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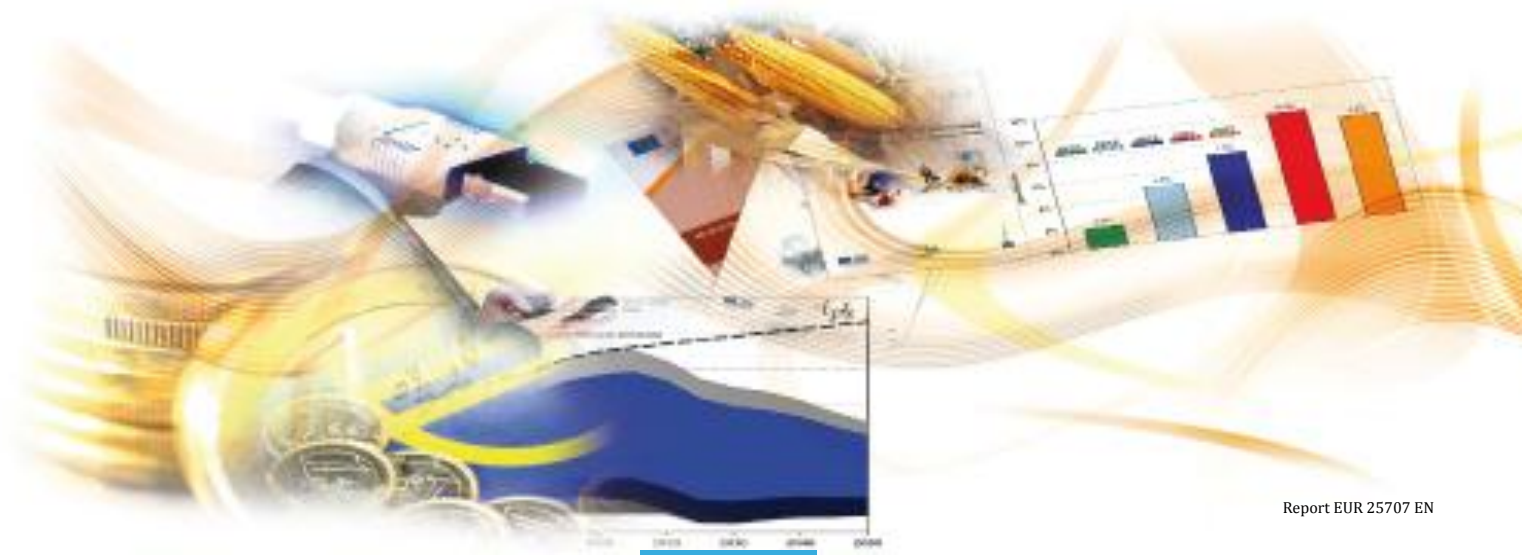

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Executive Summary

The Bulgarian research and innovation system is governed and financed centrally at national level with no regional dimension. Although by 2008 all six Bulgarian regions had developed Regional Innovation Strategies (RIS), there are no mechanisms at national level to support their implementation. The national research and innovation policies are designed and carried out by the Ministry of Education, Youth and Science and the Ministry of Economy, Energy and Tourism, along with their respective agencies. Despite the recent joint elaboration of policy documents by the two ministries, the cooperation in research and innovation policymaking remains fragmented. It needs to be spread to more policy areas and policy instruments, including laws, regulations, and elaboration of specific measures.

R&D funding increased in nominal terms in the past decade in line with strong GDP growth. Due to the economic crisis however the national R&D budgets in the public and the private sector shrunk. In effect in 2010 EU-funding in support of research and innovation became the single most important source of financing for the Bulgarian research and innovation system. Bulgaria has remained one of the countries with the lowest R&D intensity in the EU. According to preliminary data from the National Statistical Institute in 2010 the country spent on R&D 0.59% of GDP or about BGN420m (€215m). The business enterprise R&D expenditure (BERD) was €35.803m in 2010, or 0.10% of GDP (NSI), far behind the EU average of 1.25% of GDP (Eurostat, 2009). Due to the crisis BERD declined as a share of total R&D expenditure from 30.23% in 2009 to 16.7% in 2010.The government sector has historically been the main research funder and performer in Bulgaria. It provided 69% of the total R&D funding in 2000, which dropped to 43.32% in 2010 (NSI), which was still higher than the EU average. The most notable change in Bulgaria's R&D expenditures' structure in 2010 was the increase of the investments from abroad. They have been in the range of 5-8% of total R&D expenditures for the period 2000-2009. However, due to the inflow of EU Cohesion and Structural Funds in 2010 they reached 39.4% of all R&D expenditures (NSI).

The gap between Bulgaria and the EU average in human resources in science and technology is similar though smaller than the corresponding gap in financing. This might signal there is room for efficiency improvement or gains in productivity. R&D personnel have increased due to higher demand from the private sector. The human resources in science and technology as a share of labour force also increased from 30.5% in 2006 to 32.6% in 2010. The R&D personnel however remained at a level of about 0.54% share of the total employment in full time equivalent for 2010, less than half of the 1.15% EU average (Eurostat). The total R&D personnel in full time equivalent was 0.54% of the total employment in 2010, more than half less than the 1.15% EU average (Eurostat).

The main structural challenges that Bulgaria is currently facing, include:

- Institutional fragmentation. Various ministries, agencies and other entities implement research and innovation measures without sufficient coordination of priorities. National funding and Cohesion policy instruments are not utilised adequately for reforming of the institutional structure and the public research and innovation system;

- Ensuring predictability and coherence of public policy and consistency between multi-annual strategy documents. The frequent changes in public policy create inconsistency in the funding of research and innovation measures, as well as to weak institutionalisation of policy measures. All stakeholders need to better focus their efforts on the effective coherent implementation of support measures;
- Enhancing budgetary prioritisation, while increasing public, private and EU funding. There is lack of effective public R&D resource management, directed towards the national research and innovation targets. The share of competitive funding in public budgets for research and innovation is disproportionally small. Available policy instruments are directed primarily towards established entities in research and innovation. The participation of the private sector in R&D expenditures is very low, including its absorption capacity of EU funds directed towards research and innovation.
- Setting up an evaluation and monitoring system of innovation and research policy implementation, including for individual measures and organisations. Despite the measures envisaged in various strategic documents, as well as in the implementation of EU funds, a regular and comprehensive evaluation system has not yet been established;
- Strengthening the link between education, research and business both at governance and implementation level. The policy governance of higher education, research and innovation is departmentalised. There is a lack of measures to stimulate firm collaboration with universities and public research institutions, at the backdrop of prohibitively costs and minimal benefits from producing knowledge-intensive products for an unsophisticated consumer base;
- Increasing the attractiveness of the research career. The current levels of research personnel salaries, and the outdated material base and equipment do not attract young researchers, resulting in brain drain and aging R&D staff.

In 2010-2011 the Bulgarian government undertook some actions to update the strategic framework and address structural challenges. The National Reform Programme (2011) set the national R&D spending goal at 1.5% of GDP by 2020. The National Strategy of Scientific Research to 2020 (adopted by Parliament in 2011) listed five priority areas for the development of research in Bulgaria:

1. Energy, energy efficiency and transport. Development of green and eco technologies;
2. Biotechnologies and bio-foods;
3. New materials and technologies;
4. Cultural and historical heritage;
5. Development of fundamental research on programme and competitive principles to reach 15% of the total public expenditures on science.

The information and communication technologies have been listed as a horizontal topic.

In 2010 the Bulgarian government adopted the Roadmap for Research Infrastructure, which should provide support for upgrading the out-dated research and innovation technology base. The amended Law on Scientific Research Promotion (October

2010) introduced the idea for independent evaluation of public research funds' spending. From November 2010 the Bulgarian government introduced a university rating system, which should lead to differential funding based on achieved results. For example, universities can receive up to 25% more financing than the allocated subsidy if they excel in research. The Bulgarian Government's Position on the Strategy Europe 2020 (2010) focused on the support for export oriented and high technology industries. However, the adoption of many necessary innovation and research strategic documents and measures is still pending, e.g. the Draft Law on Higher Education and Science (to replace the current Law on Higher Education) and the Draft Law on Innovation, which would reinstitute the National Innovation Fund and the activities of the National Council on Innovation. These changes address and are expected to tackle pressing structural challenges of the research and innovation system.

Bulgaria participates in the Seventh Framework Programme (FP7), the initiatives of the European Science Foundation (ESF), COST, ERA NET+ and other EU-programmes, there is no real concentration of public resources in priority scientific areas, including such targeting the ERA pillars. Bulgaria needs to set more precise guidelines for cross-border collaboration, as well as elaborate and implement effectively a number of support measures in order to achieve the objectives of the ERA pillars. The Innovation Union Competitiveness Report 2011 for Bulgaria notes that there can be potential to raise the quality of the scientific production, should the necessary reforms be adopted. Still, currently there are no common promotion procedures for researchers that could ensure career stability. The education curricula should also be improved to focus on creativity and critical thinking, and it should be based on analysis of the labour market. The National Roadmap for Research Infrastructure was adopted in 2010 and Bulgaria is included in several European research infrastructure projects. Bulgaria however lacks financial, industrial and human potential for the construction and maintenance of big research infrastructures. The main national measures supporting cross-border cooperation include the bi-lateral scientific and education agreements with other countries. More national collaborative support schemes are needed to raise the number of joint research activities, as well as the number of co-publications and co-patenting.

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Introduction

Bulgaria has a population of 7.5m people, or 1.5% of the EU-27 population (2011 Eurostat forecast data). Between 2004 and 2008, Bulgarian GDP experienced stable growth of over 6% annually. Due to the financial crisis, however, the country's GDP decreased by 5.5% in 2009 to €35.042b and its growth levelled off at 0.2% in 2010. In 2010, the country's GDP amounted to €36,033.5m,[1] i.e. the country produced 0.29% of the total EU-27 GDP (Eurostat, 2010). Its GDP per capita in Purchasing Power Standards was 43.4% of the EU-27 average (Eurostat, 2010). Unemployment reached 10.2% in the first quarter of 2010, which was two times higher than in 2008 (NSI[2]).

Bulgaria is one of the countries with the lowest R&D intensity in the EU. Bulgaria's intramural R&D expenditure (GERD) has remained at stably low level over time – 0.57% of GDP in 1999, 0.49% of GDP in 2004, and 0.52% of the GDP in 2009. The preliminary data for the 2010 shows R&D expenditures of 0.59% of GDP (NSI). The level of R&D expenditures as a share of GDP is almost 4 times lower in Bulgaria than the EU-27 average (Eurostat, 2009). Bulgaria's business enterprise R&D expenditure (BERD) was €35.874m in 2010, or 0.10% of GDP (NSI), far behind the EU average of 1.25% of GDP (Eurostat, 2009). The R&D funded by the government sector for 2010 was €93.045m, or 0.26% of GDP (NSI). BERD in Bulgaria as share of the total GERD (16.7% in 2010, according to NSI and 30.23% in 2009, according to Eurostat and NSI) was lower than the EU average (54.07% in 2009) (Eurostat).

