related to territorial matters such as energy policy, agriculture, public works, environment, and economic support. The Flemish community and the Flemish region have merged their institutions into one administration, government, parliament, etc.

Looking at the overall Belgian STI-policy mix, the main policy level is the level of the Communities and the Regions (= the federated entities), although several instruments have been developed on the federal government level. In Belgium, each federated entity and the federal authority defines its own STI-policy. Namely, the communities are in charge of education (including the university level), and research related to their own competencies. This includes, among other, the competency for fundamental research in universities, applied research at college schools, science popularisation, and the community scientific institutes. The Regions are in charge of economic support and technological innovation, and research related to their own competencies. This includes, among other, the competency for basic technological and industrial support, the development of new products and processes, technology transfer, and the public research organisations (PROs). The federal authority is responsible for research related to its own competencies, for scientific research in particular areas (space and nuclear research), and for the federal scientific and cultural institutes. If a cooperation agreement exists, it can also deal with research requiring homogenous execution at overall country level and research related to international agreements. It is also charged with IPR policy and tax policy including fiscal measures in support of R&D. Cooperation exists between and among the federated entities and the federal authority through a number of agreements. More information can be found in the background report (see annex 2).

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. This, as such, has also been a central element of discussion during the peer review meeting in Brussels.

4 Main challenges and issues examined

The key challenges that have been identified in the background report (further substantiation is provided there) and which have formed the focal point in the discussions between the peers and the experts are grouped around 4 topics.

- i) Coherence and cohesion of the various decision making bodies
- ii) Belgian NIS in a globalised world – mechanisms for policy development
- iii) Human Capital (more and better qualified researchers)
- iv) Valorising research and technology transfer

Coherence and cohesion of the various decision making bodies

1. ‘Policy orchestration⁴’ 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’ (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. Policy orchestration may take place in various forms such as networking, communication, and frequent (organized) interaction. This peer review looked into the current policy orchestration efforts and shed more light on whether and why ‘real’ policy orchestration is needed. It looked into suitable instruments/approaches to achieve this without distorting the current political reality.

Belgian NIS in a globalised world – mechanisms for policy development

2. Policy development is a challenging task in a multi-actor and multi-entity environment like Belgium. 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. This is partly due to cultural reasons and characteristics. Policy initiatives are often ‘reactive’ instead of ‘proactive’, although increasingly use is made of foresight studies to look ‘ahead’. Research priorities are mainly ‘bottom-up’ driven, although some thematic priorities are set, in one federated entity more than in the other. Strategic intelligence is not always available, just as the right ‘evidence’ is not always available when needed. The review looked at the mechanisms lying behind policy development in Belgium today; is there a right balance between proactive and reactive, bottom-up and top-down approach, focus on technology-push versus market-pull mechanisms?

Human Capital (more and better qualified researchers)

3. The Belgian levels in education and research are internationally appreciated. However, Belgian universities are not found very high on the various existing international rankings (cf. Background report, p. 8). A common explanation refers to the lack of ‘critical mass’. The peer review reflected on the fact that on some federated levels an explicit policy choice has been made in the past, to locally embed universities which led to a large number of universities. The peer review looked into issues in view of the increasing globalisation and increasing costs of (frontier) research. The review reflected in particular on the following aspects: how can a country like Belgium increase its attractiveness and thus excellence, which could imply higher attraction of foreign students and researchers? Are current rationalisation efforts (in the context of Bologna) sufficient? Are the instruments designed in order to sufficiently facilitate collaboration?

⁴ The concept of orchestration, and especially of policy orchestration, is a key concept in this report. It involves (operational) dialogue between entities and fine-tuning of S&T tools and measures to enhance their impact by fostering their complementarity.

4. In relation to point 3, the peer review looked into and reflected on the issue ‘internationalisation and rejuvenation’ of the R&D system, also in the context of the ERA and the broader globalisation, as another challenging topic. Today there are language laws limiting the use of English in teaching and training. This makes inflow of foreign English-speaking students (mainly at master level) rather difficult. Moreover, the application procedures for research funding prohibit the use of English as it would put local students in direct competition with foreign students. At the same time it is not common for Belgian researchers to go abroad for a number of years and build up international experience and networks. This may result in so-called ‘inbreeding’ and thus a lack of rejuvenation.
5. In relation to point 4, mobility in general (in particular science-industry) seems to be perceived more as a ‘cost’ (burden) instead of an ‘investment’ (asset). There seems to be a general absence of ‘slack’ in companies but also in public research organisations (PROs) that would enable people to ‘move’ around. Despite the fact that this is a problem of mentality, the various governments could and are already trying to change this attitude. The peer review looked into the current instruments in place and reflected on how mobility can be further supported (e.g. through stimuli especially towards SMEs).

Valorising research and technology transfer

6. The R&D expenditure indicators would suggest that Belgium has not managed to fully turn around the declining trend and move towards the Lisbon goals and Barcelona 3% target. In Belgium, business expenditures on R&D highly depend on a limited number of large firms (often international firms with foreign HQ – and thus where the decision power lies abroad). The peer review looked into the critical issues in the policy mix (as well as the socio-economic conditions) in order to make this turn-around. Moreover, the review looked ‘beyond’ the 3% target and into the potential policy options and related effects.
7. This peer review looked into the alleged ‘mismatch’ between scientific/technological excellence and economic valorisation. How should this mismatch be interpreted? is it a result of the ‘absorptive capacity’ of Belgian industry, mainly consisting of (traditional) SMEs; are the consultation channels for industry sufficient; does the public research base take sufficiently into account the industry needs; is there a power balance between academic and industrial actors?
8. In relation to point 7, given the fact that the R&D strategies of large (international) R&D players in Belgium in many cases are decided upon abroad, the peer review considered how Belgium could respond to, or anticipate, this. How could internationalisation go ‘hand-in-hand’ with keeping R&D activities here in Belgium by keeping the decision centres here? Are the right instruments/conditions in place?
9. ‘Open innovation’ plays an increasingly growing role in today’s STI landscape. It offers many opportunities. Companies are increasingly convinced of the need to open their traditional boundaries and share knowledge with others in order to find new combinations (collaboration). Open innovation mostly concerns generic knowledge that is developed in a pre-competitive phase, after which companies can take the elements they need and translate them into their products and services. Open innovation refers to the capacity to ‘plug-in’, to intelligently manage IP and to be able to optimally translate the general knowledge into company specific knowledge (also by SMEs). At the same time market intelligence also becomes crucial in order to be able to timely identify opportunities. The peer review looked into the challenges that Belgium is facing in this respect. How should/could policy react to this new paradigm? Do the current policy options respond to these developments (including collaboration developments)?

5 Commentary by the review team

5.1 Introduction

Belgium is a rich nation having a high quality level of knowledge generation. Located in the centre of Europe, it is the political and administrative centre for EU, NATO and various other international institutions. In general, the population is well-educated and speaks two or three languages. Belgium is an open economy with a century long tradition of international trade. Belgium has many SMEs but only a few real competitive large companies with headquarters in Belgium. However, due to Belgium's central socio-economic and political position, most globally active companies have representation offices in Belgium.

It has been an integrated part of Belgium's political reality to allocate more and more competences to the various regions and communities. The peer review panel acknowledges this situation. However, since it was more or less agreed by all parties during the peer evaluation that the major challenge for Belgium is to maintain its competitive position in an increasingly globalizing environment, new solutions from a 'content' perspective have to be sought. In some cases this may even mean to acknowledge the need for a better 'targeted' policy orchestration across the regions and communities beneficial to all involved parties.

The peers have recognized many successful examples of scientific and technological excellence in Belgium. Also the economic performance has been good. However, the global environment of the Belgian economy is changing rapidly. In particular the medium and low-tech sectors that comprise a large share of the manufacturing sector in Belgium (91.5 % according to OECD-figures from the OECD Economic Survey Belgium, March 2007: 29) are very prone to international competition especially from low-cost countries. Thus, the economic risks are judged very high for the Belgian economy in the years to come. The question arises what the appropriate benchmark could be when judging future economic prosperity in Belgium.⁵

It is proposed by the peers to lift the view from the overall Belgian perspective and to watch international developments very carefully. It is agreed that a common understanding of the challenges and related actions, a common vision of where to go and a common and strong will to implement improvements on an overall national level are somehow missing⁶ today (although it is acknowledged that this is not easy to develop in the current institutional setup or political environment). 'Common' in this context however should mean that 'understanding', 'vision' and 'will' are shared either by both the different federated entities and the federal authority, or by the different societal stakeholders (such as academia, industry, civil society, administration, politics etc) by acknowledging the need for complementarity.

⁵ For judging the present situation in respect to the Lisbon goals in Belgium, we think that it is worthwhile to consider the situation in Germany and compare the Länder differences that prevail in the country. In Germany, with respect to R&D valorisation, the Federal Land North Rhine-Westphalia (NRW) faces a similar situation; Bavaria and Baden-Württemberg have been rather successful in the last decades in answering the global challenges.

⁶ "We believe that common ownership of a process of problem identification, action design and monitored implementation would be mutually beneficial. As an example we learn the successful reaction to the car industry crisis. Some key characteristics: first there was the common detection of the problem; the launched process was chaired by a reputed personality which had no stakes to defend; stakeholders were integrated through informal networking; an action plan with duties for each stakeholder was set up; its success was monitored regularly; awareness and pressure was built up by the implication of the media."

Even if it is widely understood that Belgium adheres to the Barcelona and Lisbon objectives, there is not a real vision about where to get and how to get there on the overall national level. To turn possible improvements into reality, further efforts to strengthen an open dialogue to find out opportunities and synergies as well as to foster mechanisms for implementation and monitoring are needed. To some extent, changing the perspective (into a more global), will also lead to a different judgement of problems like the high labour costs that Belgium is facing. Perhaps the problem is not the high level of labour costs, but rather the level of competitiveness (e.g. in research excellence, valorisation etc.) taking into account the current levels (cf. the Lisbon agenda).

The challenge for Belgium, as an ‘open’ economy, is thus a global strategy and the peers feel that there is not enough ‘sense of urgency’ in this respect, as the ongoing debates (and policy agendas) in Belgium today are in some cases of a more ‘introspective’ nature.

In this report we will analyse the situation in the perspective of a globalizing environment and the challenges this poses to Belgium as a country, including the various federal, community and regional levels, in order to be able to benefit from opportunities. The following discussion should be seen in this light: the light of possibly *lost opportunities*.

5.2 The Belgian NIS a globalized world

5.2.1 Cohesion and coherence

Starting from the fact that most Science, Technology and Innovation (STI) competencies, and hence policies, are almost completely transferred to the different communities and regions, with no hierarchy between the competencies and policy setting(s), the review team was impressed by the level of commitment of all the entities concerned on the need to set up a policy mix dealing with “bridging policies” to facilitate STI across internal borders and diminishing the risk of excessive policy fragmentation, which is inherent to the Belgian institutional structure. This high level of commitment together with a strong co-operation culture was also found among the different STI stakeholders during the review interviews. Of course co-operation mechanisms are in place, such as the Inter-ministerial Conference on Science Policy, IMCSP, with the International Co-operation Commission (CIS) and the Federal Co-operation Commission (CFS). However, the review team got the impression that there are limits to their effectiveness (and competences), concerning the extent to which the various federal, regional or community initiatives can be fine-tuned mutually. Questions were raised as to why these committees were not given the possibility to fulfil a more pro-active role in identifying potential gaps.

In general we believe that applying a more systemic view will open opportunities for more streamlining and focussing. The present set of instruments sometimes seems to be shaped more by institutionally driven competence distribution than by the goal to achieve the best environment conditions for those who are affected by the policies. In this respect, differentiation of instruments is justified and necessary if you have to tackle different problems and when it is in the benefit of the specific target groups (e.g. differentiation between types of firms or regions). To the contrary, obstacles for excellence and performance-driven behaviour should be maximally removed (e.g. regarding cooperation between researchers / universities as well as cooperation between firms and universities on the overall Belgian level). Due to the complexity, the speed and agility of action is reduced on the overall Belgian level, but both are increasingly important success factors. At the overall Belgian level, a more actor-driven approach could be beneficial and further concerting efforts among the various decision making bodies are needed.

As discussed with the experts during the review, in a small country like Belgium, informal ad hoc mechanisms of orchestration and collaboration among the different actors might be very successful. Nevertheless, the process of formalisation should be continued to better clarify who is in charge of what; this is especially of importance for those actors that are not that close to the ‘system’. Especially when competencies of different regions or communities risk overlapping each other, or when a clear problem is identified, involving all different authorities, further clarification seems necessary.

The current distribution of competencies in the STI domain is in general clear. However, in practice there are several important omissions or ambiguities which hamper successful synchronisation of policies. There is still some degree of ambiguity and uncertainty on “who should lead, define, finance and implement certain policies” in order to improve the setting-up of a coherent Belgium policy mix on R&D and Innovation. In addition, due to the institutional setup, the federal level is not in a position, hence rather reluctant to take the lead. So, there is room for better orchestration led by opportunities. Today’s fragmentation of STI governance at overall Belgian level is recognised as a problem, especially by industry, academia and some policy makers.

Belgian policy makers from the different governments are well aware of the rather complex governance structure of STI in Belgium, though an impressive effort has been made to clarify the respective competencies between the Federal authority, the Regions and the Communities. There is a general appreciation, especially among the R&D performers, that in order to achieve a more effective and pro-active policy mix, strengthening the co-operation culture and decreasing barriers that make trans-community/regional co-operation among public and/or private research entities essential. It seems that in the present situation, policy orchestration is only achieved to face concrete threats, i.e. industrial crises with loss of employment (e.g. the automobile sector). However, this situation hampers the formulation of a pro-active policy mix that is needed in order to anticipate problems and thus design policy measures to face the challenges that in the present context of globalisation and internationalisation of the R&D activities may be needed.

The need for further concerting efforts is especially urgent to improve the link between science and innovation (given the fact that responsibilities are divided among different ministries belonging to either the same government level or to different government levels). In addition, also the orchestration of initiatives facilitating public to private partnership (P2P) across Belgium is critical. This calls for a clear allocation of responsibilities as well as efficient co-operation mechanisms. In Belgium, there are indications that certain mechanisms facilitating further orchestration do function, as long as the approach is well-considered and the ‘leader’ cannot be associated/identified with one of the institutional STI-actors. In section 6 we will present a number of recommendations on how to further ensure policy orchestration in specific areas of interest.

5.2.2 Priority-setting and policy development

Inherent to policy orchestration is the way that priorities are set and policies developed. Though there are differences among the federated entities, it seems that research priorities are mainly defined through a wide spread consultation reflecting the interests of the different R&D stakeholders (bottom-up), but with the risk of lacking some focus on strategic research. While in general there is an appropriate mixture of policy measures, i.e. strategic research centres, competence centres, and a sound mix of funding instruments, there was some criticism amongst the interview partners on the scarcity of (funding) mechanisms at the national level, (especially regarding the possibility for companies and/or universities and PROs to cooperate across regions and communities). Only few such mechanisms exist: e.g. at the federal level, the Inter-university Attraction Poles (IUAP) were setup to promote

collaborative research between universities across the regions and the communities, which is recognized as a good mechanism and which could be further reinforced in the future, according to the peers. Similar mechanisms could very well be established for cross-regional company collaboration by acknowledging that a good working intra-regional system does not guarantee an effective system at overall Belgian level. Prioritising and developing policies should therefore take into account cross-regional issues as well.

In prioritisation and policy development, building up of policy intelligence plays an important role. In Belgium most federated entities and the federal authority have developed their own advisory capacities which function well within their respective competences. At the same time it could be examined whether a more overarching advisory capacity that observes and analyses 'Belgian' issues as well as signals potential conflicts and/or synergetic possibilities should not be developed as well. In addition to the already existing exchange of notes and observers, it might be beneficial to look for synergies, especially when applying the necessary global perspective referred to above. Especially industrial actors call for a more 'overarching' policy intelligence approach.

Foresight activities and prospective analysis to support the formulation of STI priorities are in place at the federated level, but not at the level of the federal authority. There is a need for reflection on how the federal authority level could contribute as efficient as possible to the success of the different STI policies, given the institutional context which results in various policies and priority settings.

There is a general demand to strengthen monitoring and ex-post assessment schemes giving feedback to the programme design and defining research priorities (taking into account that the need to do so on the overall Belgian level is acknowledged). Evaluation in general needs to be better incorporated in the different policy making mechanisms of all entities (not only ex-post, but also 'mid-term' in order to facilitate timely adjustment). Transparency, learning and international openness are crucial elements herein. On a more micro-level, the peers recommend to further increase international peer review in research selection proposal mechanisms in order to ensure international excellence, even if this means that more proposals should be produced also in English. More specific recommendations for Belgium will be presented in section 6.

5.3 The Science base and excellence in public research

In comparative terms the Belgian science base, mainly carried out by universities and large international research centres, is of high standard, being above the EU-average in publications and citations, with some universities in the list of top-performers in Europe. However and though the Belgium R&D intensity is slightly above the EU average, the share of public funding is well below the EU average, and only around 25% of publicly funded research goes to fundamental research. Nevertheless this significant amount of public investment in 'knowledge' domains, Belgium is not in the top of the European league and thus a call to invest more in this central resources is comprehensible and can be supported (different facets including research instrumentation). However, in this respect the peers also believed that strategic choices are needed (cf. above) as financial means are not 'endless'. The discussions during the peer review tended to support the view that additional money should be spent rather on R&D than on education (which is today of a very high standard).

On the one hand it is recommended that basic funding for universities should be strengthened, so that they can even better perform their research tasks on an international level. On the other hand more incentives and funding for collaborative work across the federated entities

would seem beneficial. Additional (competitive) funding should be calculated according to a full cost model (e.g. including overhead).

A general consensus among the interview partners was achieved on the need of cross-funding concerted programmes, fostering trans-community/regional co-operation among research teams, either public or private. To this end, the concerted programmes could work under the same principle used in the IUAP scheme, i.e. with federal funding and selection at community/regional level, or under the “virtual common pot” principle successfully tested within the EU ERA-NET scheme, i.e. each community/region funding its own participants. This is another suggestion made by the peers taking into account that knowledge production today requires interdisciplinary and heterogeneity, both present in the ‘larger’ Belgium.

