

2008 – country report

CREST
expert group report

on the design and implementation
of national policy mixes

Policy Mix Peer Reviews: Country Report

B U L G A R I A

A Report of the CREST Policy Mix Expert Group

Fourth cycle of the Open Method of Coordination in favour of the 3%
objective

CREST - European Union Scientific and Technical Research Committee

Policy Mix Review Team

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14 November 2008

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1 Introduction

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

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Mr Aidan Hodson, Principal Officer, Department of Enterprise, Trade and Employment, Ireland,

Mr Rein Kaarli, Ministry of Education and Research, Estonia,

Mr Per Koch, Director for Analysis and Strategic Development, the Research Council of Norway, Norway

The group was led by Prof Jakob Edler, Professor of Innovation Policy and Strategy, Research Director, Manchester Institute of Innovation Research, MBS, University of Manchester. Ms Desislava Kolarova from the European Commission, Directorate General for Research Directorate EC (European Research Area: Knowledge based economy serves) served as an observer.

This is the final draft of the group after their mission to Bulgaria June 2 to June 4 2008 after the feedback mission has taken place. The feedback mission was a success. There was one intensive discussion by experts from stakeholder organisations (morning) and one by policy-makers, including three vice-ministers (economy, science, finance). In the review mission in June, the team had intensive discussions with a large number of stakeholders from ministries, scientific organisations, firms, federations and agencies (for a full list see the annex), including a number of vice-ministers. The review exercise was prepared with a previous mission of Jakob Edler to Sofia, May 8 to May 10 2008, on the basis of which a background paper with major issues for discussion was produced for the review team. Next to comprehensive secondary and primary material considered for this background, further input the team considered comprised the current country report by Trendchart¹ (2007), the ERAWATCH research inventory report for Bulgaria² and analytical country report by ERAWATCH (Annex 2). Those reports give a very broad overview of current structures and policies both in innovation policy (Trendchart) and in research policy (ERAWATCH).

This review therefore does not claim to summarise all the main developments, structures and processes in Bulgaria, for which we refer to those reports mentioned. Especially the EWN analytical country report is very valuable in raising problematic issues and should be consulted for a full understanding of the reviewer's comments.

¹ Inno-Policy TrendChart – Policy Trends and Appraisal Report. Bulgaria 2007, <http://www.proinno-europe.eu/index.cfm?fuseaction=page.display&topicID=263&parentID=52>

² ERAWATCH Research Inventory Report For Bulgaria <http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.countryReport&countryCode=BG&rintme=1>

Rather, on the basis of the 3 days review programme (see Annex 1), the reviewers have formulated some observations, assessments and recommendations. These are summarised in this report.

The review team would like to express their gratitude to the Bulgarian partners who have been accessible for long and intensive discussions. A special thanks goes to the organising team in the Ministry of Education and Science, first and foremost to Albena Vutsova and Guenoveva Jecheva for their effectiveness and hospitality.

The CREST Policy-Mix Conceptual Framework³

As in previous CREST OMC cycles, a simple analytical framework or model depicting and linking the different domains of an R&D and innovation system was used to structure issues and discussions during the peer review exercise.

In this model, policy mixes are conceived as the aggregate of policies affecting four major domains: Human Resources; the Science Base; Business R&D and Innovation; and Economic and Market Development. The governance system linking policies in all these domains is also of central interest, as are the linkages between national and regional, and national and international R&D and innovation systems. Exhibit 1 (see next page) depicts all these domains and some of the more important links and flows between them.

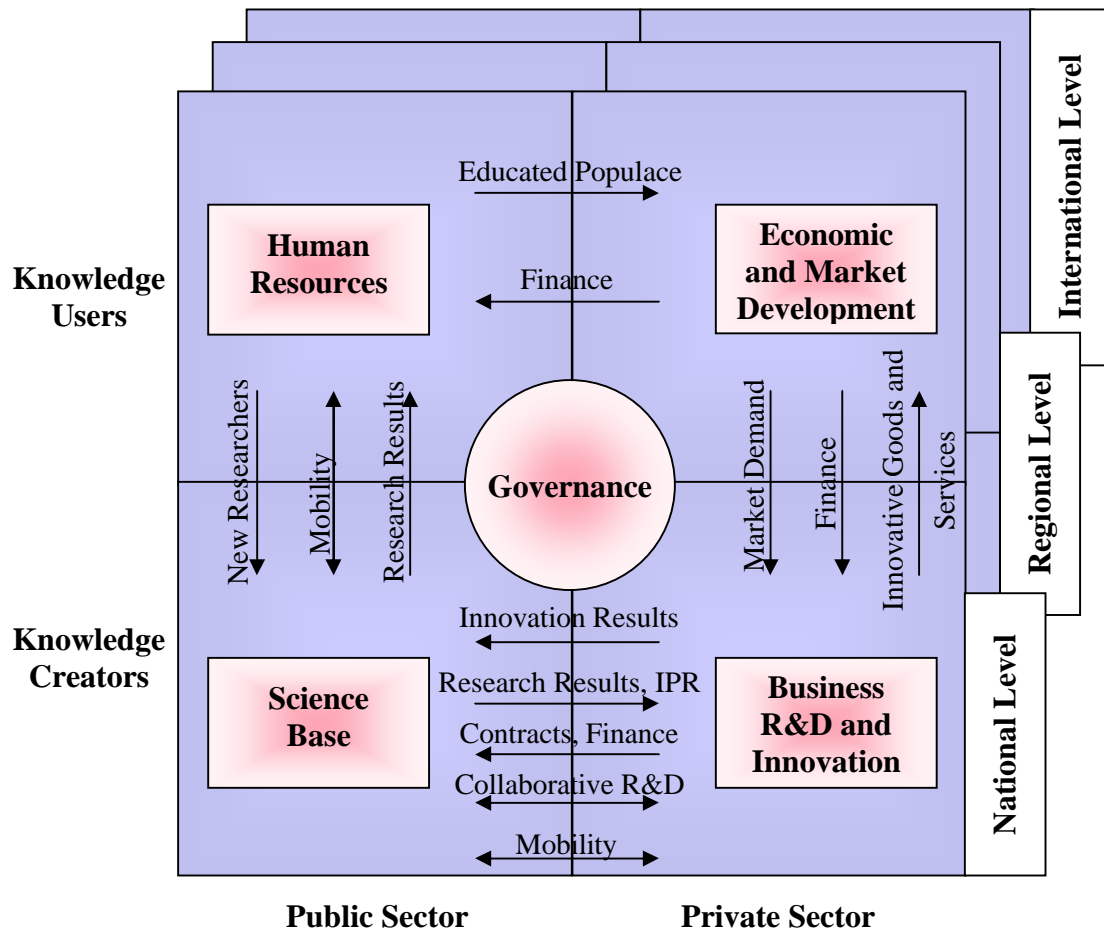
Although R&D and innovation systems are typically much more complex than depicted here, this simple model provides a convenient way of visualising some of the more important domains within an R&D and innovation system and the relationships between them. It also provides a useful framework for the questions that were asked during the peer review exercise relating to:

- The relative scale of the challenges Bulgaria confronted both within each of the four R&D and innovation system domains and across them;
- The range of policy responses to these challenges and their 'location' within the R&D and innovation system, e.g. 'reinforcement' policies to strengthen particular domains such as the science base or business R&D and innovation, or 'bridging' policies designed to improve the links or flows between domains, e.g. policies to enhance university-industry interactions or to improve the flow of capital from capital markets to innovative high-tech firms and start-ups;
- The match between problems and policy responses within and across domains;
- The conflicts and synergies between policies within and across domains;

³ This section is – with minor modifications – the general template as used in most of the CREST OMC Policy Mix reports.

- The governance of policies within and across domains;
- The links between national and regional R&D and innovation systems, and between national and international systems.

Exhibit 1 A Simple Model of an R&D and Innovation System



The remainder of the report is structured in three sections. Section 2 provides – for the reader not familiar with the Bulgarian background – a very short abstract of the Bulgarian R&D and innovation system and its associated policy mix. In Section 3, some of the most important impressions gained by the Review Team are recounted, together with suggestions for future policy that might be considered appropriate in the Bulgarian context. Section 3 starts with one horizontal section about governance and coordination (governance and coordination issues, 3.1) and is subsequently structured along our domains Human Resources (3.2), Science Base (3.3), Business R&D and Innovation, Market Development and Framework Conditions (3.4) (CHECK IF WE HAVE 3-6). Therefore, in section 3 there is a slight focus on science policy issues, while the general market development and framework conditions have not been discussed in greater detail. Section 4 revisits the most important recommendations of the Policy Mix Peer Revision Team. Annex 1 provides an overview of the review programme and the participants.

2 The Bulgarian R&D and Innovation System and Policy Mix

A report on the policy mix in the RTDI system in Bulgaria must first put the Bulgarian situation into context. Together with Romania, Bulgaria is the youngest Member State of the European Union. Obviously, it is still in the middle of a challenging transition period, both in terms of its structures in the performance of research and innovation, and in policy and supporting implementation structures. Institutions have been -- and still are -- changing, and calls for further institutional transformation are to be heard. This report certainly contributes a few more of those calls. But we have to keep in mind that Bulgaria is not only in the process of catching up, it is a transition of institutional re-configuration. This is fundamental to the understanding of the challenges that have been behind all actors and those that still lie before them: Institutional change is not only about new organisations and functions; it is also about norms and formal and informal rules, and about constant new demands on performance and transparency.

Therefore, in the current period of change, new programmes, new implementation modes, transporting new rationales into the system, the learning and adaptation costs are still high in the country, both for the administration and the stakeholders. Policy learning takes time, learning too quickly might prove detrimental, and the danger of simplified policy copying is the shadow of dynamic change. The interplay of complex interests, new ideas and competencies that have been passed on for decades has to find a new balance, and conflicts between actors for the direction, speed and endpoint of change are an inevitable consequence, and even a driver. All this turbulence amidst the intensive struggle to catch up in economic terms, to modernise the economy, to survive competition against low cost countries around the globe, to bring the educational system in line with European standards, to keep the youth and thus the future in the country – while attempting to preserve dear and culturally important traditions.

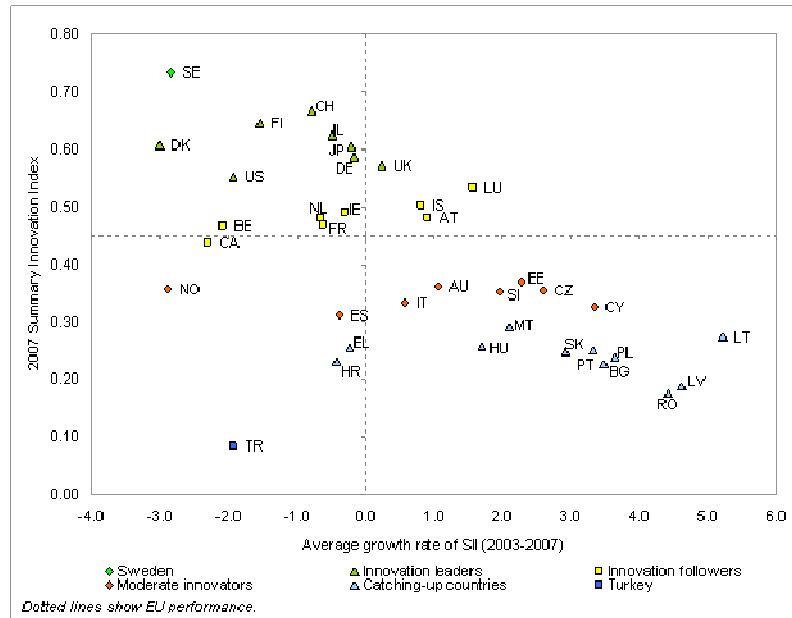
Against this background of uncertainty within multidimensional change and challenges, the country has now started its journey into a new era of being fully integrated into the European Union. As for the RTDI system, the journey of modernisation and of finding a model that works best for Bulgaria is well underway, but a first stop, a first breath to consolidate achievements lies – unfortunately – a considerable time in the future.

Some snapshot on the relative position of the country elucidates this; although we may add that already the attempt to measure the country with those metrics that we use for countries that are on their journey since more than 50 years is of course open to manifold criticism. We urge the reader to keep this in mind. However, without arguing about the justification of individual metrics, the magnitude of the challenge is obvious (exhibit 2). Based on a rather complex innovation index⁴,

⁴ The index is calculated on the basis of a set of sub-indicators, which can be grouped into input and output indicators: innovation inputs cover three innovation dimensions: Innovation drivers

Bulgaria is a catching up country, that lies “in front” of countries like Lithuania, Romania or Latvia and has a similar level even as Portugal. However the gap to the moderate innovators or even the leaders is naturally still extremely large.