Bulgaria responded to the economic crisis with a reduction of the budget allotted for R&D as early as 2009. Thus R&D intensity remains one of the lowest in Europe although R&D funds have increased in nominal terms in the past decade in line with strong GDP growth. Investment in research infrastructure has improved but remains sporadic and low. R&D personnel have increased due to higher demand from the private sector. The human resources in science and technology as a share of labour force also increased from 30.5% in 2006 to 32.2% in 2009 and 32.6% in 2010. The R&D personnel however remained at a level of about 0.54% share of the total employment in full time equivalent for 2010, less than half of the 1.15% EU average (Eurostat). According to national statistics the number of researchers in full-time equivalent increased steadily with about 500 researchers per year until 2010 (NSI, 2010). The number of new PhD candidates also slightly increased from 583 in 2006 to 636 in 2009 (Eurostat).

The Bulgarian research system is coordinated and financed centrally at national level with no regional dimension. The highest policy-making bodies for research and innovation are the Standing Committee on Education, Science, Children, Youth and Sports and the Standing Committee on Economic Policy, Energy and Tourism at the National Assembly. Implementation and coordination of the national research and innovation policies are designed and carried out by the Ministry of Education, Youth and Science and the Ministry of Economy, Energy and Tourism. In addition, the Council of Ministers endorses, among other things, research and innovation-related strategic documents. There are a number of consultative councils at the different

[1] According to Eurostat forecast for 2011, the country`s GDP is set at €38,989.9m.

[2] National Statistical Institute (NSI), website: http://www.nsi.bg/

ministries and at the Council of Ministers that have varying degrees of impact on the national research and innovation policies (e.g., the National Council on Innovation chaired by the Minister of Economy, Energy and Tourism, the National Council on Science and Innovation chaired by the Minister of Education, Youth and Science, the Council on the Protection of Intellectual Property Rights chaired by the Minister of Culture, etc.) (Mini-TrendChart Report Bulgaria, 2011). Bulgaria has not yet developed a regional dimension to its innovation and research policy. Although by 2008 all six Bulgarian regions had developed Regional Innovation Strategies (RIS), no mechanisms at the national level support their implementation. The main obstacle to RIS implementation is that Structural Funds are coordinated at the national level with little or no authority of regional administrations in the distribution of funds (ERAWATCH Country Report Bulgaria, 2010).

In terms of outputs, there were only 9 Bulgarian patent applications with the European Patent Office in 2010 (17 in 2009, 15 in 2008), submitted mainly by large companies. The applications submitted to the National Patent Office average some 250 a year over the last ten years. The number of granted patents to Bulgarian patent owners decreased since 1997 from 300 to about 100 per year, while the foreign owners steeply increased to 1.495 in 2009 (Bulgarian Patent Office). The majority (1.148) of the Bulgarian patent owners hold patents in the chemistry or metallurgy areas, followed by human necessities (977) and the technological processes (777 Bulgarian patent owners) (BPO, 1994-2010 and ARC Fund 2011). About 50% of the applicants in Bulgaria come from individuals.

The total number of Bulgarian publications in the Essential Science Indicators has risen to 120% in 2004 – 2008 compared to the preceding five-year period but remains among EU countries with low performance (ERAWATCH Country Report Bulgaria, 2010; Bulgarian Patent Office, 2009).

The economic specialisation of the country is based on its low cost and cheap labor force as competitive advantages, although the latest strategy documents call for measures for increasing the high value added and the technology intensive sectors. According to 2010 NSI data, the sectors with most value added to the GDP are the manufacturing, mining and quarrying, electricity and gas supply, as well as wholesale and retail trade, as well as repair of motor vehicles and transportation. The export specialisation of Bulgaria is mainly in consumer goods and raw materials, both as trade balance and net export (BNB, 2010). The trade balance (FOB-CIF) shows that the country is a net exporter of manufactured articles, manufactured goods, food and live animals, as well as beverages and tobacco (NSI, 2010). The country also exports machinery and transport equipment; however it imports almost double the amount of the same type of goods from the EU.

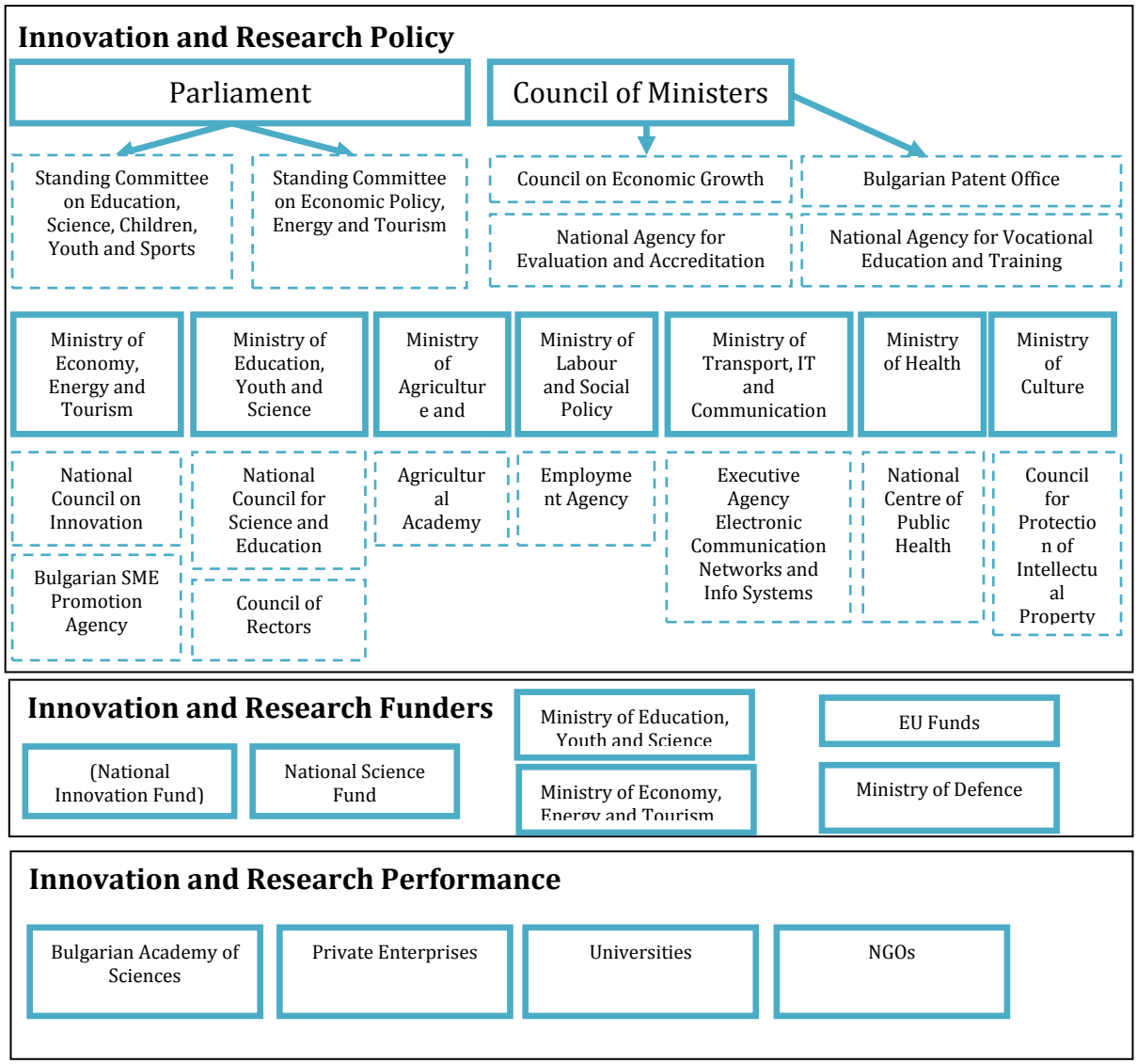
Most of the FDI in Bulgaria have been focused in real estate and related financial services, which have been related to pre-crisis credit lending boom and hence have not been conducive to knowledge demand. Accordingly, the Bulgarian economy has not been associated with technological innovation, but rather marketing and organisational innovation (ARC Fund, 2010; ERAWATCH Country Report Bulgaria, 2010).

The share of innovative enterprises that utilise new technological knowledge is increasing mainly due to expanding market share and standardisation requirements. The high-technology sectors (mainly ICT), remain one of the leading drivers of economic growth. NSI data for the period 2000 – 2010 shows that R&D spending in real and in growth terms has been highest in technical sciences and natural

sciences, followed by the agricultural sciences. In 2010 however the medicine science received the most R&D funding. Government spending dominates the natural sciences and is, therefore, of primary importance in R&D spending growth. In contrast, R&D expenditures of the business enterprise sector in technical sciences are greater than those in the public sector (ARC Fund, 2010). For example the GBAORD by socio-economic objectives favors the general advancement of knowledge in the universities (46% of the GBAORD), the agriculture (13.9%), and education (12%), followed by the industrial production and technology with only 9.2% (NSI, 2010).

In terms of scientific specialisation, in most publications in Scopus Bulgaria focuses mainly on physics and astronomy, medicine, biochemistry, and genetics (ARC Fund, 2011; Scopus).

Figure 1: The Bulgarian Research and Innovation Systems



Structural challenges faced by the national system

The Innovation Union Scoreboard 2010 (IUS) put Bulgaria in the group of "modest innovators" together with Latvia, Lithuania and Romania. The Scoreboard noted that these were countries, which innovation performance was well below that of EU-27. However, Bulgaria was also among the countries – "growth leaders", with an average annual growth rate of their innovation performance of above 5%. The latter denoted a steady convergence trend. The Scoreboard found that the relative strengths of the country lied in the area of "human resources", while its relative weaknesses were in "linkages & entrepreneurship", "intellectual assets" and "innovators"[3].

The main structural challenges that Bulgaria faces in the area of innovation and science are:

Institutional fragmentation

Various ministries, agencies and other entities implement research and innovation measures without sufficient coordination of priorities. National funding and Cohesion policy instruments are not utilised adequately for reforming of the institutional structure and the public research and innovation system. There are signs however that the implementation in the country of the EU policy-making and funding cycles related for example to the Europe 2020 strategy has created momentum for more concerted and coordinated efforts in developing the country's national innovation system. In 2011 the Bulgarian government adopted the National Strategy of Scientific Research to 2020, which for the first time has been consulted between the ministries of science and of economy and has incorporated important innovation policy elements. Furthermore, the Ministry of Economy, Energy and Tourism has pledged to introduce a new Law on Innovation in 2011-2012 (Mini-TrendChart Report Bulgaria, 2011).

Ensuring predictability and coherence of public policy and consistency between multi-annual strategy documents

One of the main challenges is related to the chaotic nature of the changes in public policy, inconsistency in the funding of individual scientific fields, as well as the weak institutionalisation of policy measures (Innovation.bg, 2011; ARC Fund). The innovation structure of the country is not well developed. This results in separate measures being implemented by separate institutions. As of 2011 Bulgaria does not have any demand-side innovation policy. At this stage, the governance challenge for Bulgaria is to define its innovation priorities and develop consistent innovation policies in the first place (Mini-TrendChart Report Bulgaria, 2011**).** The National Strategy of Scientific Research to 2020 has set precedence in overcoming one of the persistent structural challenges in the Bulgarian national innovation system – the divide between science and technology and innovation policy. Still, all stakeholders need to better focus their efforts on the effective coherent implementation of support measures.

