# NATIONAL RESEARCH DEVELOPMENT STRATEGY 2020

*...I want Europe to emerge stronger from the economic and financial crisis....*
*Jose Manuel Barroso*
*President of the European Commission*

The National Research Development Strategy of the Republic of Bulgaria pursues the government's policy as part of its responsibilities for the country's strategic development. The Strategy aims to **promote the development of science in Bulgaria in order to advance it as a factor for development** of the economy based on knowledge and innovation. The target audience of this Strategy includes scientific organisations – universities, research institutes and other organisations involved in research.

The National Research Strategy reflects the government's position that education, research, technological development and innovation serve as a basis for achieving dynamic and sustainable economic growth.

At EU level, the headline 2020 targets have been defined as follows[1]:

1. 75 % of the population aged 20-64 should be employed;
2. 3% of the GDP should be invested in Research and Development (R&D);
3. The "20/20/20" climate and energy targets should be met including up to 30% emissions reduction compared to the current emission values;
4. The share of early school leavers should be under 10 % and at least 40 % of the younger generation should have a tertiary degree;
5. 20 million less people should be at risk of poverty.

To meet these targets, research and innovation are becoming now more than ever a key competitive edge in the global economic competition. A number of analysts suggest that the so-called BRIC countries (Brazil, Russia, India and China) as well as emerging economies such as Japan, Singapore and Korea, which have considerable human and material resources, will gradually overtake by 2050 G-6 countries (the USA, Japan, Germany, France, the UK and Italy) in terms of GDP. Above all, these countries allocate a sizeable percentage of their GDP for research and innovation (Figure 1 and Figure 2).

**Figure 1**

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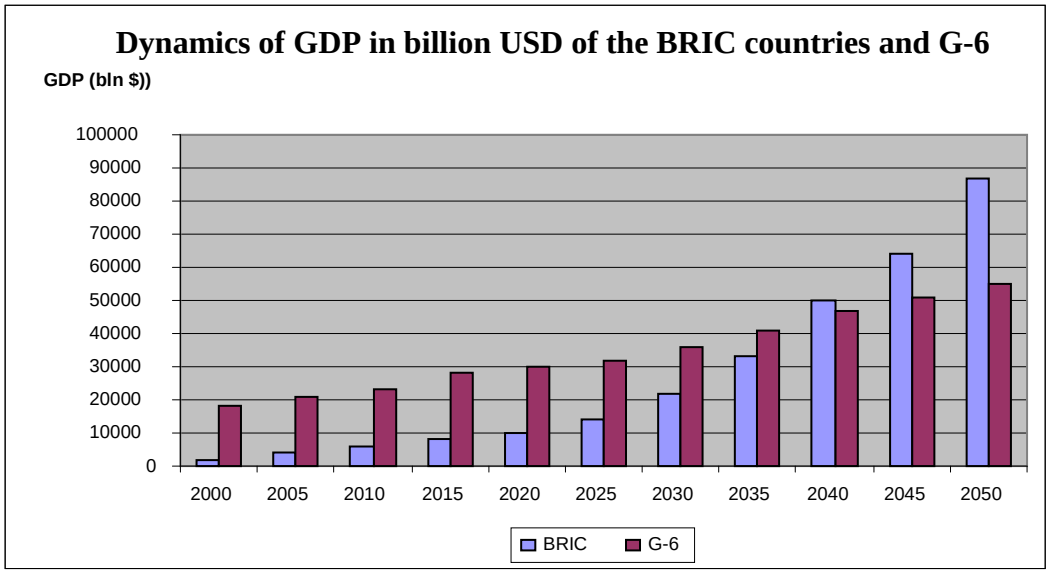
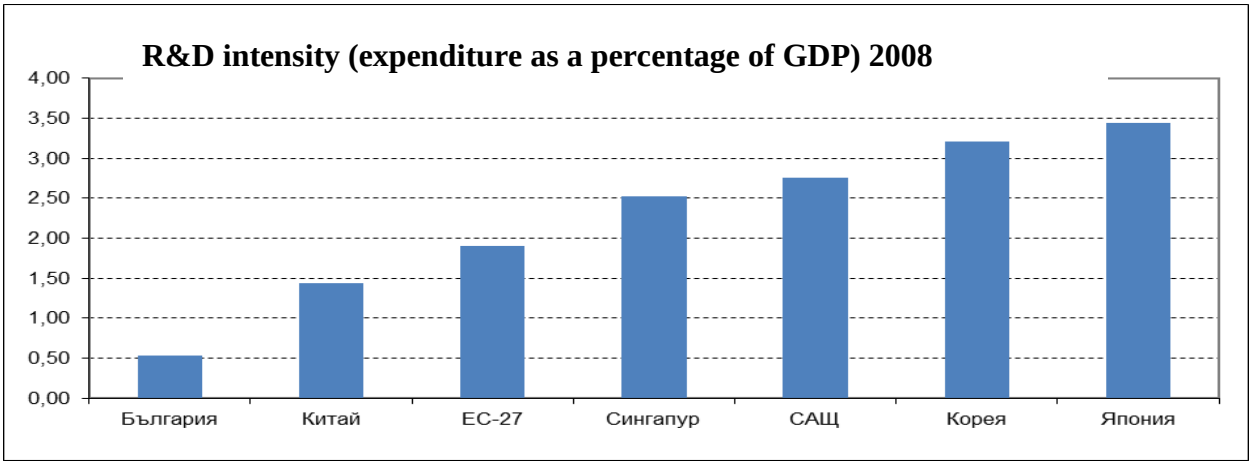



*Source: Eurostat, 2009*

**Figure 2**



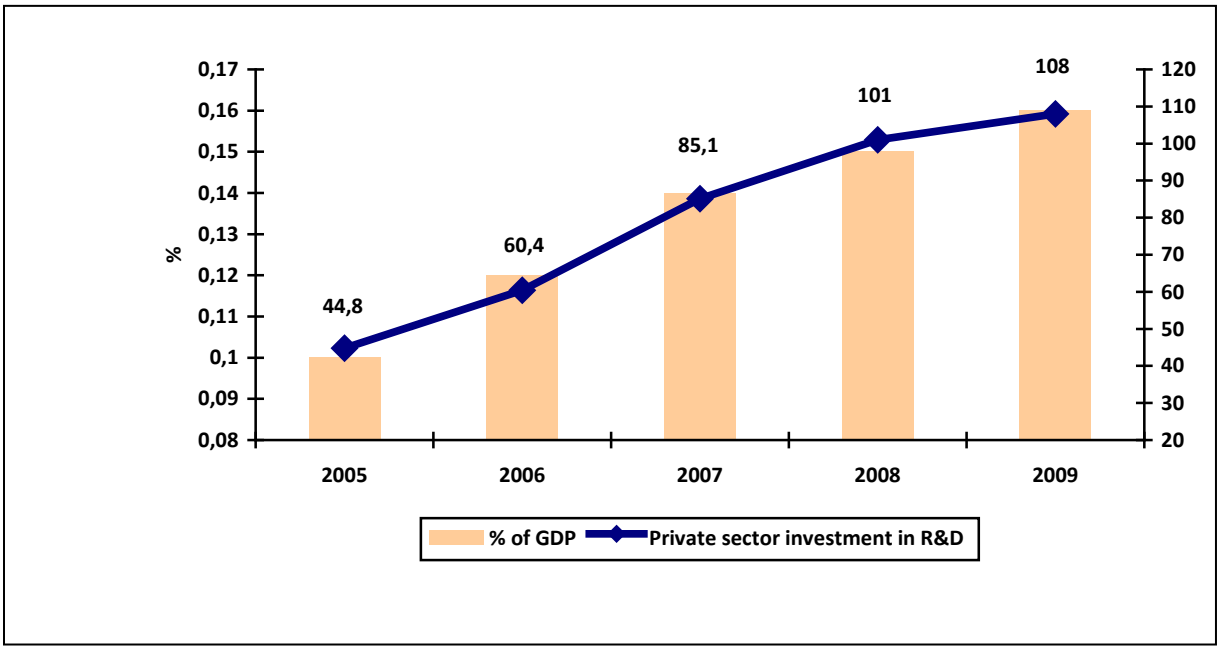

*Source: Eurostat, 2009*

Bulgaria China EU-27 Singapore USA Korea Japan

The countries which register high levels of R&D investments also mark strong economic growth and an increasing share in the knowledge and innovation global market.

Bulgaria is lagging behind leading world economies and many other Central and Eastern European countries, which are EU Member States, in terms of investment in research and development (R&D). Figure 3, however, shows a fast growth in the R&D expenditure of the private sector in absolute terms (over 20% annual growth) and as a percentage of GDP.

**Figure 3 Private investments in science in Bulgaria**




*Source: Eurostat, 2009*

This Research Development Strategy aims to:

• formulate the national science policy which will create conditions and outline prospects for achieving the tasks laid down in the EU's 2020 strategy;

• launch and encourage an overall process of modernisation of research bodies. This is a necessary prerequisite for a considerable increase in the public funding for science;

• further develop the analysis of problems that entrepreneurs face in developing innovation and provide for problem-solving measures;

• contribute to the transformation of Bulgaria into a knowledge-based society;

• encourage the growth in the share of green technology in the national economy.

The Strategy sets objectives and details measures to ensure higher quality of research and innovation, including creation of suitable environment and incentives for the business to invest in research projects. It sets out target values to be achieved as a result of implementation of the measures defined therein. It also puts forward indicators to enable the analysis as to how the measures have been implemented and the effectiveness level of the science policy pursued.

The Strategy provides a stable framework for the development of research institutions and science and innovation in Bulgaria over the next ten years. The Strategy will serve as a

basis for action plans to detail measures for its implementation. Independent external experts will assess the effectiveness of the implementation of the set targets and measures on a three-year basis.

**The understanding that research, technological development and innovation are drivers of contemporary economy in modern societies underpins the National Research Strategy. It is consistent with the objectives of the National Innovation Strategy of the Republic of Bulgaria and its implementation measures aimed at enhancing the competitiveness of Bulgarian industry by strengthening scientific capacity; joint financial instruments for support of science and innovation and establishment of competence centres in priority economic areas.**

**At national level** the Strategy provides universities, scientific organisations and the whole research community with the necessary framework to formulate their views and plans for participation in national research activities, by prioritising programme-based funding. Furthermore, the Strategy provides society and law-makers with information on the government’s efforts to guarantee the effective use of public funds for R&D.