Obviously, in a country like Belgium with its current institutional setting, fragmentation and duplication cannot be fully avoided. Concerning excellence, the issue of different levels of fragmentation within the overall Belgian university landscape, and the possible lack of collaboration and critical mass in certain strategic areas, remains important. Although the review team noted that this problem is not unanimously recognised, and the link between excellence and critical mass was rejected by some interviewed partners. We can only take note of the fact that actors within the STI-system operate within their own respective competence domain, defined by the institutional setup, and that therefore perhaps the full potential at overall national level is not fully exploited (e.g.: see above: trans-community/regional cooperation).

The problems arising from the present situation, i.e. fragmentation of research at overall Belgian level, missed research co-operation opportunities and a lack of critical mass in certain areas, a lack of cross-funding mechanism across communities/regions addressing large scale research at overall national level etc., were generally acknowledged by the interview partners. Some of these problems, mainly related to cross-community and/or cross-regional collaboration, could be solved by going onto the EU level. In fact the review team was told that the only way for research teams, located in different regions of under the competency of different communities to co-operate, was to go as partners in the same work package in the EU (Framework Programme for R&D) funded projects. Concerning EUREKA projects the experts have presented examples where due to differences in evaluation outcomes by and in the regions, Belgian participation (in consortium) has not been possible. Obviously, in multi-actor settings like the EUREKA projects represent and aim for, the risks of project partners being differently evaluated is at all times present. In case Belgian interregional consortia cannot become part of a European program like EUREKA due to regional evaluation differences, it is clear that opportunities are lost.

During the review, many examples of scientific excellence were found in all regions and communities. However, the peers do want to emphasize that regional funding may lead to the spread of funding over many small programmes addressing the needs of small communities which may dilute the quality of research and critical mass in the longer run. Moreover, this calls upon prioritisation skills as well (cf. supra). In the second place, where applicable and feasible, the peers also suggest to consider critical mass on the Belgian level as well.

While there is a general feeling that knowledge exploitation by the private sector rather than knowledge generation by the science base, is one of the weaknesses of the Belgian STI system, the shift in the policy mix to strengthen the innovation capacity of the private sector should not be at the expense of a continuous support to improve the excellence of the science base. In section 6 we will present some more specific recommendations for the Belgian system.

5.4 Human Capital

5.4.1 Education and training

To be globally competitive in terms of human capital world-class education and research is among other things required. Competitive knowledge however does not start or end at university level. Knowledge generation is now a question of lifelong learning from kindergarten to retirement. In the early years language skills, entrepreneurial skills and innovative curiosity should be introduced or strengthened. In colleges and at universities this approach should continue and include cooperation on project basis or in terms of traineeships with industry or public institutions. Later on, vocational training and advanced learning must be an integrated part of the working life for any adult.

At the university level, similar ambitions should be focused on. During the peer review interview it was stated that relatively few universities had more than a few Bachelor or Master Courses offered in English. Belgian laws and community decrees even limit the degree to which courses can be offered in English. In order to gain international competitiveness more Bachelor and Master Classes at universities should be taught in English. Experiences from other countries show that this will attract foreign students and researchers. Some of the students will just follow a semester or two; others will take the full course and might end up being good candidates for PhD scholarships or highly skilled employees in industry either in Belgium or abroad (inflow). Even more important, courses conducted in English with foreign and local students will help making local students much better in dealing with the global challenge when they finish their education and it will encourage them to study abroad themselves for a few semesters.

Specialisation and task division of teachers and professors is another issue of importance. Some university professors complained that they were forced to teach students up to 150 or 200 hours a year. They stated that they had very little time for this since they also had to conduct research and administer their institute or faculty. In view of today's multitasking environment in which professors and researchers have to fulfil various obligations and tasks, which require very different skills, specialisation and division of labour should be put on the university management agendas. As such, most university teaching of students does not require researchers but research-based education. Persons with Ma or PhD degrees and good pedagogical and communication skills should be rewarded for teaching students. This would leave better time for good researchers to concentrate on what they are best at: namely research.

Like many countries in Europe, Belgium also faces the challenge of 'life-long-learning'. Opening universities for a 'life-long-learning' programme paid by companies or the students could further stimulate the dissemination of knowledge to society; such programs could be conducted as industrial R&D cooperation programmes. The revenue from such activities could be regarded as additional source of income for the universities and to a certain degree the professors, institutes or faculties participating in the courses or projects. All such activities can be enhanced by public support programmes, rewarding the universities with funds covering the full costs (basic financing + overhead). Especially if the vocational training programmes or the cooperation projects are offered to SMEs this should be the case.

Likewise university teaching and training should to a high degree be conducted in cooperation with public and private organisations and companies regardless their community adherence or regional location. This can be achieved by introducing or increasing support schemes facilitating the cooperation in consortia that consist of a number of private companies and knowledge institutions. Since the crucial question is to obtain critical mass

and combine knowledge with needs (e.g. in industry), such schemes could be arranged with participants from two or more regions and/or communities and taking into account their respective support programmes. The coordination costs could be a federal issue to handle. In order to facilitate this work good teachers and researchers are essential. This too requires lifelong learning and a world-class environment for teaching.

5.4.2 Scientific career and mobility

As in many other EU countries the commitment of the different governments with the Barcelona target and the consequent increase in the level of R&D funding, requires more researchers than the Belgium STI-system is able to ‘produce’. In the case of Belgium, specific difficulties may come from: i) career opportunities in the university system partly due to its closeness and fragmentation; ii) mobility of researchers both between communities, sectors and territories, sometimes motivated by cultural reasons; iii) comparatively high R&D labour costs hampering R&D private investments; iv) low intake of foreign science students and researchers.

These problems are acknowledged by both public administrations and university authorities and sound policy measures, especially to increase the attractiveness of the scientific career and to foster the mobility of researchers that are in place. The definition of the scientific career from graduate and post-doc level to tenure positions, as well as the establishment of pure research positions at universities with limited or no teaching loads, may help to increase the attractiveness of the scientific career (cf. previous section). The intake of foreign science students and young researchers could be improved by maximally allowing courses in English at graduate and post-graduate level.

Concerning the attraction to Belgium of either Belgian researchers or top foreign researchers that work abroad, further special attention should be paid to the capacity of the Belgian universities and research centres to create stable job research positions for the incoming researchers. This is relevant since the basic public funding for universities is mainly determined by the number of students, rather than by the number of researchers. The “Ramón y Cajal” programme⁷ in Spain could be a reference on how to deal with these problems.

In relation to sector mobility, especially from academia to the industry, the first step is to foster the creation of technological and research job positions in the private sector. Since the Belgium industrial tissue is dominated by low and medium tech SMEs, not all of them have research units to which engineers or researchers from the public sector have interest to go to.

The Spanish programme⁸ “Torres Quevedo” mobilising more than 300 technical and research positions per year from the academy to the industry can be a good example of this type of

⁷ The “Ramon y Cajal” Programme was launched to answer the researchers’ community claims about the lack of job opportunities in the National Public Research System. The programme covers partially the cost of researchers’ contracts in Public Research Centres (or non-profit Private Centres) for a five year period. A commitment from Public/Private Research Institutions (RTO and Universities) in this initiative is required (more information: <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=prog.documentAjax&uuid=7D87B9B9-9907-CA00-68D740A1967FD783>)

⁸ This programme aims at facilitating the incorporation of academic, scientific or technical personal into the private sector to carry out R&D projects or to make prior technical feasibility studies. It is mainly directed towards SMEs, which might not possess the knowledge, skills or means to acquire, develop or implement a new technology. Furthermore, it fosters the interaction between the public and the private sector and actively contributes to an efficient knowledge transfer. The funding varies between 25% and 75% depending on the type of project and the beneficiary, with a maximum of three years per researcher. In addition the program aims to support non profit research institutions (more

schemes. Of course, concerting mechanisms to allow and foster trans-regional mobility should be effectively put in place (see above).

5.5 Valorising research and technology transfer

5.5.1 Increasing the private R&D effort

The Belgian Business R&D Expenditure (BERD) lies above the EU average, but it is strongly dependent on a limited number of R&D intensive Multinational Companies (MNCs) whose decision-taking centres lie abroad, causing sensitive fluctuations in the BERD. This is due to the fact that R&D investment location decisions of MNC largely depend on the framework conditions (complicated by the Belgium institutional setup, with fiscal measures standing at federal level and subsidies at regional level), quality (Belgium is well positioned) and labour costs (where Belgium has a competitive disadvantage). Like any other industrialized country, Belgium cannot compete in respect to R&D costs with countries like India, China or Eastern European countries. Thus, the policy effort should lie more on the first two aspects.

As in the case of public R&D performers, there was a general feeling among the business interview partners on the need for further orchestration efforts among the different authorities to avoid policy fragmentation possibly leading to duplication of research, missed opportunities and lack of incentives to innovate. This might certainly be the case in some respect. However, we feel that this is not the main problem in respect to increase the private R&D effort.

On a global scale, R&D activities are dominated by an increasing trend to internationalisation. Large technology-oriented global companies increasingly choose R&D locations among worldwide centres of excellence abroad. Competition with these R&D locations will increase in the future. At the same time, production and R&D are increasingly located in Eastern Europe and Asia. Belgium like all other industrialized countries faces an intensified global competition for high value added activities of the multinational firms. Keeping that in mind, we propose that Belgium should further try to increase the quality of the innovation system(s) by working on the attractiveness and openness of its public R&D system (i.e. among other, scientific excellence and quality of education), cost structure for foreign companies performing R&D in Belgium (e.g. tax incentives), development of high-tech companies (as a catalytic factor for local R&D activity) and last but not least stimulating as much as possible within the legal/institutional framework comparable conditions (rights and obligations) in the various regions and the communities.

Current strengths should also be further developed, like in the case of the life sciences. At the same time enough attention has to be devoted to knowledge diffusion among actors, not only STI knowledge, but also more general knowledge.

In addition to the slightly declining trend in public support to R&D, there is a low leverage effect of the public spending in R&D on the private one. In this sense, more detailed evidence on the additionality or substitution effect of the public R&D spending (on private R&D spending) is still needed.

information:

<http://cordis.europa.eu/erawatch/index.cfm?fuseaction=prog.documentAjax&uuid=7D87B2D3-D196-1823-675EE457D22AF8E1>).

Some SME representatives claimed during the interview, that it was extremely difficult for them to have to demonstrate to the regional authorities, in order to obtain subsidies, that the results of their research would be valorised in the region! Again the solution can come from the EU level through the integration into Technology Platforms. Other barriers mentioned by the business interview partners, dealt with the lack or low development of: lead markets, public procurement, risk capital market and the EU patent policy. Section 6 contains more specific recommendations.

5.5.2 Links between science and industry and creation of NTBFs

In terms of cooperation between knowledge institutions and industry there seems to be a mismatch between scientific excellence at many universities and the direct needs of industry; besides the challenge of transferring their knowledge to industry. In our view, the crucial deficiency lies partially in the lack of “absorptive capacity” of the Belgian industry, and more specifically the industrial backbone of Belgium today which contains a small share of high-tech industries. Another complicating factor is the large share of SMEs (mainly small companies) in Belgium that are not always capable of applying the state-of-the-art knowledge produced at universities and public research facilities.

It also became clear that there are also difficulties in respect to cooperation between public research and industry in Belgium. It works well if both the university and the industry are located within the same regional borders or belong to the same community, but to a lesser extent even hardly, if they are located in different regions or belong to other communities in Belgium. We do believe that Belgium misses a number of opportunities in this respect. This is underlined by the fact that there are only a few schemes (and mainly on the science level) supporting cooperation between and among knowledge institutions (both universities and PROs) and companies across Belgium, i.e. located in different regions and/or belonging to different communities.

A main challenge here as well is to increase the share of high-tech industries by both improving the conditions for national firms to develop, and by increasing the attractiveness of Belgium for R&D-intensive firms from abroad (cf. supra). The peer review team acknowledges that the different policy actors in Belgium have undertaken many efforts to promote the creation of high growth start-ups. Of course, there are many possible initiatives to foster high-tech ventures. Sometimes, financial means may be missing for the after-seed phase to scale up the new ventures. However, in Belgium like in other countries, many programmes to increase the number of start-ups already exist. Increasing the number of such programmes does not always lead to positive economic effects as they often lack solid business cases. By giving more financial funds to these firms, technology policy could end up with preventing the market selection process from working.

In our view fostering high-tech start-ups should aim at fostering entrepreneurship-spirit in (early) education and changing the attitude towards risk-taking. Notable efforts in this direction that have already been taken in Belgium should be increased (especially at the early stages of basic education and training). Some of the participants in the Peer review from Belgium stated that there is a lack of programmes focussing on the post-seed growth phase of start-ups.

Therefore, the quite successful cluster approaches should be further strengthened and broadened. The role of the public sector in relation to open innovation of collaborative development of generic knowledge in a pre-competitive phase must support the development of technological clusters and competence centres in different business areas, involving public and private R&D performers that create a favourable environment for both P2P and inter-firm R&D links. The institutional setup may cause to some extent policy fragmentation, which leads to different solutions among different regions, which in turn may impede trans-regional

collaboration. The need for further orchestration efforts at two levels occurs on the one hand between different federated entities from different communities/regions, and on the other hand, in some cases, between ministries in charge of science and innovation in one region. The next section provides more detailed recommendations.

6 Lessons for Belgium

Although the peers realize that the duration and design of this review do not allow for very precise and strong recommendations, especially looking to the complexity of this country, some suggestions (recommendations) are possible. Hereafter the key actors are invited to take these recommendations into consideration as a basis towards a possible refinement and/or implementation. These recommendations and suggestions are given without any prioritisation.

The recommendations are presented according to the main topics discussed during this peer review: coherence and cohesion of the decision making bodies, Belgian NIS in a globalised world, human capital and valorising of research and technology transfer. Firstly, two general recommendations are given.

General

1. A first recommendation is to make the aspect of internationalisation (globalisation) of the STI-landscape more prominent on the policy agenda. In addition, one must reflect on and analyse the challenges linked to this aspect. Furthermore, all policy makers should pursue a common understanding and a common vision of future challenges and steps to be developed, in accordance with the institutional setup.
2. Secondly, Belgium is an open economy based upon a century-long tradition of international trade, and has a central socio-economic and political position in the EU, resulting in a prominent representation of MNCs. Hence, framework conditions to attract and keep international companies located in Belgium, are crucial. Consequently, Belgium should further increase its efforts to get the issue of favourable framework conditions for STI more prominent on the EU policy agenda.

Coherence and cohesion

3. Discussions between peers and different stakeholders clearly demonstrated the general agreement 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. Such approach can allow the overall STI system to respond to challenges more appropriately, and to better take advantage of the opportunities provided. As a result, higher level of ‘win-win’ for all actors involved could be reached. More precisely, the following actions could/should be considered:
 - 3.1. Develop a common vision (actor-driven approach) how to further optimise and fine-tune the policy mix within the institutional setup. In addition, common goals should be defined and pursued, in view of valorising the opportunities offered in a globalising environment.
 - 3.2. It should be considered to what extent the current formal co-operation and advisory mechanisms could be applied as forums for orchestration and creation of more intra-Belgian policy coherence (e.g. on a discussion of strengths and weaknesses). A redefinition of the role of these forums could be considered.

- 3.3. Establish task forces (similarly to the task force of the automotive sector) involving all federated entities and the federal authority in order to analyse specific issues hampering the effectiveness of the policy mix for the actors involved, for example the case of the diverging funding mechanisms and instruments in the different entities.
- 3.4. Establish special ad-hoc panels to address international challenges, i.e. attractiveness of Belgium for international R&D activities.
- 3.5. Further clarification of the precise linkage between the entities and their respective competencies is necessary, especially for those actors who are not sufficiently familiar with the overall “STI-system”.

Such measures are believed to bridge the different STI-policies, which consequently can lead to the development of more pro-active and content-driven policy orchestration instruments, that could be based and even integrated in the existing co-operation mechanisms, i.e. the CIS-CFS provided that some influence, through the achievement of consensus, can be given to these commissions in improving the policy mix.

Priority setting and policy development

4. Establish knowledge sharing platforms on an overall Belgian level. These can help define / fine-tune the appropriate policy mix. Such platforms could also monitor the progress towards the achievement of the common vision and the common goals.⁹
5. Foresight activities and prospective analysis to support the definition of STI-priorities exist among the federated entities, though not at the federal authority level. In view of the contribution to the success of the community science policies and the regional innovation policies, the federal authority level should consider if and how it can establish similar activities, which in turn can lead to foresight activities on an overall Belgian level.
6. The research selection proposal mechanism could increase international peer review, as a mechanism to ensure international excellence, even if this means that more proposals should be submitted in English.
7. Evaluation should be better incorporated in the different policy making mechanisms at all entities (not only ex-post, but also ‘mid-term’ in order to facilitate timely adjustment). Transparency, learning and international openness are crucial elements herein. Furthermore, evaluation should move away from analysing direct output towards analysing ‘effects’ and long-term ‘impact’.
8. Additional measures should be taken to further increase the internationalisation of the Belgian R&D. Efforts in this sense, such as the setup and the promotion of either bilateral or multilateral cooperation programmes with selected countries to face global challenges (climate change, health...) should be made.

Excellence in public research

9. Competition between universities should be more embedded in the strategy of the universities. It is often seen, that individual researchers apply for project funding without considering the overall strategy of their university or association. A higher degree of

⁹ Like in Flanders the example of the Policy Support Centres). Such units could monitor the progress towards the achievement of that global challenge (cf. supra) by investing in strategic intelligence not only in the Regions (as today) but also inter-regionally.

competition for public research funds shall stimulate excellence (e.g. up to 50 per cent of the total research funding)¹⁰. Moreover:

- 9.1. Grants should be both substantial and long-term based, since these criteria facilitate the strategy of the universities and foster their knowledge capacity.
 - 9.2. Research grants should cover all costs. The rules for research grants allocated on a competitive basis should be revised, so grants cover the full costs of the institution, including the case private industry is co-financing the projects.
10. A general consensus among the interview partners was achieved on the need of cross-funding concerted programmes, fostering trans-community/regional co-operation among research teams, either public or private. To this end, the concerted programmes could work under the same principle used in the IUAP scheme, i.e. with federal funding and selection at community/regional level, or under the “virtual common pot” principle successfully tested within the EU ERA-NET scheme, i.e. each community/region funding its own participants.
11. The Barcelona goal of 1% of GDP for public funding in 2010 should be met. In relation to this:
- 11.1. Fundamental (basic) research needs to be reinforced, especially in view of the increasing need to support and strengthen research infrastructures and equipment necessary to carry out excellent research.
 - 11.2. Strengthen and extend existing policy measures providing long-term financing of excellent research groups.
 - 11.3. Set up concerted support to large scale research infrastructures
 - 11.4. Support strategic frontier (either basic or applied) research.