Enhancing budgetary prioritisation, while increasing public, private and EU

[3] Please, note that these categories are specifically defined by the Innovation Union Scoreboard to mean an aggregate of certain individual indicators and hence should be interpreted with care outside the framework of the scoreboard.

funding

The national research system still lacks sufficient funding and effective public resource management. The share of competitive funding in public budgets for research and innovation is disproportionally small. One of the enduring problems in Bulgaria is the high percentage of R&D funding which comes from the public sector in the form of direct budgetary aid. Available policy instruments are directed primarily towards established entities in research and innovation. The participation of the private sector in R&D expenditures is very low, including its absorption capacity of EU funds directed towards research and innovation (OP Competitiveness and OP Development of Human Resources). Despite this fact, as EU funding becomes more and more available for R&I infrastructure reform, national efforts should be focused on streamlining policy formulation and coordination and on leveraging very limited public funds to attract higher private R&D investment. The latest available data shows that the crisis has exacerbated existing structural challenges in research and innovation in Bulgaria. As was generally expected enterprises' expenditures on R&D have shrunk by 36% y-o-y in 2010 and stood at BGN70m (€36m). The public sector also cut heavily on R&D expenditure, which declined by 17% y-o-y in 2010 to BGN182m (€93m). The reduction in public R&D in Bulgaria contradicted the general EU trend of increasing R&D expenditure to compensate for private sector cuts during the crisis (IUC Report, 2011). These developments put at considerable doubt the attainment of the national R&D goal by 2020.

The Innovation Union Competitiveness Report 2011 (IUC) Country Profile on Bulgaria notes that Bulgaria is "one of the countries with the lowest R&D intensity in the EU" and "ranks the lowest in the EU" on private R&D investment as a share of GDP. The Report sees the structural reason for this worrying performance in the "sectoral specialisation in low technology sectors and the … scarcity of medium and high technology firms in the economy". Aware of the challenge the Government of Bulgaria adopted a national target of reaching R&D intensity of 1.5% of GDP by 2020. The IUC Report 2011 notes that this target can only be reached if "strong efforts and reforms based on a long-term strategy is put in place and implemented in a sustained manner".

The National Reform Programme 2011 – 2015 (NRP) projects that Bulgaria will be able to attain its 2020 R&D target with the "use of additional funds for research and innovations under the European programmes", as well as through increased absorption of EU funds allocated for R&D and innovations. It expects that "the loss of competitiveness in the lower added value sectors as well as the expectation for reorientation and restructuring of the economy towards innovation-intensive sectors will press the private sector to increase the funds invested in R&D relatively fast". The NRP projects the value of the investments in R&D to reach 1.5% of GDP by 2020 based on the following assumptions:

- Using at least 15% of the Structural Funds designated for Bulgaria during the next programming period for financing research and innovations;
- Nominal growth in the national public financing for R&D of 5% per year, which is close to the expected inflation;
- Pace of increase of the enterprises' investments in R&D and innovations of 15% per year.

The NRP assumes such projections to be feasible on the basis of several factors. Over the last 6–7 years a considerable increase in the private sector investments in

innovations has been observed. The private sector investments in innovations significantly surpassed forecasts of the EC, which on the basis of a linear extrapolation had estimated that the expenditure on R&D and innovations in Bulgaria would reach only 0.55% of GDP in 2020.[4] The NRP considers that the linear extrapolation does not take into account the opportunities of Bulgaria to use additional financing for research and innovations under European Funds designated for the country. It should be noted that the average share of the expenditures on innovations in the total amount of the Structural Funds in the EU is over 30%, which highlights the growth potential for Bulgaria in this regard. It is expected that the EU Fund's absorption for R&D and innovations will increase by 2020, thus contributing to the leveraged increase of the overall national public and private investments in this area.[5]

Setting up an evaluation and monitoring system of innovation and research policy implementation.

The introduction of an efficient system for R&D evaluation is a component of each modern research, technology and innovation policy. Despite the measures envisaged in various strategic documents, as well as in the implementation of EU Funds, however, a comprehensive evaluation system has not yet been established in Bulgaria.

Evaluation instruments have not yet been regularly implemented in practice. For example, the National Innovation Strategy, which foresees the Minister of Economy, Energy and Tourism's submission to the National Innovation Council, and to the Council of Ministers, of an annual report on the status and development of the innovation policy in Bulgaria. By the end of 2011, the Ministry of Economy, Energy and Tourism had issued two such reports on the innovation policy in Bulgaria – for the years 2006 and 2007. Despite the good start, such reports need to be regularly updated.

Another example relates to the National Strategy of Scientific Research to 2020, which foresees, but has not actually implemented, activities such as:

- carrying out impact assessment of the application of new solutions and measures in the field of science and innovation;
- introduction of compulsory, regular international evaluation of the organisations providing financing to and carrying out scientific research, R&D and innovation;
- regulation of long-term objective evaluation and monitoring criteria of scientific programmes and results; and
- definition of a system for regular internal evaluation of scientific organisations with clear long-term criteria.[6]

[4] Community Innovation Survey and the European Innovation Scoreboard (2007, 2008, 2009, 2010)

[5] National Reform Programme (2011-2015),

http://ec.europa.eu/europe2020/pdf/nrp/nrp_bulgaria_en.pdf

[6] National Strategy of Scientific Research to 2020

http://mon.bg/opencms/export/sites/mon/en/top_menu/science/national_research_strategy-2020.pdf

Strengthening the link between education, research and business both at governance and implementation level

The policy governance of higher education, research and innovation is departmentalised. Bulgarian firms do not collaborate with public research institutions on their innovation projects citing prohibitive costs and minimal benefits from producing knowledge-intensive products for an unsophisticated consumer base with low demand pull potential (Innovation.bg, 2009). The dominance of public funding in research activities is indicative of problems in both the efficiency and utility of research in stimulating economic growth in Bulgaria, as well as of an unhealthy relationship between publicly funded research on the one hand, and the technological absorptive capacity of private sector firms on the other. (ERAWATCH Country Report Bulgaria, 2009: Analysis of policy mixes to foster R&D investment and to contribute to the ERA).

Increasing the attractiveness of the research career

The current levels of research personnel salaries, and the outdated material base and equipment do not attract young researchers, resulting in brain drain and aging R&D staff. There is also lack of stimuli for attracting leading researchers from abroad.

The National Strategy of Scientific Research to 2020 strategy also reviews the state of the national R&I system and lists nine top challenges, which it aims to address through the proposed tasks and measures:

- Sustainability and predictability of R&D investments in pursuance of the national R&D target for 2020. An important component in raising R&D investment would be the increase of financing from European funds and programmes and private sector investment. Growth in R&D investments should come primarily from private business as currently public R&D investment is still much higher that private;
- Rigidity of the institutional structure of the public scientific system. Cohesion policy instruments are not utilised adequately for its updating;
- The aging structure of scientific personnel deteriorates further as the structure and incentives in place do not stimulate new entrants to the system;
- The disproportionally small share of competitive funding in public budgets for scientific research;
- Lack of mobility schemes in the public and the private sector – internal and inter- institutional, as well as inter-sectoral, for which there are also regulatory obstacles;
- The absence of competitive funding of doctoral studies and need of introduction of project financing of the doctoral studies under projects of interest for the hosting institution;
- Lack of coherence between the education, science and innovation policies;
- Underdeveloped innovation infrastructure; inactive innovation intermediaries (clusters, technology centres; technology transfer offices; centres for commercialisation of patents and intellectual property, etc.);
- Limited instruments at national level in support of innovation – start-up funding schemes; guarantee and venture capital funds.

The number of challenges outlined in the national science strategy indicates the steep learning curve, which Bulgaria faces in developing a modern research and innovation system. These issues align quite closely with the definition of the term structural challenges. On the one hand, the various innovation strategies, official documents and national priorities have, for the bigger part, succeeded in identifying and targeting the core structural challenges. The policy mix in place, however, is not optimised and is not ambitious enough (in terms of funding and reform) for effectively tackling such challenges in the long term. This results in lack of sufficient implementation and impact of the Bulgarian innovation policy agenda.

Assessment of the national innovation strategy

National research and innovation priorities

The period 2003-2010 was marked with a lack of coordination and consistency between the main Bulgarian policy documents that relate to resource provision for R&D. These strategic documents include the Law on Scientific Research Promotion, the draft National Strategy for Scientific Research for the Period 2009-2019, the National Innovation Strategy, the Regional Plans for Development, the Regional Innovation Strategies, the Operational Programme Competitiveness, the Law on Higher Education, the Law for the Bulgarian Academy of Sciences, and the Strategy for Encouraging Investment in Bulgaria 2005-2010. Most of these documents present in a general way various, sometimes conflicting, priorities, and it is difficult to make an assessment of the overall thematic focus of national R&D policy or of the financial planning behind it.

The newly set national goal for R&D investments to reach 1.5% of GDP by 2020 is a testimony for some change in priority setting by attributing a growing priority to innovation. To that end, the latest National Strategy of Scientific Research to 2020 contains innovation goals and measures, which aim to achieve the newly set goal for investments in R&D and innovation. The Strategy takes note and addresses to a large degree through its measures the structural challenges, listed in the previous chapter. Still, since the strategy is newly adopted, no tangible results have been observed. There are no notable changes in the established framework for developing the innovation capacity in the country between 2009 and 2011. There is a visible split between bodies responsible for research and education policies, and those in charge of innovation. This split is evident throughout the system and is a major cause for the lack of coordination.

In 2011 the National Strategy of Scientific Research to 2020 set for the first time the five specifically listed priority areas for the development of research in Bulgaria:

1. Energy, energy efficiency and transport. Development of green and eco technologies;
2. Biotechnologies and ecological foods;
3. New materials and technologies;
4. Cultural and historical heritage;
5. Development of fundamental research under programme and competitive principle to the amount of 15% of the public expenses on science.

The information and communication technologies will be developed as a horizontal topic that affects all spheres of life and economy. The Strategy envisages that over 60% of the public R&D financing will be concentrated in these areas by 20207. The support for scientific activity will be continued through institutional financing based on developed scientific programmes and plans in order to maintain the level of scientific knowledge and specialists relevant for the state, needed in various fields of economy and governance, as well as creation of innovative solutions (National Strategy of Scientific Research to 2020, Bulgarian Ministry of Education, Youth and Science, 2010)

The Government claimed that it specified the newly set priority scientific areas taking into account the national economic interests, the priorities of the Bulgarian government defined in the National Reform Programme, analysis of the scientific activity and export potential in Bulgaria, as well as the EU scientific priorities. They are also accounting for the leading market initiative, analysis of the Esko Aho Group regarding the measures for creation of Innovative Europe, the foreign direct investment data, the priority areas of the Seventh Framework Programme and the need of promotion of applied research.

Other emerging topics in the national policy discussions in the last three years have been the restructuring of the Bulgarian Academy of Sciences, the re-launching of the National Innovation Fund activities and the need of new Law on Innovation, the possibilities for countering the brain-drain and the lack of interest towards research in the young people, as well as the need of providing incentives for the technology intensive sectors. The latest public discussions also focus on the energy efficiency, necessity of support of green and social innovations, as well as developing rules for promoting the pre-commercial procurement.