Exhibit 2 Innovation Leaders, Followers, Moderate Innovators and Catching-up Countries



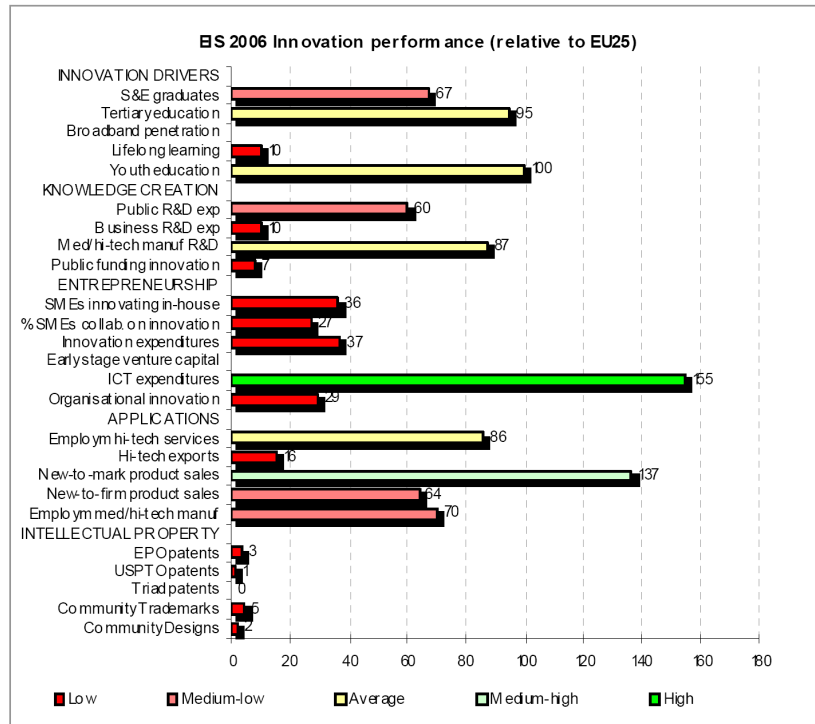
Source: <http://www.proinno-europe.eu/index.cfm?fuseaction=page.display&topicID=275&parentID=51#>

If we look at individual indicators for performance (exhibit 3), we see the major reasons why Bulgaria is still far behind. One main problem area is in the performance as for knowledge creation. The R&D activities of the company sector is extremely low, which may be the single most important problem of the systems as such. Similarly, the public funding for R&D is far below average; in fact, spending had been reduced for a set of years, and the public funds for innovation are almost negligible (data 2006). In terms of numbers, the education system performs better, but the report will show that hidden behind those numbers are some structural problems. The market position, the “application” side, shows mixed results, Bulgaria certainly is now a Hi-Tech location. The exceptionally low IPR activities reflect the poor R&D and innovation funding as well as institutional problems in the system itself. An area in which the country has made great progress is ICT deployment, the expenditures are impressive.

measure the structural conditions required for innovation potential; Knowledge creation measures the investments in R&D activities, considered as key elements for a successful knowledge-based economy; and Innovation & entrepreneurship measures the efforts towards innovation at firm level. Innovation outputs cover two innovation dimensions: Applications measures the performance, expressed in terms of labour and business activities, and their value added in innovative sectors; and Intellectual property measures the achieved results in terms of successful know-how (source: Innovation Scoreboard 2007, p. 35)

<http://www.proinno-europe.eu/index.cfm?fuseaction=page.display&topicID=275&parentID=51#>

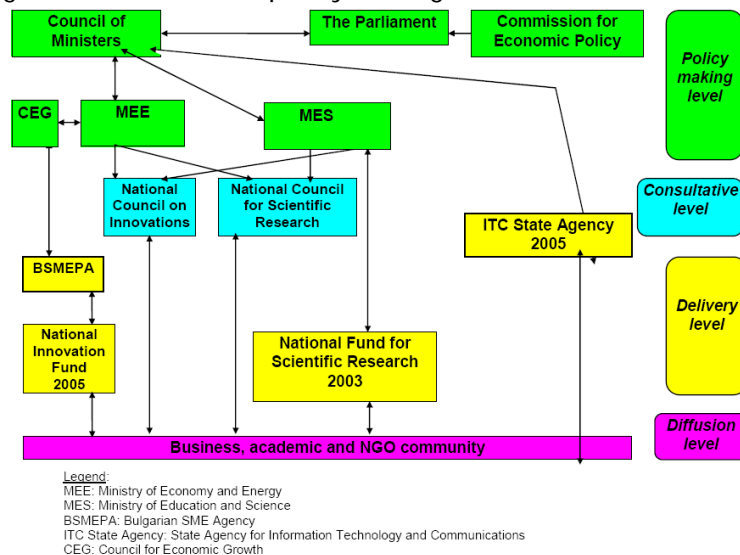
Exhibit 3 Bulgaria's Innovation Performance



Source: http://www.proinno-europe.eu/docs/reports/documents/Country_Report_Bulgaria_2007.pdf, p: 72.

As regards the political system governing RTDI in Bulgaria, there is a classical division of labour between science and education (MES) on the one hand and innovation and market development (MEE) on the other hand. Both ministries are supported by funding agencies (MES with NSF; MEE with the SME agency, the remit of which is broader than funding) (exhibit 4).

Exhibit 4: the governance of RTDI policy in Bulgaria



Source: Trendchart Country Report Bulgaria, 2007

The Ministry of Finance is responsible for the overall allocation of budgets, especially also for the Structural Funds, and the Ministry of Labour takes responsibility for

many aspects of education and vocational training that are relevant for the innovation system. In addition, there are three advisory councils and coordinating bodies. A peculiarity of the Bulgarian System is the Higher Attestation Commission which is responsible for the attestation of academic titles (Bulgaria still has a complex, multi-step career for academics) and final appointments of University Professors.

Bulgaria's science system is scattered, and the division of labour as well as the profile of individual institutions is not fully established and clear. Bulgaria has a very high number of institutes for higher education (37 public and 16 private). Traditionally, Universities in the Soviet style system had not carried out much research. Research was performed in application oriented Non-University institutes and in the institutes of the Academy of Science and Agricultural Academy.. Formally, the Bulgarian universities and colleges are still not research institutions in the sense that research is an objective following from public funding. Only education is. The Academies are, at least on paper, the main public research institutions.

At the beginning of the transition period, the majority of non-university, application oriented institutes were closed, leaving a severe gap in the system. Some Universities have slowly increased their research activities, but this increase has been imbalanced, with some – especially the larger – universities being more ambitious in establishing a strong research pillar than others.

A further distinct feature of the country is that it has comprehensive departmental, mission based research structures, whereby large specialised organisations do research and development under the sole responsibility of the Ministries of Agriculture, Medicine, Health and the State Agency for ICT, with individual governance principles and mechanisms. The human resource capacity in the system has diminished drastically, the average age is extremely high and the system is not as attractive for PhD as it should be, with brain drain being a very serious challenge.

The following list illustrates the nature and direction of policy change, but does not claim to deliver a comprehensive record of all policy initiatives:

- Introduction of an innovation policy strategy in 2004 and introduction of a National Innovation Fund for project funding for modernisation and innovation, mainly – but not exclusively for SME. This is implemented by the SME Agency.
- The implementation of the Operational Programmes of the Structural Fund, which opens up enormous new opportunities. The SF means a severe increase for funds to modernise the economy and make it more innovative, including measures to improve the IPR system and the attraction of foreign corporate R&D potential, but with less resources for Human Resource in the Science System and almost none for the Science system more generally.
- The formulation of an explicit science strategy in 2004, which was never implemented, but on the basis of which currently a new strategy is formulated and inserted into the political process
- A severe increase of funds into funding programmes of the National Science Foundation (it almost tripled in 2008), enhancing the relative share of

programme funding for the science system; this goes hand in hand with a proliferation of funding schemes, mainly geared towards increasing structural and project cooperation in the system (such as TOP Technology Institutes).

- An initiative of the MES for road-mapping the national infrastructure and a systematic foresight exercise in a selected set of scientific fields.
- Two parallel initiatives for innovation vouchers (MES and MEE), allowing firms to contract public science institutes.
- Formulation of regional innovation strategies, the implementation of which, however, is not fully clear yet.
- The design of a new doctoral scheme to make PhD within the country more attractive.

3 Commentary by the Review Team

3.1 The governance and overall approach of RTDI policy and the policy mix

Vision, overall strategy

Bulgaria still lacks a broad vision of the future of the RTDI system and certainly a clear-cut overall strategy of how to make such a vision a reality. The country is busy with organising transition and supporting broad economic growth, and is across the board successful in doing so. However, growth needs underpinning with innovation and in the long run with science feeding into it. The window of opportunity to adopt and further transform the system would be ideal, given accession to the EU and the opportunities of the Structural Fund. If those opportunities are to be seized most effectively and with the most profound systemic changes to the better, a sound holistic strategy would be needed, that leaves enough freedom for distinction and domain specific sub-strategies, but that has better intertwined common elements, a joined long term idea and more transparency. Coordination, based on openness and transparency, is essential.

The panel got the impression that there is a good opportunity at the moment for a fresh start, many actors in the system are engaged in various strategic considerations and even strategy making. To be sure, in all complex RTDI systems – and certainly in those that are in the middle of multi-dimensional transitions and re-shaping – strategy making is challenging, and the more so its implementation. However, in Bulgaria there are parallel worlds, as clearly indicated by the process of high level strategy making and the codification of those strategies in strategic documents. A whole range of strategic papers exist that relate to aspects of RTDI policy making. Most importantly, there have been two distinct strategic documents for innovation policy and science policy. The latter, decided upon in 2004, was never implemented because of changes in the government and administration. When the panel visited Bulgaria, there were concrete steps taken to re-formulate and update this science strategy (see next section), in a process that is broad in terms of science stakeholders and tries to integrate all actor groups in the science sub-system. This strategy is developed and would be implemented against the background of an already existing innovation strategy.

In and for itself, this may not be a problem, as far as the two are closely coordinated as regards the development of overall policy objectives and the division of labour within agencies and ministries within the system. However, again, it is not clear how considerations of the interface to innovation are dealt with. Proposals are made for further programmes that fund joint action (on top of existing schemes in both funds). But it is not fully clear to the panel if and how the link to industry and to priorities within the economic and innovation policy are taken into consideration, or which kinds of processes are proposed to improve this strategic interface in terms of policy making and in terms of concrete action in the field. Again, this is not a criticism of the attempts that are being made and the changes that are being proposed (see below, science system); the argument at this point is about a suboptimal cross-referencing and integration of strategic approaches.

The variety of strategic and operational actions and pathways is striking. It seems that the two strategies in innovation and science policy represent two different paths of policy development. Consequently, there are no clear – or even joint – priorities across the RTDI system in Bulgaria. In science policy there has been more or less explicit concentration on the areas that are funded in the Framework Programme of the EU, in order to maximise the likelihood of funds and activities for Bulgarian stakeholders – although recent attempts with a limited foresight exercise have tried to contribute to a more appropriate priority definition. In human resources the link to science needs and priorities is not obvious, in innovation policy there is a strong bottom up approach and some links to the priorities of the National Reform Programme, the origin of which could not be traced back to either innovation or science policy discourse.

Division of labour and coordination

The lack of a meaningful and horizontal strategic discourse that guides decision making in all areas points towards a more fundamental challenge: the coordination within the system. The governance system as such, in its structure, resembles many systems in Europe and in principle is fine. To have two major ministries responsible for most aspects of the STI system and to have agencies and funds to support policy implementation matches European standard. However, the panel received the impression that, as in many systems, the division of labour is less clear than it appears on paper, and the coordination of this configuration of institutions has room for improvement. This has become apparent in the various discussions, as institutions of one area are not fully aware of current new activities in other areas. For example, the fact that both the Ministry of Education and Science and the Ministry of Economy and Energy had worked out separate voucher schemes in parallel is irritating – certainly for some stakeholders, even if the voucher schemes are quite different in their conditions. The impression of the panel was that mutual information between and common shaping of policy of the two major ministries could be advanced.

The high level activity around the implementation of the Structural Fund have contributed to the complexity. Apparently, as in most countries, the strategic lead in those discussions was with the Finance Ministry. The panel cannot assess how the coordination around the Structural Fund activities was functioning. From the impressions got in the discussions, the policy needs as expressed, for example, by the MES, were not fully recognised. In consequence, meanwhile the majority of actors, and our panel, share the view that too little money in the Structural Fund has been earmarked for an increase of funding of science in the country. This is not to say that nothing has happened. There are plans to increase science budgets, and especially programming within science. The argument here is about the strategic discourse and planning across government when presented with a unique opportunity to re-design a whole system.

The Structural Fund agenda is very much driven by the more obvious economic and innovation rationale. For the innovation policy side, the Operational Programme appears to be clearer and more systematically linked to the overall system requirements (see below). However, given that the budgets available through the

Structural Fund will alter the Bulgarian RTDI system to a great extent and sow the seeds for further positive developments in all areas, the implementation and further adaptation of strategic activities financed through the Structural Fund should take into consideration the systemic inter-play of innovation and science policy more explicitly.

Given all these different discourse arenas, it is not entirely clear to what extent the main coordinating bodies Council for Economic Growth, Council for Scientific Research and National Council on Innovation fulfil their functions. The frequency of meetings appears low, there seems to be a lack of clearly defined functions of these bodies and low transparency as to what they discuss and achieve – at least this has been the impression of the panel and has been confirmed by stakeholders. Apparently, the outcomes of the meetings and joint decisions appear to be reported back poorly to the stakeholders, as in our meetings the stakeholders were only faintly aware of the activities of the bodies. The integration of stakeholders in the strategic discourse has not become clear. There are intensive discussions with and stakeholders in the limited discourses of innovation and especially science policy. But overall, at a horizontal level where innovation and science meet, the integrative discourse is not well established.

While apparently the high level decision making body, the Council of Ministers, endorses the most important policy documents in the field of innovation policy development and backs high increases for programme funding, the panel did not get the impression that the Council of Ministers functions as an effective innovation policy learning arena or instrument for proactive policy development. This body has a lot of other areas to cover, and there is probably not enough time for in depth innovation policy discussions.

A tentative conclusion is, therefore, that although there is a strong will and a good understanding of the need for the development of a broad based science innovation policy, the policy system itself demonstrates the types of organisational weaknesses we find in many countries as regards inter-ministerial collaboration and coordination.