**At international level,** the National Strategy reflects Bulgaria's efforts to increase investments in science and technological development to 3 % of the EU's GDP in line with the goals set out in Europe 2020 by achieving accelerated use of the outcome of research and innovation, modernising the scientific process and implementing efficient European models and practices.

The Strategy takes into account the EU priorities for establishment of a European research and innovation area:

- concentration of public resources and investments in scientific organisations whose existing capacity covers priority scientific areas and which have potential for further modernisation;
- support for scientific infrastructure and sustainable development of research organisations which have the necessary capacity and development potential;
- involvement of the private sector in research and innovation processes;
- better coordination of education, research and innovation policies;
- incentive for the free movement of people, knowledge and technology.

The National Research Strategy contains several important components to guarantee its effectiveness:

**I. Priority areas for science and innovation development.**

These have been defined on the basis of:

- priorities set out in the Programme of the Government of European Development of Bulgaria;
- thematic priorities laid down in European research programmes and initiatives (Sixth and Seventh Framework Programmes; COST Programme for European Cooperation in Science and Technology, the European Roadmap for Research Infrastructures, the Joint Research Centre and the Joint Technology Initiatives);
- existing analyses and assessments of the scientific system and institutions in the country[2].

The national research priorities cannot exist isolated from world trends. They require allocation of more and more effective investments in areas relating to: energy sources and energy-saving technology; addressing and control over harmful and hazardous household and industrial waste; new raw materials and resources; information and communication technology, biotechnology, food and health, etc.

The national research priorities give evidence for the political will and commitment to the country's strategic development in the coming years. The allocation of investment for priority areas will come in response to the major challenges and will ensure the correlation of research and innovation outputs and the needs of the economy.

**II. Instruments for achieving the Strategy's tasks,** which introduce joint financing schemes, accumulated resources from different financial sources and a set of incentives that create a favourable environment for promotion of research and innovation activities;

**III. Assessment of the achievement of the Strategy's objectives,** which provides continuous monitoring and feedback during the implementation of specific measures. The assessment will quantify the effectiveness and efficiency of the Strategy's implementation and will serve as a corrective measure for future actions.

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## ANALYSIS OF THE CONDITION AND PROBLEMS OF THE NATIONAL SCIENTIFIC SYSTEM

### 1. INSTITUTIONAL FRAMEWORK

Various groups of entities in Bulgaria undertake scientific activity: individual scientists, academic institutions – universities, research institutes, for-profit legal entities with, non-profit legal entities (see Annex 1 with an organisational chart). They all generate and/or absorb scientific knowledge, scientific products and other forms of knowledge.

The Ministry of Education, Youth and Science (MEYS) and the Ministry of Economy, Energy and Tourism (MoEET) pursue the national research and innovation policy and are the leading institutions involved in its implementation. The Ministry of Agriculture and Food, the Ministry of Transport, Information Technology and Communications, the Ministry of Health, the Ministry of Defence, the Ministry of Interior and the National Fund at the Ministry of Finance are also actively involved in the development of science and innovation policy, by providing support or funding/ co-funding certain tasks in this field.

To implement the state policy of promotion of research and innovation, the ministries rely on the support of the National Research Council (NRC) and the National Innovation Council. These are chaired respectively by the Minister of Education, Youth and Science and the Minister of Economy, Energy and Tourism and consist of representatives of other public bodies, scientific organisations, universities, employers' organisations, non-governmental organisations and other stakeholders in the field of science and innovation.

Currently, public scientific organisations – universities, the Bulgarian Academy of Sciences and the Agriculture Academy – carry out a large part of research in Bulgaria.

## HIGHER EDUCATION INSTITUTIONS

Bulgaria has 51 higher education institutions in total. They include second-level spending units, which are 37 state-run universities and specialised colleges.

Currently, higher education institutions carry out research in accordance with the Higher Education Act and Ordinance No 9 concerning the conditions and procedure for planning, allocation and spending of funds allotted in a targeted way from the state budget for scientific and creative activity intrinsic for state-run higher education schools as well as from the involvement of higher education institutions or their units in R&D with project-based public and/or private funds.

## BULGARIAN ACADEMY OF SCIENCES

The BAS is a research organisation, a second-level spending unit of the Ministry of Education, Youth and Science. The BAS carries out basic and applied research. Its structure incorporates 64 units, including 42 standing research bodies with an independent legal status. The BAS structure includes also the assembly of academicians and corresponding members, consisting of 58 academicians and 81 corresponding members. The BAS total staff[3] amounts to 6,747, including 1,531 scientists with an academic rank and 1,594 scientists without an academic rank. In terms of the age structure, nearly 49 % of BAS scientists are over 51 and those under 30 are 3.4 %. In 2010 the BAS was training 273 full-time doctoral students, or 6.5 doctoral students on average per standing scientific unit. The doctoral students who defended their dissertation in 2010 were 64, i.e. 1.5 on average per standing scientific unit.

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## AGRICULTURE ACADEMY

The Agriculture Academy performs its activity within the state agricultural policy. It is a second-level spending unit of the Ministry of Agriculture and Food. Its 27 scientific institutes, 19 testing stations and 2 testing bases carry out:

- fundamental strategic and applied experiments in the field of agricultural science and food industry, ecology and environmental protection;
- preservation, enrichment and reproduction of the plant and animal genetic fund of the country;
- provision of pedigreed seeds, nursery and reproduction materials for producers.

The Agriculture Academy provides also consultancy services and training. The total staff at the Agriculture Academy is 2,742, including 678 researchers – 369 with an academic

[3] Data in the BAS annual report for 2010.

rank and 309 without a rank (according to the 2008 annual statement). It also holds a number of certificates for varieties of plants and breeds of animals as well as patents.

**SCIENTIFIC ORGANISATIONS AT MINISTRIES AND PUBLIC BODIES**

Research and innovation entities operate at various sectoral ministries. These include:

- The Ministry of Health and the Public Health Protection Centres which carry out research activity and are involved in national and EU programmes. The National Centre of Infectious and Parasitic Diseases and the National Centre of Radiobiology and Radiation Protection are most active therein;
- The Ministry of Interior;
- The Ministry of Culture, mainly via national museums and libraries;
- The Ministry of Agriculture and Food via the Institute of Plant Protection.

The availability of sectoral research centres can be interpreted as a sign of maturity of the research system when however there are also stable financial resources, efficient funding and usability for the public and the economy. The budget funding of these institutions is low, which fails to create the conditions necessary for carrying out competitive research and services and leads to additional fragmentation of financing of science.

**ENTERPRISES**

The structure of the private sector shows the dominant role of small and medium-sized enterprises (SME). By definition, they can hardly set aside funds for research, as they do not have resources or opportunities to develop technology of major significance for certain sectors or branches. The concentration of these enterprises around large economic entities which are well-positioned to develop their own technology has not been intensive enough yet. The small number of SME applying for projects at the National Innovation Fund of the Ministry of Economy, Energy and Tourism reflects the low level of innovation activity at SME. Barely 0.04 % of the 250,000 SME in total have taken part in competitions of the National Innovation Fund.

Another issue is that few of the large high-tech companies in the country have well-developed R&D units, whose main task is to transfer technology. In the telecommunication sector, enterprises do not produce but provide services. (For example, Sopharma, Mobiltel, etc).

2010 was marked by a decline in foreign investment, but data of the Bulgarian Investment Agency for 2010 show that investments grew in industry and energy – 49 % of all

FDI versus 29 % for 2009[4]. The share of metal and chemical production is on the rise at the expense of the finance and real estate sectors.

Intermediary organisations remain underdeveloped and do not provide dynamic interaction between active players and the National Innovation System. Less than 10 % of active innovative enterprises are related to research organisations[5].

**NON-GOVERMENTAL SECTOR**

The past years have been marked by pickup of non-governmental research organisations set up on the basis of the US think-tank model. When it comes to the research expenditure, the sector's contribution is at minimum levels. Barely 1 % of the total expenditure on science falls under the so-called private non-profit sector, with fluctuation of expenses.

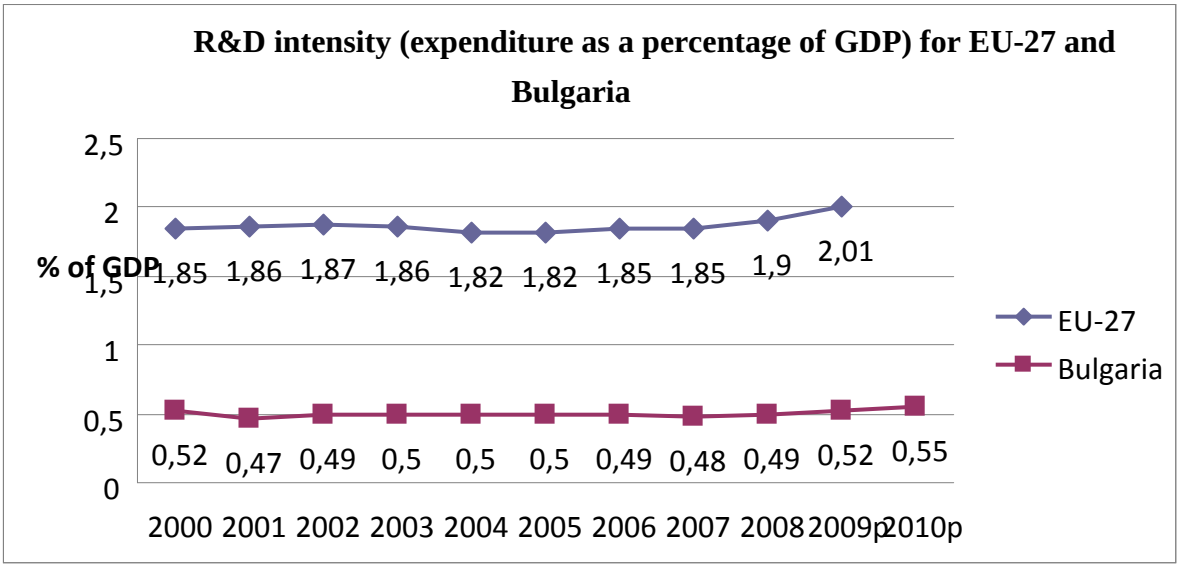
[4] Source: BNB, BIA, 2011.