The National Strategy of Scientific Research to 2020 specifically addresses some challenges through its measures. However it should be stated that within the interpretation of the Strategy the term “social challenge” implies issues such as promotion of the scientific community and social and economic status of the researches. The Strategy does not concerns itself with the conventional meaning of societal challenges (e.g. climate change, aging population, etc.), though the latter are indirectly addressed by programmes such as “Natura 2000”. The term societal (or social) challenges is used in the context of measures, such as introduction of targeted programmes supporting scientific activity in SMEs and creation of managerial culture for collaboration with scientific institutions; introduction of financing model stimulating competition, development and application of scientific results in society and economy and increase of the funds for research and innovation; and strengthening the social dimensions of science by introduction of a programme for promotion of scientific activity of students at schools and universities, scientific activity awards and “science shops”. The rationale for such measures is that the quality of the performed scientific research depends mainly on the human potential - highly qualified and motivated researchers. The idea is to follow a more efficient policy toward raising the scientists’ economic and social status and creating attractive conditions for scientific activity that will give them sufficient professional self-confidence. The state encourages the return of highly qualified Bulgarian scientists working at foreign institutions abroad. Support is also to be provided to the

[7] Page 34 of the Strategy states 70% of R&D financing, page 32 – 60%

collaboration between the Bulgarian diaspora and the scientific organisations in Bulgaria through introduction of specialised schemes.[8]

There are no regular evaluations implemented in regards to the achievements of the research and innovation policies conducted, nor the functioning of the NSF and NIF. There is also no formal evaluation of Bulgaria's participation in EU's Framework Programmes, and the operational programmes currently carry out their mid-term reviews (results to be presented at the beginning of 2012). According to the National Innovation Strategy (2004), the Minister of Economy, Energy and Tourism should submit to the National Innovation Council and to the Council of Ministers an annual report on the status and development of the innovation policy in Bulgaria. By the end of 2011 however, the Ministry has issued only two reports on the Bulgarian National Innovation Policy – for 2006 and 2007. Analyses are prepared ad hoc and sporadically. For example, in 2010 the Ministry of Education, Youth and Science elaborated an Analysis of the Scientific Activity in Bulgaria[9], which once again confirms the challenges in from of and the shortcomings of the national innovation system. The trends and developments of the innovation and research policy are analysed by the civil society (for example the Innovation.bg report, issued by ARC Fund), as well as by the EC through the platforms ERAWATCH, TrendChart, Regional Innovation Monitor, etc. Additional challenge to the measuring of innovation trends provides the fact that the National Statistical Institute (NSI) presents data with a few years lag.

The National Strategy of Scientific Research to 2020 sets new rules and indicators for monitoring the achievements and implementation of the Strategy. It also calls for the introduction of a system for evaluation of the national research activity. The implementation effectiveness of the set targets and measures in the Strategy are to be evaluated by independent external experts every three years.

The Council of Ministers, the Ministry of Economy, Energy and Tourism and the Ministry of Education, Youth and Science are the primary public bodies to implement and monitor the Strategy. Some of the monitoring indicators and corresponding targets include:

- Increasing the percentage of public resources for science used in priority scientific areas up to 60% by 2020;
- 5 modern research infrastructure constructed per priority scientific areas by 2020;
- Increasing from 6 to 10 the number of projects with Bulgarian participation in the framework of the European Roadmap for Research Infrastructure by 2020;
- 3 institutional / long-term research programmes under the priority areas by 2020;
- 2 joint research centres;
- Increasing the number of established national research networks from 25 to 115 by 2020, etc.

[8] http://mon.bg/opencms/export/sites/mon/en/top_menu/science/national_research_strategy-2020.pdf

[9] Analysis of the Scientific Activity in Bulgaria, Ministry of Education, Youth and Science, 2010, http://www.mon.bg/opencms/export/sites/mon/top_menu/science/news/analyse_researches_bg.pdf

The business enterprise R&D expenditure (BERD) in Bulgaria has been gradually increasing as a share of GDP and as a proportion of the total R&D expenditures from 2000 to 2009; it however dropped due to the economic crisis in 2010. Yet, the share of the government financing is still predominant. There is a need of establishing new innovation and research financing instruments, especially since the discontinuation of the National Innovation Fund and the low absorption rates of the EU-funded operational programmes. According to the National Strategy of Scientific Research to 2020 examples of such instruments are the JEREMIE Initiative (launched in 2011) and other guarantee funds, sectoral research programmes (still not established), specialised national programmes in a specific scientific field, national programmes for support of scientific infrastructure, and for the implementation of the National Roadmap for Scientific Infrastructure, etc.

Trends in R&D funding

Gross domestic expenditure on R&D as a share of GDP was 0.59% in 2010 or about €215m.[10] The government sector has historically been the main research funder and performer in Bulgaria. In 2010 it provided 43.32% of total R&D funding (NSI), which was a substantial crisis-related drop compared to previous years. For example, the Bulgarian Academy of Sciences experienced about 40% cut of its initially approved state budget for 2010. In BAS 2011 and the draft 2012 budgets have seen further cuts. The contribution of the business sector to total R&D financing was 30.23% in 2009 (Eurostat and NSI). This share, however, decreased steeply in 2010 to 16.7%. HEIs provided a minute 0.49% of the R&D funding (NSI, 2010). All these trends reflect the effects of the economic crisis and the lack of demand for development of innovations on the domestic market. The main change in the R&D expenditure trends, in 2010, was the increase of investments from abroad[11]. These had been steadily low (in the range of 5-8% for the 2000-2009 period), before reaching 39.40% of total R&D expenditures in 2010 (NSI).

Table 1: Basic indicators for R&D investments in Bulgaria

	2008	2009	2010	EU average 2010
GDP growth rate	6.2	-5.5	0.2 2.2 (forecast for 2011)	2,0
GERD as % of GDP	0.47	0.53	0.6*	2.0
GERD € per capita	21.8	24.3	28.4*	490.2
GBAORD (€ million) [gba_nabsfin07]	108,646	117,822	99,713	92,729.05
GBAORD as % of GDP [gba_nabsfin07]	0.31	0.34	0.28	0.76

[10] National Statistical Institute's preliminary data for 2010, available online at: http://www.nsi.bg/otrasalen.php?otr=54 [last visited December 06, 2011].

[11] The source of the abroad funding remains confidential according to NSI rules. Still, most probably the increase was due to the inflow of financing from the European Commission - through the Cohesion and Structural Funds as well as the European framework programmes for research (FP 7) and for innovation (CIP).

	2008	2009	2010	EU average 2010
BERD (€ million)	51,699	55,309	107,68*	151,125.56
BERD as % of GDP	0.15	0.16	0.3*	1.23
GERD financed by abroad as % of total GERD	6.8%	8.4%*	39.40%*	N/A[12]
R&D performed by HEIs (% of GERD)	9.6%	14%	11.79%	24.2
R&D performed by PROs (% of GERD) **(GERD, performed by the Government sector, Eurostat indicator rd_e_gerdtot)**	58.3%	55.2%	37.40%	13.2
R&D performed by Business Enterprise sector (as % of GERD)	30.6%	30.0%	50.1%	61.5

Source: Eurostat;

In June 2010, the Bulgarian government adopted a national R&D investment target of 1.5 % of the GDP by 2020, set as part of the national position on the European 2020 Strategy. The 2011 public budget for science however remained at 0.3% of GDP, despite the planned increase in absolute terms.

The main competitive public R&D funding instruments are the National Innovation Fund (NIF) and the National Science Fund (NSF). Due to considerations of overlapping with EU funding programmes, NIF has not distributed any funds since 2008, when it reached a budget of €10.3m. Its future remains unclear. NSF's budget peaked in 2009 (€51.1m), but government cuts in 2010 have substantially restricted it to €13m. In addition to the two funds, direct budget subsidies to public research organisations are provided by the government.

For the first time, in 2008, the ratio between national institutional (direct subsidies for public research organisations) and competitive funding was almost equal (ARC Fund, 2009; Innovation.bg, 2009). Tax incentives for R&D expenditures have been limited and have not attracted private enterprises. In the context of the EU, the allocated ERDF and Cohesion Fund support for the 2007-2013 period amount to €310.6m for RTDI and linked activities and €292m for Support for innovation in SMEs (DG Regional Policy data; Country Report on achievements of Cohesion Policy: Bulgaria, 2011).

The national competitive funding usually does not have strict thematic or sectoral focus, or it focuses on the support of 6-7 areas per one open call. It should be noted, however, that several of the sectors, listed as priorities in the National Strategy of Scientific Research to 2020, currently receive less than 1% of the government budget appropriations or outlays on R&D (NSI data).

There is neither consistent information on the leveraging of additional funding through public-private partnerships nor adoption of specific policy measures for the promotion of spin-offs. Collaboration between research institutions and SMEs is "hidden" and usually neither business enterprises nor public R&D units account officially their R&D activities. Specific innovation and research cross-border or

[12] 8.4 (2009), 9.04 (2005)

regional programmes and support schemes are also absent in the country. Nevertheless, some general trans-national funding initiatives partially complement the national innovation and research funding.

Evolution and analysis of the policy mixes

There have not been any notable changes in the innovation policy mix, programmes and measures in Bulgaria between 2009 and 2011. After the introduction of the Currency Board in the country in 1997, Bulgaria has relied primarily on public expenditures to promote research and innovation. There is a general reluctance with respect to introducing tax relief for R&D and innovation in Bulgaria. There has been no funding allocated for the National Innovation Fund since 2008, except for BGN5m (€2.5m) secured in 2011 to cover payments due for the completion of already approved projects. Some universities become more active in promoting scientific and innovative activities, including research projects, knowledge exchange between universities, organisation of scientific conferences. The budget of the National Science Fund was reduced in 2011 to BGN35m (€17.8m) resulting in downsizing or discontinuation of support schemes and individual projects (Mini-TrendChart Report Bulgaria, 2011).

The main factors that present weaknesses and threats, but also opportunities for future improving the innovation and research environment, include:

Governance structure

The institutional fragmentation presents a challenge to the policy implementation. The research and innovation policies remain within the authorities of two different ministries that have different policy-making mechanisms and policy implementation structures. There are indications for collaboration between the Ministry of Economy, Energy and Tourism and the Ministry of Education, Youth and Science, for example the joint consultation during the elaboration of the National Strategy of Scientific Research to 2020. The strategy for the first time incorporates important science, technology and innovation policy guidelines in one document. Still, the cooperation needs to be spread to more policy areas and policy instruments, including laws, regulations, and elaboration of specific measures (Mini-TrendChart Report Bulgaria, 2011).

The Ministry of Finance is also active in the processes of policy formulation and discussion in the area of RDI. Representatives from the Ministry have taken part in various expert groups and committees, both on national and EU level, concerned with innovation policy. Experts for the Ministry of Finance are also participating in the monitoring and evaluation process of the National Innovation Strategy`s implementation.[13] The ministry is also hosting and coordinating an information system for management and monitoring of the EU's structural instruments in Bulgaria. The system operates as a project, funded by OP Technical Assistance, and provides detailed, publicly available information on the implementation of the various Operational Programmes in Bulgaria.[14]

Multi-annual strategy

[13] http://www.csd.bg/artShow.php?id=5650

[14] http://umispublic.minfin.bg/

The National Strategy of Scientific Research to 2020 was adopted in 2011. It puts in place conditions and defines prospects for attaining the targets set forth in the Europe 2020 Strategy. There is also foreseen adoption of new Law on Innovation (to re-place the law from 2004), as well as new Higher Education and Science Law. Still, the chaotic changes in public policy and inconsistency of funding towards the individual scientific areas create uncertainty both in the publicly financed research institutes and the business. In order for both the national and Europe 2020 objectives to be achieved the strategy documents, as well as implementation measures, should be harmonised and jointly elaborated between all stakeholders. These should also include standardisation, public procurement rules, regulations, etc. The coordinated policy-making process should aim to achieve increased coherence between the education, science and innovation policies. Moreover, the foreseen measures in the strategies should be adequately financed, efficiently implemented and regularly monitored, assessed and updated.