For an improved, systemic co-ordination there is not one best practice in Europe. In principle, the existing structures could perform better, as they present a clear division of labour and still provide for regular, institutionalised exchange of major ministries. The principal idea of having one major Council led by the MES (Scientific Research) and one by the MEE (Innovation) stresses two rather distinct perspectives on -- and activity lines within -- the RTDI policy mix, which then would – ideally – be embedded in a more general discourse provided by the Council for Economic Growth. This model could work, but would need much more common discourse and mutual information early in policy and strategy cycles – not only ex post – that results in a true coordination at the strategic and operational level.

One approach could be to hold joint meetings between the two National Councils for Science and Innovation, once or twice a year, preferably combined with separate

workshops on relevant topics. Given that there are stakeholder members in the two councils, such joint meetings may also lead to a better dialogue between, for instance, universities and industry.

The establishment of a joint MES and MEE task force for preparing such meetings could contribute to develop a common learning platform for the two ministries. Other ministries could be invited to these preparatory meetings to the extent the topics discussed in the joint meetings are relevant to their area of responsibility.

An alternative model would be a merger, the development of a high level innovation policy development council. This has pros and cons. The Finnish Science and Technology Policy Council, chaired by the Prime Minister and with ministers and external experts as members, is often cited as an example – and was also mentioned by some of the ministerial representatives as an option. The Finnish STPC is the child of a particular consensus driven culture, and does not necessarily work equally well in other countries. In some cases moving innovation policy development up to the prime ministerial level might even weaken the government's ability to coordinate policy development because of the limits to the Prime Minister's capacity to handle a large number of issues in detail. Moreover, there is some possibility each change in government would lead to an entire disruption of this coordination model, as it would be high level will the danger of little operational underpinning. On the other hand, however, there is a counter argument. Structural, groundbreaking reforms in RTDI structures and directions in other countries (Estonia was mentioned explicitly), were decided and pushed through the system from above, strongly relying on the authority of the PM as chairman of the R&D Council and on key ministers as they were also members of the Council. Further, if a merger is considered, it must be fully integrated into the working level of the ministries and be sustainable. Such a unified body must ensure that both science and innovation issues are represented and that those issues that are not linked to the other domain are not unnecessarily hampered or used as bargaining chips. A merged body should thus provide for an equal representation of issues. One way to achieve this could be to have the responsibility for the agenda and even the location of the meetings alternate between the two ministries.

Strategic intelligence and evaluation culture

The actors in the Bulgarian system are becoming more reflexive, but do not use the tool box of strategic intelligence to its full potential. Indicator based analysis and benchmarking activities are used for all major policy arguments. The annual analytical report of the MEE is comprehensive, analytical and does not disguise structural weaknesses, policy shortcomings and further challenges. The data and insights in the area of science are equally sophisticated, although a similar report from the MES would help to make developments and challenges more transparent to the general public (as the stakeholders involved are very aware of the situation). Statistics in the area of Human Resource are abundant, but again, could be presented in a more accessible way.

The main argument, however, is that in terms of assessing and planning policies as well as assessing and planning institutional developments, the arsenal of methods

and techniques is not used. In fact, for the range of programmes that have been discussed in the review, the panel was not aware of real evaluations being done – or even published. Meanwhile, ex ante impact assessments are being planned by the government. This does not seem to be sufficient; policy measures need broader ex ante evaluation, clear monitoring that feeds into interim evaluations and interim and ex post evaluations that help the system to learn and become more reflexive. An evaluation culture seems not established. There has been an international assessment of the National Science Foundations two years ago, which in itself was good practice. This panel recommended to build up a stronger evaluation culture and some changes in the evaluation of the NSF itself (such as stricter internationalisation, stronger responsibilities of the evaluators vs. administrators, larger evaluation teams etc.). All these recommendations can still be endorsed. Even more changes are needed on the level of programmes and for the allocation rules to underpin institutional funding and to assess institutions and centres of excellence. Here, clear-cut metrics and understanding of the contextual conditions linked to formulated strategies should guide policy-making. The requirement to report on and justify activities co-financed by the EU could be a catalyst for a more reflexive and accountable system. One very practical issue is to ensure access to data that is crucial in order to understand and benchmark the output of research in the country (access to ISI Web of Science and related data sources).

Next to evaluation, foresight and methods like constructive technology assessment could be mobilised even more, whereby societal, economic and scientific actors engage in a discourse on concrete future priorities, opportunities and challenges connected with certain technological pathways. The foresight activity being done in some selected areas within the science discourse (see below) is a very promising start, and could be the seed for a more holistic, systematic and future oriented discourse that brings together demand side and future societal needs with the supply side. This is challenging in any system. However, especially in times of transition and relative openness on the one hand, and financial opportunities (Structural Funds) on the other, the organisation of such a cross-domain, inclusive, basic discourse through well established techniques and methods would support the much needed development of a vision for Bulgaria, and support coordination through common vision building.

3.2 The Science Base

When trying to comment on the public science structure and its governance as such, the panel first acknowledges the strong willingness of all actors in the system to increase research efforts and to strive for more excellence and relevance. There are trends to be observed towards more reflexivity in all parts of the system, output is now being measured towards a more conscious system of governing research within institutions. Strategic discourse is underway and the system is “on alert”, realising the importance of streamlined, excellent and efficient processes.

Budgets and capacity

While there are no clear political priorities as yet for scientific activities, there is still a pattern of scientific strengths in the Bulgarian system. In terms of research input, the strongest fields are natural sciences (33% of GERD in 2005) and engineering (28% of GERD) which should be a good starting point for becoming more supportive to economy. The proportion of agricultural sciences is very high (18% of GERD). Social sciences and humanities cover 17% of GERD, which is among the highest for new MS (no data on research fields for old MS). In terms of output, the strongest fields of research are chemistry, physics, engineering and mathematics, which rank in the first half of the ranking list of countries by ISI WEB of Knowledge Essential Science Indicators database, these fields provide also nearly half of the quality research output referred to in this database. Taken together, in principle the scientific profile for developing a knowledge based economy underpinned by scientific activities within the country is promising. The real problem, it seems, is when we look at the future generation of scientists who need to further expand and improve these activities (see below, HR)

What is overly obvious is that the overall capacity of and budget for science in Bulgaria is far too low. Although we have to be careful with simple figures and comparisons, various characteristics result in a clear picture: More – and better governed – efforts are needed to boost science in Bulgaria, to make it more relevant and more excellent across the board. Both GERD and BERD are among the lowest in EU27 (0,5% and 0,11% of GDP respectively). In relative terms, the number is even more sobering: GERD per researcher is 11 700 EUR, which is more than 13 times less than average level of EU27. While the panel does not argue for the 3% target to be reached in Bulgaria in the short and medium term, a big increase from the existing levels is needed.

Further, this R&D is extremely reliant on public spending; private R&D in Bulgaria is extremely low. While there is no optimum relation between private and public R&D, and while almost all countries in the EU have private R&D below the EU aim of two thirds, company R&D in Bulgaria is by far too low. This indicates a set of challenges across all four domains of this policy mix report to which we will return below.

This special role of the public sector in research is even more accentuated when looking at its internal structure. Bulgaria has an exceptionally high proportion of funding that goes into the non-university sector, either directly to departmental research or to the Academies. According to EUROSTAT the number of public FTE researchers outside the Higher Education System and non for profit sector in 2006

was 6148 versus 2756 in the Higher Education sector⁵, for FTE personnel the numbers were 10255 in government vs. 3464 in Higher Education⁶. In all other EU countries HES is larger than the government sector; in the EU the average HES is ca 2 times more numerous.⁷ The panel was further amazed at the small the share of government funding that goes to the Higher Education Sector (ca 5-6% in 2003-2005, the figures vary, see also below). In 2005, the Higher Education Sector received almost twice as much from domestic but mainly from foreign businesses. The strength of the non-University research is accentuated in the overall shares of GERD, as the two large Academies receive by far more funds than all Universities combined, and this money is outside the remit of the ministry that is responsible for science policy in the system.

This is partly caused by the division of labour from the old system that gave the Academies the role of research institutions, while the universities and colleges were to provide education. On paper this remains the case. University employees are paid for their teaching, not for their research. In practice, however, the universities have taken an active role in research, partly because research is necessary for any academic career at this level, and partly because advanced teaching requires a sufficient research base. On the other hand we were told that researchers from the Academies did teach at universities and colleges. Given the need for dissemination of knowledge and collaboration across institutional boundaries, this makes sense, but the panel would recommend that the new de facto roles of the universities and colleges on the one hand and the Academies on the other are further clarified and included in the legal framework and in work contracts, so that the different roles of teachers and researchers are reflected in policy strategies. Today collaboration and knowledge dissemination is a by-product of the fact that both university and Academy employees need more than one job to keep up their living standards, not a result of conscious policy planning.

The latter should not distract from a more principle problem: There is an extremely low absorptive capacity in the business community in Bulgaria. The Bulgarian business community offers too few partners for the science base, introducing ideas, asking for scientific solutions, offering complementary resources, interested in long term partnerships etc.. This, in turn, means a very low level of cooperation and even interaction between science and the industry base – even if instruments are in place meanwhile. This is not to say that there are not many interesting examples and some faculties in the large, more research active Universities have reported about intensive collaboration and contract research with firms, growing in recent years. However, this is by far not broad enough, and indeed, many of the companies that are cooperating are foreign firms, most of which without R&D capacities of their own within Bulgaria.

⁵ See: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=EU_TB_science_technology_innovation&root=EU_TB_science_technology_innovation/t_science/t_research/tsc00004

⁶ EUROSTAT 2008: Statistics in Focus 91/2008
http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-08-091/EN/KS-SF-08-091-EN.PDF

⁷ See both previous footnotes.

In addition, for those activities that need “translation”, following a traditional transfer model, there are no sufficient transfer structures in the public science system that pro-actively try to link firms and public scientists. Finally, Universities face legal obstacles when entering into PPP with industry, large scale common activities that are co-financed are not possible or only with very creative constructions. The Panel advises that the linkages between industry and science should be looked at in more detail, to tackle the legal and Human Resource issues that stand in the way of more fruitful cooperation across the system. The fact that the absorptive capacity of the industry is low and that there still is a strong focus on products, production and marketing should not be an excuse for not dismantling inhibiting framework conditions.

It should be noted, though, that the lack of industry research is partly a result of the present stage of Bulgaria’s economic development, a pattern found in other economies in transition as well. Bulgarian companies do innovate, but they innovate by buying new technologies from others. Given the low salaries, they can still be very competitive in the world markets. In the short run, this may be considered a good strategy. However, some of these companies will in time reach a critical mass through internal growth or through mergers and acquisitions – a point at which the risk involved with investing in R&D becomes so low that it makes sense for them to explore new technologies for themselves. The Bulgarian government need to establish a macroeconomic framework as well as knowledge institutions that make such a development possible. The economy is already open and the tax levels are low. Now is the time to invest in the supply of competent manpower and knowledge institutions that can collaborate with industry.

New instruments

Further, a set of new instruments have been implemented or are in the making, such as centres of competence, integrated University centres, a voucher scheme (next to the one by MEE), or further post doc fellowships and re-integration grants for scientists at the end of their careers. Some of these new initiatives developed within the National Science Foundation appear to be playing the role of a testing laboratories for new approaches. The opening up of the NSF grants to joint applications with public research and the possibilities in the National Innovation fund (a similar voucher scheme) have been getting better in recent years and months. In addition, the growth in funding for the National Science Foundation is a very positive sign in the right direction, as “fresh money” is channelled into the system.

These instruments promise to trigger structural change in the system, bundling competencies (critical mass, visibility), setting up lasting cooperation structures (centre) or ad hoc cooperation with industry (voucher). There is no information as yet if those instruments will work and how they will be linked to an overall science strategy. However these instruments go in the right direction and create hope for structural developments to the better. The panel encourages to further strengthen attempts for structural change towards more heterogeneous cooperation. Still, at the same time, those instruments need to be integrated with priority setting and linked systematically with complementary instruments in the area of innovation policy.

Increasing budgets, clarifying incentives

In terms of financing, the panel would like to stress two related issues: the overall budgets for the system (also in relation to the Structural Fund money that will be distributed in the system in the future), and the rules for allocation of those budgets, which need to be more incentive driven and performance based.

First, as regards the overall budget for science, there are important attempts underway to significantly increase the budget, as mentioned above mainly through the National Science Foundations. At the same time, however, the panel finds it hard to understand why in the allocation of funds from the Structural Fund the needs for an increase in science budget have not been taken better into account – and why science is not given sufficient funding within the National Reform Programme. The panel therefore recommends that the government channel more of the SF budgets into the science system in order to lay the foundation for future sustainable development. Such increases, however, must go hand in hand with stronger efforts to increase efficiency of spending.

Second, as regards the rules for allocation, the science system as such needs a clear-cut incentive system, whereby resources for research are distributed on the basis of excellence and relevance. This should apply both to the parts of the budget that will remain within institutional funding (block grants) and, more importantly, should mean a further move towards research and innovation programme development. The allocation of money based on the number of students and a fixed share for research does not set the right incentives for profiling and research strategies. There will have to be an element of institutional assessment and evaluation, the results of which should influence the distribution of institutional funds.

One should further strengthen the development of more competition based funding, and the share of funds allocated through competitive programmes should be even higher in the future. This will make it easier to underpin political priorities with relevant research; it will make it easier to implement incentives for excellence and it will, at the level of individuals, give scientists more time and resources for research (see also section on Human Resources).