[5] Analysis of the opportunities and trends in technological development of Bulgarian enterprises, Bulgarian Industrial Association, www.bia-bg.com

## II. FINANCING OF SCIENCE IN BULGARIA

The major challenge for Bulgaria, like for many other EU Member States, is the achievement of goals outlined by the Barcelona Council of European Science Ministers -- an average level of 3 % in research investments. Figure 4 shows a serious difference between Bulgaria and the average EU-27 value. Nevertheless, there is a rise in the total percentage of R&D expenditure and this is due to the increase in private investments in science. This is a good sign for the national economy, but if the level of public expenditure remains at 0.35 %, this cannot guarantee the necessary quality of research and cannot maintain a minimum educational and scientific potential for the benefit of society and industry. Furthermore, the percentage of public expenditure includes also expenditure on science in the higher education sector, which is traditionally very low – at about 0.07 % of GDP according to Eurostat estimates for 2009. The average percentage for EU-27 is 0.48 %.

**Figure 4**




*Source: Eurostat and the MEYS*[6].

The new European strategy 2020 reiterates the necessity of increased investment in science and innovation activities and clearly raises the issue of the necessary definition of national goals for investment in research and development activity until 2020. Europe 2020 brings to the fore the business as a major investor -- at least 2 % of expenditure on science and

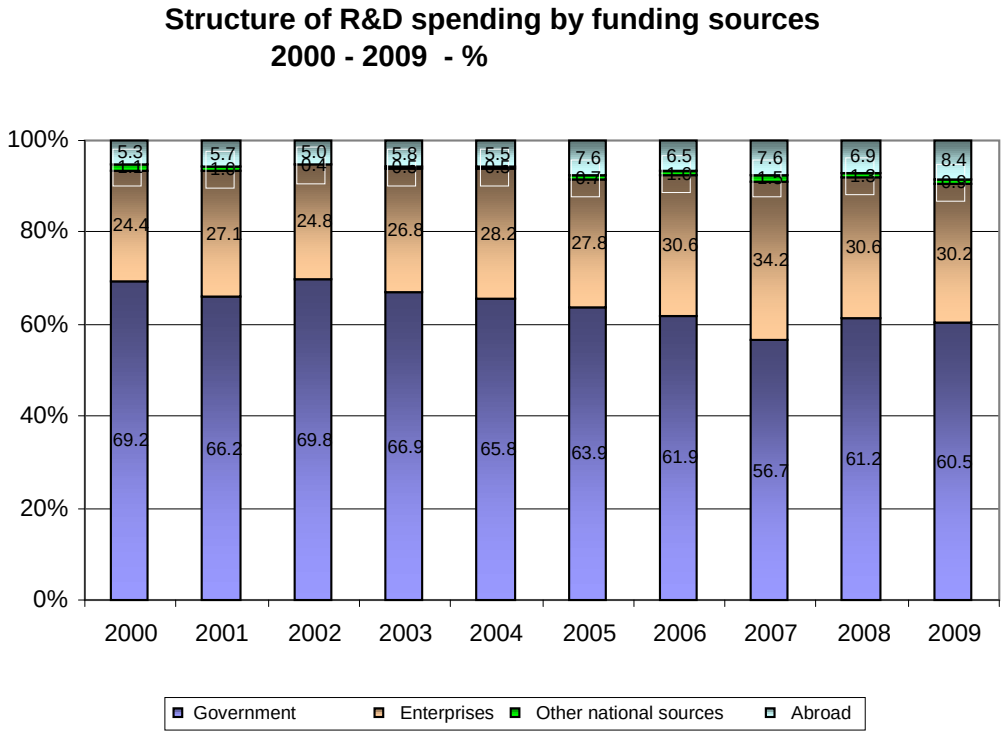
[6] The data for 2009 for Bulgaria and EU-27 are Eurostat estimates. For 2010 the data are estimates of the NSI and the MEYS.

innovation should be provided by industry. The adoption of national goals for science and innovation is not the sole condition to enable the transformation of Europe into the most dynamic and science-intensive economy on a global scale. Much more integrated actions are needed to cover an effective model of science and innovation management coupled with a successful financial model which guarantees interrelated policies and instruments.

Council of Ministers Decision No 803 of 10 November 2010 concerning the adoption of a preliminary version of the National Reform Programme of the Republic of Bulgaria (2010-2013) implementing Europe 2020 Strategy has formulated a national goal for R&D investments in the amount of 1.5 % of GDP by 2020.

To achieve the national goal, integrated actions are required in this direction. The current allocation of R&D expenditure in Bulgaria between institutional sectors is in proportions opposite to those in the EU. The state budget has the largest share – over 2/3, while business accounts for 30 %. The revenue from international scientific programmes is low. Figure 5 which presents a relatively static profile for the past 10 years illustrates this ratio.

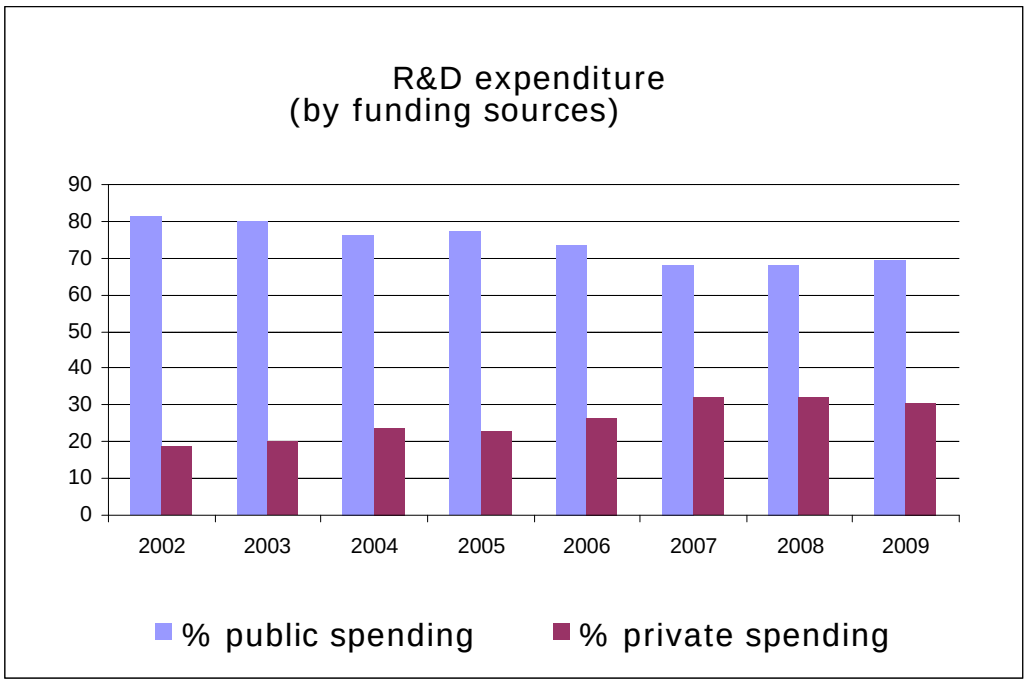
**Figure 5**




*Source: NSI, 2009.*

We would like to point out that there is a positive trend relating to the amount of R&D expenditure from the private sector. Figure 6 presents the trend of growth of the public and private expenditure as a percentage of GDP and although private spending on science remained at the same level in the past three years, it has grown by over 10 % since 2006. This is a positive sign with a view to EU trends and the necessity for a more effective market placement of scientific output and knowledge.

**Figure 6**




Source: NSI, 2009.

There are various reasons for the country's unfavourable financial profile as regards R&D expenditure. In general, these are:

**Firstly,** an archaic management model, including ineffective HR management, highly unfavourable age distribution and lack of vision for the replacement of the academic staff (we have made efforts with the newly adopted Academic Staff Development Act, to give opportunity to universities to develop their own staffing policy), lack of constant exchange of young experts among universities and other organisations (e.g. the BAS), overstaffing, useless burden of administrative procedures and poor use of modern online technologies to support administrative activity.

**Secondly**, so far Bulgaria has lacked a strategic vision and stable policy with regard to scientific development. The absence of clearly defined priorities in science and the commitment for annual growth of public funding for science, places us in a catching-up position compared to the EU average, with constant percentage of 0.48 % of GDP up until 2009 and a declining trend in the three-year budget forecast - down to 0.3 % of GDP

The **third reason** is the unfavourable ratio between public and private investment. The majority of investment in science in Europe and in some Member States comes from the "non-state sector". The most developed European countries such as Germany, Finland, Sweden, Denmark, and France demonstrate the highest share of private investment. In other

countries such as Latvia, Malta, Greece, Estonia, etc., the funding in the higher education sector is dominant. Bulgaria has the most unfavourable structure in terms of sectoral funding of science, characterised by a high burden of public spending (70%) at the expense of the rest and low levels of funding for research in the higher education sector.

Further incentives are needed for companies to invest in research and innovation such as for example recognition of this expenditure at 200% for the purpose of corporate income taxation. The MEET plans to introduce such incentives via the adoption of the Innovation Act.

**Fourthly** -- the unfavourable expenditure structure in the public sector and lack of concentration of resources. The institutional support prevails characterised by a large number of scientific organisations with a very low share of programme-based and project-based financing. There is a lack of competitive environment and independent external (international) expertise of scientific ideas, developments and outputs.

The **fifth** reason is the artificial separation of science and higher education imposed by the model of the research and innovation system in the country until the 1990s and the difficulties relating to the reconsideration of the vision of universities as purely educational entities. As a matter of fact, if students are not dedicated to scientific careers and activities in their curriculum, they could be hardly expected to take subsequent interest in a scientific career. This has a direct impact on the flagging interest of the new generation of young people in science and engineering studies. The relatively small number of cluster projects -- in which representatives of various institutions and organisations involved in R&D participate -- falls under the scope of this characteristics.