Adequacy of public funding and budgetary prioritisation

Since the transition to a market economy started in 1989, the predominant public research and development (R&D) funding has withered quickly. R&D expenditure levelled off at an annual average of just below 0.5% of GDP in the period 2003–2011, which is less than one fourth of the average EU–27 value. The national financial recourses need to be adequately planned and increased. This would bring stability to the business environment and provide more incentives for the currently low private research and innovation activities.

Another challenge is that currently the national budget funding is neither concentrated in the priorities, defined by the various strategic documents produced in the past, nor the newly set priorities of the National Strategy of Scientific Research to 2020. The government depends heavily on the available EU funding for reaching the national targets. Moreover, instead of applying strategic approach, based on analysis of the national needs, the policy measures often follow the EU financing priorities. The absorption level of EU funds and in particular the operational programmes is rather low due to delay in the start of the programme, lack of experience and administrative capacity. Cohesion policy instruments should be used more adequately.

The above speaks for the fact that Bulgarian RDI politics is currently very much dependent on external, EU, guidance, both financially and strategically. This creates unsustainable innovation environment, which results in Bulgaria inadequately addressing its internal innovation challenges. Giving priority to EU-wide financing priorities is also among the reasons for the considerable delays in the implementation of the various strategies in the field of RDI. To be continuously competitive and to successfully attract EU funding, the research base must at least be kept in a good state through adequate domestic funding and through a properly carried out prioritisation process.

Reaching the national R&D financing goal of 1.5% of GDP by 2020 would require both increasing the national funding, as well as providing new and regularly updated and effectively financed support measures for promoting the private sector investments in R&D activities. The 2009 budgets of most of the research and innovation policy measures and schemes in Bulgaria have not been updated with appropriate funding for 2010 and 2011 (for more information see Annex A of the Mini-TrendChart Report Bulgaria, 2011).

Monitoring system; Evaluation of institutions and policies

The lack of up to date statistical and qualitative data on the implementation of the research and innovation policy and measures is a weakness for Bulgaria. Evaluation is performed ad hoc and irregularly. Statistical data is produced with a lag of several years. A positive step is the newly introduced university rating system (launched in 2010), which is intended to serve as a tool for discretionary state funding according to universities' achievements. Still, there is need of establishment of evaluation system and rules for initiating policy and structural changes in all innovation and research-related institutions based on the recommendations from the evaluations. The National Strategy of Scientific Research to 2020 foresees as one of its measures the introduction of scientific activity evaluation of the research organisations, which will help the state to design better policy measures. The strategy also sets new rules and indicators for monitoring the achievements and implementation of all its measures. It is expected that monitoring and control procedures will be also introduced with the future new Law on Innovation and the new Higher Education and Science Law.

Research careers; Attraction of world talent and countering the brain-drain

The country experiences a shortage of qualified human resources, as reflected in the fact that Bulgaria scores lower than the EU average on the availability of a highly qualified and educated workforce. A decreasing share of young Bulgarians choose science and technology as a career (i.e. in 2009 the share of people out of the economically active population with science and technology major was 32.2% in Bulgaria, lower than the EU-27 average of 40.1%, according to 2009 Eurostat data) (Mini-TrendChart Report Bulgaria, 2011). Moreover, the research personnel is characterised by its ageing structure. In order to overcome these challenges, Bulgaria needs to develop more effective mechanisms for attracting the young people, as well as leading researchers from abroad. Pre-conditions for increasing the attractiveness of the research career are the improvement of the business environment, updating the research infrastructure and equipment, ensuring effective collaboration between the research institutes, the education and the business.

Link between education and research; Partnerships at all levels and between all actors

R&D institutions and universities do not actively cooperate with companies. There are no specific policy measures aimed at promoting public-private knowledge transfer or spin-offs. The mobility of research staff between the public and the private sector is rare and it is not supported by any specialised programmes for fostering inter-sectoral mobility. The majority of Bulgarian business enterprises do not have research units, thus not attracting research staff from the public sector. Collaboration between research institutions and SMEs often remains "hidden" as a result of lacking tax and other incentives (Mini-TrendChart Report Bulgaria, 2011). To ensure enhanced partnerships at all levels and between all actors, the state should not only put in place the necessary support measures and implement institutional restructuring, but also guarantee accountability to society on funds spent, and build mutual trust between the science, the private sector and the society.

Business environment promoting private investments

Due to the lack of specific measures for promoting private investments in R&D, the discontinuation of the National Innovation Fund and the effects of the global crisis, the businesses are reluctant to invest in research and innovation.

Tax incentives for R&D expenditures are very limited in scope[15] and have failed to attract private enterprises. They do not favour in-house R&D, and tax breaks' effects are significantly delayed in time. Moreover, while there is an increase in absolute terms in the R&D funding from higher education and enterprises, the share of the latter in total R&D expenditure in Bulgaria remains half that of the EU average. This implies that the capacity of Bulgarian enterprises to support research infrastructure and staff is limited (Mini-TrendChart Report Bulgaria, 2011).

In order to promote private investments in research and science, the state should provide new instruments in support of innovation such as start-up funding schemes, support to clusters, technology centres, commercialisation of patents. The new financial engineering instruments, guarantees and venture capital funds should be further enhanced and more broadly used.

Assessment of the policy mix

In 2010-2011 the Bulgarian government undertook some actions to update the regulatory framework, set new rules, procedures and priorities, as well as create coherence and synergies between the previously numerous strategic documents. The Strategy of Scientific Research by 2020 (2011) listed the main science priority areas. The National Reform Programme (2011) set the national R&D spending aim of 1.5% of GDP by 2020. The Roadmap for Research Infrastructure was also adopted in 2010. The amended Law on Scientific Research Promotion (October 2010) introduced the idea for independent assessment on public research funds' spending and better accountability to society. The government's position[16] on the Strategy Europe 2020 (2010) focuses on the support for export oriented and high technology industries. Many necessary strategic documents and measures however are still under preparation: new Higher Education and Science Law (to update the current Higher Education Act); new Law on Innovation, which will reinstitute the National Innovation Fund, the activities of the National Council on Innovations, and most probably will introduce new tax and research public procurement incentives; update of the university rating system. These changes address and are expected to tackle the challenges, discussed in Chapter 2. Still, an extensive effort from all stakeholders is needed to implement the foreseen measures. Despite the fact that most of the challenges still remain without measures or budgets for practical solution, several policy actions have already been implemented. The Law on the Development of the Academic Staff (May 2010) decentralised the academic career promotion and lead to increased autonomy of the universities. Other recent developments include provision of state co-financing of FP7 projects, restructuring the Bulgarian Academy of Sciences, and introduction of university rating system (November 2010).

Table 2: Assessment of the policy mix

[15] Art. 69 of the Law on the Corporate Income Tax states that enterprises can claim R&D expenditures for tax credit purposes only if these have been spent on R&D procured from public research organisations.

[16] The government's position on the Strategy Europe 2020, http://www.minfin.bg/document/8030:1

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Overcoming the institutional fragmentation	Recent (2010-2011) trend for joint preparation of strategic documents and collaboration in the formulation of priorities and measures.	Despite the trend of increased collaboration, the innovation and science policy remain within the authority of two different ministries and further institutional changes are necessary. The national innovation system needs new management models which would provide faster institutional reform and boost creative interaction and integration (Innovation.bg, 2011; ARC Fund).
Ensuring stability of public policy and consistency between multi-annual strategy documents	Adopted National Strategy of Scientific Research to 2020 (2011). Foreseen new Law on Innovation and new Higher Education and Science Law	Despite the adoption of the new National Strategy of Scientific Research to 2020 and the foreseen adoption of new Law on Innovation and new Higher Education and Science Law, there is still a feeling of inconsistency of funding and chaotic changes in public policy. All future strategy documents should be harmonised, consistent and jointly elaborated between all stakeholders.
Increasing public funding and enhancing budgetary prioritisation	Increased public funding in nominal terms. Trend towards increased utilisation of EU funds for innovation support at the end of the programme period. Increased funding for the universities in the draft 2012 budget. Co-funding of FP7 projects.	Although the public funding increased in nominal value, it retained the same levels in relative terms (share of GDP), which is evidence for lack of achievements in increasing the innovation potential. Public funding is not concentrated in the national scientific priority areas. The 2009 budgets of most of the research measures and schemes have not been updated with appropriate funds in 2010 and 2011. The Bulgarian managing authorities of operational programmes increased the pace of launching calls and implementing payments to the beneficiaries These include Operational Programme (OP) Competitiveness and the support to innovative enterprises. There is need of national co-funding for programmes other than FP7, coordinated funding between all national and EU programmes and utilisation of public-private partnerships. (Innovation.bg, 2011; ARC Fund).
Setting efficient evaluation and monitoring system of innovation and science policy implementation including in individual organisations	Introduced university rating system (2010). Evaluation measures set in the new National Strategy of Scientific Research to 2020 (2011).	The evaluation of research is still performed irregularly. There is need of annual assessment of the scientific results of public research organisations and directing the funding to scientists and units with the greatest potential for development. (Innovation.bg, 2011; ARC Fund). The university rating system (2010) serves as an effective tool for discretionary state funding according to universities' achievements, including research activities (up to 25% more financing than the allocated subsidy can be received). The National Strategy of Scientific Research to 2020 foresees as a measure the introduction of scientific activity evaluation and sets new rules and indicators. It is still early to assess the efficiency of the strategy implementation.

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Increasing the attractiveness of the research career	Push for increasing the national budget financing of education. Availability of EU-financed operational programmes to develop human resources. Adopted new Law on the Development of the Academic Staff (May 2010).	There is a policy push for increasing the national budget for education. The draft national budget for 2012 foresees increase of BGN12m (€6.1m) for the state universities. On the other hand the number of schemes supporting the R&D personnel and the research institutes is much higher than that for companies, which may further deepen the lagging of business sector. The new Law on the Development of the Academic Staff (2010) abolished the Supreme Attestation Commission. This decentralised the academic, as well as research career promotion and lead to increased autonomy of the universities to grant academic titles. In some cases however this put barriers to the mobility of the academic staff between universities. There is need of elaboration of common criteria and rules for granting academic titles so that they can be recognised by all institutions.
Ensuring the link between education and research	NSF 2010 competition-based scheme "Stimulating scientific research in the state universities"	Only the National Science Fund (NSF) allows for the communication between the industry, educational institutions, and public research centres. There is need on new support measures in this area.
Improving the business environment promoting private investments in R&D	OP Competitiveness. Launch of JEREMIE and JESSICA funds (2010). Adopted National Reform Programme of the Republic of Bulgaria 2011-2015. Guarantee fund for Micro-crediting, Bulgarian Development Bank (2009).	Focus in OP Competitiveness is strongly placed on the infrastructure and much less on the services, which might result in under-use of the available funds. Despite the successful launch of JEREMIE and JESSICA funds, there is still need of more venture capital. Bulgaria is about to lose its competitive advantages due to the decreased quality of education and brain-drain. The Bulgarian economy continues to have a low technology profile. The funding to intermediary organisations for technology transfer is still neglected. The lack of long-term budget financing plans for specific research priorities results in insecurity in the private sector and its investment decisions. The National Reform Programme of the Republic of Bulgaria 2011-2015 promotes the clusters, technology transfer offices and technology parks, however its effects are yet to be seen.