Universities – profiles, research capacity and autonomy

In terms of the university system, it could be argued that many of the institutions that are now labelled as universities neither have the resources nor the knowledge base needed to fulfil the traditional role of such institutions. One may, of course, say that the function of an institution is more important than its name. In many countries, including the US and the UK, most institutions of higher education may be given the name universities, regardless of their research intensity. It may make sense to clarify the role of the various universities/colleges and make clear to what extent the public funding is to be used for research. If this is not made clear, the academic drift present in all such institutions may lead to uncoordinated and under funded research activities in a large number of areas, and the meaning of what is a “University” may be denuded.

It should also be noted that a too large number of institutions for higher education may lead to a duplication of administrative work. The institutional landscape in Bulgaria is too scattered already. An institutional concentration through mergers and the creation of clear institutional profiles may make the system more efficient and help the government implement strategic priorities in the research policy area .

As stated above, in general the capacity of Universities to perform research appears to be too low. The picture is not uniform, though, as some Universities contribute considerably to the research output in Bulgaria. There are large differences in the capacity to perform research in the various institutions. The biggest University in terms of research output is the University of Sofia with approximately 16 % of all Bulgarian publications in the ISI Web of Knowledge (Essential Science Indicators). The development will further accelerate, as three of the more research intensive and larger Universities have recently established an association of research Universities in order to speak with one voice and to improve the conditions under which University research is performed.

However, the overall budget dedicated to research is too small. The tradition of focusing research outside the University and have Universities focus on education is still showing in the low share of the overall institutional budget that is channelled to the Universities for research. Further, the budget for research is allocated according to student numbers, which does not set the right incentives.

Finally Universities are not free to appoint professors, but have to get approval by the Higher Attestation Commission. While formal approval for Professors is practice in some European countries (but mainly done via the responsible ministries), to have an external committee decide on strategic positioning within Universities is a challenge for the flexible and still systematic strategy development for University leaders and limits their autonomy. There are on-going discussions to change the system, one idea (put forward by the Higher Attestation Commission) is to follow some European countries (e.g. Spain, France) and to grant the full right of appointing to the Universities, but to have procedure in place whereby potential candidates first have to qualify through a habilitation with the Higher Attestation Commission. A second option is to let Universities decide entirely freely, with the central habilitation as a "can", not a "must" for their procedure.

The role of the Academy

In continuation of the tradition of the Soviet and even pre-Soviet period, the Academy of Science in Bulgaria is by far the biggest research performer. The Academy has downsized considerably since the early 1990s. In June 2008 the Academy of Science comprises 3,700 scientists, 52 research institutes, 12 laboratories, 3 research centres and roughly 8.100 employees altogether, in July 2008 the overall figures had dropped to 7.600. It contributes to scientific research across the board of the most disciplines (except medicine, agriculture and food), provides national services (metrology etc.) and is responsible for of large scale infrastructure. Roughly 70% of all funds are institutional core funding by the MES and distributed through the Academy leadership itself, 30% are various projects in NSF, EU FP etc..

The Academy has also introduced programme driven research internally⁸ and opened up to the EU. The role of the Academy of Science and its institutes is formally defined in the Law of the Academy and in its Statutes. For the panel this role is very broad, indeed multi-functional and thus still remains a bit unclear (see below). In terms of output, the Academy is the most important single actor, as it is responsible for slightly more than half of all Bulgarian publications (53,5%) referred by ISI Web of Knowledge (Essential Science Indicators, Nov. 4 2004)⁹. However, there are on-going discussions as to what the specific role of the Academy is. The relative size of this structure is enormous, leading to an unusual ratio between University and Non-University researchers – and leading to a clear need for justification of all the functions and to try – more thoroughly than has been done hitherto – a restructuring along those functions.

The panel argues that the processes of reform and re-evaluation talked about by the BAS need to be continued and strongly reinforced. In fact, the Academy would benefit from a thorough international independent evaluation.. The issues for such an evaluation should be the following: What are the roles of the Academy? In which areas and for which functions are non-University research activities sensible? How could and should Universities be better equipped with research capabilities? Why does the Academy have to perform research in areas that are performed in Universities already or in parallel, thus de-couple research from education and diminishing the build up of a critical mass across one area? What are the internal governance mechanisms to allocate research funding and decide about priorities and how transparent is the governance?

The evaluation of course would have to be entirely objective, open ended and international. Following standard procedure it would be good if the Ministry responsible for science (MES) also would be responsible for this evaluation and to commission the evaluation to a neutral team of external evaluators. Following an international procurement this could take advantage of the international experience of the ESF as one of the potential participants in the evaluation. Other Ministries should also be involved as stakeholders of the evaluation process.

Such a re-evaluation cannot be done in an isolated fashion only for the Academy, it should be part of an overall assessment of the science system and the division of labour within it. It must be accompanied by a clear strategic vision of what functions are defined as being important. The overall aim should be that the BAS works closely together with and is integrated with those actors that are politically responsible for science (at its core the MES). In the view of the panel the MES as Ministry responsible for science should lead the development of a vision as to how the BAS and its institutes fit into the Bulgarian overall innovation system and this should then

⁸ The programming is organised in three policies (Scientific servicing and counselling of the state and the society. Development and integration of the research potential and infrastructure in the European Research Area, national values and identity) and altogether 10 programmes. The Panel could not assess the internal governance model to implement those programmes.

⁹ According to figures provided by the Academy on the basis of ISI Web of Science the number is higher, almost 60%, this might have to do with different search strategies, and the message is obvious: the Academy is the dominant player in terms of output.

drive the process of re-evaluation. Following functions should be – at least - distinguished:

- § Institutes performing vital national functions, which might move closer to those institutions, for which they provide services (as, for example, in the Ministry of Regional Development and Public Works) and thus be departmental institutes rather than institutes of the Academy.
- § Institutes having the large scale infrastructure and the staff capable of and motivated to run long term research projects in specific areas that necessitate large scale infrastructure: Here is a genuine function of the Academy, as Universities with their pressures stemming from education are less well equipped to perform large scale infrastructure activities.
- § Institutes that close other gaps in the system, where Universities are not active or lack the capabilities to become active. This may, for instance, be relevant to cross-disciplinary research or research in industrial or social areas that does not fit well with traditional disciplinary dividing lines.
- § Institutes performing world class leading edge basic research with a clear critical mass to do so and a full concentration on doing so, in areas that are of importance to the Bulgarian science and innovation system (see: priorities).
- § Institutes that are geared towards application oriented research and able and willing to cooperate closely with industry in order to make up for a widely recognised gap in the Bulgarian system – again with the critical mass and the sustainability needed for industry. The experience from countries like Norway, Denmark and the Netherlands shows that market-oriented institutes may to a certain extent compensate for the lack of R&D capabilities in small and medium sized companies and function as efficient partners for larger firms.

This overview – that given the nature of our panel exercise is illustrative rather than comprehensive – shows the heterogeneity of the Academy. Thinking about the role of the Academy along those lines – and defining for each institute a clear role – could further support a productive discourse within Bulgaria about how to best use the doubtless enormous potential of the Academy, and how to break out any silo-mentality.

While in other countries those functions are shared by different institutions with different allocation mechanisms, the Academy shares one allocation model for all those roles, there is no differentiation of funding mechanisms for the various roles.

The panel does not want to speculate about the best overall institutional configuration – and of how much “non-University research a country can afford”, as one interviewee put it. As just stated, there are many reasons for investing in non-university research. We find a large number of institutional configurations in Europe. The main point is to see to it that the main functions are covered, including, for instance, basic research as a basis for higher education and market near research based on an intimate understanding of the needs of companies. If the present institutional structure may serve as a foundation for such a future system, all the better. However, it is clear that the various functions should also follow appropriate funding and governance models (see below).

However, steps towards a more integrated system are needed. Thus, for the sake of enriching the debate, the panel simply suggests to discuss, on the basis of the re-evaluation, a whole range of organisational adjustments: For example, there are a range of functions and institutes in at least three areas where a closer cooperation up to an integration with Universities could be tested:

- § areas in which Universities perform similar research but with a much larger number of staff.
- § areas in which the content of research is of high relevance for the training of the next generation in Bulgaria. Here there should be a better link to education on all levels. Given the severe human resource challenges in Bulgaria, the country should not have too large a number of first class researchers not engaged in training or not better linked to training. As training is the core business of Universities, Universities should better define their needs and how Academy institutes could support them with joint courses, use of infrastructure etc.
- § areas in which a strategic co-operation of universities and selected companies could create a relevant critical mass in focus areas of industrial development

Next to the potential merger of individual institutes, new forms of exchange between the BAS and Universities should be developed and mid- to long term co-operation could be thought of, for example in the form of joint projects, common infrastructures, joint ventures, or in the form of joint centres. In application oriented areas those centres could even be set up with (foreign) firms in form of multi-annual competence centres (in shared priority areas for science and industry). All these examples point towards the creativity that is needed to better use and equip the system, and to bring the various functions of the Academy institutes much better in line with an adequate structural set up and governance scheme.

For the Academy of Agriculture the situation is different, as this Academy performs a whole range of specific functions beyond research, and even for research it seems that the overlap with universities is much less clear.

A necessary pre-condition for all institutional re-configurations would be to clarify roles and long term planning in the Academy. The different roles of the Academy would then have to lead to different allocation models and incentive structures – up to new institutional configurations. There are not as yet clearly defined science priorities for the country as such, thus the linkage of Academy priorities into overall country priorities is not defined. However, there is an overlap of internal programmes with the Framework Programme and the NRP is apparent, and secondly, as there are no clear-cut priorities from above, i.e. from the MES. Given the importance of the Academy for society and economy as a whole, strategic decision-making – and the internal programmes of the Academy – should be better linked to political, societal and economic stakeholders, and be linked to priorities (once those are clearly defined). It appears that science policy has few mechanisms, beyond individual programmes, that could re-direct capacities within the Academy.

However, the panel regards it as important that the allocation of funds and the setting of priorities in the Academy is done in a way that leads to a more harmonious relationship between science policy in general and the science policy discourse on the one hand, and the priorities of the Academy on the other hand. This is not to play down the significance of the work being done in the Academy; the panel is in no way able to assess the excellence and relevance of the scientific work carried out. It is a basic question of the structure of the science system and the sharing of responsibility for allocation and priorities.

To some extent, and indirectly, the Academy is already going into that direction as it is already successful in acquiring project funding from national programmes and the EU Framework programme and other international sources. The link to “priorities” can be obtained to a further increase of the share of budgets that is obtained through programmes, and thus a lower share of core funding.

A re-evaluation of the Academy should also include the governance practices within the Academy. Compared to the Universities, which are responsible for the next generation, the Academy has more discretion in terms of research funds. For the institutional budget the Academy receives, the internal procedures for the allocation of money should not only be linked more closely to an overall strategy and the different roles (see above), but to institute specific performance indicators, with a transparent control for quality and efficiency. For those functions that the Academy fulfils on behalf of certain ministries or agencies, priority making should be more directly linked to the decision-making of the responsible ministry or agency. In general, the overall evaluation should be open to suggesting best institutional structures for the various functions the Academy currently fulfils.

Such a shift towards greater linkage to the science policy community and stakeholders would also be of relevance to the double function of the Academy as a self-recruiting club of members on the one hand, and being the largest research centre in Bulgaria on the other hand. This double function has historical reasons, but it is not apparent why these two functions should be mixed.

Further departmental and domain based activities

Bulgaria has a comprehensive departmental, mission based research structure, whereby large specialised organisations do research and development under the sole responsibility of the Ministries of Agriculture, Medicine, Health and the State Agency for ICT, with individual governance principles and mechanisms. This adds to the coordination challenge across the whole RTDI system, and - by definition – it weakens the possibilities for the MES to design full fledged, broad strategies that realise synergies between all those areas. Further, it complicates the process of defining priorities across the system and it potentially waters down performance and merit based funding.

However, there might be a unique chance for Bulgaria in this structure: Just as in the US, the mission oriented, or domain based structure of financing and governing research is built into the structure through some major domain based research organisations that are linked to the respective sectoral ministries. This allows to link research activities very directly with sectoral policy goals (grand challenges) and to

make funding dependent on the contribution that the institute makes to achieve the sectoral goal. In this way, the funding is more closely linked to the sectoral (industrial) discourse in the area. Thus the relevance of the funded research is in-built. The challenge is to guarantee that those institutes follow a competition-based model and that the actual science is done under peer review and with clear signs of international integration.

International involvement

Given the capacity in the STI system, the participation in the FP appears satisfactory. Especially in the horizontal programmes the participation is encouraging. However, in thematic programmes there appears to be a lack of strong actors able to coordinate projects, and therefore the possibility of tailoring consortia to the specific needs of Bulgarian actors is not exploited to its full potential. Furthermore, the participation in the important people Strand of the FP 7 programme is too poor. Awareness and readiness seem to be low to engage in Marie Curie schemes and the like. The participation in COST, as far as the panel could see, was good, while one former important source for international activities, the NATO programme, is less accessible since Bulgaria is a full member and the potential of EUREKA is not exploited.

Although one can always further strengthen support structures, the success in the Framework Programme and other international schemes is very much dependent on the overall situation of research in a country, the number of willing and able companies and institutes and the number of early stage researchers who want to engage in international activities -- not by leaving the country for good for a considerable number of years, but through participating in instruments like Marie Curie,. An EC study has shown that a country's ability to get EU funds is correlated (with high precision) to R&D spending. This means that if Bulgaria, as any new Member State, wants to obtain more resources from European research funds for their teams, they will have to invest more into their own R&D systems.¹⁰

However, there is another, almost ironic challenge. As happened in other countries, a the strong increase in national resources, especially for companies through the NIF and the Operational Programme activities (see below) might lead to less pressure to seek funds internationally, especially in the EU FP.. The panel advises not to diminish efforts to mobilise for the international arena. Growth in funds nationally should be accompanied with strong efforts to integrate internationally.