The **sixth reason** consists of the existing financial instruments for science and, in particular their "scarcity". There are only too few national tools for support of research and development projects. The existence of only two funds -- the National Fund for Scientific Research and the National Innovation Fund -- is not sufficient. There are no sectoral research programmes, for example in the field of healthcare, agriculture or environment. No specialised national programmes are available in certain scientific fields, or for the support of research infrastructure, including for the implementation of the National Roadmap for Research Infrastructures. This hampers the emergence and implementation of competitive scientific ideas. Furthermore, the state does not use effectively the scientific potential to facilitate the administrative process or to carry out strategic analyses of key economic sectors or strategic studies in socially significant areas.

Last but not least, the **seventh reason** is the inefficient use of various funding sources in the implementation of a specific scientific task or in the solution of an economically or socially significant problem. Apart from the national funds, various programmes are available for funding of research and technological development at a European level. The European Commission has identified the Structural Funds as crucial for the optimisation of scientific systems in new Member States. Bulgaria is not fully aware of this fact as only 0.1 % of the Structural Funds could be used to support research and in particular the part related to establishment of research infrastructure and R&D complexes. Barely 3 % of all Structural Funds financing has been earmarked for innovation, whereas the EU average stands at over 30 %.

In the 2007-2010 period, only 30 beneficiaries - scientific organisations were registered under the Structural Funds and solely under the Operational Programme (OP) Human Resources for scientific potential building among doctoral and post doctoral students and under OP Regional Development with regard to energy efficiency. The absorption rate of the funds under OP Development of the Competitiveness of the Bulgarian Economy, Priority Axis 1 Development of Economy Based on Knowledge and Innovation Activities is only 0.42 %.

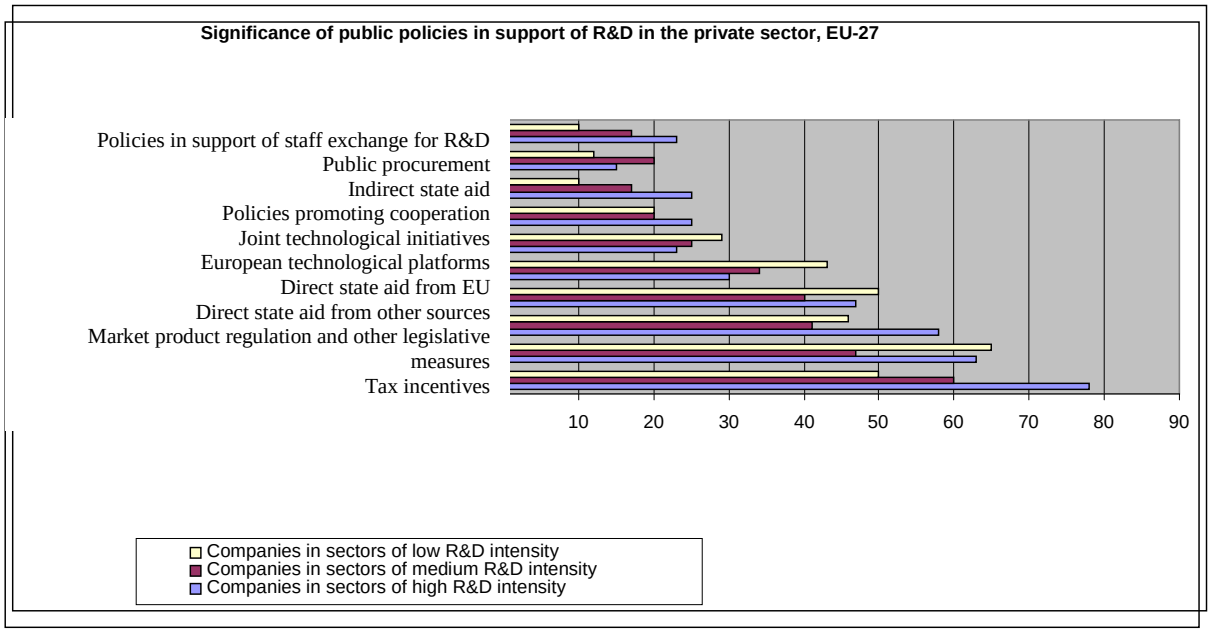
The fragmentation of funding provided by the two main national instruments - the National Fund for Scientific Research and the National Innovation Fund – adds to the problems. Both financial instruments should focus on technologies identified as priorities for the country's economic development. The interaction between the two funds has to improve with a view to enhancing effectiveness of funding…

Financial instruments, which are new for the country but relatively well-known in world practices, should be introduced to step up technological innovation - programmes providing start-up capital for innovative ideas, start-up enterprise schemes and venture capital schemes.

The increase of investments in research and innovation should take place along with the more effective mechanisms of management, monitoring and assessment of the research system while guaranteeing full transparency of processes. This includes introduction of priorities, strengthening of the research base of scientific organisations and universities, assessment of the scientific activity of universities and scientific organisations, removal of barriers and introduction of flexible financial instruments for innovation. These measures come in line with the policies offered and applied by the other countries of the EU family. (Annex 2 outlines the national goals relating to science and innovation in EU-27).

Public policies have to create a favourable environment encouraging the private sector to invest in science and innovation and to seek scientific knowledge. IRMA research shows that policies which are of decisive significance among companies which choose to invest in R&D include tax incentives, such as low corporate income taxes, accessible public procurement regimes and market product regulation as well as other legislative forms. Figure 7 shows the results from a study of the European Commission and the Institute for Prospective Technological Studies at the Joint Research Centre, held among 185 industrial companies.

**Figure 7**




Source: the EC and the JRC (2010), European industrial observer.

## III. NATIONAL INSTRUMENTS FOR FUNDING OF SCIENCE AND INNOVATION

### 1. NATIONAL FUND FOR SCIENTIFIC RESEARCH

The National Fund for Scientific Research finances the implementation of project-based and competition-based research. The Scientific Fund for Scientific Research is the sole national instrument which supports research projects on competition principle. The Fund has been operational since 1990 and has evolved into a modern European instrument for promotion of research over the years.

The National Fund for Scientific Research is a flexible financial entity – it offers opportunity for support of long-term scientific programmes by addressing at the same time newly emerging scientific trends and needs for research expertise and knowledge.

The Fund's instruments include in general:

- research in certain thematic scientific areas;
- support and promotion of university research as well as joint projects of universities and other organisations involved in R&D;
- support of young researchers;
- support of established Bulgarian scientists;
- funding of projects approved within bilateral scientific cooperation;
- development of scientific infrastructure;
- establishment of excellence centres;
- enhancement of innovation at small and medium-sized enterprises;
- promotion of the participation of Bulgarian scientists in the Seventh Framework Programme and the COST Programme;

The beneficiaries include state-run and private universities and higher education institutions, scientific organisations and companies.

### 2. NATIONAL INNOVATION FUND

The National Innovation Fund finances applied research projects and technical and economic projects which integrate new or improve existing products, processes or services. The Fund's strategic goals include enhancement of the competitiveness of the Bulgarian economy through promotion of market-oriented applied research designed for the industry and creation of conditions for attraction of private capital for funding of innovation. One of the Fund's priority areas is to subsidise part of the expenditure for acquisition and/or maintenance of industrial property rights of small and medium-sized enterprises and to

subsidise part of eligible expenditure for innovative start-ups. For the past 2 years, the National Innovation Fund has introduced also thematic priorities. In general, the areas are:

1 Information and communication technologies.
2 Appliances
3 Biotechnologies, pharmaceuticals, chemistry.
4 New materials and nanotechnology;
5 Green technologies and waste treatment;
6 Energy-saving technology and renewable energy sources.

In 2009, the NIF had a zero budget, but thanks to bank guarantees under special accounts it paid BGN 6.67 million over the year under contracts in force. In 2010, BGN 4 million was transferred from the budget. The 2011 budget provides for another BGN 5 million to support the Fund's activity.

The procedure for Bulgaria's accession to the EUREKA European initiative and the country's inclusion in the EUROSTARS joint programme started in 2009 (Council of Ministers Decision No 658 of 23 July 2009). The Small and Medium-Size Enterprises Promotion Executive Agency is the coordinator of the initiative, and the NIF is the national partner of the EUROSTARS joint programme. The adoption of the act ratifying the Memorandum of Understanding between the EUREKA Secretariat and the members in 2010 finalised the country's accession to the initiative.

Conclusions:

- Sustainability of R&D investments and gradual increase of public spending on science and R&D activity is required;
- Sustainable expenditure of funds in support of scientific and innovative projects should be guaranteed;
- A favourable environment should be created to promote the interaction between science and business and this should be the prerequisite for growth in private investments in science and innovation.

## IV. HUMAN RESOURCES

At European level, as early as in 2005 an acute question emerged regarding the shortage of human resources in science and technology and the withdrawal of researchers to more dynamic economies such as the USA, Japan, Singapore, etc. Coupled with the slack interest of the young in science, the general trends of ageing of the population and the current conditions of the world economic crisis outline an unfavourable profile of the scientific area.

Bulgaria witnessed the emergence of this problem in the early stage of the transition period in 1989 and its subsequent constant aggravation. These trends are becoming more conspicuous as there are other obstacles to scientists, in particular young people. These include the low pay, the lack of free choice of jobs, the slow career development and other obsolete practices in HR management. The newly adopted Academic Development Act aims to introduce flexible and fast procedures for acquisition of academic degree, but for the time being fails to solve the issue of the low pay of researchers' work. The issue relating to the low pay of scientists at most scientific organisations in the country is due to primarily the archaic management methods and the lack of an HR development vision within these organisations. Another material complication arises from the strong conservatism and institutional inertia. This reduces considerably the capacity of the state to encourage scientific organisations via the competent ministries, including with financial incentives, to overcome this problem.

The withdrawal of the young from academic career and engineering professions is another factor facilitating the low innovation activity. Engineering experts are highly important for the economy of each country, as on the one hand, they develop innovation which props up technical prosperity and economic growth, while on the other hand facilitate the competitiveness of the economy. Bulgaria ranks among the top EU countries in terms of employment of engineering experts, but over 76 % of engineering graduates do not have jobs in their competence, compared to the 28% average level. In Bulgaria, this level is the highest[7].