National policy and the European perspective

Bulgaria needs to set more precise guidelines for cross-border collaboration, as well as elaborate and implement effectively a number of support measures in order to achieve the objectives of the ERA pillars. The Bulgarian R&D personnel increased due to higher demand from the private sector in 2010. The Innovation Union Competitiveness report 2011 for Bulgaria notes that there can be potential to raise the quality of the scientific production, should the necessary reforms be adopted. Still, currently there are no common promotion procedures for researchers that could ensure career stability. The education curricula should also be improved to focus on creativity and critical thinking, and it should be based on analysis of the labour market. Although the draft state budget 2012 foresees some increase of the subsidy

for the universities, the financial support in general has remained too weak to bring about a qualitative change in the universities' research activities. The National Roadmap for Research Infrastructure was adopted in 2010 and Bulgaria is included in several European research infrastructure projects. Still, Bulgaria lacks financial, industrial and human potential for the construction and maintenance of big research infrastructures. The available research material base remains obsolete. There also is need of further regulations and incentives in regard to the cross-border cooperation, jointly funded activities, as well as common foresight. The main national measures supporting cross-border cooperation include the bi-lateral scientific and education agreements with other countries. More national collaborative support schemes are needed to raise the joint research activities, as well as the number of co-publications and co-patenting. The weak links between R&D institutions and industry remain a major challenge. There is also a lack of strong institutional policies in the field of intellectual property. The technology transfer offices are in the process of establishing. As participant in the FP7, among the EU-27, Bulgaria ranks 20th in terms of number of applicants and requested EC contribution (Innovation Union Competitiveness report 2011for Bulgaria). Despite Bulgaria's participation in the FP7, ESF, COST, ERA NET+ and other EU-programmes, there is no real concentration of public resources in priority scientific areas.

Table 3: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

	ERA dimension	Main challenges at national level	Recent policy changes
1	**Labour Market for Researchers**	Further enhancement of the secondary and the higher education systems in needed. Low number of researchers compared to EU. Need of adequate financing for research and increased absorption of the EU Funds in support to PhDs and human resources development. Need of promotion procedures for researchers and financial incentives. The education curricula should focus on creativity and critical thinking and be based on analysis of the labour market.	Adopted university rating system. New Higher Education and Science Law is foreseen.
2	**Cross-border cooperation**	Need of strategic guidelines for participation in European coordination and integration of research funding. Need of further regulations and incentives in regard to the cross-border cooperation, jointly funded activities, as well as common foresight. Need of more effective mechanisms to support the preparation of European projects under the EU Framework Programmes. Re-institutionalising of the Bulgarian Council on Innovation and its advisory functions on issues such as international cooperation, envisaged in the forthcoming Law on Innovation.	No changes. Foreseen new Law on Innovation, re-institutionalising of the Bulgarian Council on Innovation.

	ERA dimension	Main challenges at national level	Recent policy changes
3	**World class research infrastructures**	Needed further development of national research infrastructures, including by national support schemes. Increasing the financial, industrial and human potential for construction and maintenance of big research infrastructures. Attraction of foreign researchers and knowledge. Update of the research material base is needed. Uneven spatial and thematic distribution of scientific infrastructure. Lack of adequate information, communication and e-services. Lack of interest, financial stability and commitment from the business.	Amendments of the Law on Scientific Research Promotion (on 22 October 2010). Adopted National Roadmap for Research Infrastructure (2011). Adopted national target for R&D expenditure of 1,5% of GDP by 2020.
4	**Research institutions**	Quality of teaching is declining. Distribution of the limited public budget resources among a large number of institutions. The financial support in general remained too weak to bring about a qualitative change in the universities' research activities. Complexity of own revenue generation. Lack of management experience. The criteria for granting scientific titles should be unified to ensure recognition of titles from all institutions.	Adopted new National Research Strategy by 2020 (2011). Adopted new Law on the Development of the Academic Staff (2010). Launched new university rating system (November 2010), allowing up to 25% more financing than the state subsidy. The draft state budget 2012 foresees increase of the universities' subsidies. Adopted Law on Student and Postgraduate Loans (January 2010).
5	**Public-private partnerships**	No effective national policies to strengthen the links between R&D institutions and industry. Private funding in research is scarce, hindering researchers mobility. Technology transfer offices are still in the process of been established. There are no centres for commercialisation of patents and intellectual property. Inactive innovation mediators - clusters, technology centres; technology transfer offices; centres for commercialisation of patents and intellectual property, etc. (according the National Strategy of Scientific Research to 2020). Impossibility of the organisations to develop mobility schemes – internal and interinstitutional, as well as inter-sectoral, for which there are also normative obstacles (according the National Strategy of Scientific Research to 2020).	Launched scheme for creation of technology transfer offices under OP Competitiveness (January 2011). Foreseen new Law on Innovation and re-institutionalising of the National Innovation Fund.

	ERA dimension	Main challenges at national level	Recent policy changes
6	**Knowledge circulation across Europe**	Lack of effective national measures supporting cross-border cooperation and knowledge circulation. Low FP7 success rate (financial contribution and number of applicants) compared to the EU average. The number of co-publications between Bulgarian researchers and researchers from other ERA countries is one of the lowest in Europe. Low co-patenting activity. Research outputs are usually not freely available to the public.	The National Science Fund implements the bi-lateral scientific agreements.
7	**International Cooperation**	Need of national strategic guidelines for participation in European coordination and integration of research funding, as well as concentration in several priority areas. There is no real concentration of public resources in priority scientific areas. The higher education institutes should further expand their research activities, including by international collaboration.	Bulgaria participates in the FP7, ESF, COST, ERA NET+ and other EU-programmes. Co-financing of priority R&D projects in FP7 (expansion for all programmes is foreseen in the future Law on Innovation).

Annex 1: Alignment of national policies with ERA pillars / objectives

1. Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers

1.1 Supply of human resources for research

The educational structure of the population between 25 and 64 years shows Bulgaria's good position in respect to secondary education graduates, and its average one in respect to the higher education graduates. Still, the crisis in the real estate and the financial sectors has led to a decrease in the number of work places open, especially at newly established enterprises, limiting the employment of highly skilled persons. There are also increased negative effects caused by population ageing and brain drain.

The Bulgarian R&D personnel increased due to higher demand from the private sector. The human resources in science and technology as a share of labour force also increased from 30.5% in 2006 to 32.2% in 2009 and 31.6% in 2010. The R&D personnel and researchers however remained at a level of about 0.4% share of the total employment for the period 2006-2008, almost half of the 1% EU average (Eurostat). According to national statistics the number of researchers in full-time equivalent increased steadily with about 500 researchers per year until 2010 which marks decrease with 1036 researchers (NSI, 2010). The number of new PhD candidates also slightly increased from 583 in 2006 to 636 in 2009 (Eurostat). No reliable data is available on job-to-job mobility of HRST.

The Innovation Union Competitiveness report 2011 for Bulgaria notes that the number of researchers employed in the system, while still low compared to the EU average, is slightly higher than in the comparison countries, and, therefore, there can be potential to raise the quality of the scientific production, should the necessary reforms be adopted. The number of new doctoral graduates increased, albeit from low initial values, above the EU average, and at a similar rate as the reference group of similar countries.

New schemes were launched under the National Science Fund (NSF) and OP Development of Human Resources to stimulate the young researchers in the country and ensure an adequate supply of human resources. Examples include the scheme Support of the career development of doctoral students, post graduate students and young scientists by OP Human Resources Development; the schemes Establishment of Entrepreneurship Centres at Universities, Establishment of University Science and Research Complexes, Integrated Scientific Centres in the Universities, Sabbaticum Competition, Young Researchers and Young Talents by the National Science Fund etc. Mobility of researchers is supported by the NSF scheme Reintegration Grants for Bulgarian Researchers Working Abroad and the research competitions, based on bilateral agreements for scientific and technical cooperation. According to Eurostat, the share of job-to-job mobile HRST[17] in Bulgaria (3.6% in 2009) is almost twice lower than in the EU-27 (6% in 2009). The mobile (foreign) students[18] in Bulgaria (Bachelor and Master) were 3.89% of all students in the academic 2010/11 (NSI). Eurostat provides similar data for 2007 – 3.61% of foreign students in first and second stage of tertiary education (levels 5 and 6), far below countries such as Germany (11.34% of all students), Cyprus (26.87%), etc.

Despite the achieved harmonisation with EU policy on paper in the area of supply of human resources for research, there is a persistent lack of public funds and slow implementation of EU funds, which results in slow real convergence.

1.2 Ensure that researchers across the EU benefit from open recruitment, adequate training, attractive career prospects and working conditions and barriers to cross-border mobility are removed

[17] Persons that have changed jobs during a twelve month period (Eurostat)
[18] Students with different country of prior education

There are no common promotion procedures for researchers that could ensure career stability. Usually salaries at public research institutions are fixed or depend on the academic title and the provided budget subsidy. Some additional payments may be available from participation (institutional or private) in the EU-funded programmes. The situation is similar in the universities, although with the new rating system they can increase their public funding through academic and research achievements. Research positions are usually permanent, although with uncertainty availability – the national research infrastructures have been only recently defined in the National Roadmap for Research Infrastructure and the Bulgarian Academy of Sciences closed some of its institutes due to restructuring. The salaries of the Bulgarian researchers are considerably lower than compared to EU average, thus providing incentives for brain-drain. The Bulgarian Rectors' Conference (as a collective body of the largest national university network) has signed the European Charter for Researchers and Code of Conduct on 2008. Still, there are no specific regulations or schemes for increasing the researchers' salaries.

Accredited Bulgarian universities with doctoral programmes train foreign doctoral students and/or conduct PhD training in joint programmes with European and other universities. Further training of researchers, academic staff and postgraduate students takes place under the People (Marie Curie) Programme of FP7, as well as Erasmus Mundus. Training of PhD students and post-docs is implemented also under a scheme of the Operational Programme "Human Resources Development". There is no publicly available data and/or evaluation yet as to how effective these schemes have been in the past years. (ERAWATCH Country report Bulgaria, 2010).

Social security and supplementary pension of mobile researchers in Bulgaria are harmonised with the relevant EU legislation and regulations. When a Bulgarian public body sends a researcher to work abroad, it covers his/her stipend, but also social security. When a foreign researcher visits Bulgaria for the implementation of a research task or project, the Bulgarian organisation has no obligation to pay social security. This obligation is with the sending institution. Bulgaria has no general regulations on how social security and supplementary pension obligations are split between the sending and the host organisation if private organisations are concerned. For example, if a private Bulgarian research body or enterprise is involved as host or sending organisation in exchange of researchers, social security payments are settled on contractual (individual) bases. (ERAWATCH Country report Bulgaria, 2010).

Non-nationals are eligible to participate in the Bulgarian competitions for research grants. The National Science Fund operates with a wide range of schemes, supporting individual scientists, scientific groups, universities, and business enterprises. The consortia may also include foreign individuals and teams of researchers. (ERAWATCH Country report Bulgaria, 2010). There are usually limitations on trans-national portability of individual grants, since they are provided under fixed conditions to a specific team of experts. In general, a researcher awarded a research grant is not allowed to transfer it to another national or foreign institution.