Science – industry linkages

In the early years of transition, the public institutes geared towards innovation and applied science have been abolished, new structures performing mainly applied research or functioning as intermediaries between science and industry (see below) have not been created on large scale. The Bulgarian system has not yet recovered from this loss. The panel has learned of many successful individual activities of cooperation, but there is no clear-cut profile of institutes, supporting structures and

¹⁰ Monitoring 2004, Implementation of Activities under the EU and EURATOM Framework and corresponding specific programmes, August 2005, final.

even joint initiatives, neither within the Academy of Science nor within the Universities, which would promote efficient co-construction of knowledge and transfer of results. Moreover, Bulgaria lacks market oriented research institutions that intimately understand the needs of industry.

To be sure, a major reason for that is the lack of demand for industry for advanced research and, even worse, the lack of absorptive capabilities in industry. As stated above, new instruments under development, such as centres of competence or integrated University centres go in the right direction. However, the problem is even more basic, the panel holds the view that new efforts would be needed to integrate industry more closely into the build up of common structures in the science system and thus increase the responsiveness of the system. This would have to start with a more integrated discourse and more pro-active, coordinated voice of industry (these aspects are taken up below, section on business R&D).

Science Strategy – a much needed process, still too isolated

A new science strategy is in the making, and the panel was lucky enough to discuss this with those responsible for the discourse towards that strategy. It should accelerate the transition into a more competition based science system and show ways in which more money can be distributed to the scientists, especially the young scientists. It is also the best way to coordinate in complex system, as actors can align their goals and processes to the strategic vision and thus “coordinate by objective”. Overall, the objectives and most of the instruments under discussion appear sensible and fit to the context and challenge. The process of designing such a strategy has been organised through a discourse by key stakeholders, including the variety of actors in the science system. This approach is in principle legitimate and effective. It is clear that political decision makers will have to take the strategy forward into the political realm.

What seems problematic in the strategy is the fact that it is once again done largely without the innovation community involved. While such involvement may actually hinder a focused science debate, it would however increase the responsiveness of the science system to the innovation system and also the understanding on both sides about expectations and about what is specific in each of the two realms.

The panel did not fully grasp the process of priority setting within the new strategic approach (this links back to the general issue of priority setting across the system as stated above). The strategy mentioned a limited number of priorities, but again their origin is opaque. While all the major actors in the country seem to wait for or demand priorities, no clear process to define them has been set up across the science system. There are on-going foresight processes which follow the highest standards of foresight in STI in Europe. These foresight activities, however, are limited to pre-defined areas such as agro-bio, energy, chemistry, and nanotechnologies. Thus, the system lacks the first step, i.e. to define areas that are of importance for science, society and industry and on that basis to fine-tune within selected areas. Up to now and before the foresight activities, the priorities for the science system have been those set by the Framework Programme. The logic behind this focus is obvious and legitimate (maximise the participation in the FP and thus

linking Bulgarian researchers to the European community and taking advantage of supporting structures). However, Bulgaria is too small to cover all FP priorities with equal weight, and as many other countries, Bulgaria gives up the opportunity to build a distinct research profile that better fits the resources and aspirations of the country and its industry. Through following the rest of Europe, distinct advantages will be impossible.

Therefore, the panel advises that the science strategy itself proposes a process by which priorities will be set in the future, and instruments that will allow to implement those priorities in the system. This strategy process should be linked to – but not simply be derived from – the innovation strategy priorities and the economic profile of the country as such, not to make all research instrumental for short term economic needs, but to design a system that is more responsive to the specific needs of the country rather than continues established trajectories of structures and processes.

3.3 Human Resources

The profile of HR: Too few researchers, and too few young researchers

The human resource base in Bulgaria faces a whole range of challenges. However, there is a strong potential that needs to be strengthened and better exploited. The strongest fields of research are chemistry, physics, engineering and mathematics, which rank in the first half of the ranking list of countries by ISI WEB of Knowledge Essential Science Indicators database. These fields provide also nearly half of the quality research output, referred in this database. This could make a good basis for the knowledge base economy, although in terms of future profiles, one problem seems to be the very high and growing share of new PhDs in social and humanitarian sciences (from 35% in 2004 rise to 41% in 2005 and 46% in 2006 and 2007).

There are severe structural challenges, and all major stakeholders are of course fully aware of them: The scientists in the system are – on average - too old and there is a severe lack of young people striving for a career in science, especially in those areas that are more directly relevant for the economy. A related problem, and in consequence maybe an even more severe one, is the low number of Professors who are younger than 45. According to the recently developed information system of the Higher Attestation Commission (HAC) the average age of the newly elected professor is 58 and the corresponding number for Associate Professors is 48.

Bulgaria thus has a severe lack of talent that seeks academic careers and high level scientific education (PhD). The relative number of research personnel and researchers (headcount) is the smallest in the EU, the percentage of research personnel from the active population equals 0.56% versus 1.32% in EU27 and the share of researchers is 0.36% versus 0.8% in EU27. Further, the relative number of researchers (FTE) is the one of the smallest in the EU: As percentage of active population the share of researchers is 0.30% versus 0.55% in EU27, 0.19% in Cyprus, 0.27% in Malta, 0.29% in Latvia and 0.23% in Romania.

The lack of critical mass of young researchers also leads to a low exploitation of European instruments in the People Programme, the mobilisation for Marie Curie and other schemes is not satisfactory, which then leads to a lack of international involvement of those young researchers which do not leave the country. Additional mobility schemes with return obligations would certainly be helpful. The panel emphasises that all efforts must be mobilised in order to secure a future human resource base for Bulgaria, which means radical dismantling of barriers and a better balance of incentives.

The disincentives for scientific careers

The low numbers of PhDs and young researchers are of course an indication of the poor incentives for academic careers, especially compared to the incentives that are offered for high potentials in industry or in science careers in other countries. For example, a recent study has found that the average weighted total yearly salary of Bulgarian researchers was 3,556 EURO, which is by far the lowest in the EU27. To

understand the level, we need to compare: The second lowest income was reported to be in neighbouring Romania, with 6,286 EURO still 76 % higher, the third lowest is Latvia with 10.488 and thus almost three times as high, in Greece scientists earn on average more than 25,000 EURO, and thus more than 6 times as much. Just to put it into perspective in a common market for researchers, in the UK the average salary is 56,000 EURO, in Switzerland it is above 82,000 EURO.¹¹ When considering purchase power standards, the situation is only slightly better, with Bulgaria still in last position, the distance to Romania as second lowest still is 38% higher than in Bulgaria

These low numbers speak for themselves. About 30% of PhD places are not filled. Stipends are not attractive even if they have been increased significantly (although this in turn creates problems further up the system). There are significant outflows of young Bulgarians to study and then work abroad. University and institute scientists have clearly stated that that low levels of salaries and poor career progression limited their ability to attract and retain the best people in research careers, although according to numbers of the Attestation Commission the number of granted had has grown (from 588 in 2005 to 860 in 2007). The stipend of PhD is growing now, a new scheme is in the making that promises to improve the situation, but may be too narrow. The high drop out share is also due to non serious PhD who go for the money. Many talented students leave for industry or to go abroad just after their studies or during their PhD, often even shortly after their PhD. That explains why the share of PhD working in engineering and natural sciences is low, while in social sciences and humanities the share is higher.

Given the huge differences in salaries to be earned and also in the quality and reputation of education to be obtained abroad, the intensive brain drain in the last 10 years from Bulgaria is a serious challenge. The panel believes, however, that brain drain issues cannot be solved through targeted measures for the expatriates. Rather it needs economic development and opportunities and – more specifically for the science careers – dismantling of a whole rang of hurdles (see below).

Those who stay to finish their PhD and then engage in a Bulgarian scientific career struggle with low income and thus have to take on a number of parallel jobs in the system. The panel has learned that individuals sometimes have up to five different jobs in teaching and research in order to get together a salary that covers their own living costs.

While this low level of salaries is in itself a severe problem to attract and retain the highest quality of researchers for the public research system or subsequently high level company careers, this multiple affiliation has an almost perverse consequence, as it seems to be an important channel for the transfer of knowledge and practice across the system, between institutions. However, the bottom line is obvious, undisputed and fully recognised in large parts of the scientific, industrial and political community: There need to be higher salaries for all stages of scientific careers. There have been recent steps to raise the salaries, but first, given the numbers above

¹¹ EUROPEAN COMMISSION (2007): Remuneration of Researchers in the Public and Private sectors, Service Contract REM01, Final Report, published in 2007.

these are not sufficient, and second, the rise has only been approved for the young generation; mid career scientists cannot expect a severe change in their work conditions.

The MES appear to be responsible for setting the number and allocation of PhD places. They should consider whether they should remove this part of the system and allow institutions to decide how many PhDs post to offer, thus funding would follow the number of PhD students mobilised. This would appear low risk in terms of budgets but makes competition between institutions more transparent.

Further, while salaries need to be raised, the link between higher salaries and monitoring of individual performance needs to be carefully designed. For example, the suggestion by the MES that in future professors would be restricted to holding two posts would have to be accompanied by a raise in salary and by the assessment of the performance of those professors. A further problematic aspect of the science system is that after a short while scientific posts are becoming permanent. This practice can be justified only as a trade off for the poor salary. As incentive mechanism for researchers to perform and to be mobile and as a means for strategy development in Universities and in the academy, it is detrimental. The panel does not argue to abolish this system now, but at a later stage in combination with higher salaries more flexibility for strategic Human Resource and profiling in Universities is needed.

The activities of the Higher Attestation commission is a relic of former times. The proposition that universities cannot choose the Professors they appoint undermines the whole concept of academic freedom and strategy development of Universities. We understand the commission proposes some reforms to remove this constraint and these should be pursued. However, the Ministry should consider more radical reforms. It should consider the abolition of the "second degree" (which in addition is a severe hurdle for the circulation of brainpower) or – at the very least – to make it unnecessary for advancement. Transparent processes for promotion are needed – but Universities and institutes should have a strong role in them and candidates should be assessed on their demonstrated record in delivering quality research and high quality teaching. Improved and intensified assessment processes for institutions and individuals are called for. Further, the degrees and titles to be obtained are still awarded strictly in disciplinary fields and borders. This is of course not in line with the requirements of a modern science system and creates a counter-productive tension between being relevant for industry and in the international realm and fitting into the promotion system of the Bulgarian system. The attestation commission has already defined this problem itself, and action to change the situation is urgently needed.

Focussing on HR

Although large parts of the scientific community and the political stakeholders are on alert, the panel got the impression that the human resource dimension in science did not receive the necessary weight in the design of Structural Fund instruments for the innovation system at large. While for the areas of innovation and business

development a whole range of large scale programmes have been designed, for Human Resources there appears to be no breakthrough, no basic change towards better financing and incentivising.

To be sure, next to an insufficient increase in starting salaries – some minor changes have been applied in the system, such as reward for NSF projects employing young staff. However, all future development in technology and knowledge based innovation in the Bulgarian economy, all attraction of foreign companies that goes beyond the low cost or market argument and that is supposed to lead to sustainable knowledge and technology networks in the country will depend on the human factor. The panel is convinced that the focus on attempts to modernise and better equip the science system must be in human capital, as all priority setting and all restructuring of the system runs dry without a capable and motivated new generation.

Skills for industry

The panel has heard manifold complaints about skills provided in the education system not being adequate for the needs of industry. These complaints referred to the secondary and tertiary education as well as to vocational training and life long learning. Indeed, Bulgaria has an extremely low figure in terms of population engaged in life-long learning and vocational training (next to the low numbers of PhDs). Even though the educational levels in general are high, which represents a strength, these particular problems raises cause for concern. There are few Ph.D. in the engineering and natural sciences, while there is in comparison a relatively large number of Ph.D.s in the social sciences and humanities.

Apparently, especially high tech firms have started to engage in in-house education to make up for gaps they perceive. This is not a trend that is particular to Bulgaria. Even firms in the leading economies do so, as fast technological changes and the need for specialization requires such in-house training, even when the knowledge system is able to deliver a sufficient number of skilled candidates. However, the more up-to-date and relevant courses in higher education are, the quicker companies can make use of new recruits.

There was no consensus in the system as to which direction the system should go. Some were arguing that the education system should provide – next to the basic educational necessities – for more general soft skills, team abilities, creativity, flexibility, curiosity etc., others wanted to see more up-to-date training on latest methods and concrete skills for concrete job profiles. The panel cannot assess the education system as such from the discussion held. However, complaints about the skills for industry were abundant, and the panel strongly advises to recognise this as a common challenge.

While these complaints have been broad and should be taken very seriously, it is at the same time not clear whether business has clearly defined their needs in the various sectors and branches. The discussion on the educational system seems to be symptomatic for many important discussions going on in Bulgaria: They seem to be

too much inward looking, and there is too little horizontal analysis. The panel had the impression that the broader discussion on these issues is nearly absent. A cross-systemic, broad and much better structured discourse on what kind of educational system is wanted is needed.

At the same time, there is still limited demand within the country for high level PhD for research activities in firms, which may partly explain the low numbers of PhD in natural and engineering sciences (above). Not only is the level of business R&D extremely low (see chapter on Business R&D and innovation), but many of the foreign companies entering the country still do it for the benefits of low cost production. R&D labs or at least strong adaptation developments (for the internal or Eastern markets) are not common – thus the need for researchers from foreign firms is rather low.