This trend will intensify in the future. The number of young people aged between 15 and 34 has decreased by 300,000[8] since 1990. The number of school-leavers will further decline due to the low inflow and the high dropout rate –14 %[8a]. A study of the Programme for International Student Assessment (PISA) on the level of use of scientific knowledge by

[7] According to data of EUROSTAT and FEANI – the federation of professional engineers, October 2009, European Engineering Report.

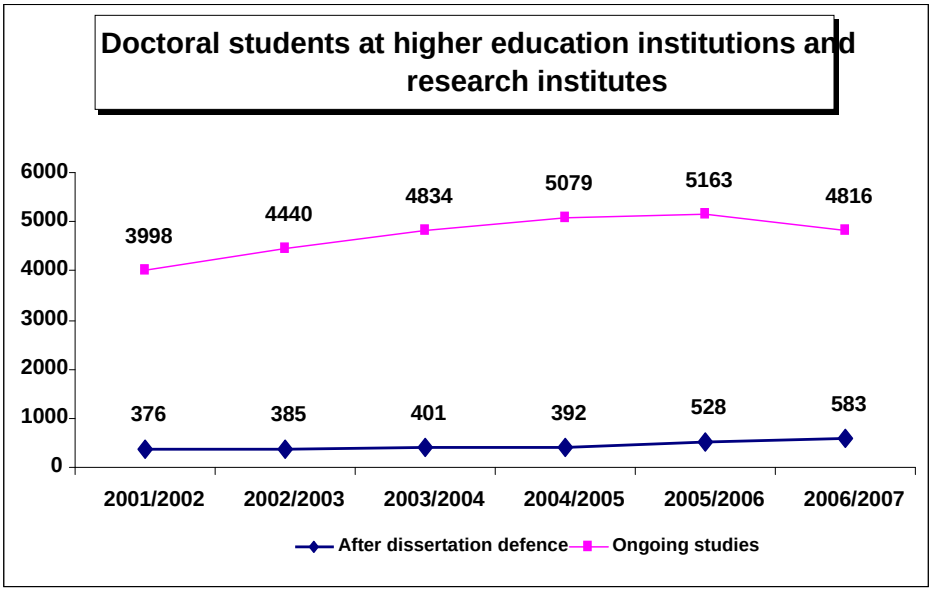
[8] Statistics shows that if today people aged between 15 and 34 are nearly 2,103,259.
in 2015 they will total 1,747,648, and in 5 more years -- nearly
1,555,852 according to data presented in the National Strategy of Youth Development

[8a] This is a relative share of the population aged 18-24, which are not currently covered by training at levels below secondary school.

15-year-olds ranked Bulgaria 28 out of 29 European countries which took part in the study[9]. This will have an impact on the interest of the young in natural and engineering studies, which now is low -- 24 % (according to NSI data) of the students choose to study natural science, mathematics, technical science and architecture.

The age profile of scientists is also unfavourable. According to the academic staff register of universities kept by the Ministry of Education, Youth and Science (MEYS) there were no professors under 35 in 2008 and only 12 were between 35-44 years of age. Over 600 professors (out of 1,290) are over 65 of age. Data of the Higher Attestation Commission (HAC) showed that there are 134 senior research associates aged between 35 and 44 years (out of 2,700) and the majority of senior research associates are between 45 and 54 years of age (990 out of 3,138).

**Figure 8**




***Source: HAC, MEYS***

The low interest in a doctoral degree as a whole is due to three main factors: unattractive pay of PhD holders, lack of clear and well-paid professional path after the defence of the doctoral dissertation and thirdly, the lack of attractiveness and capacity among scientific organisations.

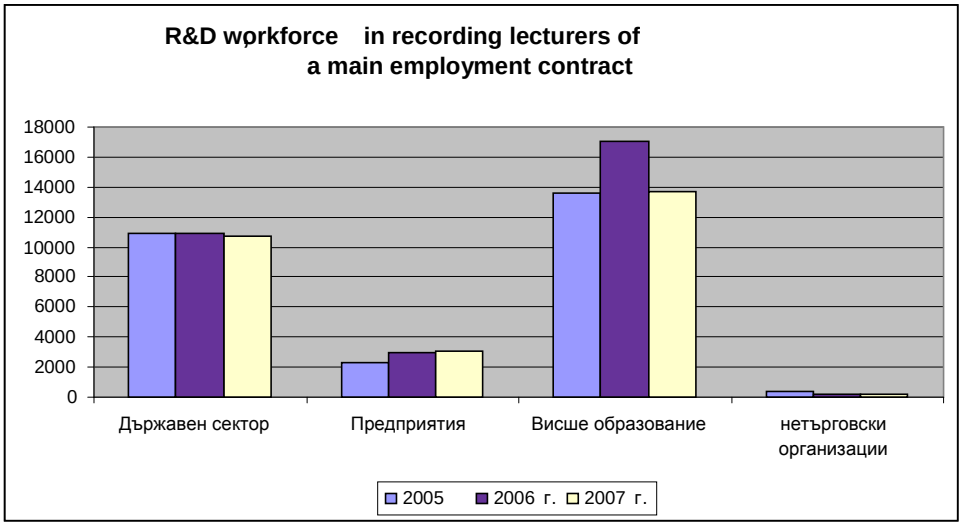
Bulgarian research organisations hardly consider mobility a key tool for scientific and professional development of researchers. There are practices of intra-institutional mobility, especially between similar scientific groups, but examples of inter-institutional mobility are rare. The schemes introduced by the National Fund for Scientific Research cannot have a significant positive impact because of certain obstacles (e.g. legal, administrative, etc.) related to the reintegration of Bulgarian scientific Diaspora and the inapplicability of temporary

[9] PISA covers 65 countries such as China, Singapore, Japan, New Zealand.

employment contracts. The lasting trend of scientific potential concentration in the capital city should be also taken into account, given the weak development of regional research and innovation centres.

The institutional structure of the R&D workforce in the country is atypical In European countries R&D employees work predominantly in the private and in the higher education sectors. Nearly 60 % of R&D employees in Bulgaria work in the budget-funded public sector and namely in scientific organisations with a dominant institutional funding mechanism compared to the EU average of 13 %. Figure 8 shows the structure of R&D workforce in terms of the number of lecturers, and not in terms of full-time equivalent (FTE), due to lack of applicable national methodology for reporting the workload of lecturers in higher education. A survey carried out by the MEYS in 2009 shows that the workload of R&D lecturers at universities ranges between 20 % and 30 %.

**Figure 9**




*Source: NSI, 2009.*

The gradual increase of R&D workforce in the business enterprise sector over the past three years amid a trend of a slight decrease of scientists in the public sector and of almost total lack of scientists working in NGOs is noteworthy.

Employment in high- and medium-tech industries and knowledge-intensive services is an indicator of the progress in the innovation process. Bulgaria followed the European trends in employment in high-tech manufacturing sectors until 2007, which consisted of initial reduction of workforce in these sectors until 2004 and a subsequent gradual increase; however the country is still in a catching-up position compared to the EU average.

Conclusions:

- Actions should be taken to initiate and promote the process of modernisation of research entities and to enhance their potential.
- Meanwhile, actions are required to overcome negative trends of reduced inflow of young people into science and to provide incentives for their retention through scientific career opportunities as well as special care to ensure the introduction of a scientific approach also in secondary education. The state should encourage the research interest of school and university students through involvement in various projects and initiatives (a priority task of the National Youth Development Strategy as well);
- Facilitation of opportunities for additional remuneration of scientists, including doctoral students, post-doctoral and young researchers via programme-based and project-based funding;
- The free movement of intellectual capital should be guaranteed through governmental efforts to create favourable environment - regulatory, social and material with a view to making scientific careers attractive and popular;
- The availability of continuous training opportunities is of great significance, including distance learning in higher education, improvement of scientific employees' qualification and skills and implementation of joint programmes for scientific training and internships between the academic and business communities.

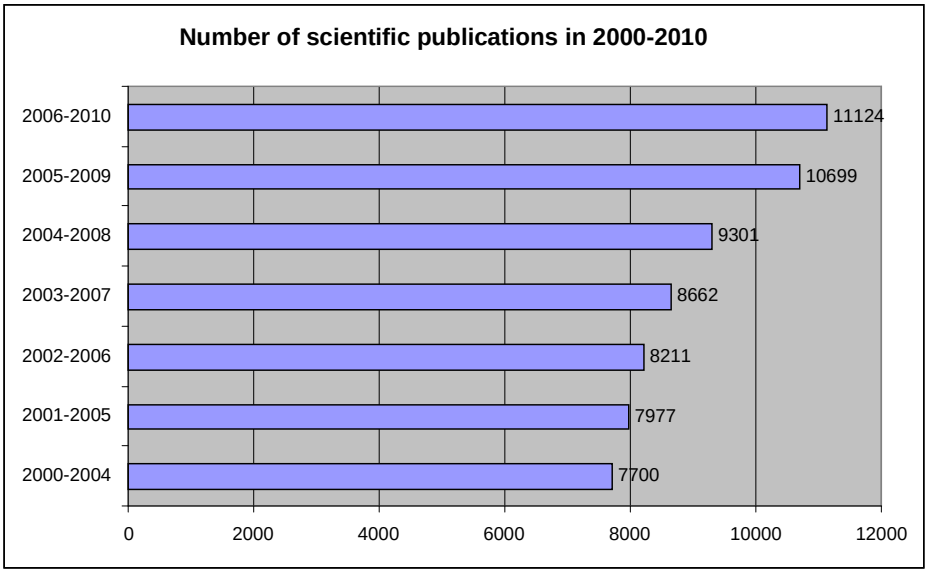
## V. SCIENTIFIC PRODUCT – PUBLICATION ACTIVITY

Publication in referenced scientific editions and databases is one of the indicators measuring the effectiveness of research outputs. In 2009, the Bulgarian government joined six specialised databases. These are: ScienceDirect; SCOPUS; EngineeringVillage; Embase; ISI Web of Knowledge and ProQuest Central.