On 27 February 2008 Bulgaria has adopted an Ordinance on the Terms and Conditions for Inclusion of Research Organisations based in the Republic of Bulgaria in the National List of Research Organisations that can Accept Foreigners for the Development of Research Projects in accordance with European Council Directive 2005/71/EC of 12 October 2005 on a specific procedure for admitting third country nationals for the purposes of scientific research. The Visa Package – Transposition of the Council Directive 2005/71/ES from 12 October 2005 (on specific procedure for admitting third-country nationals for the purposes of specific research) was implemented in 2007. The managing authority for the transposition of the Directive 2005/71/ES (Directive) is the Ministry of Interior (MI). The Ministry of Education, Youth and Science (MEYS) is a co–managing authority for Articles 2, 5, 6 of the Directive. MEYS adopted Order № 1 on the rules and procedures for inclusion of national research organisations in the national list of organisations having the right to employ third-country residents on research positions. There are no targeted national schemes for researchers from third countries. However, participation in joint calls under the ERA-NET projects is an opportunity for third country scientists' mobility. (ERAWATCH Country report Bulgaria, 2010).

1.3 Improve young people's scientific education and increase interest in research careers

The education curricula should be improved to focus on creativity and critical thinking. Currently there are discrepancies between the supply and the demand on the labour market as regards qualification levels and skills, as well as the insufficient number of those employed in R&D. During the academic 2010/11 year, the technical sciences (35,717 students) were the second preferred study field after the economic and administration one (56,947 students). This trend is even more pronounced in the doctoral candidates. Most PhDs are engaged in technical sciences (661), followed by healthcare (467) (NSI data, 2010/11). Still, the education curricula should also be based on analysis of the market's needs and the latest developments in each subject area.

The orientation of the students towards a PhD degree has not changed since the 2001 level, despite the June 2008 increase of PhD scholarships per month and the possibilities provided for gratuitous financial support for young scholars under the Operational programme "Human Resources Development" (OPHRD). Only 15 % out of an average of 4,000 PhD students per year defend their dissertation. (ERAWATCH Country report Bulgaria, 2010).

1.4 Promote equal treatment for women and men in research

The Bulgarian strategic documents are harmonised with the European requirements, including in the area of equal treatment of women and men in research. The restoration of the same position after maternity leave is guaranteed by law (until the child reaches 3 years of age).

Still, specifically listed requirements and monitoring indicators for non-discriminative or equal participation are more commonly used in the EU-funded programmes, rather than the guidelines in the schemes, supported by the National Science Fund.

In Bulgaria there is a growing share of women engaged with research (from 45.9% of all researchers in full-time equivalent in 2000 to 50% in 2010, according to NSI data). This trend should be considered as a potential for increasing the number of human resources in science. According the report Remuneration of Researchers in the Public and Private Sectors, DG Research, 2007, the gap in remuneration between the male and female researchers is significantly reduced (difference below 15%) in Bulgaria.

2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding[19]

Bulgaria lacks national strategic guidelines for participation in European coordination and integration programmes. The collaborative research programmes of the National Science Fund are the main venue for funding international research cooperation in Bulgaria. There is need of further regulations and incentives in regard to the cross-border cooperation, jointly funded activities, as well as common foresight. A positive step in this direction would be the re-institutionalising of the Bulgarian Council on Innovation and its advisory functions on issues such as international cooperation, envisaged in the forthcoming Law on Innovation.

The national research funding schemes are open for development of networking activities between Bulgarian research teams and their counterparts in Europe. Bulgaria has shown interest in participation in the joint programmes on Cultural heritage. Still there is no clear engagement of the country for an active role in a Joint Technology Initiative. One of the reasons is the underdeveloped industrial sector in the country and insufficient private funding for research activities. This, along with the still insufficient project-based funding, are the barriers for Bulgaria's integration into the joint European initiatives. (ERAWATCH Country report Bulgaria, 2010).

[19] Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

- Ensure the development of research systems and programmes across the Union in a more simple and coherent manner.
- Promote increased European-wide competition and access of cross-border projects to national projects funding

As of October 2010 Bulgaria is actively participating in 8 ERA-NET schemes and 1 ERA-NET+ programme recognising the significance of such coordination of priority areas and of funding. In 2007 the Ministry of Education, Youth and Science (MEYS) introduced a new initiative to support the preparation of European projects under the Seventh Framework Programme. This instrument was expanded in 2009 to include the preparation of projects under the European Programme COST. Less than 2 % of all projects submitted to the Seventh Framework Programme have used it. In 2008 the Ministry of Education, Youth and Science started another support scheme for European scientific programmes – the scheme for co-financing of projects that are already successful under the Seventh Framework Programme. As of 2010, 43 scientific projects have submitted a request for financing, out of a total of 158 projects. The application procedure has been simplified as much as possible, and the term to receive national co-funding is 3 months as of the application date. (ERAWATCH Country report Bulgaria, 2010).

3. Develop world-class research infrastructures (including e-infrastructures) and ensure access to them

The Ministry of Education, Youth and Science has developed a **National Roadmap for Research Infrastructure (2010)**, which includes big scientific complexes that service specific economic and social needs of the state and the Region of South-East Europe. Based on the specialisation of the available national research institutes and equipment, Bulgaria aims to be included in several European research infrastructure projects. By November 2011, Memorandum of Understanding was signed with three of them: EURO-ARGO (European global ocean observing system), BBMRI (European structure for biobanking) and CLARIN (linguistic models). Other key initiatives include: SPIRAL2 (production system of on-line accelerated radioactive ions) and ES Survey (European social survey), PRACE (Partnership for Advanced Computing in Europe), etc. The Ministry of Education, Youth and Science will jointly apply for an ERIC (European Research Infrastructure Consortium) status of these priority RIs.

The Roadmap introduces a procedure for Bulgaria's future participation in the European infrastructures. The procedure includes an international evaluation of the scientific institutions and an analysis of the effectiveness of the participation of the Bulgarian scientific community in the new regional or European infrastructural projects. Each new project will be subject to external evaluation and will be based on the cost – benefit approach.

The Law on Scientific Research Promotion was also amended (on 22 October 2010) towards the support of the creation of scientific infrastructure (through state subsidies and programmes), as well as the access to electronic research databases, promotion of the patent activity and knowledge sharing. It sets the principles for creation and work of two bodies – the National Council for Scientific Research and the National Science Fund. The law specifies that the National Science Fund should support projects and activities to promote research, taking into account:

- The National Strategy for Research Promotion;
- Framework Programmes of the European Union and other European and trans-European initiatives;
- The National and European Roadmap for Research Infrastructure.

There is still no evidence of the implementation of the roadmap, or the activities of the newly defined research infrastructures. In general, Bulgaria lacks financial, industrial and human potential for the construction and maintenance of big research infrastructures, as well as attraction of foreign researchers, and the available research material base remains obsolete.

Most opportunities for financing the creation and the improvement of research infrastructures are available under the Capacity topic of the FP7 (€ 4.68m granted EU contribution by 25.03.2011 according to the Innovation Union Competitiveness Report 2011 for Bulgaria). The funding under OP Competitiveness is also relevant to some extend in terms of support provided for clusters and modernisation of innovative enterprises. In regards to e-infrastructure, Bulgaria participates in the SEEREN initiative, the SEE-GRID project, and the HP-SEE and SEERA-EI project.

4. Strengthen research institutions, including notably universities

According to the Registry of Accredited Higher Educational Institutions in Bulgaria, maintained by the Ministry of Education, Youth and Science, the total number of higher educational institutions is 51. A total of 42 of them are universities, of which 37 are public universities. As of November 2010, there are 7 in-house R&D units in the higher education sector. The universities in Bulgaria are public and private, some of them with widely diverse curricula. Sofia University and the Technical University - Sofia are the leaders among the Bulgarian participants in the Seventh Framework Programme (FP7). As of 2010, the Bulgarian universities rank first among Bulgarian institutions according to the volume of funds received by the programme. The average university size in Bulgaria is 5,600 students. The number of universities has expanded rapidly in the past two decades while personnel have remained largely unchanged. As a result educational and support expenses are increasing and the quality of teaching is declining. The major problems the higher education is facing in Bulgaria today are the distribution of the limited public budget resources among a large number of institutions; the complexity of own revenue generation; the lack of management experience; etc. (ERAWATCH Country report Bulgaria, 2010).

The universities in Bulgaria have academic autonomy, which is expressed in academic freedoms and academic self-governance, freedom of teaching, conducting scientific research, creative expression and education. The academic self-governance is characterised by the freedom to elect and decide the term (duration) of governance bodies, selection and employment of the R&D and teaching staff, implementation of research projects. Regarding the financial autonomy of the universities, the rector approves all university expenditures and the Academic Council decides on the salaries of the university personnel within a range, approved by the national legislation and within the constriction by the received budget subsidy. The funding of public universities is implemented through state subsidies and own revenues from research, consultancy, postgraduate qualification activities and tuition fees. Planning and resource allocation were based solely on differentiated standards by vocational areas per student and the number of students. A university rating system was launched in November 2010 and currently there is combined uniform block funding and differential funding of the universities based on achieved results, including research activity. The main rating criteria include indicators measuring the quality of the educational process, the material and administrative base and equipment, the R&D activities of the university (issued articles and books, participation in international projects, R&D expenditures per student, number of awarded PhDs), realisation of the students on the labour market, etc. The universities can receive up to 25% more financing than the allocated fixed state subsidy based on their achievements. In the Bulgarian system for higher education there are potentially two more elements that aim to ensure education quality: The National Evaluation and Accreditation Agency, and the internal (university) system for evaluation and maintenance of the education quality. The functioning of these elements has not been assessed and is generally perceived as ineffective.

The new Law on the Development of the Academic Staff (2010) abolished national body that managed all academic career promotions (the Supreme Attestation Commission). Currently titles are granted by scientific juries hosted within the individual academic institutions, which are not necessary recognised by other institutions or universities.

The situation is similar in the state R&D organisations within the Bulgarian Academy of Sciences (BAS) and the Agricultural Academy. The autonomy of the Bulgarian Academy of Sciences is defined in the Law and the Statute of BAS. The research units of BAS are separate legal entities and also have the autonomy to allocate external funding from research projects and commercialise research products, in conformity with national and internal regulations. The restructuring that took place in 2009-2010 and the internal regulations of BAS have been criticised for increasing the centralisation of BAS management and at the same time – for limiting the autonomy and possibilities for bottom-up initiatives on the side of the institutes. (ERAWATCH Country report Bulgaria, 2010).

Although a new Law on the Development of Academic Staff was enacted in 2010 and the draft state budget 2012 foresees some increase of the universities' subsidies, the financial support in general has remained too weak to bring about a qualitative change in the universities' research activities.

5. Facilitate partnerships and productive interactions between research institutions and the private sector

There are no effective national policies to strengthen the links between R&D institutions and industry. Collaboration between research institutions and SMEs is "hidden" and usually neither business enterprises nor public R&D units account officially their R&D activities because of lack of tax relief and other reasons. Although some opportunities are presented by the National Science Fund, as well as OP Competitiveness, the support for creating science-industry collaborations should be further regulated and more effectively implemented. There is also a lack of strong institutional policies in the field of intellectual property. Most inventors do not patent their inventions. Patent data show that R&D institutions and universities do not cooperate actively with companies – there is only one patent, jointly owned by a PRO and a company for the period 2006-2008. Moreover, there are no specific policy measures adopted for the promotion of spin-offs in Bulgaria. (ERAWATCH Country report Bulgaria, 2010).

There are no formal restrictions on mobility of research staff between the public and the private business. However, examples of such mobility are rare. There is lack of research units in the business sector and a lack of public incentives and mobility schemes. Mobility exists primarily towards foreign research units. The majority of business enterprises in Bulgaria do not have enough resources to attract research staff from the public R&D units. The National Science Fund funds doctoral research conducted in Bulgarian enterprises.