Education and training

12. English taught Bachelor and Master Courses are a prerequisite for attracting foreign students who want to build an international (English-based) curriculum. Most universities in Belgium have only few university Bachelor and Master courses taught in English (depending on the orientation). This is a barrier for attracting foreign students and professors. Based on experience and objectives in other countries, one could aim at 25 % to 50 % of total Bachelor and Master courses being taught in English after 10 years. In addition, this could facilitate cross-community cooperation within the Belgian STI-system. If language laws are prohibiting or limiting the use of English in the Bachelor and Master courses, perhaps these laws should be reconsidered in view of the missed opportunities.
13. In relation to the challenge of ‘life-long-learning’ Belgium should open universities for a ‘life-long-learning’ programme paid by companies or the students; this could further stimulate the dissemination of knowledge to society. Such programmes could be set up as industrial R&D cooperation programmes.

¹⁰ Like it is the case in Denmark for 2010.

Scientific career and mobility

14. Grants for rewarding the best PhD students' positions as Postdocs or Professorships should be made available and the best performing Postdocs and Professors should be rewarded with bonus arrangements or higher salary. Quality research requires that the university can award the best researchers permanent positions either as Postdocs or Professorships. Part of the salary could be related to performance contracts, of which cooperation projects with industry should be integrated. Flexibility in payment policies at universities should as such be further increased (also in order to be able to deal with the problem of 'brain drain').
15. Special attention should be paid to the capacity of the Belgian universities and public research organisations (PROs) to create stable job research positions for the incoming researchers. This is relevant since the basic public funding appropriations for universities are mainly determined by the number of students, rather than by the amount of researchers or the outcome/output.
16. In relation to inter-sectoral mobility (from academia to industry) the creation of technological and research job positions in the private sector should be fostered and initiatives to this end should be strengthened. Since the Belgian industrial tissue is dominated by low and medium-tech SMEs, not all of these have research units capable of absorbing academic engineers or researchers.

Valorising research and technology transfer: increasing the private R&D effort

17. One important way to increase the attractiveness of Belgium for international technology firms is to further develop the excellence and the international ranking of first class university research. This leads to increasing funding for basic research, but also looking for means to actively promote the (outward oriented) international prestige of public research.
18. In addition to direct public research support, the decision-making process of MNCs can be influenced by fiscal measures including tax reductions on direct R&D investments, R&D labour and on sales of "new to the market" and "new to the firm" products and services. This may help to increase the country's attractiveness for R&D intensive MNCs. Moreover, actions to strengthen the creation and reinforcement of subcontracting chains of large MNCs, could help as well.
19. A combination of direct subsidies with conditional loans to carry out research projects together with indirect support offering specialised consultancy services (i.e. international project management, technological surveillance,...) could be useful for medium and high tech SMEs in specialised sectors. Supportive services should not be 'forgotten' in the policy mix, especially in view of the large number of SMEs in Belgium.
20. Awareness campaigns addressed to traditional and low-tech SMEs on the benefits of accessing and applying R&D as well as direct subsidies to hire engineers and researchers, using high-tech SMEs as mentors or good practice examples, can be used to increase the absorptive capacity of these traditional SMEs. Currently, these measures do already exist to some extent.
21. A more appropriate policy mix, consisting of truly adapted types of different measures, depending on the targeted groups of business, could be either set up or strengthened in order to increase BERD.

22. It should be considered whether fiscal measures on R&D labour (researchers) should/could be extended to all technology-oriented companies as a stimulus to further increase private R&D efforts.

Valorising research and technology transfer: ISL and creation of NTBFs

23. It could be considered to allow individual rewards (i.e. a salary allowance as a percentage of total generated income) for researchers that get contracts from either public or private sources on a competitive base. The implementation of this type of measures could certainly have an impact to go into a contract research organisation model for universities or PROs, fostering knowledge exploitation. In addition this type of measures could cope with the problem of low wages for professors and researchers at universities and public research organisations.
24. Public co-financing of participation in private and public international research programmes/initiatives/cooperation/... should further be enhanced. Especially within the EU framework programme on R&D a number of co-financing schemes from the federated entities or the federal authority should be considered.
25. Public co-financing of cross-community R&D and/or cross-regional innovation projects/programmes of universities, PROs or knowledge institutions (involving the private sector) should be stimulated.
26. Programmes to promote the creation and consolidation (up to 5 years after their creation) of new technology based firms (NTBF) have first to be evaluated and next strengthened. Measures to stimulate entrepreneurship among researchers and professors could include mechanisms to guarantee the possibility to go out from their institution to set up a NTBF while keeping their position at the institute allowing them to possibly re-gain their position.
27. Another way to develop the linkages between the science base and the industry and to increase P2P and networking, could be the implementation of market pull programmes, rather than technology push, on the innovation needs of the significant number of medium and high tech SMEs (whose decision making centres are in Belgium) and by way of mobility programmes to foster mobility from the academia or PROs to the industry and vice versa.

Annex 1- Program of the peer review and list of participants

Programme and background for Policy Mix review of Belgium 9 – 11
May 2007

Examining Team:

- Jens Peter Vittrup, Danish Agency for Science Technology and Innovation, Denmark
- Michael Rothgang, Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Germany
- Luis Delgado, Ministerio de Educación y Ciencia, Spain
- Patrick Vock, Center for Science and Technology Studies, Switzerland

Consultant:

- Arnold Verbeek, Senior Expert, IDEA Consult, Brussels

Observer:

- Marnix Surgeon, DG Research, Brussels

Organisation:

- Ward Ziarko, Head, department of Production and Analysis of R&D Indicators, Belgian Science Policy Office
- Bernard Delhousse, expert, department of Production and Analysis of R&D Indicators, Belgian Science Policy Office

Wednesday 9 May 2007

Time	Location	Focus <u>Introduction and the key concepts of the Belgian NIS</u>	Participants
17:00 – 17:45	hotel	Arrival (meeting at the hotel)	Examining team + Consultant
18:00 – 20:00	Espace Moselle	Informal presentation of the Belgian NIS (in presence of the Examining team, Consultant, Organisation, and members of the CIS/CFS)	
18:00 – 18:10	Welcome		
18:10 – 18:30	Introduction		Philippe Mettens (Belgian Science Policy)
18:30 – 18:45	Importance of the process and expectations		Bart Laethem (President of the CIS/CFS)
18:45 – 19:00	Modus operandi of the Peer Review		Arnold Verbeek (Idea Consult)
19:00 – 19:30	Belgian Policy Mix, Research and Innovation System		Claire Nauwelaers (MERIT)
19:30 – 20:00	Informal exchange of views. Questions and discussion.		Examining team + CIS/CFS + representatives of Ministers
20:30	Brussels	Diner	Examining team + Consultant + Organisation

Background Wednesday May 9

Introduction to the Belgian Policy Mix, Research and Innovation System

Evening - Day 0.

Presentation of the Belgian NIS and question round

Main challenges

Belgium shows a unique feature amongst all EU Member States, namely that it is the only country where most Science, Technology and Innovation policies are nearly completely decentralized across several governments enjoying full autonomy of decision power in such matters. This decentralized structure holds both promises and threats.

Decentralization allows for more direct policy interest, flexibility and support. The federal organization of Belgium allows each region and Community to take decisions according to its own specific challenges. This is well in line with the specificity of each regional innovation system. It helps fine-tuning policy instruments to real needs and to pursue voluntaristic objectives with a greater degree of social consensus. It is also likely to lead to a fragmentation of STI policy governance across the various governing entities. However, this organization is much less suited to deal with activities and spillover effects that span across borders. Such "bridging policies" could precisely be the most needed ones, in a system of innovation's perspective.

(Excerpts from the Report of the High Level Group 3% for Belgium)

The presentation during this kick-off meeting will be essentially factual, presenting the facts and figures of the Belgian NIS, the challenges, the results of a SWOT approach...

Participants

- **Mr. Philippe Mettens, President of the Direction Committee, Belgian Science Policy Office**

The Belgian Science Policy Office is responsible for the design and implementation of research programmes in support of the federal competencies. This includes applied research as well as fundamental research. It oversees the federal public research institutes and runs the Belgian international space activities.

- **Mrs. Claire Nauwelaers, MERIT**

*Senior Research Fellow at MERIT since 1996. She is responsible for one of the research line of UNU-MERIT: "**The governance of science, technology and innovation**". Main areas of research and expertise involve the analysis and policy advice on innovation systems and research, technology and innovation policy.*

- **Mr. Bart Laethem, EWI, President of the CIS-CFS**

The CIS-CFS is a consultative board where all the authorities responsible for scientific policies meet. It deals with situations that have to be dealt with at a national level (CFS) and prepares the Belgian points of view regarding international matters [CIS]. Presidency is attributed to a different authority every 6 months.

Thursday 10 May 2007 a.m. – Institutional and structural aspects of the Policy Mix

Time	Location	Focus on the <u>Mechanisms of Information Exchange and the Building of a Policy Mix</u>	Participants
9:00 – 10:45	Espace Moselle	A1. Existing platforms and cooperation with each other	- Rudy Aernoudt (EWI) - Xavier Dehan (IRSIB) - Richard Martin and Etienne Cools (French Community) - Philippe Mettens and Ward Ziarko (BELSPO)
10:45 – 11:00	id.	Coffee	
11:00 – 12:45	id.	A2. Belgian Policy Mix: how are research policies and priorities defined?	- Dominique Graitson (CWPS) - Danielle Raspoet (VRWB) - Jan Cornelis (FRWB) - M. Denayer (CCE/CRB) - Paul Van Snick (CSP ^{BCR})

12:45 – 13:30 Lunch for the Peers at the Espace Moselle

Thursday 10 May 2007 p.m. – Can an adequate Policy Mix reinforce the Belgian Public R&D in globalised framework?

Time	Location	Focus on <u>R&D in universities</u>	Participants
13:30 – 15:00	Espace Moselle	B1. Fundamental research: funders and clients	- Elisabeth Kokkelkoren (FNRS) - Benno Hinnekint (FWO) - Joseph Martial (ULg) - Dirk Van Dyck (UA)
15:00 – 16:00	id.	B2. Mobility of researchers and career plans	- Pierre Feyereisen (UCL - Objectif recherche) - Jan Danckaert (VUB - Focus Research) - Didier Flagothier (BELSPO)
16:00 – 16:15	id.	Coffee	
16:15 – 18:00	id.	B3. Excellence in public R&D vs. brain drain: an important clients' view	- Karen Haegemans (EWI) - Emmanuelle Javaux (ULg) - Roger Bouillon (KULeuven) - Marcel Crochet (UCL) - François De Schutter (VITO) - Christian Delporte (FUCaM)
18:00 – 18:30	id.	Discussion on impressions of the day and debriefing – preparation for tomorrow	Examining team + Consultant
19:30	Brussels	Diner	Examining team + Consultant + Organisation

Background Thursday May 10 a.m.

Institutional and structural aspects of the Policy Mix

Day 1. Focus on Mechanisms of information exchange and the building of a Policy Mix Session A1. Existing platforms and cooperation with each other

Statement for debate

“Policy orchestration’ among the various federated entities today 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. Policy orchestration can come in various forms, like networking, communication, and frequent interaction” Do you agree ?

Questions on this topic are related to the *modus operandi* of policy orchestration bodies.

- *Considering the current policy orchestration efforts (and policy context), is more ‘content-driven’ policy orchestration needed and why?*
- *If it is needed, what might be suitable instruments/approaches to achieve this without distorting the current political reality (is there an optimum and how can it be found?). In other words, what are the opportunities in this respect for Belgium and how have the peer countries dealt with similar challenges?*

Participants

- **Mr. Rudy Aernoudt – Secretary-General of the EWI**

EWI is the Flemish Government’s Department for Economy, Science and Innovation..

- **Mr. Michel Charlier – Director-General of the DGTRE**

*DGTRE is the **Error! Hyperlink reference not valid.***

- **Mr. Xavier Dehan – Adviser in the Cabinet of Benoît Cerexhe**

Adviser in the Cell Scientific Research for the Minister of the Region of Brussels-Capital in charge, among others, of Economy, Employment, Scientific Research...

- **Mr. Richard Martin, Director at the French Community**

Responsible for Scientific Research in the DG Non mandatory Education and Scientific Research. This DG supervises fundamental research and the FNRS (Fund for Scientific Research of the French Community)

- **Mr. Philippe Mettens - President of the Direction Committee, Belgian Science Policy Office**

The Belgian Science Policy Office is responsible for the design and implementation of research programmes in support of the federal competencies. This includes applied research as well as fundamental research. It oversees the federal public research institutes and runs the Belgian international space activities.

Day 1. Focus on Mechanisms of information exchange and the building of a Policy Mix Session A2. How are research policies and priorities defined?

Issues for debate

Policy development is a challenging task in a multi-actor and multi-entity environment like Belgium. To what extent do we really find the different steps in the 'policy cycle' (from articulation and prioritisation of needs to evaluation and reformulation of priorities) in Belgian policy making at different levels? 'Real' evaluation is not fully embedded everywhere, to some extent due to cultural reasons and characteristics. Policy initiatives are often 'reactive' instead of 'proactive', although increasingly use is made of foresight studies to look 'ahead'. Research priorities are mainly 'bottom-up' driven, although some thematic priorities are set, in one federated entity more than in the other. Strategic intelligence is not always available, just as the right 'evidence' is not always available when needed. The review should look at these mechanisms that lie behind policy development in Belgium today.

The urgency of the problems which confront the Belgian research and innovation system are, in the view of the HLG3%, still insufficiently recognized.

Questions related to this topic involve:

- *Is there a right balance between proactive and reactive, between bottom-up and top-down, between focus on technology versus focus on the market? How could it be found?*
- *Are the available mechanisms sufficient for Belgium in order to keep track of international development and opportunities?*

Participants

- **Mrs. Dominique Graitson - Secretary of CWPS**

The CWPS is a consultative board. Its function, among others, is to advise and to formulate recommendations on scientific policy for the Walloon government.

- **Mr. Jan Cornelis – FRWB**

Vice Rector for Research at the VUB (Vrije Universiteit Brussel) and Head of the ETRO department (department of electronics and information processing), member of the Federal Council for Science Policy (FRWB)

- **Mr. Luc Denayer – Secretary of CCE/CRB**

The Central Economic Council, as a consultative organ, organizes the dialogue and consultation between social and economic actors and partners (unions, ...), and delivers advices and reports to the Minister.

- **Mr. Paul Van Snick – Secretary of the CSP^{BCR}**

The Council for Science Policy of the Brussels-Capital Region is an independent body; it provides advice & recommendations to the government on its own initiative or upon request by the government.

- **Mrs. Danielle Raspoet – Secretary of the VRWB**

The VRWB is the advisory board of the Flemish government and parliament for scientific and technological matters (gives advices and recommendations, manages research...).

Background Thursday May 10 p.m.

Can an adequate Policy Mix reinforce the Belgian public R&D in a globalised framework?

Day 1. Focus on R&D in universities and the science base

Session B1. Fundamental research: funders and clients

Issues for debate

Fundamental research in Belgium is one of the missions of the universities. The Belgian level of education and the level of research are appreciated internationally. However, Belgian universities are not found high on the various international rankings (though the citation indices sometimes show some other, more optimistic, patterns). Often this is explained by referring to the lack of 'critical mass'. It is also often called for a reinforcement of the public R&D infrastructure (See Report of the High Level Group 3% for Belgium).

What is the share of competitive research among fundamental research programs? How can the funding of fundamental research take into account the current process of globalisation of R&D?

Furthermore, the crucial importance of sufficient funding for fundamental research is not just acknowledged by the public research actors, but also by private companies, who in the more mobile international knowledge environment of the 21st Century are looking for long-term access to fundamental research and human capital. It is important to realize from this perspective that companies are connected to fundamental research through several mechanisms. This question could also be addressed during this session of the Peer Review.

- *Is there a lack of critical mass, and if yes, how could Belgium deal with this challenge?*
- *Fundamental basic research is increasingly put under pressure in the sense that 'application' and the 'return' of this type of science should be shown faster; is this pressure legitimized and how can be dealt with it?*

Participants

- **Mrs. Elisabeth Kokkelkoren – External Relations manager, FNRS and secretary of the CReF**

The FNRS is the main institution for funding fundamental research in the French Community. The CReF is the Council of Rectors of the universities of the French Community.

- **Mr. Benno Hinnekint – Director, FWO**

The FWO is the main institution for funding fundamental research in the Flemish Community.

- **Mr. Joseph Martial - University of Liège (ULg)**

Professor at the University of Liège, head of the Laboratory of Molecular Biology and Genetic Engineering.

- **Mr. Dirk Van Dyck - University of Antwerp (UA)**

Professor at the University of Antwerp, Chairman of the Department of Physics at the University of Antwerp. Founder and head of the Vision Lab (UA)

Day 1. Focus on R&D in universities and the science base
Session B2. Mobility of researchers and career plans

Issues for debate

Mobility in general (in particular science-industry) seems to be perceived more as a 'cost' instead of an 'investment'. There seems to be a general absence of 'slack' in companies but also in research institutes that would enable people to 'move' around. Despite the fact that this is a problem of mentality, the government could and is already trying to change this attitude.

Several programs do exist in the different Regions and Communities to help the researcher go abroad and come back.

The peer review should look into the current instruments in place and should reflect on how mobility can be further supported (e.g. stimuli especially towards SMEs)? Other questions relate to the notion of research careers, charter of the researcher... For what concerns the career of the researchers, the question seem more related to giving opportunities to the researchers instead of giving 'ready-to-use' tenures or posts.

Participants

• **Jan Danckaert - VUB - Focus Research**

Professor in the faculties of Science and Engineering. Board member of Focus Research, the association of Belgian researchers, and member of advisory panels on science policy in Flanders.

• **Pierre Feyereisen - UCL - Objectif recherche**

Professor (Cognition and Development) and Research director at the FNRS. President of Objectif Research (the association of Belgian Researchers).

• **Didier Flagothier - BELSPO**

Responsible for the "Back to Belgium" grants at the federal level, scientific visa, Charter of the researcher and Code of recruitment.

Day 1. Focus on R&D in universities and the science base
Session B3. Excellence in public R&D vs. brain drain

Issues for debate

Despite the fact that this is/has been an explicit policy choice in the past, to embed universities locally (which has led to a large number of universities), the peer review should reflect on this. In particular, how can a country like Belgium increase its attractiveness and thus excellence, which could imply higher attraction of foreign students and researchers? Are current rationalisation efforts (in the context of Bologna) sufficient? Are the instruments offered in order to facilitate collaboration sufficient? Are they necessary?