This probably means that there is a need for a strategy that takes a step-by-step approach to the development of the learning and innovation capabilities of firms. An immediate priority will be to produce enough low and medium level engineers, experts and researchers that can help the companies find, understand and make use of advanced technology and knowledge. In time this will make them more capable of performing in-house R&D and collaborate with R&D environments in universities, academy institutes and larger firms abroad. At that time the need for relevant PhD's will become more urgent. Given that it takes time to get students through the system, the investments in new PhD's will have to be done pretty soon.

Mobilisation and clarification: Bringing research closer to education

In terms of the equipment of the system to educate PhD broadly, it appears – as said above – that much of the capacity to educate PhD, namely through the Academy of Science – is not used to full potential. Only roughly 20% of PhD-s students work in the institutes of the Academy (data from the Academy). Given the overall size of the Academy, the involvement of researchers from the Academic institutes in teaching of the Universities could be higher. The teaching offered by the Academy relies on very dedicated individuals who are very active, a clear-cut coordination and integration of courses offered by the Academy into University syllabus could not be found in the discussion of the panel.

The panel concludes that there is a need for mobilising high level teaching in all stages. This involves the mobilisation of the best brains for teaching, and thus a much more systematic inclusion of high level researchers of the Academy. This is not to say that Academy should develop into a Higher Education institution, as this is the role and function of strong Universities (which, as said elsewhere, across Europe includes the autonomy to assign doctoral degrees), but more systematic linkages would be sensible. Furthermore, as in so many European countries, the practice of training students seems in many cases to be rigid, inflexible and uncreative,¹² as teachers are relying more on memorising established text book knowledge rather than encouraging the development the soft skills, entrepreneurial skills and creative

¹² Here indeed we rely on very few voices in the discussions.

thinking that is needed in industry. In other words: The institutions may be focusing too much in “teaching” and too little on “learning”. The need for flexibility in industry (and the public sector) means there is a need for students who have learned how to learn and who are able to find and digest new knowledge when they are out in the labour market.

If this more old-fashioned traditional approach to education is found across the system – and surveys made by industry indicate this – then it will be a true challenge to improve the responsiveness of the education system for industry. One way may be to adjust education programmes. This, however, would necessitate a strong involvement of industry federations and large companies. The latter, at least, have started to invest in those university courses for which they see a direct impact on their own business. But from what the panel can judge, industry in all its breadth does not seem to be overly active in supporting universities and the ministries in improving the education programme in the county, by formulating clear demand or by offering on-site-training and fellowships etc.

Further, the fragmentation of the Higher Education landscape in general makes it increasingly hard to get an overview of the education offered and to compare quality. Quality assurance in education is in its infancy in all countries. Also in Bulgaria much more should be done to make education comparable, and to have performance measurement of teaching across all levels. Indeed, to counter the negative impact of fragmentation, the country could consider separating much more explicitly between university education and professional colleges -- the former doing more basic research and delivering research based higher education, the latter providing professional studies aimed at needs in industry and society. The current fragmentation of the system, with many institutions having the status of universities and with lecturers having multiple affiliations, weakens the systems ability to focus.

3.4 Business R&D, Innovation and General Market Framework

Innovation activity and capacity

The main challenge in Bulgaria in terms of innovation is the lack of innovative activities of companies. This is common sense and valid no matter what kinds of statistics we look at. There is too little real R&D, especially corporate research is extremely low, in fact the lowest in EU27. This is not only true for domestic companies, but also for foreign ones who do not perceive Bulgaria as a research or development location, but as a low cost location. Second, not only is there little R&D, but little incremental innovation built upon improvements stemming from process modernisation or from new demands etc. In general companies innovate by applying technology and knowledge developed by others. For a while this may be sufficient, but with raising wage levels, companies will have to compete more on the basis of advanced knowledge rather than cost.

According to EU statistics, the company sector in Bulgaria has too few innovative firms. This has severe implications. Most significant for the link to the science base, there is extremely low absorptive capacity in the Bulgarian economy. The market for scientific results and technological knowledge and artefacts originating from the science base is relatively small. The large majority of companies is not able to formulate technological demands to the science base or does not see the need. The demand for contract research, though growing, is still rather low. When high level contracts with companies are made, they are often with foreign companies.

It is obvious that Bulgaria needs more R&D intensive companies, more mobilisation of business R&D and industry driven linkages and co-production of technologies with science. Those companies function as competence and technology nodes in the national network of companies and institutions, disseminating technology and knowledge to smaller, R&D weak companies and to public and civil institutions that require such innovations. The companies in Bulgaria are often too small to perform R&D by themselves (or to buy it from others), they are in low tech or medium tech sectors or they follow the low cost approach competing on salaries, not on competences.

Instruments and implementation

The innovation policy in Bulgaria has a whole range of instruments, and through the various axes of the Operational Programme this range of instruments has grown. Most of the budget is used to modernise the economy, to invest in infrastructure, and programmes for intermediaries, technology transfer and IPR improvement, spin offs and business support networks. Clustering and placement of researchers in industry are all sensible instruments given the state of the Bulgarian economy. The overall mix, the basic approach that has amended significantly through the SF, seems reasonable given the context of the economy, provided an effective and transparent implementation.

As for this mix, our discussions and exploration lead to three major remarks, however: There is too little focus on innovation management, and too little focus on trying to make business engage in R&D and finally, it is not clear yet if the technology transfer initiatives at universities and the Academy and the attempts to support co-production between firms and scientific institutes are sufficient to mobilise cooperation, licensing and contract research.

The panel naturally was not able to assess the implementations or effects of the various policy instruments, although some observations from the documents provided and from the discussion can be made. The principal set up of the NSF, also vis-à-vis the MEE, appears fine. The Innovation Fund received favourable mention from many of our interviewees and is clearly a forward-looking and useful instrument for Bulgarian business development. Moreover, it counter-balances the more science-driven perspective of the Science Foundation, and may also help develop non-R&D types of learning and innovation, which is highly relevant given the current composition of Bulgarian industry (see below).

The provisions to offer an extra 10% for SME and for cooperation with public research institutions are sensible, as the overall level of cooperation in the system, also among companies, is far too low. At the same time, however, this adds up to the financing of up to 80% of the project funding (for very small companies that cooperate broadly), and the panel holds the view that this is too high, as this distorts the incentive structure to do R&D.

In terms of implementations, there are a set of issues that should be easy to resolve. There were complaints about the process to channel money to Universities when projects fund the cooperation, as the project funds are transferred fully to the companies and Universities complained about the loss of time and transparency this involves. Further, following the modernisation rationale, for the stakeholders it seems not fully clear what the definition of “innovation” in the NIF projects is and how strongly projects funded through the NIF are distinct from project under the modernisation streams. Even if on paper the definition might be clear, it seems not to be apparent for the Bulgarian industrial community. Moreover, participants reported that the evaluation of the innovation project is mainly focused on the financial viability and soundness, rather than on the technical content. In addition, there appeared to have been some timing problem, as the second round of proposals was postponed and thus the funding slowed down. The panel has noted that industry is asking for more predictability as regards sessions and scheduling. The government may consider more permanent cycles of sessions covering essential industries and technologies. Further, the practice to have companies pre-finance the activities could be an – unnecessary – obstacle. The panel cannot assess if this is true, but as a general principle advises to ensure that innovativeness and market relevance is soundly evaluated by external evaluators to make this instrument a long term, credible tool. The National Innovation Fund would certainly profit from a formative evaluation, similar to the one done for the National Science Foundation but maybe even in a more regular and accompanying way, in order to get a clear understanding about its effectiveness and efficiency – and to make the whole system learn.

Further, the awareness in industry about the instrument and its possibilities is not high enough, as indicated by a survey done through the CEIBG, the Confederation of Employers and Industrialists, and as indicated by the small number of companies who take advantage of the scheme. Thus, mobilisation for the programme could be enhanced. The panel is aware that this is a hard task, as the vast majority of companies are not asking for support for innovation projects, but in order to lift the economy on a higher path, a targeted awareness programme would be advisable, ideally combined with partnering activities in order to increase the number and quality of cooperation projects in Bulgaria.

In terms of linking the firms to the science base, the remarks made above in the section on the science base can be reinforced: Over and over again the panel met complaints such as “The universities and academies do not perform R&D of relevance to us”, or “We cannot find anyone in the companies that we can cooperate with!” Within such systems, an interplay of various modes of cooperation and transfer is needed. There are structures emerging. For example, the Academy of Science has established a Centre for Innovation and a GISD Transfer Centre to intensify the linkages with companies and transfer knowledge which helps to establish new forms of contact and transfer. However, in general many of the instruments still rely on the linear model approach of transferring knowledge, and for many of the companies this is still the most important mode of obtaining knowledge from the science base. Some of these instruments, such as traditional transfer centres at Universities, seem not to work sufficiently and would need improvement. On the other hand, there are a range of instruments planned or already in place that enable science driven cooperation, such as NSF proposals with industry, science based technology centres or competence centres, enabling project oriented or more structural cooperation. Such an additional pathway, a shift towards more engagement in the co-production of knowledge is needed, and innovation policy should also think along those lines in order to make the co-production of knowledge also demand, i.e. user driven. The voucher system is one possibility, but maybe it is not enough. For example, a policy for public private partnerships (PPP) is needed, not only to bring ideas and innovations from the university sector to the private sector, but just as much to develop a common innovation platform for the two sectors, a platform where companies and research units can collaborate on solving problems of relevance to industry. A sophisticated mix of modes, bringing knowledge demand and knowledge supply in perspective, would better help to solve the main problem: The development of company competence which is able to make use of R&D based knowledge.

The lack of innovation policy priorities and discourse

Even more principally, as with the science base, from the discussion with stakeholders the panel did not get the feeling that there are clear and well communicated priorities given for the various instruments that focus activities in innovation policy, although there are obvious links to the National Development Plan. It is clear that many of the innovation policy measures are horizontal and should be bottom up. But for strategic activities, especially when it comes to the link to the science base, the lack of clearly communicated priorities is a problem also for

the innovation policy stakeholder community. This problem has been long defined in Bulgaria, still the current discussions on strategic priorities do not seem to reflect this link.

This leads to a further problem we can identify. The panel had the impression that the general discourse on innovation policy matters within and across the business community is not very vivid – there seem to be many other more pressing issues. While for large and foreign firms a voice can be heard, and is heard in policy making, the bulk of the industry is not visibly engaged in the STI policy discourse. This is a specific problem when it comes to coordinated action between science and firms, for which better discourse routines and structures would be needed. The panel cannot judge the engagement of industry in policy in Bulgaria in general, but again, the impression has been that in terms of innovation and- more strikingly – science policy industry is not well organised.

In other economies in transition it has been noted that the industrial organisations are understaffed and focused on the day-to-day needs of companies, and thus they do not have the resources needed to develop and innovation and research policy capability. This makes it harder for civil servants to develop the necessary competences as well, as such innovation policy learning often takes place in the interaction between stakeholders and policy-makers. This may be the case in Bulgaria as well, although we saw several examples of industry representatives well versed in innovation policy. One way of improving the innovation policy capabilities of the relevant NGOs may be to develop common learning arenas and co-finance studies of technology needs and branches of industry (cp. the Norwegian VS2010 programme).

Attracting foreign companies

A further route to more R&D intensity is to invite foreign companies, i.e. companies that are willing to invest in R&D in Bulgaria. To attract foreign R&D investments depends on the existence of relevant clusters of expertise in the country. As long as foreign investors invest in Bulgaria because of low production costs, they will most likely not establish R&D units in Bulgaria. There are two factors that may change this, however. The first is the existence of local competences that might help the foreign companies expand in the market or in markets where Bulgarians have special expertise (e.g. the Balkans or Russia). Such small R&D activities may, if the circumstances are right, lead to further investments in the future. The other is the existence of local competence clusters where Bulgaria shows excellence. Given that there are so few Bulgarian companies with excellent R&D capabilities, these centres of excellence will for the time being have to be found in the universities or in the academy institutes.

The panel in principle welcomes the range of activities in the Operational Programmes that is geared towards the attracting foreign companies. These activities as a mixture of marketing, subsidising and services are sensible. However,

as empirical studies have shown,¹³ the crucial element is the embedding of those companies. All schemes to attract foreign corporate R&D must try to achieve that those companies do settle down, cooperate with local actors, produce spill-overs to other companies and institutes, engage in co-operation with local partners in terms of innovation and research. If this is not achieved, there is no reason why the attracted companies should not be foot-loose and thus a temporary phenomenon in taking advantage of temporary conditions in Bulgaria. This, in turn, brings us back to the prioritising across the system, only those priorities and critical mass of excellent activities would make attraction of foreign corporate R&D a viable strategy, as embedding needs clusters of competence and relevance as hosts.

Linking modernisation to demand and sectoral policy goals

There are few explicit demand oriented measures to support innovation activities and diffusion that are labelled as such, in particular there is no public procurement that takes into consideration the innovation dimension, and thus there is not much awareness or related discussion in Bulgaria. However, an interesting approach is tested within Axis 2 of the Operational programme, the modernisation of industry. There is an inbuilt additional reward if the equipment bought is an innovation and if it is eco-efficient. This approach seeks to create markets for innovations and energy efficient technologies, linking support measures to demand driven innovation dynamics. The panel regards this instrument as a very appropriate and intelligent one. Such a supply-demand link is topical and able to link sectoral policy aims (energy efficiency) with modernisation (with the investor) and innovation (with the supplier of the product or equipment and with the investor provided the purchase leads to new internal processes). The panel advises to closely monitor the implementation of this scheme and its effects and to check for extra benefits on all three domains. Further, the government could think about enlarging these ideas to the public sector, when modernising buildings, vehicle fleets, the health system, infrastructure and other public services.