The majority of Bulgarian business enterprises do not have research units, thus not attracting research staff from the public sector (Mini-TrendChart Report Bulgaria, 2011). The technology transfer offices are still in the process of been established. The creation of technology transfer offices is supported by an OP Competitiveness scheme, launched in January 2011. The National Strategy of Scientific Research to 2020 (2011) also stresses on the importance of clusters, technology centres; technology transfer offices; centres for commercialisation of patents and intellectual property, etc.

Participation of persons employed in the private sector in the management of public universities is regulated in the Higher Education Act. According to Art. 35a. a board of trustees is established to each state university. The board consists of 7 members - donors of the high school, people with active social position, representatives of employers, of industry and professional organisations, representatives of the Student Council and of the Minister of Education, Youth and Science (ERAWATCH Country report Bulgaria, 2010).

6. Enhance knowledge circulation across Europe and beyond

The main national measures supporting cross-border cooperation include the bi-lateral scientific and education agreements with other countries. Bulgaria relies mainly on the EU programmes in this respect. The single national funding instrument to support cross-border cooperation is the National Science Fund, which implements the bi-lateral agreements, several national research competitions, and manages initiatives for Bulgarian preparation of European projects under the 7FP and COST. The Scientific Research programme, financed by the National Science Fund is an example of the promotion of knowledge transfer (contract research, licences, and research and IPR issues in public/academic/non T profit institutes). It has an estimated public budget of €896,099 for 2010 (Mini-TrendChart Report Bulgaria, 2011). The Bulgarian research organisations, the Bulgarian Academy and Sciences, the Agricultural Academy and the universities actively participate in FP7, ESF, COST and other EU-programmes. They present various possibilities for international collaboration, co-publication and co-patent activities of Bulgarian and foreign researchers. Mobility is supported by the NSF and FP7. SMEs participate to a smaller degree (for example 19.74% of the signed FP7 agreements from the total BG participation are with SMEs; Innovation Union Competitiveness report 2011 for Bulgaria). Still, the presence of almost 20% SME participation in FP7 is a good example in respect to the positive balance of participations on behalf of the non-state sector. Furthermore, the SME participations are in scientific projects, which is a good sign for the inclusion of the private business in the exploitation of scientific results.

The Innovation Union Competitiveness report 2011 for Bulgaria underlines that the overall number of co-publications between Bulgarian researchers and researchers from other ERA countries is one of the lowest in Europe. This suggests that the country does not sufficiently benefit from the international knowledge flows favoured by the European Research Area architecture. Main partners in terms of co-publications are the big European countries: Germany, France, Italy, the United Kingdom, and Spain. As

regards co-patenting, Bulgaria is in the category of under 50 co-patents in 2007. Germany, Switzerland and Belgium appear to be among the main partners of Bulgarian technological actors.

As participant in the FP7, among the EU-27, Bulgaria ranks 20th in terms of number of applicants and requested EC contribution and 26th in terms of EC financial contribution success rate. As of 16.03.2011, Bulgaria has submitted 2,014 eligible proposals involving 2,600 applicants from Bulgaria (0.98% of EU-27) with 337 proposals retained for funding requesting €53.95m of EC financial contribution. Bulgaria also has 292 signed grant agreements (Innovation Union Competitiveness report 2011for Bulgaria).

The national participation in intergovernmental organisations and schemes includes:

- European Organisation for Nuclear Research (CERN) – until 2010, approximately 40 scientists, PhD students and technical staff from the Institute for Nuclear Research and Nuclear Energy had regular access to participation in various experiments carried out in the international organisation.
- European Science Foundation (ESF) – Bulgaria participates in one big scientific research programme, which is financed on a national level in the sphere of monitoring global climate change.

a. International Thermonuclear Experimental Reactor (ITER) – an experimental step between present day knowledge in the sphere of plasma physics and the future energy-producing plasma power stations. The countries which participate are: all EU-member states, India, China, Russia, USA, South Korea and Japan;

b. Bulgaria has an observer status in the European Molecular Biology Organisation (EMBO);

c. Bulgaria is a member of the European Organisation for the Exploitation of Meteorological Satellites *(EUMETSAT)* and of the Convention for creation of the European Centre for Medium-Range Weather Forecasts. (ERAWATCH Country report Bulgaria, 2010).

Bulgaria participates in several projects for development of e-infrastructures (*see section 3. Develop world-class research infrastructures (including e-infrastructures*) *and ensure access to them*). The Bulgarian Current Research Information System (BulCRIS), developed and maintained by the National Science Fund, was launched in 2005. Research outputs are usually not freely available to the public.

The public research organisations have access to various science databases. Since 2008 the Ministry of Education, Youth and Science has provided all Bulgarian scientific organisations and universities with a license for access to platforms such as ProQuest, ScienceDirect, Scopus, ISI Web of Knowledge, etc.

7. Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world

Bulgaria lacks national strategic guidelines for participation in European coordination and integration programmes. Bulgaria's participation in the FP7, ESF, COST, ERA NET+ and other EU-programmes is focused in the pre-defined supported topics, rather than in areas set as national priorities.

The teams from the universities and the Bulgarian Academy of Sciences (BAS), which apply in the competitions of the Seventh Framework Programme (FP7), are well-known winners of grants, which have acquired their experience from the participation in the Fifth and Sixth Framework Programmes. Two strong institutes stand out with five successful projects each – the Institute of Oceanology and the Institute for Parallel Processing. Among the more active fields are biological and technical sciences. The situation is similar for the universities with high regional concentration of successful candidates. The universities in Sofia have the strongest presence (Sofia University St. Kliment Ohridski and Technical University - Sofia), followed by Plovdiv (University of Plovdiv Paisii Hilendarski, Agrarian University and Medical University - Plovdiv).

According to the Innovation Union Competitiveness report 2011 for Bulgaria, the most active FP7 research priority areas (both in terms of number of applicants and EC contribution granted) are the Information and Communication Technologies and the Research for the benefit of SMEs.

Bulgaria is developing bilateral cooperation with over 10 countries, with which agreements for scientific and technological cooperation have been signed. The National Science Fund regularly announces

competitions under these agreements for bilateral research projects. For 2010-2012 there are open calls for bilateral projects with Romania, the Slovak Republic, Slovenia, Germany, France, Russia, Macedonia, Ukraine, China, etc. Over the last few years there has been a significant increase of the number of states with which Bulgaria has scientific cooperation. The Ministry of Education, Youth and Science has also signed agreements with Turkey, USA and Austria, but the joint programmes for support of research projects and staff exchange are not yet effective. No specific preferred research fields can be identified. The bilateral agreements promote joint scientific projects in cooperation in all scientific areas; however the supported areas can vary depending on the partner country. For example in the agreement with the Republic of Macedonia the priority areas are agriculture, biotechnologies, chemistry, environment, engineering, social and humanitarian sciences. The joint projects with the Republic of China focus on biotechnologies, agriculture, ICT, ecology, etc.

Annex 2: Financing Innovation

Table 4: Financial allocation by main policy area (by end of 2010)

Convergence objective	ERDF and Cohesion Fund	ESF	Total SF
	EUR million		
1. Enterprise environment	**694,6**	**67,7**	**762,2**
1.1 RTDI and linked activities	259,6	51	310,6
1.2 Support for innovation in SMEs	292		292
1.3 Other investment in firms	139,6		139,6
1.4 ICT and related services	3,4	16,7	20,1
2. Human resources	**34,9**	**912,6**	**947,4**
2.1 Education and training	34,9	487,2	522,1
2.2 Labour market policies		425,4	425,4
3. Transport	**1935,6**		**1935,6**
3.1 Road	1063,9		1063,9
3.2 Rail	464		464
3.3 Other	407,7		407,7
4. Environment and energy	**1752,2**		**1752,2**
4.1 Energy infrastructure	300		300
4.2 Environmental infrastructure	1452,3		1452,3
5. Territorial development	**655,6**		**655,6**
5.1 Tourism and culture	189,8		189,8
5.2 Planning and rehabilitation	150,7		150,7
5.3 Social infrastructure	315,1		315,1
5.4 Other			

6. Technical assistance	**415,4**	**205,2**	**620,6**
Total Objective	**5488,2**	**1185,5**	**6673,6**

Source: Data provided by the European Commission DG Regio.

Table 5: Commitments by main policy area (by end of 2010)

Convergence objective	ERDF and Cohesion Fund	ESF	Total SF
	EUR million		
1. Enterprise environment	**243,6**	**9,4**	**253,1**
1.1 RTDI and linked activities	70,5	8,7	79,2
1.2 Support for innovation in SMEs	96,8		96,8
1.3 Other investment in firms	76,3		76,3
1.4 ICT and related services		0,8	0,8
2. Human resources	**28,8**	**422,8**	**451,6**
2.1 Education and training	28,8	158,6	187,4
2.2 Labour market policies		264,2	264,2
3. Transport	**650,6**		**650,6**
3.1 Road	438,3		438,3
3.2 Rail	23,3		23,3
3.3 Other	188,9		188,9
4. Environment and energy	**126**		**126**
4.1 Energy infrastructure	87		87
4.2 Environmental infrastructure	39		39
5. Territorial development	**273,4**		**273,4**
5.1 Tourism and culture	28,2		28,2
5.2 Planning and rehabilitation	127,3		127,3
5.3 Social infrastructure	117,9		117,9
5.4 Other			
6. Technical assistance	**121,9**	**139**	**260,9**
Total Objective	**1444,3**	**571,2**	**2015,5**

Source: Data provided by the European Commission DG Regio.

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List of Abbreviations

ARC	Applied Research and Communications
BAS	Bulgarian Academy of Sciences
BERD	Business Expenditures for Research and Development
BGN	Bulgarian lev
BulCRIS	Bulgarian Current Research Information System
CERN	European Organisation for Nuclear Research
CIF	Cost, Insurance, Freight
COST	European Cooperation in Science and Technology
EC	European Commission
EMBO	European Molecular Biology Organisation
ERA	European Research Area
ERA-NET	European Research Area Network
ERDF	European Regional Development Fund
ERIC	European Research Infrastructure Consortium
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESF	European Science Foundation
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FDI	Foreign Direct Investments
FOB	Free on Board
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
HRST	Human Resources in Science and Technology
ITER	International Thermonuclear Experimental Reactor
IP	Intellectual Property
IUC	Innovation Union Competitiveness
IUS	Innovation Union Scoreboard
MEYS	Ministry of Education, Youth and Science
NIF	National Innovation Fund
NRP	National Reform Programme
NSI	National Statistical Institute
NSF	National Science Fund
OECD	Organisation for Economic Co-operation and Development

OP	Operational Programme
OPHRD	Operational programme “Human Resources Development”
PRO	Public Research Organisations
R&D	Research and development
R&I	Research and Innovation
RI	Research Infrastructures
RIS	Regional Innovation Strategies
RTDI	Research Technological Development and Innovation
S&T	Science and Technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
VC	Venture Capital

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Abstract
The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries. EW Country Reports 2011 identify the structural challenges faced by national innovation systems. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. The annex of the reports gives an overview of the latest national policy efforts towards the enhancement of European Research Area and further assess their efficiency to achieve the targets.

These reports were originally produced in November - December 2011, focusing on policy developments over the previous twelve months. The reports were produced by the ERAWATCH Network under contract to JRC-IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from ERAWATCH Network Asbl.

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As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

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