'Internationalisation and rejuvenation' of the R&D system, also in the context of the ERA and the broader globalisation, is another challenging topic. Today there are language laws that limit the use of English in teaching and training. This makes inflow of foreign students (mainly at doctoral and post-doctoral level) rather difficult. Moreover, the application procedures for research funding prohibit the use of English as it would put local students in direct competition with foreign students. At the same time it is not common for Belgian researchers to go abroad for a number of years and build up international experience and networks. This may result in so-called 'inbreeding' and thus a lack of rejuvenation.

Considering the existing (and successful) programs to send the researcher abroad and to make her/him come back, a very natural question then arises: what next? The question of infrastructure for public R&D arises again (and the lack of public support, as stressed by the High Level Group 3%).

Participants

• **Mrs. Karen Haegemans - EWI**

Responsible for the Odysseus programme, aimed at attracting leading researchers from abroad.

• **Mrs. Emmanuelle Javaux - ULg**

Professor, Department of Geology of the University of Liege. (Did receive a "back to Belgium" grant to come back at the ULg)

• **Mr. Roger Bouillon - KULeuven**

Professor, head of the LRD Division Hormone Research Group.

• **Mr. Marcel Crochet - UCL**

Former rector at the Catholic University of Louvain-la-Neuve. Consultant for the Minister in charge of higher education and research at the French Community.

• **Mr. François De Schutter - VITO**

Responsible for the corporate scientific relations of VITO, a Flemish research institute active in the fields of environment, energy and materials.

• **Mr. Christian Delporte - FUCaM**

Professor, rector of the Catholic University of Mons.

Friday 11 May 2007 a.m. – How can the Policy Mix be improved in order to produce more and better R&D in the business sector

Time	Location	Focus <u>Increasing the private R&D effort</u>	Participants
9:00-11:00	Espace Moselle	C1. Generating a good R&D investment climate through a Policy Mix: an industrial perspective	- Reinhilde Veugelers (KULeuven) - Frans de Keyser (UEB) - Jean-Jacques Degroof (MIT) - Jeroen Deleu (CRIF) - Luc Desimpelaer (Barco) - Henri May (CERTECH)
11:00 – 11:15	id.	Coffee	
11:15-13:00	id.	C2. Cost vs. quality of research: can a Policy Mix be fit for SMEs and MNEs?	- Charles Bienfait (Solvay) - Stefan Gijssels (Janssen Pharmaceutica) - Pierre Hauser (GSK) - Jean-Louis Migeot (Free Field Technologies) - Marc Tombroff (Numeca)

13:00-14:00 Lunch for the Peers at the Espace Moselle

Friday 11 May 2007 p.m. – Valorising R&D and fostering technology transfer through a national Policy Mix settled in a globalised economy

Time	Location	Focus on <u>Developing Synergies between R&D Actors</u>	Participants
14:00-15:45	Espace Moselle	D1. Transforming R&D into concrete production	- Agnès Flémal (WSL) - Dirk Boogmans (GIMV) - Didier Granville (Samtech) - Luc Peeters / Eric Degroof (Innotek) - Paul Verdurme (IT-Partners) - Stéphane Waha (NCP – UWE)
15:45 – 16:00	id.	Coffee	
16:00 – 17:45	id.	D2. Spillovers of R&D and technology transfers	- Véronique Cabiaux (AST) - Claire Van de Velde (IBBT) - Rudy Dekeyser (VIB) - Michel Morant (Interface - ULg) - Johan Van Helleputte (IMEC) - Bart Van Looy (KULeuven) - Stéphane Waha (NCP – UWE)
17:45 – 18:00	id.	Debriefing and recommendations for the draft report	Examining team + Consultant

Background Friday May 11 a.m.

How can the Policy Mix be improved in order to produce more and better R&D in the business sector?

Day 2. Focus on Increasing the private R&D effort

Session C1. Generating a good R&D investment climate through a Policy Mix: an industrial perspective

Issues for debate

The R&D expenditure indicators would suggest that Belgium has not managed to fully turn around the declining trend and move towards the Lisbon goals and Barcelona 3% target. Belgium knows a specific situation: business expenditures on R&D depend to a large extent on a limited number of large firms (often international firms with foreign HQ – and thus where the decision power lies abroad). The peer review should look into the critical issues in the policy mix (also socio-economic conditions) to make this turn-around. Moreover, the review should look 'beyond' the 3% target and look into the potential choices and effects.

But, the 3% objective cannot be reduced to an investment cost target. The question must be considered of the potential results of such investments, of their efficiency. "Conducting research is ultimately all about taking risks. The only way to reduce those risks is by creating the proper framework conditions for R&D, innovation and entrepreneurship." (Excerpts from the Report of the High Level Group 3% for Belgium)

The hampering factors for the development of a well-performing innovation system seems to lie in Belgium primarily in elements outside the R&D system strictu sensu. From the evidence brought together in numerous analyses, the following appear of particular importance: Low entrepreneurship dynamics, weakness in intrapreneurship, firms' deficiencies in commercial management, Belgian SMEs lack absorption capacities to profit from external knowledge, change of mentality from "owning" a firm towards "managing" it and taking risks for innovation is needed, financing of innovative ventures is problematic...

Participants

- **Mrs. Reinhilde Veugelers - KULeuven**

Professor of Managerial Economics, Strategy and Innovation. Co-promotor for the Flemish Government "Steunpunt" on R&D Statistics, currently Economic Advisor at the Bureau of European Policy analysis (BEPA) of the European Commission.

- **Mr. Frans de Keyser –UEB**

General adviser at the Union of Enterprises of Brussels.

- **Mr. Jean-Jacques Degroof (MIT)**

Research Affiliate, focused on entrepreneurship as a source of technology innovation, spinning off new ventures from academic institutions.

- **Mr. Jeroen Deleu - Business Development Manager, CRIF**

The mission of the CRIF is to support our members, mainly industrial SMEs, to increase their competitive position on the international market through technological innovation.

- **Mr. Luc Desimpelaer - Barco**

Director Innovation programme, Corporate research.

- **Mr. Henri May – Director-general of CERTECH**

The Centre of Technological Resources in Chemistry (Certechn) offers R&D services to a broad range of industries directly or indirectly involved with chemical technology.

Day 2. Focus on Increasing the private R&D effort

Session C2. Cost vs. quality of research: can a Policy Mix be fit for SMEs and MNEs?

Issues for debate

In the Report of the High Level Group 3% for Belgium, we find: 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. It undermines the career attractiveness of research, reinforces the brain drain, and is likely in the long term to lead to major shortages in research human capital; 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. Could this be nuanced? Are such statements still valid? What can be done?

The major discrepancy between the net income earned by researchers and the gross labour costs for R&D personnel incurred by firms undermines Belgium's long standing competitive advantage in business R&D intensive activities. If it is not addressed as a matter of urgency, the whole Belgian Innovation System will be severely weakened even be put in jeopardy. The challenges are multiple: attracting new R&D investors in the country, promote further investments from existing R&D-active firms, induce companies not yet involved in R&D activities to follow this route. Public authorities have some levers at their disposal to support these goals: through notably fiscal incentives, they can act on research costs, of which the main components are salary costs.

“Private R&D has become by and large a mobile production factor, with firms locating such activities where the local conditions appear optimal” (Excerpts from the High Level Group 3%).

Knowing that the R&D strategies of large (international) R&D players in Belgium in many cases are decided upon abroad, the peer review should consider how Belgium could respond to this?

- *How could internationalisation go ‘hand-in-hand’ with keeping R&D activities here in Belgium by keeping the decision centres here?*
- *Are the right instruments/conditions in place?*
- *Is there a real trade-off between quality and cost of research?*
- *Can we design a Policy Mix fit both for SMEs and MNEs? Are MNEs sensitive to a national Policy Mix, as strategies are rather international than national?*

Participants

- **Mr. Charles Bienfait - Solvay**

Director New Technologies, Solvay headquarters.

- **Mr. Stefan Gijssels - Janssen Pharmaceutica**

Vice President, Public Affairs and External communication.

- **Mr. Pierre Hauser - GSK**

Director, R&D Knowledge Management & Scientific communication.

- **Mr. Jean-Louis Migeot - Free Field Technologies**

Director General. Free Field Technologies is involved in multiple research programs in acoustics, aero-acoustics, vibro-acoustics, high-performance computing etc.

- **Mr. Marc Tombroff - Numeca**

Director General. NUMECA is a provider of computational fluid dynamics (CFD) software and consulting services worldwide.

Background Friday May 11 p.m.

Valorising R&D and fostering technology transfer through a national Policy Mix settled in a globalised economy

Day 2. Focus on Developing synergies between R&D actors

Session D1. Transforming R&D into concrete production

Issues for debate

This peer review should look into the alleged ‘misfit’ between scientific/technological excellence and economic performance.

- *How should this misfit be interpreted?*
- *Is it a result of the ‘absorptive capacity’ of Belgian industry, which is mainly composed of (traditional) SMEs?*
- *Are the consultation channels for industry sufficient?*
- *Does the public research base take industry needs sufficiently into account?*
- *Is there a power balance between academic – industrial actors?*

‘Open innovation’ plays an increasingly growing role in today’s STI landscape. It offers many opportunities. Companies are increasingly convinced of opening their ‘boarders’ and sharing knowledge with others in order to find new combinations (collaboration). One could speak of generic knowledge that is developed in a pre-competitive phase, after which companies can take the elements they need and translate them into their products and services. This appeal on the capacity to ‘plug in’, to intelligently manage IP, to translate the general knowledge into company specific knowledge (in SMEs too). Market intelligence becomes crucial as well to timely identify opportunities. How should/could policy react to this new paradigm? Do the current policy choices respond to these developments (including on collaboration)?

Participants

- **Mr Agnès Flémal – Wallonia Space Logistics**

General manager of the WSL, incubator in the Region of Liège and active in space (high) technologies.

- **Mr. Dirk Boogmans - Executive manager of GIMV**

A Belgian investment company specialized in private equity (start-up companies and SMEs in traditional and innovative industries, in Belgium or abroad).

- **Mr. Didier Granville - Samtech**

Marketing Director of SAMTECH, an ‘old’ spin-off providing simulation software for Finite Element Analysis and Optimisation. Founded in 1986 from the Aerospace Laboratory of ULg.

- **Mr. Luc Peeters/Eric Degroof - Managing Director/Technology manager of Innotek**
Innotek’s main objective is to help and stimulate innovation, entrepreneurship and technology in start-up companies and existing SME ’s in the province of Antwerp.

- **Mr. Paul Verdurme – Investment managers, IT-Partners**

Belgian limited liability company, venture capital fund focusing on investments in companies in the ICT sector.

- **Mr. Stéphane Waha (NCP – UWE)**

National Contact Point for the FPs at the UWE (Union wallonne des Entreprises, association of the enterprises of the Walloon Region), support and partnerships with enterprises.

Day 2. Focus on Developing synergies between R&D actors

Session D2. Spillovers of R&D and technology transfers

Issues for debate

The extremely high degree of openness of the Belgian economy has a crucial impact on the Belgian NIS. Belgium is particularly characterized by the large presence of subsidiaries of multinational companies, whose R&D and innovation activities are less easily translated fully into domestic economic impact indicators, while patenting of inventions originated in Belgium can occur elsewhere through parents of multinational companies. Some studies have shown that the benefits of the presence of subsidiaries of multinational corporations in the country depend on the quality of the host environment, and most notably, on the technological competence of indigenous firms.

Belgium benefits from its openness, through access to international technology markets, but the appearance of a virtuous circle of technology and innovation spillovers between foreign subsidiaries and domestic firms is far from automatic: it will only be present if the subsidiaries are integrated both into their international corporate network as well as into the domestic economy. A further prerequisite for spillovers from foreign subsidiaries to the domestic economy is an adequate technological and innovative potential in the local economy, ensuring the necessary absorptive capacity. Thus, weak innovation performance in domestic firms impacts negatively on the development of spillovers from multinational corporations.

Participants

- **Véronique Cabiaux – Director AST**

AST is the Agency for technological stimulation, created to follow the recent Marshall Plan aimed at fostering innovation in the Walloon Region. Former vice-rector for research at the ULB.

- **Claire Van de Velde - IBBT**

Director Technology Transfer and Business Development at the Interdisciplinary Institute for Broadband Technology, a research institute founded by the Flemish government.

- **Rudy Dekeyser - VIB**

Vice-general director of the Flanders Institute for Biotechnology, a non-profit scientific research institute.

- **Michel Morant - ULg**

Managing Director of University-Industry Liaison Office of the University of Liege.

- **Johan Van Helleputte - IMEC**

Vice President Strategic Development.

- **Bart Van Looy - KULeuven**

Professor of Managerial Economics, Strategy and Innovation. Member of the European Institute of Advanced Studies in Management and of the board of the European Academy of Management.

- **Stéphane Waha - NCP – UWE**

National Contact Point for the FPs at the UWE (Union wallonne des Entreprises, association of the enterprises of the Walloon Region), support and partnerships with enterprises.

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Annex 2- Background report for Belgium

CREST- OMC Policy Mix Review

Background Report Belgium

Draft

**IPTS
ERAWATCH Framework Service Contract
Nr -150176-2005-F1SC-BE**

Prepared by:
Arnold Verbeek
IDEA Consult (Brussels) with contributions from IPTS

April 2007

Disclaimer. *This Background Report is intended as an input to the Peer Review due to be held in Belgium, on May 9-11, 2007. This report is intended to generate discussion and exchange during the Peer Review of Belgium and can by no means be considered as representing a definitive sum of knowledge.*

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1 Introduction

In 2003, the EC launched “Investing in Research: an Action Plan for Europe” as a means of achieving the objectives defined in the “Lisbon Agenda”. This so-called “3% Action Plan” describes a series of Action Lines designed to raise GERD to 3% of GDP. Some Action lines are being implemented through the “Open Method of Coordination” (the OMC process). This is a Member State driven process, overseen by CREST and facilitated by the EC, whereby countries formulate actions based on mutual learning and the exchange of best practices. For the third OMC cycle CREST decided to implement a new series of peer reviews covering Belgium, Estonia, Lithuania, France, the Netherlands and the UK. The overall aim of the peer reviews is to contribute to the work of the Expert Group on Policy Mixes and the implementation of specific Action Lines of the 3% Action Plan.

This background report is written to support the peer review of Belgium that will take place on 9-11 May 2007 in Brussels. In a nutshell it provides an overview of the innovation system in Belgium, the main challenges and the policy response to these challenges (*this report serves as input to the Peer Review process and is not intended to be exhaustive*). Belgium is a Federal State with various levels of Authority (Federal Government, the Regions and the Communities) all holding specific responsibilities for STI policy development and deployment. In view of this multi-level context it is quite challenging to arrive at synergies.

Before proceeding with the more detailed discussion, a summary of several main findings will be presented¹¹.

- Belgium is a rich, well-located, service-oriented and densely populated country with high labour productivity rates (although slightly decreasing over time). Belgium is also an extremely open economy (export shares exceeding 70% of GDP) dominated by a small number of multinational companies. The social security system is well developed but at the same time has become quite expensive with the ageing of the population. As a result this translates into high salary costs¹² putting pressure on the competitive position of Belgium.
- Belgium and all the levels of Authority are fully committed to the Lisbon objectives. R&D policy is given a high status in the National Reform Programme. The Regions put their own, nevertheless complementary, emphasis on various objectives and policy dimensions. The progress report 2006 indicates that Belgium is on the right track in achieving its longer term objectives (confirmed by the positive evaluation in the OECD Economic Survey of Belgium 2007).
- Belgium’s overall innovation performance (based on the Summary Innovation Index for 2004¹³) is relatively positive with an above average position when compared to both the EU25 and EU15. However, when looking at the traditional indicators, Belgium seems unable to fully profit from the high levels of BERD, the high level and quality of scientific performance in specific fields, and the available technological strengths. Mismatches and underlying collaboration shortcomings between the various innovation players (and federated entities) are suggested. As such diffusion and spillovers between actors need to be stimulated.

¹¹ Based on among others (frequently used sources throughout the remainder of the report): 1) European Innovation TrendChart, Country Report Belgium, 2) High Level Group 3%, final report, 3) European Commission (2006), “Monitoring and analysis of policies and public financing instruments conducive to higher levels of R&D investments”, the “POLICY MIX” Project, by: C. Nauwelaers.

¹² In 2003, fiscal and para-fiscal pressure on labour costs amounted to 43.2% of salary costs in Belgium, compared to 38.4% in neighbouring countries (Prime Minister Chancery Office 2005).

¹³ European Innovation Scoreboard, 2005.

- Gross domestic expenditure on R&D is declining since 2001 and has reached a level of 1.9% in 2004 (slightly above the EU mean). However, enterprise expenditure (BERD) is higher than the EU-average. Projections show that, if the current trend is remained, the explicitly supported 3% target by the Federal government will not be reached. A skewed industrial landscape (a few large firms and many medium to small size companies) and a subsequent skewed private R&D expenditure pattern (large companies being the main spenders) make the overall R&D profile quite fragile.
- Despite relatively strong performances with respect to the quality of human resources (well-educated population, high investments in higher education, high number of S&T workers) several challenges remain. Examples are, lifelong learning, labour costs, career perspectives for researchers and mobility, and stimulation of entrepreneurial spirit throughout various levels of education.
- Framework conditions are also of major importance, especially removal of administrative barriers, innovation impact of regulations and the promotion or establishment of suitable risk capital. Quite some work is carried out in this respect on the levels of the Regions as well as on the Federal level.

The peer review process is steered by the CIS/CFS committees (see next chapter) and is facilitated by the by the Federal Science Policy Office (www.belspo.be) The CIS/CFS committees have requested to particularly emphasize the following issues during this peer review:

In relation to ‘innovation governance’:

1. *Coherence and cohesion of the various decision making bodies*
2. *Belgian NIS in a globalise world – mechanisms for policy development*

In relation to ‘resources for R&D’:

3. *Human Capital (more and better qualified researchers)*
4. *Valorising research and technology transfer*

In view of the specificity of Belgium as a Federal State we will first briefly describe the competences of the authorities responsible for science, technology and innovation matters (see next chapter). The remainder of the report is structured around a fairly simple model of an innovation system, specifically one that considers four basic domains within an overall innovation system and the links and flows between them:

- The Science Base
- Business R&D and Innovation
- Human Resources
- Economic and Market Development

The final chapter highlights a number of issues/challenges that should be further discussed during the peer review.