Innovation Management and entrepreneurial culture

An area where the instrument tool box appears to be underfinanced and underdeveloped in comparative terms is innovation management across the board of industry. There are sources of support, mainly those linked to EU Commission supporting schemes (e.g. Innovation Relay Centre), but no big scale schemes. The modernisation activities in the Operational Programme is focused on hardware, while the software, skills in innovation management and risk taking, are not stressed enough. The bulk of Bulgarian companies are SMEs in low tech areas, but still, insights in how to develop an internal structure and culture that is more conducive to innovate, to cooperate, to look for external knowledge both on the demand and the supply side are crucial. This of course also implies a focus on non-technological and organisational innovation, an area not stressed much at all, but with enormous potential for efficient leverage. Dedicated schemes and a nation-wide web of

¹³ For some exploration and examples see the issue Edler, J.; Polt, W. (ed.) (2008): International Industrial R&D – the policy challenges– special issue of Journal of Technology Transfer 4/2008, various contributions in there.

innovation learning centres would certainly help, whereby the latter could, for example provide consultancy to companies in terms of concrete innovation projects and innovation learning more generally. Equally, the activities to increase the entrepreneurial culture in the whole system go in the right direction of uplifting the whole economy and innovation culture. The panel learned that an entrepreneurial centre is in the making, and can only support such an initiative. However, overall, the panel did not get the impression that policy did put a sufficient emphasis and focus on this formative element. The panel thus strongly recommends a shift in this direction, to add the software and turn Bulgaria into a learning innovation system.

General market development and frameworks

The review focused its discussion on science policy, innovation policy and Human Resources. The general market development and frameworks have recently been analysed in detail by the Commission and the World Bank. In the following we therefore summarise some selected impressions only.

A recent World Bank report on Bulgaria concluded that while R&D and innovation will be most important for Bulgaria to catch up in productivity and competitiveness, the modernisation of the economy (adopting existing new technologies), investment in all levels of education and the general micro- and macroeconomic conditions would be of even greater importance. Similarly, while the EU in its statement to the National Reform Plan stressed the importance of research and innovation policies, the general framework conditions were defined as being of major importance in the short and medium term.

The panel shares this view in principle, the best RTDI policy mix cannot lead to prosperity and catching up if market conditions and general framework conditions are not adequate. Therefore, as a very general and not differentiated message, the panel would endorse the claims made by the EU Commission and the World Bank. The short term and mid term reforms proposed by the World Bank,¹⁴ for example, are sensible and meet the needs of the country.

Overall, the macroeconomic and investment environment now appears attractive and informants were consistent in emphasising the new fiscal regime as important for attracting foreign investment. It has become obvious that the general economic conditions have been favourable for all levels of industry in recent years. FDI to Bulgaria has increased; it is now beyond 20 % of GDP that is produced by foreign companies – although the majority of this investment is not in the production sector but in services and other capital investments. The tax burden on companies is extremely low. The panel also noted that the membership in the European Union has led to an influx of fresh capital from abroad, partly due to the fact that Bulgarians living abroad now invest heavily in their home country. Overall the conditions to produce appear to be favourable and to improve further.

¹⁴ World Bank 2007 (Accelerating Bulgaria's Convergence: the challenge of raising productivity, Vol 1, http://siteresources.worldbank.org/INTBULGARIA/Resources/ABCreport_volume_1.pdf, retrieved May 2008)

However, in the discussion the importance of continued efforts to simplify regulations and improve the implementation and enforcement processes, including judicial processes were recognised. Like most economies in transition, Bulgaria has to prepare for a time when the economic growth leads to higher salaries, meaning that many companies will relocate to other areas. By that time Bulgaria will have to find its competitive advantage elsewhere. The experience gained from the richer, "old", economies, shows that these advantages have to be found in high level skills and the use of advanced technologies. This applies to all industries, also those that are traditionally labelled "low tech" (agriculture, energy, forestry, services like tourism, and so on), but in terms of profile as a business location, clear niches must be defined (lined to RTDI priorities, see above).

The panel noted that the government is considering a tax incentive for R&D investments. Tax incentives may actually work well in two respects: (1) to reduce the risks following from R&D investments, making more companies come down from the fence, and (2) encourage companies into developing clear R&D strategies, making R&D a conscious part of their innovation processes. However, the Bulgarian tax level is already very low, and it might be difficult for any tax incentive beyond this to make much of a difference. Moreover, it is unclear to what extent companies that are not in a tax position will get public funding instead. Orienting new companies towards R&D is and must be an essential part of Bulgarian innovation policy development. The question is whether there are other means of helping companies "getting down from the fence" and start investing in R&D. The panel recommends that the proposal of developing a tax scheme is seen in connection with the development of the voucher schemes of the MES and MEE. A combined voucher scheme may achieve some of the same objectives, at least for small companies, the main difference being that the voucher scheme will not to the same extent encourage in-house R&D.

A further issue to mention is IPR. The overall IPR activity in the country is extremely poor. This might have to do with the gap in application oriented institutes and the time needed until the science base delivers more application oriented outputs again. It also has to do with the low innovative activities of industry, of course. However, it also relates to a poor IPR system, while a sound IPR system is a precondition for turning knowledge into wealth. The improvement of the IPR system, the acceleration of the IPR process, is absolutely necessary, it appears that inventors are deterred by the process, and time and effort is wasted. The measures planned in the OP certainly should help in that direction, but the politically and administratively responsible officials must be more on alert as to how important and critical an improvement is, for domestic, and certainly for foreign actors.

Another problem that has been noted by many, including the European Commission, is the problem of corruption. Corruption may to a certain extent co-exist with economic growth and innovation. History has proved that much. It is totally clear, however, that in the long run wide spread corruption does undermine the innovative capabilities of an economy (or leads companies and other actors to use their innovative capabilities to "beat the system" rather than to develop products, processes and services that may serve the economy). The main reason for this is the lack of predictability in public governance and a mistrust in the judicial system. This

lack of trust undermines the will to invest. Bulgaria - and neighbouring Romania – already have a real profiling problem in this respect, a problem that probably also stops some foreign companies from investing in the countries.

The regional dimension

As with market development in general, the review did not go into any detailed discussion on regional innovation policy issues, there was no session dedicated to it. Some comments based on impressions may suffice here, since while there is a sound economic statistic and reporting on the regional level, policies for the regions and policies designed and implemented by the regions are still in their infancies.

In principle, given that the concentration of various industrial activities will vary from region to region, some regions being more dominated by specific clusters and value chains than others, there is a need for specific regional policies – even in a small to medium sized country like Bulgaria. Moreover, the engagement of companies, knowledge institutions and other stakeholders in the regions may encourage bottom-up policy development well tailored to the needs of the specific regions.

Today, the south-western region is the economic powerhouse of Bulgaria, and the differences as regards wealth creation, salaries, employment, etc., is unevenly distributed throughout the country. Having one dominant region serving the rest of the country is not necessarily a bad thing, but if it leads to a suboptimal use of – for instance – natural resources found elsewhere, the economy might suffer for it. The social costs may become very high, indeed.

The regional innovation policy development of Bulgaria is primarily based on the strategies developed by the regions from 2004 onwards. These were apparently implemented as a response to the EC Regional Innovation Strategies (RIS) initiative. It seems clear that the resulting processes have led to a great deal of policy learning involving stakeholders and policy makers, and that the strategies contain a lot of useful policy advice. Further, the panel has learned that regional strategies are planned, however, their implementation is yet to organise.

The six administrative planning regions are not political units governed by elected representatives.¹⁵ This means that it is imperative that the advice given by the stakeholders developing the regional innovation strategies are absorbed and utilised by the relevant government authorities on the national level and on the district (county) level, and organised through steering committees that include councils and local business. It is not clear to the panel to what extent this has been done, or how the strategies have been put to use, given the lack of a regional governance structure at this level. It might be indicative that within our various highly informative panels with highly active policy makers the regional dimension was not brought up.

¹⁵ Innovating Regions in Europe, http://www.innovating-regions.org/network/regionalstrat/by_region.cfm

Whether Bulgaria needs political governing bodies at the regional level goes beyond the scope of this review. However, the panel believes that regional exercises of the kind that has already been undertaken can be of great value to the development of Bulgaria and can feed into the development of national innovation strategies. However, for meaningful, full fledged regional strategies a much more sophisticated administration at the regional level would be needed. For the time being, the panel therefore recommends the development of a more coherent system of national innovation policy development (see above) and recommends that the work done at the regional level is strongly linked to and fed into these processes. This means that the national strategy documents need to have discussions on the needs of the relevant regions, and that regional level activities are linked. Further, if the planned regional strategies see the light of day, an implementation structure must be set in place that is sustainable and has the persistence, legitimacy, and transparency to decide about allocation of funds. If this cannot be guaranteed, Bulgaria should for the time being rather rely on national implementation of strategies for the regions rather than localised implementation of strategies of the regions.

4 Summary of Recommendations

Before summing up the recommendations that we have formulated throughout this report, we once again want to stress the enormous efforts and good achievements in the country on a challenging way of transition. In the field of RTDI policies, by and large, awareness of structural problems that need to be tackled and willingness to struggle for change is there and may good initiatives have been started.

Yet, there are severe challenges ahead. Any transition produces frictions, any change bears uncertainties. The obvious beneficiaries of any change, anywhere, will always be less loud and clear in the discourse than those who fear to lose from a transition. The situation in Bulgaria is further complicated by turbulences at the highest political levels and frequent change of political leadership that do not support consistency and coherence of policy, let alone policy coordination and policy mix. Finally, the starting position of Bulgaria, as being a very recent Member State, has been extremely challenging. Low cost and low tax are no panacea for economic catch up in Europe anymore. Bulgaria is in a more challenging position compared to other small countries which have caught up within Europe, but have done so before low cost production took advantage of global locations in addition to European ones and before general corporate tax levels have come down all across Europe.

Therefore, all these recommendations we have been making are made against this complex and challenging background and are meant to further encourage decision makers and all stakeholders in Bulgaria.

Policy focus, policy mix and coordination

First of all, the meaning of science and innovation for Bulgaria is crucial. The discussion on the future of STI in the country should be led at the highest government level and, in fact, within society at large.

Mindful of the fact that there are other overreaching welfare objectives that have to be kept in mind in Bulgaria, the panel recommends that even more is invested in research and innovation, as this is the underpinning of sustainable paths to competitiveness and a profiling that will survive the low cost – low tax era. Additional money for RTDI should be prioritised towards the science system, and therein towards the Human Resource dimension.

To prepare for a knowledge driven future, a clear vision of where the country wants to be in terms of scientific and economic profile and in terms of the structure of its economy is needed. Such a vision must be cross-ministerial, and it must be developed in a discourse that involves all the hierarchies of the ministries that are involved, since only then some form of persistence can be guaranteed.

While talk of a vision is cheap, it must be codified in an integrative strategy. The strategies already developed (innovation) or being developed (science) are, as far as the panel could judge, in principle going in the right direction. But they are not linked, they rather represent parallel worlds. Thus, a linkage process should be established that constructs overlap and common direction wherever sensible and

that enables separate pathways as needed – but with clear knowledge about activities across the RTDI policy arena. This also includes better communication practice between MES, MEE and the Ministry of Finance.

Key for such a process is a clear division of labour and a definition of cooperation, achieved through better coordination. The challenge is not so much with the configuration of existing institutions, this is by and large fine and could do the job of coordination and strategy building. The challenge is to fill existing coordination mechanism with life. For sure, a couple of simple structural changes should be considered, such as alternating common meetings and responsibilities for agendas in the innovation and the science related councils, or more radical measures such as a merger of the two councils with alternating lead of the ministries. But an attitude of pro-active coordination – characterised by ex ante information and consultation rather by ex post factum information – is needed.

This also includes a new form of discourse between policy and other stakeholders, as well as within stakeholder communities. The stakeholder discourse is fragmented, innovation and science arenas are distinct, the level of knowledge and acceptance of challenges in other areas has clear room for improvement. A mobilisation of civil society for innovation and research matters is needed, taking advantage of foresight and constructive technology assessment techniques. To put all the burden on administrations within ministries will fail.

The most important dimension of a vision, joint strategies and coordination would be priority building and re-allocation of funds. The number of priority catalogues must be reduced to one, and this catalogue of priorities must be backed with analysis or systematic discourse, including formal foresight and integrating demand and supply side issues.

The panel would like to stress that from a RTDI point of view, more radical action is needed in the domain of science and innovation policy. The country cannot afford the fragmented discourse and incremental improvements in both domains, but needs a systemic approach. For that to happen, it appears that the public science system needs a much more radical approach to contribute to economic development, societal problem solving and a better suited education.

Strategic intelligence is not used to its full potential, and improvement here is a must. To establish an evaluation culture on project, programme and policy level, including ex ante, interim and ex post evaluations and integrating international experts on all levels is essential. The country should take advantage of international evaluation capacities and support the build up of more evaluation and strategic intelligence capacities to support the ministries in the country. The capacity of ministries to deal with the complex issues of policy mix seems too limited, more personnel and budgets are needed here. Further, the administrations and research organisation should have full access to international data to assess their own system (e.g. Web of Knowledge).

Science Base

Any future reform of the science base in Bulgaria should be guided by a thorough evaluating of the strengths and weaknesses of the Bulgarian research base, which will have to be based largely on international peer review, as a means to better understand the own system, to lay the basis for performance based and incentive driven research funding and for prioritisation.

As just stated, in general the budget for the science base should be increased, taking advantage of Structural Fund opportunities that hitherto have been missed. The financing of the Universities is far too modest and must be increased, linking research stronger to education. The algorithm used for the allocation of money must change, allocation should follow institutional evaluation and a further increase in programming budgets.