The national licences give the Bulgarian scientific community access to the largest full-text platforms and databases for reference and quotes of scientific publications and other web-based resources. These electronic resources give scientific organisations fast access to editions which do not exist in a paper-based format, enable them to analyse the quotation frequency in individual and organisational terms, to compare the quality of various scientific journals, etc. Last but not least databases provide information on over 11 million inventions from 40 patent organisations around the world.

Science in Bulgaria has considerable potential in most key fields of contemporary research. Bulgarian publications in over 21 main scientific fields pass the quotation frequency mark and are subject to monitoring under Essential Science Indicators. SCOPUS scientific publications have been classified in 26 major scientific areas, and Bulgarian science is represented by publications in each of them.

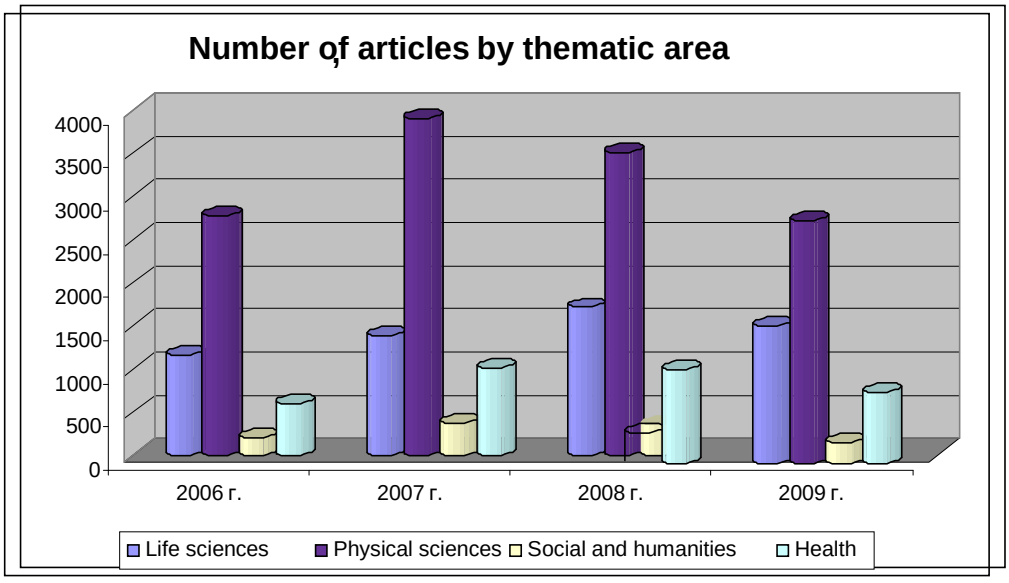
**Figure 10**




*Source: PIK Foundation and the MEYS, data from Essential Science Indicator.*

The analysis of the information of international databases – Essential Science Index and Scopus -- shows that the highest number of articles is in the field of physical and chemical sciences. Meanwhile, the comparison of these data with the number of scientists in the respective scientific fields shows that in healthcare sciences, mainly in clinical medicine, there is a high publication activity and quotation rate[10].

**Figure 11**

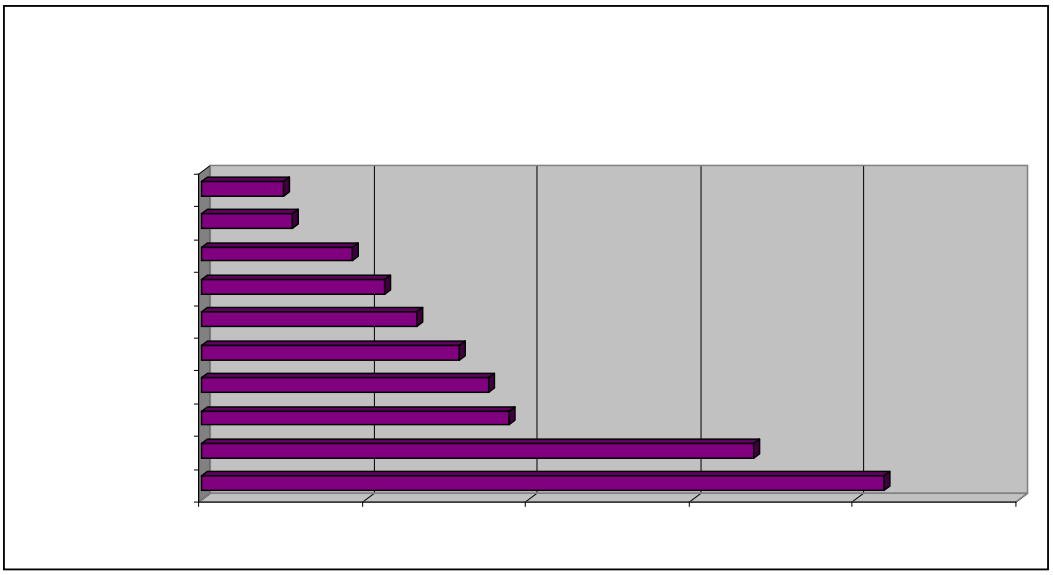



*Source: PIK Foundation*

[10] The number of articles in the field of social studies and humanities is based on data from international databases, without taking into account those in Bulgaria, and hence their number is so low.

Data on the interdisciplinary nature of the publication activity of Bulgarian scientists in both databases outline some main fields in which Bulgaria is well-positioned. First of all, these are physics and chemistry as well as closely related sciences such as studies of materials, space and earth and engineering sciences. The achievements of biology and its application in medicine and agriculture are noticeable.

**Figure 12**



*Source: PIK Foundation*

The publication activity and quotation frequency of articles are a key element for the linkage of public studies with the needs and benefits of the economy. A number of studies in the early 1990s show that 10.4 % of large European companies learn about the output of research activities mainly in scientific publications. However, a key factor for the interaction between the industry and science remains the recruitment of qualified staff, which is valid for most industrial sectors[11].

[11] ANTHONY ARUNDEL and ALDO GEUNA, Proximity and the use of public science by innovative European firms, *Econ. Innov. New Techn.*, 2004, Vol. 13(6), September, pp. 559–580

Conclusions:

- The access to international databases for referenced publications provides opportunities for monitoring of results from input resources;
- The access to new databases has to be expanded to cover an optimum number of scientific areas;
- Publications in renowned and prestigious scientific journals and databases have to be encouraged to ensure relevance of the progress of scientific achievements in the globalised world.

## VI. INTERNATIONAL DEVELOPMENT

Both in the short and in the long term the development of science in Bulgaria is related to the European Union and its major policies and trends. These policies are laid down in the Lisbon Strategy and the newly adopted Europe 2020 Strategy and refer to actions aimed not only at intensive research funding and establishment of new research infrastructures, but also at creating **networks of national and joint research programmes and strengthening of the cooperation between Europe and third countries**, through their involvement in joint research projects and networks, participation in establishment of scientific infrastructure of regional significance and promotion of knowledge and experience transfer.

The membership in international organisations is one of the methods of gaining access to global knowledge and use of the most accurate and state-of-the-art equipment. Apart from being a sign of prestigious scientific recognition, the participation in international structures and experimental large-scale projects enables the exchange of knowledge, establishment and participation in international networks, accumulation of research and management experience, use of unique research infrastructure, databases and other research sources.

However, the participation of Bulgarian scientists in international networks should also ensure financial and intellectual return as well as direct benefits for the Bulgarian academic community, society, economy and especially for the small and medium-sized enterprise sector.

The European Framework Programmes for research, technological development and demonstration activities are the most efficient instrument for establishing the European research area. Participation of all Member States is their irrevocable obligation. Bulgaria has been using to the full extent these instruments since 1997.

European Framework Programmes support the implementation of applied and basic research through cooperation between EU Member States. The industry and in particular small and medium-sized enterprises have access to them, which should boost competitiveness as well as the scientific and technological potential of the European industry. Outside the EU, leading industrialised countries such as the USA, Japan and Australia or emerging economies

such as China, India and Ukraine, also have access to the Framework Programme instruments. This promotes the establishment of global research networks, the transfer of more knowledge and intellectual potential.

Bulgaria has been a successful participant in the three Framework Programmes since 1999. They are also a main foreign source of funding for research in the past 10 years. For the 2000-2010 period, the revenue from the Framework Programmes amounted to EUR 98.67 million. These funds have been provided on a competition basis and are subject to the European Commission's management.

Table 1

| Fifth Framework Programme (1998-2002) | Sixth Framework Programme 2002-2006 | Seventh Framework Programme 2007-2013 (data until 2010) |
|---|---|---|
| EUR 18.7 million | EUR 40.92 million | EUR 39.05 million |

The following major scientific areas stand out with regard to the country's participation in these schemes in which Bulgarian scientific teams and the business have more conspicuous involvement. These are: information and communication technology, health and sustainable development, including energy and environment.

Bulgaria has not been active enough as a participant in the Competitiveness and Innovation Programme. The Programme supports three main areas - innovation and competitiveness, energy efficiency and information and communication technologies. Through this programme, the European Commission supports the development and operation of national networks of businesses that are interconnected at a European level. This is a public service in innovation, technology transfer and support for small and medium-sized enterprises (SMEs) to participate in various programmes and initiatives. The network has been operational in Bulgaria for 10 years; until 2008 it was known as two separate networks - European Innovation Centres and Euro Info Centres. Its implementation is based on European grants covering 50 % of the services provided. A supporting mechanism should be introduced at national level to expand the participation of various research and innovation entities in the network, including the public organisations.

The Bulgarian institutions' participation in the other two sub-programmes is not at satisfactory level either. Only 18 successful projects worth EUR 2.4 million were finalised under the ICT Policy Support Programme for the 2007-2010 period.

Apart from the framework programmes, in which Bulgaria has already gained experience and has gradually increased its activity and successful participation, the country is well-positioned to take part in some of the other ongoing initiatives - Cooperation in Science and Technology Programme -COST, the schemes for joint research centres; schemes for coordination of national projects. The introduction of national instruments to guarantee co-financing of successful research activities under European programmes as well as under schemes providing support for the new project preparation contributes to this activity. This practice must be retained over time as the European programmes will become more competitive and more difficult to gain access to. This prospect lays a strong emphasis on application-oriented developments, which require broad partnerships, including with industry participants.