2 Setting the stage: STI governance Belgium¹⁴

Authorities and competences

The process of turning Belgium into a Federal State has taken place in five main phases of institutional reforms in 1970, 1980, 1988/89, 1993 and the latest in 2001 (touching mainly competences in foreign trade, agriculture and development). These progressively put in place the legal framework and the institutions necessary for the establishment of a Federal State composed of largely autonomous entities linked to each other through their membership of the Federal State. Each “federated” entity and, equally, the Federal State, have exclusive powers in a number of areas. There is no hierarchy between the powers of the Federal State and those of the federated entities. The federalisation process of the country is structured along two main lines.

- The first relates to all matters linked to the “people”. Because of linguistic and cultural diversity in the country, composed of Dutch-, French, and German-speaking populations, the need was felt to arrange the allocation of powers in “personal” matters to specific entities, the Communities. The Communities are thus founded on population groups rather than on territories. The majority of competence areas involving linguistic, personal and cultural concerns, among which education is a major one, are placed under the responsibility of the Communities.
- The second relates to economic matters, broadly defined. Driven by the desire for more autonomy in the regional economies. Belgium has been divided into three Regions, defined on a territorial basis: Wallonia, Flanders, and Brussels-Capital. Economic development, land planning, environment, natural resources management and recently agriculture are among the major competencies of the Regions.

The Federal State retains competences in areas of national and international interest, such as defence, justice, monetary and fiscal policy, social security and important parts of health policy. Belgium is thus composed of seven autonomous, but related entities: the Federal State, the three Regions and the three Communities. Each entity elects its own government and Parliament and establishes all regulations and institutions necessary to ensure effective government within its realm of responsibilities. In practice the Flemish Region and the Flemish Community have merged their government and institutions (parliament, administration, advisory bodies), which are referred to as the government and the institutions of the Flemish Community. Following successive institutional and constitutional reforms in Belgium the allocation of competences in STI matters between the various entities of Belgium has been established as follows: the “primary” responsibility for STI policy is conferred on the Regions and the Communities within their own areas of competences. As an exception to this general rule a number of competences involving scientific research are entrusted to the Federal government (appendix A provides a visualisation).

The Communities are competent in the following areas:

- Research related to education, culture and other individual matters, such as health policy, and personal assistance. This covers both research in these areas as well as research conducted by organisations of the sectors concerned, namely universities and other higher education institutes. One can thus say that Communities have the main responsibility for fundamental research in universities and applied research in higher education establishments.

The Regions are competent in the following areas:

- Research related to the economy, energy policy, public works, environment, transport and the other regional competences. This covers, among others, support for basic technological and industrial research, the development of new products and production processes, the distribution and transfer of technologies and technological innovation. In short, Regions have the main responsibility for economically oriented research, technological development and innovation promotion and regional scientific institutes.

¹⁴ Source: document provided by the Belgian Science Policy Office: “The competences of the authorities in Belgium responsible for scientific research”.

The Federal State is competent in the following areas:

- Scientific research necessary for it to perform its own general competences including scientific research aimed at the execution of international or supra-national agreements;
- Space research within an international framework;
- Federal scientific institutes.
- It can also act in agreement with the Communities and the Regions on the following:
- Programmes and actions requiring homogenous implementation at national or international level;
- Maintenance of a permanent inventory of the country's scientific potential;
- BELNET, Belgian national research network providing high-bandwidth Internet connection to Belgian universities, colleges, schools, research centres, and government departments;
- Belgian collaboration in activities of international research bodies;
- Any action in areas belonging to the competences of the Communities or Regions, and which furthermore are either related to an international agreement or refer to actions and programmes going beyond the interests of one Community or one Region.

Thus, the distribution of responsibilities in STI across the various authorities in Belgium follows the logic of fields of competences, rather than one of players. This is well illustrated by the case of universities, major players on the science and research scene in Belgium. Whereas the Communities are competent for research at universities and higher education establishments and administer the basic allocations to these organisations, the Federal State and the Regions can also call upon educational institutes for STI activities in their own realm of competences. Concretely, this means that universities may receive funding from the Federal State, the Regions and the Communities (according to their location and their linguistic regime), but for different purposes and with different conditions attached to the finances received.

Administrative level

- On the Federal level, the Belgian Federal Science Policy Office comes under the authority of the Minister of Economy, Energy, Foreign Trade and Science Policy. It attends to horizontal duties involving coordination and programming at the Federal level. It also funds research programs (applied, fundamental and technology platforms).
- In Flanders we find the Economy, Science and Innovation Administration of the Ministry of the Flemish Community which has the task to: prepare, execute and support the policy of the concerned ministries, attending to horizontal coordination, handling federal and international cooperation, listing, analysing and evaluating research, and promoting science and technology towards the general public.
- In the Walloon Region the Directorate General for Technologies, Research and Energy is responsible for preparing and executing the Region's R&D policy and programmes; development of projects, management and follow-up of funding awarded to universities, research centres, companies, higher education colleges and independent investors; federal and international cooperation; coordination of data concerning research supported by the various administrations of the Walloon Region.
- In the French Community it is the Directorate General for non-obligatory Education and Scientific Research (DGENORS) of the Ministry of the French Community that prepares and executes science policy. It deals with funding of university institutes, funds for basic research (F.R.S.-FNRS and associated funds), concerted research actions and the special fund for research in university institutes as well as the funding of higher education colleges.
- In the Brussels-Capital Region, the ISRIB, the "[Institute for the encouragement of Scientific Research and Innovation of Brussels](#)" has been recently created mid 2004 with the mission to promote, support and valorise scientific research and technological innovation in the Brussels-Capital Region. The institute has the task of promoting the development of new activities (prototypes, new products and processes, spin-offs) in the Region by awarding subsidies or interest-free loans and consolidating the presence of innovating activities already in existence; moreover, to provide follow-up on international programs in the area of scientific and technical research.

Co-ordination and co-operation among the authorities

Belgium knows various consultative (and co-operation) bodies involving the Federal government, the Communities and the Regions. The most important one is the Inter-Ministerial Conference on Science Policy (IMCSP), the consultative body between the various authorities. It is composed of those members who have responsibility for science policy matters. It establishes co-operation agreements (including international affairs) and develops various procedures for co-operation and information exchanges between the various policy levels.

The IMCSP has established two permanent sub-committees: CIS (International Co-operation) and CFS (Federal co-operation). Although the work of the IMCSP focuses on research, the work of the two specialised CIS/CFS committees does however touch on innovation policy as well¹⁵.

Advisory bodies

Each authority has its own advisory bodies on S&T policy making involving various stakeholders.

- The Federal Council for Science Policy (CFPS-FRWB) is an advisory body made up of representatives from academic, scientific and socio-economic circles. It advises the Federal Government on issues of co-operation among the various authorities, science policy issues for the nation as a whole, and scientific policy issues falling within the competence of the Federal Government.
- In Flanders, it is the Flemish Council for Science Policy (VRWB) which consists of representatives from academia, industry and government. It formulates advice and recommendations on request or on its own initiative. The VRWB will be transformed into the Strategic Advisory Council for Science and Innovation
- In Wallonia the Council for Science Policy in the Walloon Region (CWPS), consisting of representatives from industry, trade unions, academia and research centres, advises the Government on R&D policies. A new Council has been created recently to perform the same role towards the French-speaking Community.
- The French Community has an organ that has some missions of scientific policy. It is the C.I.U.F (Conseil Interuniversitaire de la Communauté française – Interuniversity Council of the French Community). Its missions include: giving advice, organizing dialogue between university institutions, with students..., promoting collaborations, representing the French Community in relevant national and international bodies. The activities of the C.I.U.F. are centered on the scope of higher education (see statutes).
- In the Brussels-Capital Region, the advisory body is the Council for Science Policy of the Brussels-Capital Region (CSP^{BCR}) which formulates advice and recommendations, on its own initiative or upon request of a member of the Government, on the regional policy on science. The council is composed of representatives of Universities, Higher schools, industry and trade unions and completed by members or observers of the Government and collective research centres.

Funding bodies/other bodies

- The Institute for the Promotion of Innovation through Science and Technology in Flanders is a Flemish public body under the supervision of the Minister for Economy. It contributes to the preparation and execution of the Flemish Government's policy for promoting technological innovation by way of financial support, individual grants, dissemination of information, stimulation of network development and cooperation between companies, institutes and organisations, and the promotion of participation in international programs.
- The Fund for Scientific Research (FWO) in Flanders is a public-utility private body that grants research fellowships and provides financial support for university research. There are two associated funds. The fund receives contributions from both the Flemish Community and the Federal Government.

¹⁵ An initiative of the CFS/STAT group has been the development of the Belgian Report on Science, Technology and Innovation (BRISTI, in 2001). More informal ad hoc committees are also established, the most recent example being the High-level Group 3% Belgium.

- In the French Community the National Scientific Research Fund (F.R.S.-FNRS) is the integrated research funding agency for the promoting and the development of basic research. The resources available to the F.R.S.-FNRS consist of subsidies granted not only by the French Community but also by the Federal State and the Walloon Region. This public-utility private body awards research mandates (Ph.D., fellows, post-doctoral fellowships and tenure positions), finances a variety of activities (e.g. visits abroad) and funds research projects in universities and research institutes. F.R.S.-FNRS also has four associated funds dedicated to specific science area.
- Other administrative entities, administrations can act as funding bodies. Let us mention the IRSIB (Region of Brussels-Capital), the DGTRE (Walloon Region) or the Federal Science Policy Office.

3 Science Base (R&D Capacity)

3.1 Introduction

Gross domestic expenditures on R&D in Belgium amount to 1.9% in 2004¹⁶ representing a decline from the 2.11% reached in 2001, and placing the country slightly above the EU mean. Econometric projections carried out in 2001 showed that if current trends are maintained it will be impossible to reach the target of 3% by 2010. The decline is caused mainly by shrinking private R&D expenditures (from 1.54% of GDP in 2001 to 1.34% in 2003) and slightly decreasing public investments in R&D (in relation to GDP). Very recent figures however show a turnaround for the Flemish Region with again increasing levels of R&D spending¹⁷.

Policy declarations from various Belgian entities demonstrate a willingness to increase the importance of R&D in public policy. R&D policies are gaining momentum and receive increasing policy support in each of the Federated entities. Belgium chooses for a strong integration between science and education, meaning that fundamental research is mainly carried out at universities and not external research institutes.

This second chapter describes the main features of the science base particularly in the public sector research organisations. Business sector R&D will be discussed in Chapter 4.

3.2 Short sketch of the Science Base in Belgium

There are 16 universities in Belgium, seven of which are in the Flemish speaking Community and nine in the French speaking Community (four universities are present on Brussels ground). A large part of public (basic) research in Belgium is carried out in universities, which are major actors in the research landscape. In Belgium, education and fundamental research go ‘hand in hand’, an explicit policy choice. Furthermore, a significant amount of research is carried out at colleges, private non-profit organisation and large research centres with an international vision (IMEC, VIB...).

Belgium also has a well-developed network of collective research centres (the ‘De Groote’ centres) which have been established in the major industrial sectors, with industry financing. Flanders and Wallonia have invested in complementary public research centres with competences crossing over these traditional industry definitions (see also chapter 4). The “Interuniversity Attraction Poles” (IAP) Programme aims to provide support for teams of excellence in basic research that belong to Belgium’s various (linguistic) Communities. The federal government funds targeted programmes and administers a range of scientific institutes. A number of funds and public funding appropriations from Belgian authorities are dedicated to thematic priorities (see below).

All Belgian authorities have explicitly endorsed the Barcelona objective within their strategic policy guidelines. They are all promoting and informing RTD actors on possibilities for participation in European research programmes (National Contact Points) and support international technological partnerships through the action of the Innovation Relay Centres in the three Regions. Belgium is also an active participant in the EU RTD Framework programme ERA-NET actions.

¹⁶ Figures for GERD for 2004 and subsequent years are forecasts.

¹⁷ Flemish Policy Support Centre for R&D statistics. To be taken as very preliminary.

3.3 Indicators and Challenges

R&D investments as a percentage of GDP are only slightly above the EU average, whereas the share of public funding is significantly lower than the EU average (see Table 2, appendix). Publicly funded R&D amounted 1714 Millions€ in 2005¹⁸; these funds are allocated as follows: 26% as institutional funding to third-level education institutions and 12% for the large Research Funds which are (partly) allocated on a competitive basis, 13% to scientific institutions, 18% in the form of research action programmes, which are open to public research and/or private research performers, also including individual grants for researchers, 11% for industrial research (there is also private research funding in the previous line), and 13% for international research programmes. In terms of objectives pursued by the publicly funded research the following split is calculated¹⁹: 42% for technological objectives, 25% for non-oriented research at universities, 19% for the general funds at universities, and 9% for socio-economic objectives.

Belgian research quality is of high standard (just as the level of education is). In terms of the number of publications, Belgium can be placed in the league of Germany, Sweden and Finland. The publication output per capita has increased over time²⁰. In 2003 we find a performance of 11.62 publications per 10.000 inhabitants (this lies higher than the performance of France and Germany, but lower than the performance of The Netherlands and Sweden). The Flemish 'Katholieke Universiteit Leuven' is on the list of top-performers in Europe²¹ both in terms of output and citation impact (respectively 9th and 8th position) whereas the Walloon 'Université Catholique de Louvain-la-Neuve' can be found on the 6th position in terms of citation impact.

In terms of overall excellence (keeping other performance indicators into account as well), according to the Shanghai academic ranking²², we find 4 Belgian universities between the 101-152nd position (2 from Flanders, 2 from French-speaking Community - 1 from Wallonia and 1 from the Brussels Region). This may point to the rather fragmented university landscape (and thus lower critical mass), rather than to a lack of 'excellence'; efforts to 'rationalise' the university landscape are in progress (mainly in relation to the Bologna reforms).

3.4 Governance

Belgium has a decentralised decision-making and governance system for research funding. The Federal level provides funding for research of national and international interest such as security as well as for international research programmes such as space research. Funding for basic research is the responsibility of the Communities. This includes both institutional funding, competitive funding across universities, and support to individual researchers. More details are provided in chapter 2.

¹⁸ 2005 figures from the Federal Science Policy Office.

¹⁹ Erawatch Report Belgium (2006).

²⁰ Vlaams Indicatorenboek, 2005.

²¹ Third European Report on S&T Indicators, 2003.

²² the Academic Ranking of World Universities as compiled by researchers from Shanghai Jiao Tong University

3.5 Policy Objectives

The strategic aim of research policy in Belgium is in line with the Lisbon goals and with a view of reaching the Barcelona objectives. The following objectives are relevant²³.

- Increase the emphasis on the importance of science, technology and innovation activities in order to achieve the 3%
- Strengthen fundamental and strategic research in order to assure a basis for future development of the knowledge society goal (and thus also increase budgetary means for basic science)
- To open up policy to include international and especially European research cooperation dimension within the framework of the European Research Area and to facilitate access to international infrastructure
- Creation of Excellence Centres as needed in the perspective of the creation of ERA
- Increase linkages between actors in the R&D system by favouring collaboration and knowledge spillovers among all actors in the system

Key policy documents underpinning these choices have been produced in recent years by most Belgian authorities. The National Reform Programme for Belgium adopted at the end of 2005 provides a synthesis of the major axes in each entity.

More in detail, on the Federal level the Barcelona Objective of 3% as an official target is strongly endorsed. Furthermore, support of research of national and international importance through inter-Community research (IAP program) on themes under the Federal responsibility is pursued. Internationalisation of research and research mobility is also a key priority. The Flemish Community²⁴ puts emphasis on developing a strong knowledge base in the public sector and the valorisation of this base in society. ‘Open innovation’ is strongly supported. The Walloon Region also focuses on valorisation of research and industry science mobility schemes (to be discussed later). The French Community embraces the concept of ‘open science’. The Region Brussels-Capital has focused his efforts in an ambitious “Regional Plan for Innovation” embracing many aspects of fostering research, including clusters and mobility for example.

The main aim of the Communities is to finance fundamental research of high quality and to guarantee an excellent level of education for researchers.²⁵ Although some research topics do receive priority by the various entities, the thematic choices are left to the researchers and the focus lies more on the ‘quality’ of scientific research (‘bottom-up’ approach). There are three further principles to which the Regions and Communities subscribe, namely: promoting inter-university cooperation, promoting international mobility of researchers and including research in the European Research Area.

3.6 Policy Instruments

In Belgium research and education go ‘hand-in-hand’. The majority of university funding is so-called ‘block grants’ based on the number of students (by convention, about 25% of the institutional funding is considered devoted to R&D). The aim is to support fundamental research but universities may also use this funding for research with an economic finality. In the French speaking Community (Erawatch Report Belgium 2006), about 57% of the R&D budget goes directly to the support of the university and higher education institutions.

²³ European Commission (2006), Erawatch Research Inventory Report for Belgium.

²⁴ Policy Brief Economy, Enterprise, Science, Innovation and Foreign Trade 2004-2009 by the Minister.

²⁵ Regions are competent for research in enterprises, though they allocate funds to universities and sign research contracts with those research institutions.

The funding comes mainly from the Walloon F.R.S.-FNRS in and its associated funds, and the ARC in the French Community.

In the Flemish Community, the funding comes mainly from BOF (Special Research Fund) and FWO Flanders (and associated funds) which support fundamental research. There is also structural finance available and finance for specific sectors or projects as well as various smaller funds.