A completely rounded science policy would need competence of the leading ministry for the public science institution in general. The exception of that rule is with sectoral research organisations that support ministries in their concrete sectoral function, here the country might even be well positioned when it comes to link sectoral goals with research activities. It is important, though, that sectoral research organisations, such as the Academy of Agriculture, are exposed to the same performance based institutional funding mechanisms and more programming as Universities and the Academy of science.

The Universities in Bulgaria should develop into the common European model of combining research with education on an equal footing. More money for research should be channelled into the Universities and this money should be distributed not via the number of students but via institutional grants based on a set of performance indicators and via an increase in programme funding. Further, the profile of the various types of Higher Education institutions should be sharpened, the proliferations of institutions that are labelled Universities does not help a necessary profiling. Further, Universities should have full autonomy for their strategy development, which, consequently, involves the recruiting of Professors – which up to now is still within the final authority of the Higher Attestation Commission. To recommend if the country chooses a habilitation model with a central Commission to grant habilitation as precondition for applying for a professorship (as some other European countries) or if it liberates Universities and academics entirely from a mandatory habilitation (as seems to be the trend in Europe) is beyond the remit of the panel.

The academy should be better integrated into science policy in general, and into teaching in particular. On the basis of the great strengths of many institutes, an international evaluation of the Academy is needed that differentiates the various functions the Academy has and is open for structural changes and governance changes (including allocation rules in line with the function performed.. Those changes might even lead to mergers and closer cooperation of Academy institutes with University institutes, or for some institutes might lead to closer institutional connection with other sectoral ministries of agencies. Some of the suggestions made in the main body of the report may serve as initial guiding. Such a process would lead

to a much clearer profile and division of labour and thus strengthen some core parts of the Academy. Equally, the Academy would gain if it was more open to other stakeholders in terms of strategic decision-making, and new governance structures that separate the eminent scholar club from the strategic decision making should be envisaged. The allocation of the institutional grants of the Academy should gradually be linked to evaluations and clear performance criteria. The teaching activities of Academy institute members, including the support of PhD, should be enlarged and better coordinated with Universities, although the Universities should remain the main responsible institutions for organising higher education and granting PhD.

The system more generally would need consolidation, with a clearer definition of institutional roles, terminology and status. There is room for all researchers, that is for sure, but the functions of the institutions must be better defined and made more explicit, for the sake of profiling and clarity.

In terms of policy instruments, the MES should continue to strengthen the National Science Foundation and its attempts to create and implement new, appropriate funding instruments, especially increasing the funds for programmes vs. institutional funding and strengthening all those instruments that support cooperation across the system, within public science and between public science and firms. The latter is key, as support for business R&D from the side of the MES will remain limited and absorptive capabilities are still too low. Overall, the science policy priority process must be clarified and linked to overall priority setting.

Human Resource

To repeat the main recommendation of the main part of the report: The panel is convinced that the focus of attempts to modernise and better equip the science system must be in the Human Factor, as all priority setting and all re-structuring of the system runs dry without a capable and motivated next generation. The salaries of researchers in the public system in Bulgaria must increase, at all levels, not simply at the level of PHD (although a new stipend regime is to be welcomed) and post-doc.

Further disincentives for researchers should be radically dismantled, especially the unique and complex career path (with multiple degrees to be obtained to become a Professor). The function of the Higher Attestation Commission in terms of granting degrees should be reconsidered, as it is not in line with European practice and has been identified in our interviews as a hurdle in the scientific career process as well as for inward mobility (from expatriates). The complex and challenging career path must be simplified and aligned with international practice in order to reduce incentive to leave the country as a PhD and follow the way to Bologna, or the US, for that matter. Brain drain is a danger much too serious not to react, in this case traditions should make way for European convergence.

In addition, the industry oriented education has a lot of room for improvement. Joint efforts with industry – again the panel calls for engagement of societal actors! – to define content and new ways to deliver jointly should be looked for, and the attractiveness for life long learning and vocational training must be enhanced.

Innovation policy and framing of market conditions

The path to a broad modernisation of the industry must continue, the overall mix of instruments in principle is fine. Simple schemes to bring science and industry together, such as the voucher scheme, should be strengthened, profiled (two voucher schemes are irritating to the stakeholders) and further promoted. Tax incentives, however, as discussed in Bulgaria, would not have a strong leverage given the low level of taxes in the system.

Apparent challenges in the implementation of schemes should be tackled with more attention. Clear and transparent rules and procedures, reliable time frames, sound ex ante evaluation that captures the content of innovation is called for. The National Innovation Fund is an important instrument, and it needs further evaluative support and more mobilisation for its instruments, especially in light of the new initiatives underway, as the challenge for a sound process are high.

Even more than within the science discourse, the innovation policy discourse should be more inclusive towards industry, and industry should be made more aware of the need for being engaged in innovation policy and innovation priority discourse.

The attempts to attract foreign companies also for R&D activities are important, but must emphasise the need for embedding and spill-overs. This, in turn, links to science policy priorities and general conditions of cooperation with the science system, a clear field of coordination between the two spheres.

More emphasis should be given to the innovation management, organisational and non-technological innovation and entrepreneurial culture. All these soft dimensions of innovation have a great potential to lift up firms across the board, small and large, low tech and high tech. Supporting structures for the software of innovation should be set up across the country.

In terms of regulatory framework conditions, the panel doubts the leverage effect of tax incentives. What should be improved, however, is the IPR system and its administration.

Finally, the regional dimension in Bulgaria has potential, but regional policy must be implemented with caution. The impulse to design regional strategies has come from the European level. - There is a danger that regional policies are designed without regional actors being there to implement them. Therefore, national strategies should include the regional dimension and for the time being, regional innovation policy for the regions – in coordination with local actors – might be better suited to the Bulgarian context than regional policies of the regions.

ANNEX 1 THE REVIEW VISIT PROGRAMME

02-04 June 2008, SOFIA

Review Team - contacts

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Organisation in Bulgaria

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Agenda

Timing	Bulgarian R&D&I Stakeholders	Discussion Topics	Location
Sunday, June 1			
17.30 – 19.30	Review Team (internal)	Kick-off; Understanding, issue briefing, context Division of labour – interests - knowledge	Hotel Meeting Room
Monday June 2			
7.30-8.30	Review Team	Contd., briefing of late comer	Hotel Breakfast Room
9.00-10.30	MES, NSF, Council on Science, Patent Office	Science Policy – Science Funding –EU and International Dimension - Need for Reforms	Hotel Meeting Room
10.30-12.00	MoA, Health Agency, Agency ICT, MES	Science Policy – Science Funding “mission oriented”	Hotel Meeting Room
12.30-13.45	(Lunch, review team with the possibility to de-brief and brief for 15 minutes)		
13.45-15.00	MES, Higher Attestation Commission, University Representatives, Rectors Conference	Education Policy, Scientific Careers, Human Resource	
15.30– 17.00	Meeting with Universities	The University Role and System: Science and Education	At Sofia University
17.00 – 18.00	Meeting with young scientists	Early stage research careers	Hotel Meeting Room
18.00-19.00	Internal Review Team	De-Briefing	Hotel
Tuesday June 3			
7.30-8.30	Internal Review Team		
9.00-10.30	Academy of Science, MES,	The role of the Academies	BAS
10.30-12.00	Academy of Agriculture,	The role of the Academies	Academy of Agriculture
12.00-13.30	(Lunch, review team with the possibility to de-brief and brief for 15 minutes)		
13.30-15.30	MEE, SME Agency, NIF	Innovation Policy, Supporting Policies (Structural Fund)	Ministry of Economics

15.30-17.30	MEE, MoF, MEE, SME Agency, Regional Affairs / Clusters	Structural Funds, fiscal incentives, Framework Conditions in general	
17.30-18.30	Internal Review Team – Debriefing		
Wednesday June 4			
7.30-8.30	Internal Review Team Breakfast		
8.30-9.30	Companies,	Market conditions, Business Needs	Visit one company, have other companies as guests
10.00-11.00	Business Federations, SME Agency	Market conditions, Business Needs	
11.00-12.30	MES, MEE, MoF	Governance, Coordination, Overall Directions. Vision Building	
12.30-14.00	Lunch and Final Wrap up		

Timetable of the first fact-finding mission of J. Edler in BULGARIA
8-10 May 2008, Sofia

Timing	Bulgarian R&D and Innovation Stakeholders	Discussion Topics
Thursday, 8 May		
16:00 – 18:30	<p>Albena Vutsova, Director of Scientific Research Directorate: Ministry of Education and Science Guenoveva Jecheva, Head of Department Transnational Initiatives Ministry of Education and Science Lora Pavlova, expert, Department Transnational Initiatives, Ministry of Education and Science Prof. Anastas Gerdjikov, Manager of National Science Foundation, Ministry of Education and Science Emilia Radeva, state expert, Directorate Enterprise Policy, Ministry of Economy and Energy (National Innovation Fund)</p>	<p>Kick-off; Exchange of views on the objectives and the procedures of the country visit in June; Presentation of the Bulgarian policy in the field of Science, Research and Innovation: structures and funding schemes of research and innovation on competitive bases; procedural, legal and financial terms of major national funding schemes</p>
Friday, 9 May	<p>Preparatory talks with on the Bulgarian R&D and Innovation Stakeholders</p>	
9:30 – 11:30	<p>Meeting with representatives of the Governing bodies of the horizontal research organizations Prof. Naum Yakimov, coucellor of the President of the Bulgarian academy of Sciences, Prof. Dr.Todor Kertikov, Vice executive Director of the Agrarian Academy, Prof. Dr. Borislav Borisov, Chairman of the Council of Rectors, Prof. Dr. Angel Popov, Deputy Chairman of the Union of Scientists in Bulgaria, Academician Petar Kenderov, Chiarman of the Higher Attestation Commission, Boyko Denchev, Federation of the Scientific - Engineering Unions, deputy president of the Centre for IPR and Technology transfer</p>	<p>Structure of the National Innovation Systems and its governance</p>
	<p>Preparatory talks with higher representatives from ministries and state institutions responsible for Research and Innovation</p>	
11:30 – 13:00	<p>Assoc. Prof. Vania Dobreva, Deputy Minister of Education and Science, Prof. Kamen Vesselinov, Rector of Technical University of Sofia Deputy Chairman of the National Council for Scientific Research, Dr.Plamen Vachkov, Chairman of the State Agency for Information and Communication Technologies Totka Chernaeva, Director , Information Society and Information Technologies, Directorate State Agency for Information and Communication Technologies Assoc Prof. Svetla Bachvarova, Deputy Minister of Agriculture and Food and President of the Agricultural Academy D-r Emil Raynov, Deputy Minister of Health, Svetlana Spassova, Director, Directorate National Health Policy, Ministry of Health</p>	<p>Bulgarian Research Dialogue; Political Dimension of the Peer Review</p>

	<p>Eli Anavi, Director, Enterprises Policy Directorate in the Ministry of Economy and Energy</p> <p>Emilia Radeva, state expert, Directorate Enterprise Policy, Ministry of Economy and Energy (National Innovation Fund)</p> <p>Vesela Dimitrova, Budget Directorate Ministry of Finances</p> <p>Marinela Petrova, Director EU Economic Policy and International cooperation Dept., Agency for Economic Analysis and Forecasting</p>	
13:30 – 14:30	Working Lunch with prof. Kamen Vesselinov, Chairman of the working group on National Strategy of Scientific Research	Guidelines of the National Strategy of Scientific Research
15:00 – 16:30	<p>Preparatory talks with representatives for business and employers' organisations</p> <p>Dimitar Brankov, Director of Clean Industry Center at the Bulgarian Industrial Association,</p> <p>Georgy Stoev, Deputy President of the Bulgarian Chamber of Commerce and Industry,</p> <p>Lena Rusinova, Confederation of the Employers and Industrialists of Bulgaria,</p> <p>Rumen Radev, Member of the National Council of the Bulgarian Industrial Capital Association, director of Strategy and Planning of the Holding Zagora AD</p>	Transformation of research results into products; technology transfer
16:30 – 18:00	<p>Albena Vutsova, Director of Scientific Research Directorate: Ministry of Education and Science</p> <p>Guenoveva Jecheva, Head of Department Transnational Initiatives Ministry of Education and Science</p>	Summary of the discussions
Friday, 11 April		
09:30 – 10:30	<p>Yavor Djonev, member of the Board of Sirma Group Corp.</p> <p>Prof. Anna Proykova, Sofia University, Strategic Group</p> <p>Prof. Ivan Minkov, University of Plovdiv</p>	Reflexion on needs of Human Resources
10:30 – 11:30	<p>Bulgarian Academy of Sciences</p> <p>Academician Nikola Sabotinov, Acting President,</p> <p>Prof. Naum Yakimov, councillor of the President</p> <p>Prof. Alexander POPOV, acting Scientific Secretary General</p>	Role of Bulgarian Academy of Sciences
12:00 – 12:30	<p>Bulgarian Small and Medium Enterprises promotion agency</p> <p>Stanimir Barzashky, Executive Director</p>	Role of the Agency as administrating body of the National Innovation Fund and intermediary body for the OP "Competitiveness of the Bulgarian economy" under the Structural Funds
12:00 – 13:30	<p>Albena Vutsova, Director of Scientific Research Directorate: Ministry of Education and Science</p> <p>Guenoveva Jecheva, Head of Department Transnational Initiatives Ministry of Education and Science</p>	Summary of the discussions and elements of planning of the peer review meetings

ANNEX 2 ERAWATCH ANALYTICAL COUNTRY REPORT 2008:
BULGARIA