It is important to have an active position on the new European initiatives, such as implementation of joint programming initiatives between individual Member States. This is a long-term strategic process and is being carried out through a voluntary mechanism of partnership between the countries. The implementation of joint programmes will enhance the effectiveness and impact of national funding of research activities in strategic areas.

Project implementation via bilateral scientific and technological cooperation is of great significance to boost the country’s profile as a reliable partner. The gradual increase of the partner countries at European and global level is important for the establishment of large interdisciplinary research networks and consortia. The MEYS currently has over 15 agreements in place for bilateral scientific and technical cooperation in a wide geographic scope.

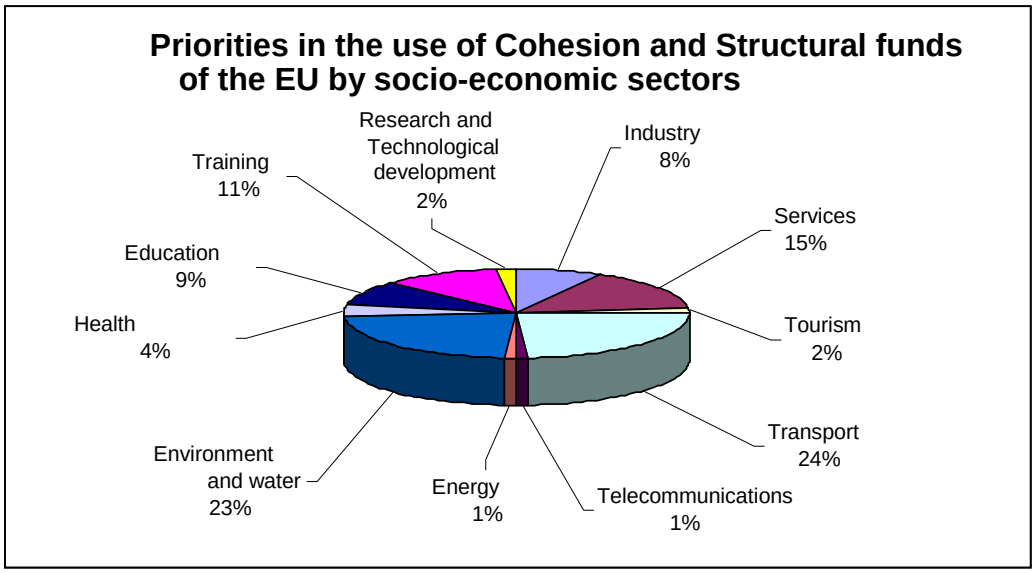
Through the Ministry of Economy, Energy and Tourism (MEET), Bulgaria became a member of the EUREKA Initiative and the EUROSTARS Programme and our participation is expected to boost the industrial potential of joint innovative project development with the scientific community.

The application of structural and cohesion instruments in science and technology is still weak. The is lack of flexibility in their use, in particular with regard to the implementation of national strategic schemes such as the National Roadmap for Research Infrastructures (NRRI); Bulgaria's participation in the new regional initiatives such as the Danube Strategy in which research activities play a central role and with regard to activities within the Regional Cooperation Council in South-Eastern Europe. Furthermore, Bulgaria does not make use of the opportunities to host the initiatives within these programmes and as a result, these

activities have been assigned to neighbouring countries such as Croatia, Bosnia and Herzegovina, Serbia, Romania and other neighbouring countries[12].

Figure 13 shows that the resources provided by the Structural instruments for research and technological development are insignificant given the European recommendations and practices. In general, they are not consistent with the major national priorities, as the energy and telecommunications sectors, which are also dependent on the application of scientific knowledge and expertise, account for 2% in total.

**Figure 13**




*Source: National Strategic Reference Framework 2007-2013*

Specific opportunities offered by cohesion instruments – which could provide a tool for initiating large-scale projects such as European groupings of territorial cooperation -- are not used either[13].

Conclusions:

- It is of paramount significance to support Bulgarian scientific teams in their preparation and participation in European programmes and initiatives to make the country's involvement more effective;

[12]The programme of the Regional Cooperation Council enumerates over 30 ongoing initiatives, of which Sofia coordinates just 1.

[13] Regulation (EC) No 1082/2006 of the European Parliament and of the Council on a European grouping of territorial cooperation (EGTC).

- National support for the development of national innovation, entrepreneurial networks and business networks is required;
- The active use of Structural Funds is needed to lend noticeable support to the achievement of national objectives for investment in science and more active business participation in scientific and technological developments;
- Participation in various European and international organisations and the extension of the scope of bilateral agreements is a key element of the exchange of knowledge and the use of numerous modern research infrastructures.

## VII. RESEARCH INFRASTRUCTURE

The establishment of modern research infrastructure is essential for achieving significant scientific outputs in the country's priority areas. Research infrastructure connects the three key factors necessary for establishment of a dynamic economic model of sustainable development and employment – education, research and innovation – and ensuring the strategic and effective development of science and innovation, enhancing competitiveness of scientific products.

In practice, Bulgaria lacks a clear well-defined institutional framework for management of available infrastructure. The **material infrastructure as part of** scientific resource is characterised by:

- outdated facilities and ineffective use of existing facilities;
- lack of a modern approach to administrative and financial management of available infrastructure within base organisations;
- lack of specialised staff trained and qualified to service equipment and its users. The academic staff often performs these activities along with other duties. The impossibility of appointing specialised staff is often due to archaic and centralised methods of management at base organisations.
- lack of coordination and complementarity of available modern equipment within an institution and between individual organisations;
- lack of concentration of equipment; in some cases – a highly personalised approach and overlapping of equipment.

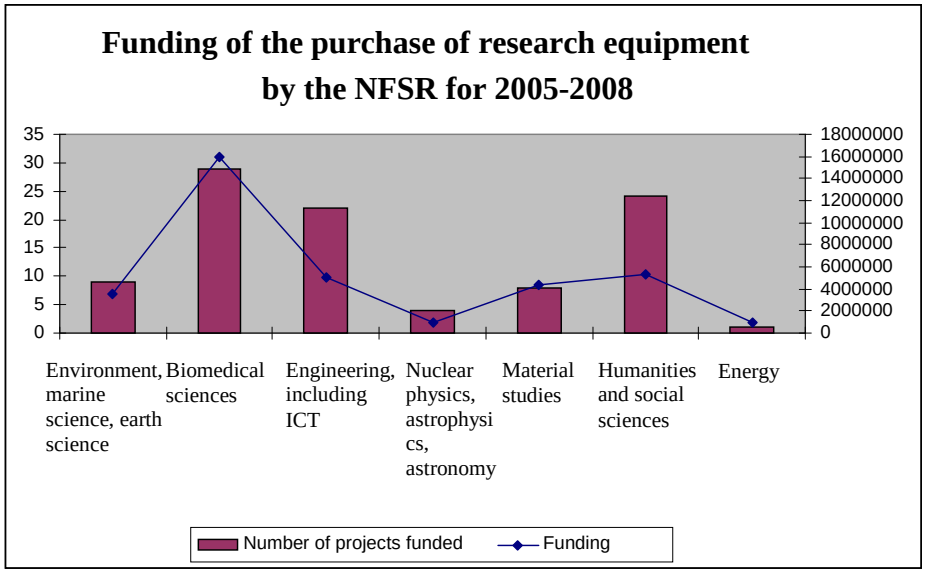
In the 2005-2008 period, the Ministry of Education, Youth and Science pursued policy of modernisation of research equipment. The steep rise in science budget in 2008 enabled the development and introduction of new competition schemes and the funding of costly and unique research equipment.

Despite this positive trend of channelling resources into the development of a modern research and innovation base, there are not effective instruments for the establishment of complex interdisciplinary facilities. For this purpose, it is necessary to guarantee the use of various types of financial instruments – for example, Structural Funds, loans from European banking institutions and national support.

Figure 14 shows the funding by thematic areas of purchased research equipment for the 2005-2008 period. Obviously, in practice there is no funding for infrastructure in energy sources. The share of research appliances in environment and marine sciences and in

engineering sciences is low. The one-off purchase of costly equipment without ensuring the necessary testing conditions and the availability of a long-term scientific programme leads to ineffective use of these appliances which inevitably results also in a higher price for providing services to business. This leads to the paradox that Bulgaria has unique research equipment, but scientific organisations and companies send samples for testing in other EU Member States because of lower prices.

**Figure 14**




*Source: MEYS*

In the European context, an important measure meant to improve the condition of scientific infrastructure at European level is the adoption of the so-called European Roadmap for Research Infrastructures**.** The document covers 44 large-scale infrastructure projects identified as particularly important and significant for the development of European research area and establishment of an economy based on knowledge and innovation. The roadmap of Europe allows for the update of the list of leading infrastructure initiatives on an annual basis.

The MEYS developed the National Roadmap of Research Infrastructures adopted by Council of Ministers Decision No 692 of 21 September 2010, which covers large research complexes servicing specific economic and social needs of the country, the south-eastern European region and pan-European infrastructures in which Bulgaria is involved. The main priority of the priority research infrastructure concerns the filed of energy, marine studies, new materials with various application, information and communication technologies and social studies.

**Conclusions:**

- Launch of policy of establishment of modern research infrastructure;
- A modern approach to administrative and financial management of available infrastructure within base organisations should be ensured;
- The use of Structural Funds for science, research infrastructure and innovation is of major significance. This will guarantee sustainability of funding of large-scale research projects with added value and a growing impact on development of the economy and regions. The national percent of the research expenditure in the Structural Funds has to be defined;
- Research infrastructure, with small exceptions, is not state-of-the-art; it does not concentrate enough indicators of various research institutions and economic units, and hence it is not used effectively and hence it is necessary to draw up a plan for its update and efficient use;
- A national catalogue of unique research equipment has to be issued.

## VIII. INNOVATION ACTIVITY

Despite the serious efforts made for the creation of appropriate environment for development of research, high-tech and innovation, the EU in many ways is lagging behind the USA, Japan and emerging countries in Asia. Data of the Global Innovation Index ranking shows certain main characteristics of EU-27 and their main international partners[14]:

- Only four of the countries ranking in the top 10 places are EU Member States;
- EU-27 ranks 20th according to average values;
- The new Member States are in catching-up positions, whereas Bulgaria ranks 38 out of 48 countries covered by the study. It is worth noting that each of the indicators measured show further worsening of the country's scientific potential. In this respect the Human Resources indicator is particularly noticeable as Bulgaria went back by 11 places compared to 1995 and 2000 (2008).