Funds are allocated following evaluation of proposals (occasionally involving international experts) and are thus ‘competitive’ in nature. Universities also receive further funding from other Belgian authorities for their research related activities as well as from other funds, notably the European Union R&D Framework programme. In more detail:

- Policy instruments at the Federal level include targeted research programmes in topics falling under Federal competences (like space research, information society, sustainable development, national cohesion and normalisation), support for participation in international research programs networks (financing of participation to the ESA research program – app. 136Mio€.) and infrastructure (EMBL, ESRF...), Federal science organisations, the “Inter-university Attraction Poles (IAP)²⁶” programme across universities of different linguistic regimes in Belgium and individual grants for researchers' mobility (“Back to Belgium”). It seems that that latter will not be prolonged in 2007.
- In Wallonia, main instruments on the public research side include: funding grants for research in universities and research centres, subsidies for technology development activities in research centres, notably through the support of technology guidance programmes that are open either to universities and research centres, or to companies, and sometimes to combinations of private and public actors. These programmes have, over the last ten years, notably covered ICT applications, Biotechnology, and Nanotechnology. The areas for these mobilisation programmes are chosen amongst the “40 key technologies” in which Wallonia has scientific and industrial expertise.
- The French Community funds fundamental research in universities and high schools through various channels, the main one being institutional funding for universities. Additional funding for researchers and research teams, based on competition, is channelled through the F.R.S.-FNRS and its associated funds (102 millions€ in 2007) Special Research Funds (13 millions€ in 2007) and Concerted Research Actions (13 millions€ in 2007) programmes.
- Flanders targets its funding through the establishment (in the beginning of the 90s) of major independent research centres, heavily supported by the regional government (IMEC in micro-electronics), VIB in biology, VITO in environment and energy, and recently IBBT in broadband technology and imaging (more details in the next chapter).
- In Flanders, the most important funding instruments for education and research in universities are: the operational subsidies for the universities (592Mio€ in 2005), the Special Research Fund (BOF, 233 Mio € in 2005) and FWO-Flanders (115Mio€ in 2005). The ‘Methusalem’ programme provides long-term funding to excellent research teams and the ‘Hercules’ fund supports large research infrastructures. Strategic basic research is also funded through a special programme (SBO) administered by IWT.

²⁶ This is a program funded by the Federal authorities with the aim of supporting collaborative research between universities across the two Communities. Funds are allocated on a competitive basis (28 MIO€).

- In the Brussels-Capital Region, instruments include subsidies and refundable deposits for industrial research and inventors, funds for technical feasibility studies, funds for filing and maintenance of patents and funds within universities programmes which aim at the launching of economically viable activities in the Region. The “Prospective Research in Brussels” programme supports projects which aid the development of the Region, whilst the “Research in Brussels” programme offers subsidies to attract foreign researchers to work in universities. The R&D budget of the region is a constantly growing one now.
- In research and technology prioritisation there is increasingly attention devoted to ‘prospective analyses’ (national and international developments). Both in Flanders (through the VRWB studies and ViWTA - the Flemish Institute for Research on Scientific and Technology Aspects) and Wallonia (DGTRE - Prometheus I and II, leading to the Marshall Plan) there is expertise in foresight exercises. In Brussels, prospective approaches are discussed between the minister, the CSP^{BCR} and the ISRIB; it provided most recently the research and innovation roadmap of the Regional Plan for Innovation. Increasingly this type of strategic intelligence finds its way into the policy cycle.

3.7 Policy Effectiveness

Effectiveness of policy is a relative concept when looking at the instruments and efforts. Several of the above mentioned instruments are recent and their effects still remain to be seen. Belgium shows relatively good levels of scientific output (and quality) but its success is increasingly threatened by low research investment, especially in the context of strongly increasing costs of research (state of the art). Moreover, high quality research (and education) is not directly translated in high positions on international university rankings.

The challenges remain and are even more relevant than before. As also pointed out by the High Level Group 3% Belgium²⁷ public investment in the research infrastructure is required. Furthermore the interconnection between science and technology and the economic structure needs further attention (as we will also see in the next chapter). Fragmentation of the institutional setting and financial resources pose serious challenges.

A more general comment with respect to accountability (e.g. in the sense of showing effect of various measures) is that only recently we can observe an increasing interest in the analysis of longer term policy effects. Systematic evaluations (although increasingly utilized²⁸) are still not structurally involved in the policy cycle. There is still reservation when it comes to practical application of evaluation (by externals).

Internationalisation of Belgian research and thus also participation in international programs (like the EU Framework Programs) remains challenging as well (intensity of participation in number of teams, number of researchers, number of leading promoter, amount of funds, etc.).

²⁷ Research, technology and innovation in Belgium: the missing links (report by the High Level Group 3% Belgium, Belgian Science Policy office (2004).

²⁸ A key priority for Flanders is the ‘rationalisation of public support and evaluation of public programs and actions’.

4 Business R&D and Innovation (Technological and Innovative Performance)

4.1 Introduction

Based on the NRP progress report (2006), Belgium is making ‘good progress’ towards achieving the Lisbon objectives. R&D and innovation in Belgium is mainly a decentralised competence. Fiscal measures and instruments, which are quite important in the efforts to further stimulate innovation, are a Federal competence. Public investments in R&D have risen lately in nominal terms.

The creation of clusters and competitiveness poles is recognised as an important tool to close the ‘gap’ between science and industry. However, the NRP progress report states that a more “comprehensive approach” to encourage international co-operation, to develop cross-border projects and clusters and to attract foreign investment is needed; especially as a rather small proportion of large (mainly foreign owned) companies in Belgium contribute strongly to R&D. The fluctuations business R&D investment over the last years is largely the result of changes in the investment behaviour of a small number of these companies.

In this chapter we shall provide a brief overview on business R&D and innovation in Belgium (including the ‘performance and challenges’). The level of discussion is the Belgian level (including the developments in the Regions and the Communities).

4.2 Indicators and Challenges

Business expenditure in R&D as a percentage of GDP amounted 1.31% in 2003 (forecast of 1.24 in 2005), a strong decline from 1.51% in 2001²⁹ (main sectors are electrical equipment and electronics, industrial and other chemicals and drugs and medicines, although the main activity in Belgium is situated in the services sectors). A large share of R&D (higher than the EU-average) is financed from abroad, as many international companies located in Belgium and performing R&D have their headquarters abroad.

Compared to other countries in the EU, the public sector in Belgium (higher education plus public research centres) performs little R&D (0.54% in 2001; only Italy, Portugal, Greece, Spain and Ireland had a lower intensity than Belgium). The relative shares of the Federal and federated entities in overall budgetary credits for R&D in Belgium are as follows³⁰: 50.27% comes from the Flemish Community (including Community and Regional competencies), 25.87% from the Federal state, 13.13% from the French Community, 9.49% from the Walloon Region, and 1.24% from the Region of Brussels – Capital.

Various analyses have pointed out the following challenges for Belgium³¹:

- Low levels of patenting may point towards a shortcoming in the exploitation of the rather strong science base and research capacity (although one should be careful when interpreting patent statistics). Furthermore, patenting activity is situated in domains and industries where no economic advantage can be observed, while comparative economic advantages can be observed in areas where there is no explicit technological strength (again; measured by patents). At the same time export figures in high-tech industries are low.

²⁹ Figures from the Federal Science Policy Office.

³⁰ 2005 figures from the Federal Office for Science Policy.

³¹ E.g. Bowen, Moesen and Sleuwagen 2006; Report of the High Level Group 3% for Belgium, 2005.

- Belgian R&D effort is sensitive to changes in the behaviour of a limited number of R&D intensive (high-tech) companies³² (even foreign companies)^{33, 34}
- Low entrepreneurship dynamics in the country is a barrier to the transformation of new knowledge in economic gain. While Belgium is quite successful in producing academic spin-offs, there is however a weakness in intrapreneurship: Belgian enterprises have no tradition to stimulate industrial spin-offs ('spinning-out').
- Financing of innovative (high-tech) ventures appears to be problematic (mainly at the expansion phase). The general availability of venture capital lies below the EU average in 2003³⁵. At the level of the funds themselves, there are problems of fragmentation and sub-critical fund size. Some investments, typically in the range of EUR 3 million do not meet the interest of investors. Especially in the high-risk high-tech ventures, the risk aversion seems to cause problems.

4.3 Governance

In addition to the explanation on governance provided in chapter 2, it should be mentioned that in the Region of Wallonia, two Ministers share to some extent the competence for innovation: the Minister for research and new technologies, and the Minister of Economy and Employment (the latter notably in relation to the creation of companies and cluster policy). In the Region of Brussels-Capital, such competences are in the hands of one sole minister under this government, namely the Minister responsible for Economy, Employment and Research.

Besides the formal coordination mechanisms on the informal side there is influence from interest groups, among which cross-sectoral national and regional employers federations and industry federations such as the federation of technology industries, AGORIA, and research centres federations such as ACCORD in Wallonia. The series of 'Pacts' concluded in the Flemish Region are an example of 'broad' stakeholder-involvement.

4.4 Policy Objectives

The main goal of R&D policy in Belgium is focused on becoming a more innovative economy, in line with the Lisbon goals and with a view of reaching the Barcelona objectives.

- Increase the emphasis (increase capacity and also foreign investments) on the importance of science, technology and innovation activities (of which research is a vital part) in order to achieve the 3% goal
- Creation of Excellence Centres as needed in the perspective of the creation of ERA (and in this context to contribute to the competitiveness of the economy)
- Increase linkages between actors in the R&D system by favouring collaboration and knowledge spillovers among all actors in the system

Between the different Regions and Communities different emphasis is put. As mentioned, the last S&T policy paper at the Federal level was presented by the then Minister of Economy and Scientific Research to the Council of Ministers on 20 July 2000. In this policy

³² Companies which have the largest amount of R&D include: Janssen Pharmaceutica, GlaxoSmithKline Biologicals and/or SmithKline Beecham Biologicals, U.C.B., AFGA-GEVAERT, Societe Internationale de Telecommunications Aeronautiques, Alcatel Bell, Siemens Atea, Alcatel Microelectronics, Solvay, Barco (Bureau du Plan, 2001).

³³ A dozen larger firms account for the lion's share of R&D expenditure and large firms (over 250 employees) contributed 66% of total R&D investments in 2001. Equally important is the geographical concentration of business R&D activity in a few provinces of Belgium and the dependence on two or three large R&D performers within many provinces.

³⁴ High Level Group 3% Belgium.

³⁵ Federaal Planbureau (2005), "Innovatie en O&O en de Belgische Gewesten in een Europees perspectief".

declaration, the Minister outlined a series of priorities for Federal Scientific Policy: Technology Attraction Poles (TAP) which involve the Collective Research Centres (“De Groote” centres); space research, technology and applications; tax deduction measures in favour of spin-offs and start-ups; promotion of the use of advanced information technologies.

The Flemish Community emphasizes innovation as a horizontal policy goal. The following priorities are put central: promote entrepreneurship and creation of critical mass in technology and innovation. Moreover, emphasis is put on the provision of adequate financial resources for innovative companies³⁶ (which is also a Federal priority). The recent socio-economic development plan for Flanders “Flanders in action” puts priority on “creativity, innovation culture and entrepreneurship”. A number of recent government declarations and stakeholder “Pacts” have set a number of ambitious goals (not always translated into operational goals and objectives).

The Walloon Region emphasizes the exploitation of public research outputs in the economic sector and enhancement of technology diffusion in companies (creation of new companies, organisational and managerial innovation linked to the use of ICT, organising the network economy, the increasing importance of the R&D and commercialisation functions in enterprises, marketing and design and management of IP).

With the recent “Marshall Plan” (2005) innovative public-private partnerships in key sectors are reinforced by the emergence of competitiveness poles, industry-science mobility schemes, and targeted R&D programs. Based on the TrendChart report Belgium (2005), in general one could argue that there are many objectives that are not always interrelated and or harmonized. As far as the Brussels-Capital Region is concerned, and as the need for enterprises to become more innovative and to increase investments in research had been mentioned in the general policy document “Contract for the Economy and Employment”, a rapid answer has been given by the “Regional Plan for Innovation” which has yielded support for the creation of clusters, “Impulse programmes” with targeted new calls for projects, a program for spin-offs and reinforced relations with higher education interface structures.

4.5 Policy Instruments

Policies to support R&D and innovation have been growing on the agendas of the various authorities in Belgium, but with different emphasis put on different aspects. The major changes to the broader innovation related policy mix since 2000 (TrendChart report Belgium, 2005) have involved a greater focus on networking and cluster policies (which, nevertheless, remain marginal in financial terms) as well as an effort to increase availability of venture capital for high-tech starters.

The Flemish Government and Agencies (like IWT) have developed a policy mix which concentrates support through a few key horizontal (non-thematic) measures targeted at specific bottlenecks in the innovation system and with a notable effort to encourage cooperation amongst actors (e.g. the VIS projects – Flemish Innovation Cooperation network). Nevertheless, through the strategic research centres, also ‘thematic’ priorities have been defined (see below).

³⁶ In the ‘Pact of Vilvoorde’ (2001), the agreements between the Flemish government and the social partners, several specific targets have been set: 1) to double the percentage of gazelles (fast growing medium sized enterprises) by 2010, 2) to be among the most competitive locations for foreign companies (investment quote among the top 5 in EU Regions by 2010), 3) to double the number of start-up companies launched by Flemish knowledge institutes (including Universities) and raise the share of turnover of Flemish companies generated by new products and services to 25% by 2010.

The Walloon approach is on the one hand driven by a number of large strategic research programs and on the other hand by a large number of grant/loan schemes aimed at specific needs of SMEs at different stages in the innovation cycle. A major difference between the two systems has been the strong focus in Wallonia on schemes aimed at encouraging knowledge diffusion through the exchange or temporary assignment of skilled researchers or innovation specialists from the universities/research centres to enterprises and vice-versa (the FIRST programs). In Flanders, this type of action is subsumed within more general industrial R&D subsidy schemes.

The Brussels-Capital Region's policy effort in favour of innovation is concentrated around carefully selected grant/loan schemes to encourage industrial research and product development. The current policy mix is essentially focused on a number of subsidy schemes for enterprises covering applied industrial research and pre-competitive development.

Let us focus further on the main policy instruments in relation to the above mentioned objectives and challenges.

- In view of the 3% objective, all of the authorities have raised their R&D budget in 2006. According to an initial estimate, government budget allocations for R&D are expected to rise by around 8% in 2006. This means that government funding on R&D should rise from 0.58% of GDP in 2005 to 0.60% of GDP in 2006.
- On the Federal level, we find a number of fiscal measures: tax reduction schemes for researchers (about 150Mio€ annually), fiscal incentives for R&D investments and patents, and for R&D personnel. Furthermore, subsidies from the Regions to companies are no longer taxed.
- In relation to R&D partnerships we find in Flanders the Strategic Basic Research Program (SBO) that provides support to all R&D actors involved in strategic basic research (in the form of collaborations) – 37Mio€ for 2005; another instrument is the Flemish Excellence Centres, demand-driven initiatives focusing on specific sectors like automobile, food, graphic and multimedia – app. 30Mio€. The Flemish VIS-program has as objective to stimulate technological innovation in Flemish enterprises by stimulating collaboration and knowledge spillovers – app. 17Mio€.
- Another instrument in Flanders is the Industrial Research Fund (IOF) that aims at directing university research towards more application. The budget for the universities is based on the valorisation performance (12Mio€ 2004/05).
- From a more sectoral perspective, also in Flanders, we find the already mentioned Strategic Research Centres (IMEC, VITO, VIB, and IBBT). Those centres are periodically evaluated and are required to obtain a share of their funding from industry (national and international) – total budget app. 110Mio€.
- Flanders is trying to create a renewed industrial dynamic by means of sectoral Round Tables: the Automotive Round Table has been completed and is still being monitored, Life Sciences are ongoing and Chemistry has just been launched.
- In Wallonia, the Excellence Poles are centres of a smaller scale, some of them have been established thanks to EU Structural funding. Collaborative research can be funded under the “research of regional relevance in Wallonia”.
- The Walloon FIRST programs fund mobility of researchers between universities and companies (knowledge transfer), including the funding of business plan development for academic spin-offs; it is an instrument that responds to many of the objectives;
- Concerning the availability of risk capital, in all three Regions measures are present. In Flanders the innovation fund VINNOF (managed by the Flemish Holding Company (Participatie Maatschappij Vlaanderen, PMV) was recently launched (75Mio€), besides the Flemish Venture Capital fund GIMV. In Wallonia there is venture capital through SRIW, FRID, SOWALFIN, and Business Network Wallonia. In the Brussels-Capital venture capital is provided by SRIB, Solvay Business Angels Connect Network. The

ARKimedes fund and the so-called ‘Win-Win loan’ are fiscal friendly measures to stimulate the availability of capital from private sources for investment (Flanders).

- At regional levels, there has been heavy investment in incubation centres and science parks.
- In the Brussels Region, there is also support for interfaces at universities/high schools, as well as for promoting R&D spin-offs with a series of original measures intended to guarantee the financial, commercial and managing base of the spin-off project. Academic and industry spin-offs are included in the program.

Finally, various measures are being deployed on the various levels based on the ‘local’ needs and policy micro-choices. Therefore (as also indicated in the TrendChart report for Belgium, 2005) there is a “divergence”, rather than a “convergence”, of measures implemented. Again by referring to the report of the High Level Group 3% Belgium, harmonization on a policy level and even the development of a “Belgian research area” might be favourable for all actors and lead to synergetic effects.

4.6 Policy Effectiveness

In terms of effectiveness of the developed policy and related measures, the above cited NRP progress report is rather positive, also on the specific RDI objectives and challenges. The report concludes that Belgium is making “good progress” in the implementation and reinforcement of its NRP (of course this applies to the overall progress and not specifically to innovation policy issues). Recently the Policy Support Centre for R&D statistics in Flanders indicated a turnaround, and thus a slight increase, in the levels of R&D spending in Flanders. Challenges remain, and the recently taken measures/implemented instruments are still to ‘yield’.

In general, various analysts indicate the good ‘fit’ between policy objectives, priorities and policy instruments. Supplementary to the comments given in section 3.7, although there is an increasing interest in policy effectiveness, policy design could become even more firmly ‘evidence-based’ by supporting a permanent process of analysis of regional innovation systems and by investing more resources in this type of analysis³⁷. In this context it is interesting to mention the work of the Flemish Policy Research Centres in this field that could be an example for the two Regions. Recently, a study on behavioural additionality of public R&D subsidies has been carried out in Flanders³⁸.

³⁷ TrendChart report Belgium, 2005.

³⁸ Steurs, G., A. Verbeek, H. Vermeulen and B. Clarysse (2006), “A look into the black box – what difference do IWT R&D grants make for their clients”, IWT study 56 (study carried out by IDEA Consult).

5 Economic and Market Development (Absorptive Capacity)

5.1 Introduction

General macro and micro economic conditions are essential for a well-functioning innovation system. Since 2004, the Belgian National Bank (BNB) has increasingly emphasised the role of innovation as a, if not the, key factor enabling Belgium to regain lost competitiveness.

As discussed, the recent NRP progress and evaluation report (2006) shows that Belgium makes ‘good progress’. Belgium ranks 20th on the Global Competitiveness Index list 2006-2007 (World Economic Forum), which is the same position as last year. Measured by the European Union’s own Lisbon criteria Belgium holds the 10th position. Recently the OECD³⁹ congratulated Belgium with its macro-economic policy (economic growth and reduction of public debt from 110% to 90% of GDP in 2006) and performance, although further improvement is possible.

The Belgian economy is strongly supported by small and medium-sized enterprises. Approximately 83% of Belgian companies have less than 10 employees and 97% of the companies employ less than 50 people. SMEs account for over 70% of GDP. The industrial ‘backbone’ of Belgium is thus mainly composed of SMEs. This implies that there is a high dependency on a limited number of large companies (mainly internationally operating companies with their HQ abroad) concerning RDI (investment) capability.

5.2 Indicators and Challenges

Competition is an important stimulus for companies to innovate. The telecommunications sector has been liberalized, as have the gas and energy markets. The postal market as of 2003 had been liberalized only to cover the transportation of large packages. Sending goods by rail had been open to cross-border competition only since the beginning of 2003. In Table 4 we present a selection of indicators reflecting some of the economic and market development conditions. In short:

- In terms of broadband penetration we see an above EU-average. In terms of exports in high-tech sectors a lower share as a percentage of total export can be observed than on average in other EU countries.
- In terms of labour productivity, although the level of productivity is still among the highest in the world, a slight decline can be observed in recent years. According to the OECD Economic Survey 2007, the high productivity level reflects in part the under-representation of low-skill, low productivity jobs in the economy. Employment levels are relatively low in international comparison, however, participation rates have increased over the past few years (see also Table 5).
- Concerning the cost of labour, Belgium shows a rather high level in comparison to surrounding countries. The annual growth rates are rather high, and have been especially in 2003 and 2004, compared to the EU growth rates. According to the OECD (cf. supra), exporters are losing market share as external competitiveness has deteriorated, partially because of the increase of unit labour costs.

³⁹ OECD (2007), Economic Survey of Belgium.

- General forecasts are favourable. In the October update of the FPB (Federal Planning Bureau) medium-term outlook for Belgium, GDP growth reaches an average of 2.3% for the 2006-2011 period. Total employment is expected to increase by about 38,500 jobs a year during 2006-2011, despite new job losses in manufacturing. The fall in the unemployment rate is expected to be limited due to the substantial rise in the labour force.

Most analysts agree that in order to keep the public deficits under control while maintaining a high-quality system of social protection in the face of an ageing population, there must be considerably more investment in innovation. The BNB (Belgian National Bank) argues that the Belgian authorities must take policy action to “strengthen the dynamic of growth through innovation and productivity improvements”.

5.3 Governance

The Federal government is responsible for social security (unemployment, sickness and invalidity, pensions, child benefit) and also has the necessary powers to ensure that the country retains its economic and monetary unity. On the regional level own priorities and policy choices are set. For a detailed discussion of governance we refer to chapter 2.

5.4 Policy Objectives

The main objective in terms of economic and market development for Belgium, as reflected in the Lisbon strategy, is ‘growth and employment’. More specifically, this involves the sustainability of public finances, an increase in the rate of employment, action to tackle long-term structural unemployment and the interregional mobility of workers, plus stimulation of the competitiveness of the services sector. These objectives are.

- Balance the budget (public finances): 1) debt ratio under 60% in 2014, 2) budget surplus of at least 1.0% in 2010 – expenditure management in the health care sector is vital
- Lower costs, particularly labour costs: 1) easing the fiscal and parafiscal pressure on labour by 2.2% of GDP between 2005 and 2010 (4.2% of labour costs) – specific focus on researchers and high-skilled workers
- Reforming and revitalizing the labour market: 1) having the older worker labour market participation rate increasing faster than the average (EU15) by 2010 compared with 2005, 2) an employment rate verging on 70%, 3) encourage entrepreneurship, 4) Increase interregional mobility (employment perspective)
- Investing to boost the economy: 1) 3% GDP investment in R&D by 2010, 2) continuing reform of the network industries and sharpening the competitive edge of public sector companies
- Consolidate social security: 1) earmarking 0.057% of GDP every year for adjustments for prosperity in the case of pensions and other benefits, 2) striking a balance in the social security system and waging a multidimensional struggle against poverty.

5.5 Policy Instruments

The year 2006 represented a milestone in the process for liberalising the electricity and gas sectors, with the arrival of new suppliers on the Belgian market. 2006 also marked a turning point for the rail sector: this was the year in which the cross-border rail transport system was liberalised.

- In terms of making financial support of RDI, all three Regions and the Federal state are making efforts to increase the availability and access (cf. supra). In general, both the Federal authorities (via the "Centre of Competence for Financing SMEs") and the Regions (via various funding systems) have made it easier to secure financial resources.

- In terms of broadband penetration, the Region of Brussels-capital made this investment several years ago.
- The question of administrative burden (among others addressed by the business federations) is also subject of policy efforts (especially in Flanders), with good results reported on the drop in number of days needed to create a company, the establishment of a central system for company formalities, or the Kafka test for new regulations.
- Competition legislation has also become more effective, due to the harmonisation of competition agencies. For certain aspects of infrastructures common to telecommunication and broadcasting still further cooperation and integration are needed. Belgium has implemented a number of ICT measures, particularly to promote e-government, to improve confidence in online security and to encourage the ICT industry.
- Another type of response consists in the creation (BEA in Brussels) or reorganisation (VLAO and the Walloon Agency for Economic Stimulation) of ‘soft’ support services to companies, notably also for exporting companies, which are complementary to direct funding to ensure adequate business environment. In this context company and labour tax reductions should be mentioned as well, just as the stimulation of ICT use (infrastructure and use). Nevertheless, ‘market driven’ innovation could be stimulated further.
- Corporate tax has been cut (basic rate) from 40% down to 33.99%, while the ‘notional’ interest rate was introduced in 2006 to create a greater degree of tax neutrality between funding from equity and from loans (in some cases an implicit reduction in the taxation rate from 26 to 28%). It consists of granting a reduction of the tax base for corporate taxation at a percentage of equity, based on the rate of 10-year linear bonds issued by the Belgian state reductions in social security contributions and tax liabilities for both employers and employees have decreased labour costs for both (Solidarity between Generations Pact).
- Representatives of employers and employees have played and are still playing a key role in the process for developing the Solidarity between Generations Pact.

5.6 Policy Effectiveness

Several of the measures discussed here are recent, and thus the full impact is still to be seen. Belgium received several positive evaluations in the context. The first in relation to the analysis of the progress made on the NRP objectives (2006) which was judged to be “positive” mainly due to a series of measures and efforts. Nevertheless, Belgium still has one of the heaviest taxation pressures in comparison to its surrounding countries. According to EUROSTAT, among the EU-25 countries, the highest ratios of tax revenue to GDP in 2005 were above 50%, in Sweden and Denmark followed by Belgium⁴⁰, although the general level has decreased since 1999.

The Economic Survey of Belgium carried out by the OECD (2007) praises Belgium macro-economic policy in the previous years. According to the OECD “Belgian economy is in a strong recovery phase” but additional measures are needed. Progress made in the field of better regulation and administrative simplification is noteworthy as well.

⁴⁰ Statistics in Focus (2007), Economy and Finance, 31/2007, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-07-031/EN/KS-SF-07-031-EN.PDF.

6 Human Resources (Human and Social Capacity)

6.1 Introduction

Projections indicate that for Belgium to reach the 3% target that it will require an annual growth of some 2992 FTE R&D personnel in the economy between 2001 and 2010 (about 15.000 additional FTE R&D personnel in 2010 are needed⁴¹). The Federal Government has taken various fiscal measures in order to facilitate this. The Regions and Communities contribute with different measures and actions as well.

One of the major strengths of Belgium is the education level of the population but at the same time there are concerns about the number of researchers, lifelong learning, labour costs (42.6% of wage costs in 2005 versus 38.4% on average in the neighbouring countries), brain drain/gain, mobility, rejuvenation and career opportunities etc. As labour costs are the main budget item in R&D expenditures, levels of labour costs do matter in the attractiveness of private R&D investments. Costs should nevertheless be considered in relation to quality. In that respect Belgium performs strongly.

Note that this chapter is complementary to chapter 3.

6.2 Indicators and Challenges

The Belgian population is generally well educated (see level of population with tertiary education) and investments in higher education are superior to EU average. The number of science and technology graduates is rather low (below the EU-level) but increases over time.

Belgium, like many other European countries, is confronted with the phenomenon of ‘brain drain’. The level of adults that participate in life-long learning lies below the EU level (8.3% in Belgium versus 10.2% in the EU). A more generally acknowledged challenge is the limited career opportunities for researchers in the university system due to the ‘closeness’ thereof. As a result, the mobility of academics (including researchers) seems to be limited, just like the intake of international students and researchers.

Lifelong learning is below the EU-average (and target of 12.5% participation) and needs to be further targeted with specific measures (see also chapter 6). The more general employment rate is lower than the level in the EU. Moreover, also in relation to the ageing society and the related health costs, we see that Belgium has a quite low participation rate of older workers (31.8% in the group of 55-64 years, in relation to 42.6% in the EU).

Labour productivity (a major asset in the attraction of foreign investment) is strongly above the EU-level, but is decreasing slowly since 2004. Labour costs are higher than in the surrounding countries, although the levels have decreased somehow over the last years. Particularly in relation to the costs of researchers, various measures have been taken recently.

What seems to be even more challenging is to develop incentives to help creativity flourish in education and at the workplace. A major contribution to this can be made by the educational culture that has to be turned around from ‘absorbing’ to stimulation of ‘creativity’ (High Level Group 3% Belgium).

⁴¹ High Level Group 3% for Belgium.

6.3 Governance

Human resources can be typified by their horizontal character in the sense of policy interest. In the first place it relates to education, secondly to research and to stimulation of entrepreneurship and the promotion of science, and thirdly to economic policy in the sense of labour costs and social security. For a detailed description of competences of the various authorities we refer to chapter 2.

It should be noted that the Federal State and the relevant federated entities can call upon educational institutes for STI activities in their own realm of competences.

6.4 Policy Objectives

Major policy efforts are dealing with the costs of labour (and specifically of researchers), for which Belgium clearly stands at a competitive disadvantage. More in relation to STI we find objectives in relation to mobility of researchers, and the attractiveness of the researcher's career. The relevant federated entities put emphasis on their own priorities.

On the Federal level, also in view of the competences, we see that priority is put on internationalisation of research, mainly through international researcher's mobility. Moreover, fiscal incentives should promote R&D and increase international attractiveness. The Flemish Community emphasizes entrepreneurship promotion through education, creation of critical masses in technology and innovation. Also attention is paid to improve researcher careers and to increase mobility. The strategic plan "Flanders in Action" acknowledges that the education system still needs improvement. In the Walloon Region the objectives are mainly on 'mobilization' and 'industry-science' mobility schemes. In the French Community these are key objectives as well. Within the F.R.S.-FNRS, a specific fund (FRIA) is dedicated to research within industry and agriculture. The Brussels-Capital Region subscribes to these objectives as well.

6.5 Policy Instruments

The challenges mentioned (although they are recent) above are dealt with in different ways. In Flanders but also in the Walloon Region attention is paid to improve career opportunities. Specialization grants for PhD and post-doc researchers are meant to improve the career of researchers by providing funds for research positions at universities (IWT grants in the Flemish Community and F.R.S.-FNRS or FRIA grants in Wallonia and the French-speaking Community (Wallonia included); in Brussels such grants are allocated on a more thematic basis). On the Federal level as well, supplementary grants exist (16Mio€ 2006) for researchers at universities and Federal scientific organizations.

More specifically:

- The Federal authorities provide a "retour grant for post-doc researchers" coming to work (back) in Belgian universities.
- In the French-speaking Community, in order to cover the needs of incoming and outgoing mobile researchers the F.R.S.-FNRS has designed several funding instruments allowing mobile periods. Especially the promoters of a research program financed by the F.R.S.-FNRS or one of its associated Funds allow grants to researchers of foreign nationality, of post-doctoral level, detached of their laboratory of origin for a period ranging from one year up to three years.
- The "Odysseus" and the "Methusalem" programs in Flanders. The first provides grants to attract top-researchers to Flanders (12Mio€ 2006); the target group is Flemish and other researchers with a position at foreign universities. These top-researchers are expected to develop research groups and create Excellence Centres. The second program provides

structural financing for top-researchers so that they can focus on research instead of finding funds (3Mio€ in 2006).

- The RIT program in Wallonia gives subsidies for employees in charge of innovative projects in SMEs (1.2Mio€ 2006). The SME programme in Flanders provides subsidies for hiring the first highly qualified employee. The future “Micro-projects programme in Brussels will allow fruitful innovative ideas in SME’S to receive support for their fulfilment. Another programme for a peculiar form of “retour grant” is under development too.
- In all the relevant federated entities various measures are taken to encourage entrepreneurship, varying from learning pupils in the secondary education about the business world (in Wallonia), to giving opportunities to pupils to develop a business plan (in Flanders).
- In terms of researcher mobility, in Wallonia we find the FIRST programs that fund mobility of university researchers between universities and companies, under various modalities (funding of industrial theses, international mobility and business plan development). Still underdeveloped, however, is the return of researchers to universities after several years in a business company.
- The Federal tax measures focus on lowering the wage costs and as such address the important issues of labour costs, especially for researchers (50% reduction in withholding tax⁴²).
- On education and employment policy various measures are set up: Action Plan “Entrepreneurial Education” in Flanders, “Technology at School for the 21st century” in the Flemish Community, “Improvement measures for vocational Training” in the French-speaking Community, “Harmonisation of administrative and financial rules for training and life-long learning” within companies, and the obligation for all enterprises to invest 1.9% of wages in training actions.

6.6 Policy Effectiveness

The effectiveness of most of these instruments remains still to be seen. Nevertheless, the chosen instruments seem to fit quite well to the challenges. In terms of “balance” in the emphasis put on the various instruments some work optimization seems desirable. Active monitoring and evaluation are needed. The first results over the last 1-2 years (based on the evolution of the various indicators) seem to be promising (and in line with the general NRP assessment).

A major challenge of a more cultural nature seems to be the attitude towards employment and mobility. Positions at universities are considered life-time positions; the mobility of researchers is still too low and the level of rejuvenation in various knowledge institutions simply too low.

⁴² Since 1 July 2006, this measure is extended to all personnel of small young companies. Since 1 January 2006, the withholding tax paid by the employer has been reduced by 25% for researchers who are masters, civil engineers, or Ph.D. holder in sciences or applied sciences, medical or veterinary sciences... In March 2006, this measure was extended to include researchers from the biomedical sector, agricultural engineers and researchers in chemistry, biology and physics.

7 Overall Innovation System

7.1 Summing up challenges, responses and issues for the peer review

Belgium is a Federal state with strong autonomy for the Regions and Communities in socio-economic (including labour), scientific, technological and innovation policy. The powers of the Federal government are today limited to so-called ‘issues of national and international importance’ and can be summarized to be around more macro-economic and fiscal issues and research of national and international importance (like in the space sector).

One could simply ask the questions whether Belgium has a single innovation policy system and governance, or whether there are several innovation systems that ‘co-exist’ and occasionally interact? We also find different governance structures and ways of policy implementation. The various federated entities in Belgium put their own emphasis on various STI related issues without necessarily keeping into account priorities and/or measures set in the other entities. To what extent can real synergies be achieved?

Underlying background report is based on previous studies made in relation to the Belgian innovation system. However, this project attempts to identify a range of major issues and challenges and to provide alternative and new inspiring solutions/approaches in an ‘open’ sphere. A first step in this direction was taken in the Data Gathering Mission, where 14 key-experts from industry, academia and policy system from the various Regions and Communities were involved, has been instrumental in this respect.

In what follows, a selection of main issues will be presented in line with the priorities set for this peer review.

Coherence and cohesion of the various decision making bodies

10. ‘Policy orchestration’ among the various federated entities today 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. Policy orchestration can come in various forms, like networking, communication, and frequent interaction. *This peer review should look into the current policy orchestration efforts and shed more light on whether ‘real’ policy orchestration is needed and why, and if it is needed, what might be suitable instruments/approaches to achieve this without distorting the current political reality (is there an optimum and how can it be found?). In other words, what are the opportunities?*

Belgian NIS in a globalised world – mechanisms for policy development

11. Policy development is a challenging task in a multi-actor and multi-entity environment like Belgium. To what extent do we really find the different steps in the ‘policy cycle’ (from articulation and prioritisation of needs to evaluation and reformulation of priorities) in Belgian policy making at different levels? ‘Real’ evaluation is not fully embedded everywhere, to some extent due to cultural reasons and characteristics. Policy initiatives are often ‘reactive’ instead of ‘proactive’, although increasingly use is made of foresight studies to look ‘ahead’. Research priorities are mainly ‘bottom-up’ driven, although some thematic priorities are set, in one federated entity more than in the other. Strategic intelligence is not always

available, just as the right ‘evidence’ is not always available when needed. *The review should look at these mechanisms that lie behind policy development in Belgium today. Is the right balance found between proactive and reactive, between bottom-up and top-down, between focus on technology versus focus on the market?*

Human Capital (more and better qualified researchers)

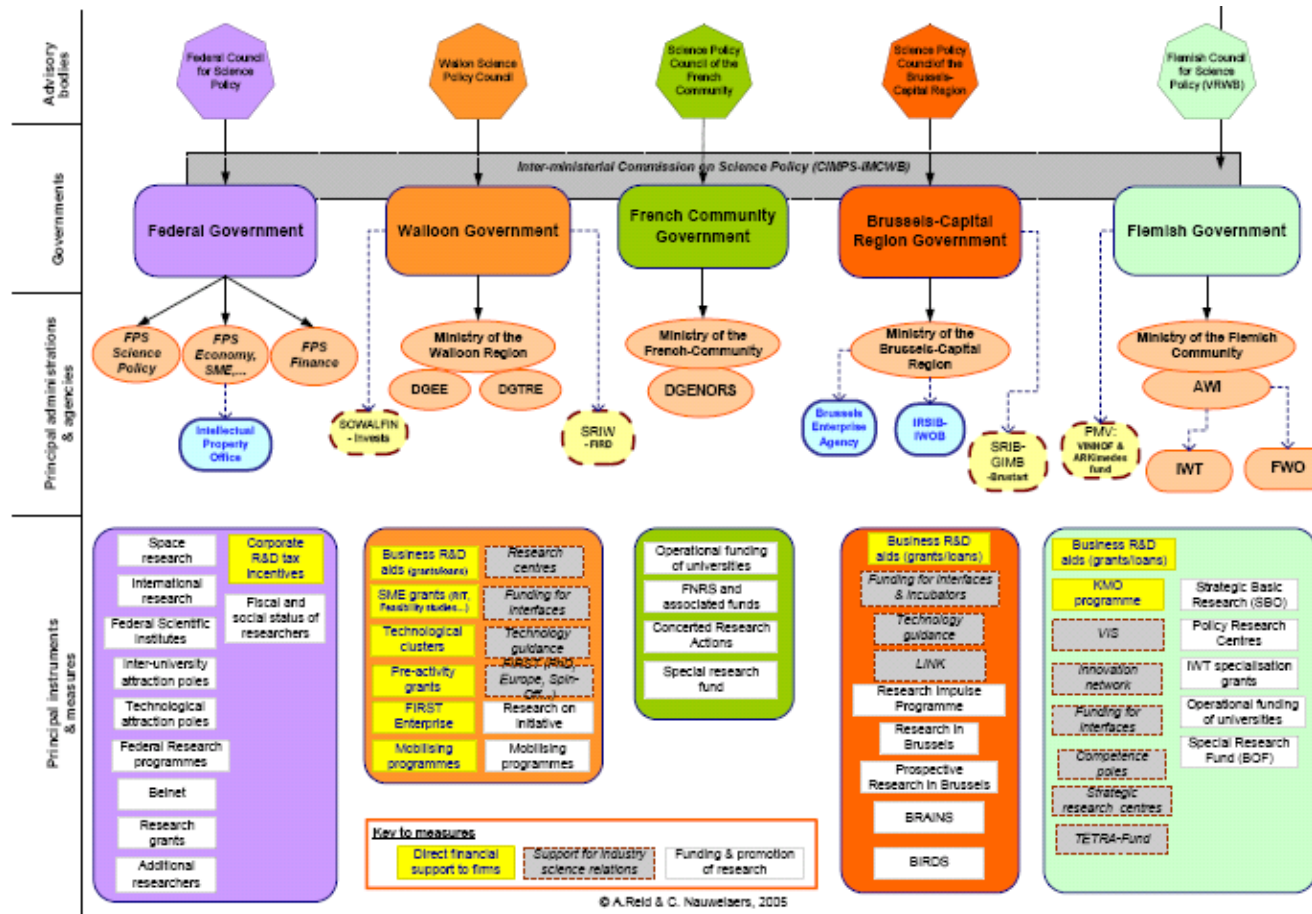
12. The Belgian level of education and the level of research are appreciated internationally. However, Belgian universities are not found high on the various international rankings. Often this is explained by referring to the lack of ‘critical mass’. Despite the fact that this is/has been an explicit policy choice in the past, to embed universities locally (which has led to a large number of universities), the peer review should reflect on this. In particular, how can a country like Belgium increase its attractiveness and thus excellence, which could imply higher attraction of foreign students and researchers? Are current rationalisation efforts (in the context of Bologna) sufficient? Are the instruments offered in order to facilitate collaboration sufficient? *The peer review should look into this in the light of increasing globalisation and increasing costs of (frontier) research.*
13. In relation to point 3, ‘internationalisation and rejuvenation’ of the R&D system, also in the context of the ERA and the broader globalisation, is another challenging topic. Today there are language laws that limit the use of English in teaching and training. This makes inflow of foreign students (mainly at doctoral and post-doctoral level) rather difficult. Moreover, the application procedures for research funding prohibit the use of English as it would put local students in direct competition with foreign students. At the same time it is not common for Belgian researchers to go abroad for a number of years and build up international experience and networks. This may result in so-called ‘inbreeding’ and thus a lack of rejuvenation. *The peer review should look into this issue and reflect on it.*
14. In relation to point 4, mobility in general (in particular science-industry) seems to be perceived more as a ‘cost’ instead of an ‘investment’. There seems to be a general absence of ‘slack’ in companies but also in research institutes that would enable people to ‘move’ around. Despite the fact that this is a problem of mentality, the government could and is already trying to change this attitude. *The peer review should look into the current instruments in place and should reflect on how mobility can be further supported (e.g. stimuli especially towards SMEs)?*

Valorising research and technology transfer

15. The R&D expenditure indicators would suggest that Belgium has not managed to fully turn around the declining trend and move towards the Lisbon goals and Barcelona 3% target. Belgium knows a specific situation: business expenditures on R&D depend to a large extent on a limited number of large firms (often international firms with foreign HQ – and thus where the decision power lies abroad). The peer review should look into the critical issues in the policy mix (also socio-economic conditions) to make this turn-around. Moreover, the review should look ‘beyond’ the 3% target and look into the potential choices and effects.

16. This peer review should look into the alleged ‘misfit’ between scientific/technological excellence and economic performance. How should this misfit be interpreted? Is it a result of the ‘absorptive capacity’ of Belgian industry, which is mainly composed of (traditional) SMEs? Are the consultation channels for industry sufficient? Does the public research base take industry needs sufficiently into account? Is there a power balance between academic – industrial actors?
17. In relation to point 7, knowing that the R&D strategies of large (international) R&D players in Belgium in many cases are decided upon abroad, the peer review should consider how Belgium could respond to this? How could internationalisation go ‘hand-in-hand’ with keeping R&D activities here in Belgium by keeping the decision centres here? Are the right instruments/conditions in place?
18. ‘Open innovation’ plays an increasingly growing role in today’s STI landscape. It offers many opportunities. Companies are increasingly convinced of opening their ‘boarders’ and sharing knowledge with others in order to find new combinations (collaboration). One could speak of generic knowledge that is developed in a pre-competitive phase, after which companies can take the elements they need and translate them into their products and services. This appeal on the capacity to ‘plug in’, to intelligently manage IP, to be able to translate the general knowledge into company specific knowledge (also by SMEs). At the same time market intelligence becomes crucial as well in order to be able to timely identify opportunities. The peer review should look into the challenges that Belgium is facing in this respect. How should/could policy react to this new paradigm? Do the current policy choices respond to these developments (including on collaboration)?

Appendix A Chart of the innovation governance system



Source: European TrendChart on Innovation, Country Report Belgium (2005)

Appendix B Key indicators on RTDI in Belgium

Table 1: Generic indicators on status for Belgium

		2000	2001	2002	2003	2004	2005	2006
Real GDP growth rate (% change previous year)	Eurostat	3.7	0.8	1.5	1.0	3.0	1.1	2.7 (f)
<i>EU</i>		3.9	2.0	1.2	1.3	2.4	1.7	2.9
Increase in labour costs (%)	Eurostat	-1.5	2.2	0.3	-1.0	-2.6	0.3	-1.5
<i>EU</i>		0.2	0.2	-0.4	-0.5	-1.0	-0.6	0.2
General government debt (as % of GDP)	NRP 2006	-	-	103,20	98,50	94,70	93.30	-
<i>EU</i>	NRP 2006	-	-	60.50	62.00	62.40	63.40	-
Inflation (%)	NRP 2006	2.7	2.4	1.6	1.5	1.9	2.5	-
Labour productivity per person employed; GDP in PPS. Index: EU25 = 100	NRP 2006	125.90	126.20	127.50	128.40	128.60	128.00	127.90
Labour productivity per hour; GDP in PPS. Index: EU-15 = 100	NRP 2006	124.60	124.80	125.10	126.00	128.50		
Gross domestic expenditure on R&D as percentage of GDP	NRP 2006	1.97	2.08	1.94	1.89	1.9	-	-
<i>EU</i>	NRP 2006	1.86	1.89	1.90	1.90	1.86	-	-
Total employment rate; Percentage of working persons in relation total population in the 15-64 age group	NRP 2006	60.50	59.90	59.90	59.60	60.30	61.10	-
<i>EU</i>	NRP 2006	62.40	62.80	62.80	62.90	63.30	63.80	-
Percentage of GERD financed by government	NRP 2006	22.90	22.00	23.20	23.50	-	-	-
<i>EU</i>	NRP 2006	34.10	34.00	34.00	34.90	-	-	-

NRP 2006: Indicators in the context of the follow-up of the implementation of the national reform programs (Eurostat Structural Indicator database October 2006)

Table 2: Indicators on the Science Base for Belgium

		2000	2001	2002	2003	2004	2005	2006
New S&E graduates per 1000 population aged 20-29	EIS 2005	9.7	10.1	10.5	11.0			
<i>relative to EU</i>	EIS 2005	95	92	92	90	--		
Population with tertiary education	EIS 2005	27.1	27.6	28.1	29.0	30.4		
<i>relative to EU</i>	EIS 2005	135	138	138	136	139		
Gross domestic expenditure on R&D as percentage of GDP	NRP 2006	1.97	2.08	1.94	1.89	1.9	-	-
<i>EU</i>	NRP 2006	1.86	1.89	1.90	1.90	1.86	-	-

Public R&D expenditures (% of GDP) <i>relative to EU</i>	EIS 2005	0.56	0.57	0.56	0.56	--		
	<i>EIS 2005</i>	85	85	82	81	--		
Business R&D expenditures (% of GDP) <i>relative to EU</i>	EIS 2005	1.48	1.60	1.40	1.33	--		
	<i>EIS 2005</i>	121	128	112	106	--		

NRP 2006: Indicators in the context of the follow-up of the implementation of the national reform programs (Eurostat Structural Indicator database October 2006)

Table 3: Indicators on Business R&D and Innovation for Belgium

		2000	2001	2002	2003	2004	2005	2006
Business R&D expenditures (% of GDP) <i>relative to EU</i>	EIS 2005	1.48	1.60	1.40	1.33	--		
	<i>EIS 2005</i>	121	128	112	106	--		
Share of medium-high- tech and high-tech R&D (% of manufacturing R&D expenditures) <i>EU</i>	EIS 2005	81.6	83.8	--	--	--		
	<i>EIS 2005</i>	92	94	--	--	--		
Share of university R&D expenditures financed by business sector <i>relative to EU</i>	EIS 2005	11.8	12.7	--	--	--		
	<i>EIS 2005</i>	181	189	--	--	--		
SMEs innovating in- house (% of SMEs)	EIS 2005	38.3						
Innovative SMEs co- operating with others (% of SMEs)	EIS 2005	9.6						
Innovation expenditures (% of turnover)	EIS 2005	2.65						
Early-stage venture capital (% of GDP) <i>relative to EU</i>	EIS 2005	0.099	0.073	0.041	0.028	--		
	<i>EIS 2005</i>	174	122	109	112	--		
Venture capital investments (% of GDP) <i>Relative to EU-15</i>	NRP 2006	0.21	0.12	0.09	0.04	0.08	0.04	-
	<i>NRP 2006</i>	0.23	0.14	0.11	0.11	0.11	0.14	-
ICT expenditures (% of GDP) <i>relative to EU</i>	EIS 2005	6.7	7.0	6.7	6.4	6.4		
	<i>EIS 2005</i>	103	111	102	100	102		
SMEs using non- technological change (% of SMEs)	EIS 2005	49						
Employment in high-tech services (% of total workforce) <i>relative to EU</i>	EIS 2005	3.60	4.08	4.18	3.94	--		
	<i>EIS 2005</i>	117	124	129	124	--		
Employment in medium- high and high-tech manufacturing (% of total workforce) <i>relative to EU</i>	EIS 2005	6.90	6.57	6.68	6.42	--		
	<i>EIS 2005</i>	99	94	98	97	--		
New EPO patents per million population	EIS 2005	157.7	160.9	148.1	--	--		

<i>EU</i>	<i>EIS 2005</i>	<i>118</i>	<i>113</i>	<i>111</i>	--	--		
USPTO patents per million population	NRP 2006	42.66	26.99	12.86	2.31	0.39		
<i>EU</i>	<i>NRP 2006</i>	<i>40.74</i>	<i>23.64</i>	--	--	--		
New Triad patents per million population	EIS 2005	35.1	--	--	--	--		
<i>relative to EU</i>	<i>EIS 2005</i>	<i>157</i>	--	--	--	--		
New community trademarks per million population	EIS 2005	--	--	58.1	92.5	81.6		
<i>relative to EU</i>	<i>EIS 2005</i>	--	--	<i>89</i>	<i>109</i>	<i>94</i>		
New community industrial designs per million population	EIS 2005	--	--	--	67.6	92.2		
<i>relative to EU</i>	<i>EIS 2005</i>	--	--	--	<i>99</i>	<i>110</i>		

NRP 2006: Indicators in the context of the follow-up of the implementation of the national reform programs (Eurostat Structural Indicator database October 2006)

Table 4: Indicators on Economic and Market development for Belgium

		2000	2001	2002	2003	2004	2005	2006
Broadband penetration rate (number of broadband lines per 100 population)	EIS 2005	--	--	6.7	10.1	14.0		
<i>relative to EU</i>	<i>EIS 2005</i>	--	--	--	--	<i>184</i>		
High-tech exports (as a % of total exports)	NRP 2006	8.69	8.98	7.49	7.42	7.12		
<i>EU</i>	<i>NRP 2006</i>	<i>21.37</i>	<i>21.14</i>	<i>18.79</i>	<i>18.43</i>	<i>18.37</i>		
Sales of new-to-market products (% of turnover)	EIS 2005	5.1		--				
Sales of new-to-firm not new-to-market products (% of turnover)	EIS 2005	13.9		--				
Early-stage venture capital (% of GDP)	EIS 2005	0.099	0.073	0.041	0.028	--		
<i>relative to EU</i>	<i>EIS 2005</i>	<i>174</i>	<i>122</i>	<i>109</i>	<i>112</i>	--		
Labour productivity per person employed; GDP in PPS. Index: EU25 = 100	NRP 2006	125.90	126.20	127.50	128.40	128.60	128.00	127.90
Labour cost index (total labour costs) - % change on previous period	Eurostat	4.3	4.7	3.8	3.4	3.3	2.7	2.9
<i>EU</i>		<i>2.0</i>	<i>5.0</i>	<i>4.9</i>	<i>1.3</i>	<i>2.2</i>	<i>2.9</i>	
Business investment; Gross fixed capital formation by the private sector as a percentage of GDP	NRP 2006	19.00	18.80	17.60	17.20	17.30		
<i>EU</i>	<i>NRP 2006</i>	<i>18.30</i>	<i>17.80</i>	<i>17.20</i>	<i>16.90</i>	<i>17.10</i>		

NRP 2006: Indicators in the context of the follow-up of the implementation of the national reform programs (Eurostat Structural Indicator database October 2006)

Table 5: Indicators on Human Resources for Belgium

		2000	2001	2002	2003	2004	2005	2006
Population with tertiary education per 100 population aged 25-64 <i>relative to EU</i>	EIS 2005	27.1	27.6	28.1	29.0	30.4		
	<i>EIS 2005</i>	<i>135</i>	<i>138</i>	<i>138</i>	<i>136</i>	<i>139</i>		
Participation in life-long learning per 100 population aged 25-64 <i>relative to EU</i>	EIS 2005	6.8	7.3	6.5	8.5	9.5		
	<i>EIS 2005</i>	<i>86</i>	<i>92</i>	<i>81</i>	<i>91</i>	<i>96</i>		
Youth education attainment level (% of population aged 20-24 having completed at least upper secondary education) <i>relative to EU</i>	EIS 2005	80.9	79.4	81.1	81.3	82.1		
	<i>EIS 2005</i>	<i>106</i>	<i>104</i>	<i>106</i>	<i>106</i>	<i>107</i>		
Employment in high-tech services (% of total workforce) <i>relative to EU</i>	EIS 2005							
	<i>EIS 2005</i>							
Labour productivity per person employed; GDP in PPS. Index: EU25 = 100	NRP 2006	125.90	126.20	127.50	128.40	128.60	128.00	127.9
Total employment rate; Percentage of working persons in relation total population in the 15-64 age group <i>EU</i>	NRP 2006	60.50	59.90	59.90	59.60	60.30	61.10	-
	<i>NRP 2006</i>	<i>62.40</i>	<i>62.80</i>	<i>62.80</i>	<i>62.90</i>	<i>63.30</i>	<i>63.80</i>	-
Labour participation of older employees; Percentage of working persons in relation to total population in the 55-64 age group <i>EU</i>	NRP 2006	26.30	25.10	26.60	28.10	30.00	31.80	
	<i>NRP 2006</i>	<i>36.60</i>	<i>37.50</i>	<i>38.70</i>	<i>40.20</i>	<i>41.00</i>	<i>42.50</i>	
Percentage of adults participating in life-long learning in the 25-64 age group <i>EU</i>	NRP 2006	6.2	6.4	6.0	7.0	8.6	8.3	
	<i>NRP 2006</i>	<i>7.5</i>	<i>7.5</i>	<i>7.6</i>	<i>9.0</i>	<i>9.9</i>	<i>10.2</i>	
S&T graduates (per 1000 of population) <i>EU</i>	NRP 2006	9.70	10.10	10.50	11.00	11.20		
	<i>NRP 2006</i>	<i>10.20</i>	<i>11.00</i>	<i>11.50</i>	<i>12.30</i>	<i>12.70</i>		

NRP 2006: Indicators in the context of the follow-up of the implementation of the national reform programs (Eurostat Structural Indicator database October 2006)

Exhibit 1 The impact score of scientific publications by country

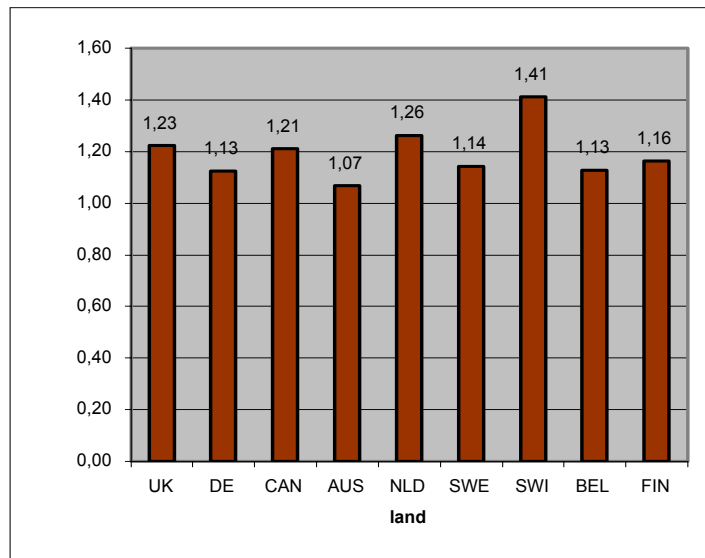


Exhibit 2 Doctorates per 1000 of the population 25-34 year olds