The high-tech market has been divided among developed industrialised countries. Out of 50 base areas, they control 46 and produce 80 % of high-tech products. The USA has developed and controls 22 of these technologies and holds one-third of the world high-tech market, followed by Japan with 17% of the high-tech market and Europe – a leader in energy-saving technology and biotechnology.

Bulgaria faces the challenges of other developed EU Member Sates, under the conditions of painstaking transition after long lasting isolation from the international research life and a low percentage of GDP earmarked for R&D. In this sense, the effective management of science as an economic factor guaranteeing growth, employment and dynamics of the national economy is a priority for the Bulgarian government.

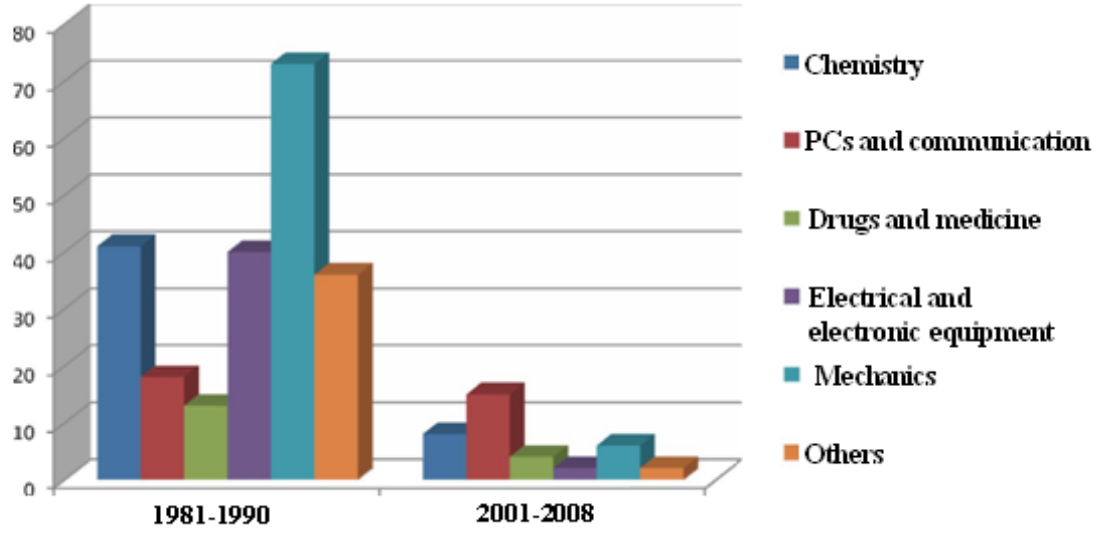
Bulgaria's economic growth marked over the past years has sharply slowed down its pace, as it was prompted by the availability of traditional and high-return market segments such as construction, real estate and finance. Meanwhile, innovative and science-intensive technologies which could boost the competitiveness of the economy, were not developed. A small part of innovation in the country relates to industry, and the sectors dependent on cheap labour have a large share of the added value. Over the past seven years (2001-2008, World

[14] GIS, Global Innovation Index, http://www.proinno-europe.eu/page/thematic-papers-1. This is an international system measuring the innovation profile of EU Member States and their main international partners on the basis of three composite indicators – business activity; human resources; infrastructure provision.

Bank data)[15], the country's export potential has also focused on traditional labour-intensive sectors which require imported natural resources. Eurostat data for 2008 show that the share of high-tech products of total exports is 3.57, while for other new Member States it ranges between 4 and 6.5 and the EU-27 average is 15.

The scientific capacity marked a steep decline during this period. This is visible in the change in the intensity of patent issue before and after 1990 and in the low activity of application and issue of protection certificates at the European Patent Office, the Japanese patent office and the US patent office. Triadic patents (i.e. those issued and granted by three offices – the European, Japanese and US offices) are hardly available. Eurostat data for 2005 for Bulgaria these total 0.13 per 1 million population.

**Figure 15 Patents granted by patent offices and trademarks in the USA**

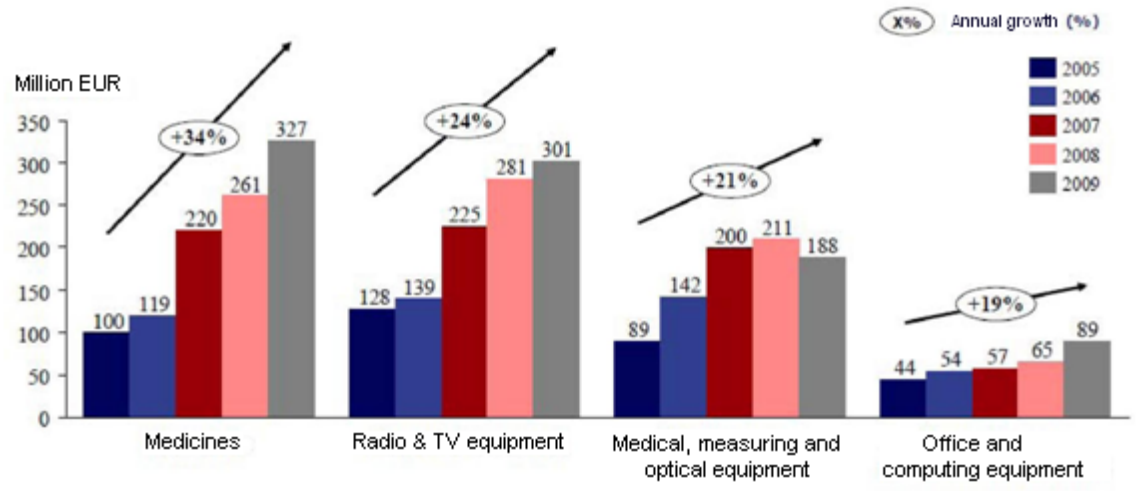



*Source: World Bank*

The fact that protected patents since 2000 have been in new fields of industry such as communications, for example, is a positive sign, but Bulgaria is lagging behind EU-12 countries, which as a group lag behind Europe's innovation leaders (Finland, Denmark and Germany). Bulgaria's exports of medium- and high-tech products marks very low values, as Figure 15 shows, compared to the EU average, but even in times of global economic crisis there has been a rise in the share of these products of total exports.

**Figure 16 Exports of medium- and high-tech products for Bulgaria**

15 http://www.worldbank.bg/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/BULGARIAEXTN/0,,contentMDK:22622283~menuPK:305444~pagePK:2865066~piPK:2865079~theSitePK:305439,00.html




*Source: Eurostat and MEET*

The European Innovation Scoreboard shows that together with Romania, Latvia and Lithuania, Bulgaria has been identified as a "modest innovator"[16], but still it is one of the quickly catching-up Member States in terms of innovation activity. The summary innovation index (SII) for 2010 was 0.226. The EU-27 average index stood at 0.516.

Conclusions:

- The priorities for development of economically and socially significant research an innovation technologies should be set;
- A gradual increase in the funds for research and technological development as percentage of the GDP has to be ensured and in particular through undertaking actions to promote private investments in science.
- The actions of the government and scientific institutions should be stepped up as regards the effective transfer of knowledge in order to guarantee the market sustainability of new scientific developments.
- The state has to intervene actively by determining the concentration, structure and business model of the entities which would successfully implement market innovations within a sustainable public-private partnership.

[16] European Innovation Scoreboard 2010, http://www.proinno-europe.eu/inno-metrics/page/innovation-union-scoreboard-2010. This is an index which assesses indicators such as *Human Resources, R&D Finance and Support, Firm Activities* and *Outputs*.

**UNSETTLED ISSUES BEFORE BULGARIAN POLITICIANS AND THE ACADEMIC COMMUNITY INCLUDE:**

1. There is no sustainability and predictability of investments in R&D; the goal set out in Council of Ministers Decision No 803 of 10 November 2010 concerning the adoption of a preliminary version of the National Reform Programme of the Republic of Bulgaria (2010-2013) in implementation of Europe 2020 Strategy serves as a base indicator. An important component in increasing R&D investments is the growth of EU funding and the programmes and investments of the private sector;
2. Lack of modern management methods at public universities and scientific organisations; This has resulted in low turnover of the academic staff, a highly unfavourable age structure of the staff and incentives, including unattractive educational programmes and modules for the young in school and university age which can attract them to a scientific career;
3. The is no dynamics of institutional structure of the public scientific system and the instruments of the cohesion policy are not used to bring it up-to-date;
4. A small share of programme funding of research as well as change in the ratio between public and private investments;
5. Organisations cannot develop mobility schemes – intra- or inter-institutional and inter-sectoral – because of regulatory obstacles among others;
6. The implementation of doctoral studies lacks programme base and predominantly project funding has to be introduced for doctoral decree under projects of interest for the industry;
7. There is no coordination of policies in education, science and innovation;
8. The institutional research framework remains underdeveloped; there is no interaction between various public and private organisations, through modern inter-institutional entities, such as clusters, technological centres, technological transfer centres, centres of patent marketing and intellectual property, etc);
9. There are few instruments which are not efficiently applied on a national level to support innovation – initial funding schemes, guarantee and venture capital schemes;
10. Intellectual property management at public-funded research organisations and universities is not modern;
11. There are no coordination mechanisms such as national technological platforms, to bring together scientific and industrial interests.

## VISION FOR THE DEVELOPMENT OF THE RESEARCH AND INNOVATION SYSTEM

This strategic vision aims not only to respond to European prospects, but also to create conditions for achieving the national goals and indicators which by 2020 have to place our country in the position of a *moderate innovator* in the European Science and Innovation Observatory.

The government's ambition is to assist in the establishment of a knowledge-based society by creating conditions and prospects for achieving the goals set in the European 2020 strategy.

The fulfilment of the goals and tasks set in the National Research Development Strategy 2020 will enable the full integration of Bulgaria into the European science family and will make it an active and competitive partner in European research and innovation networks.

The national scientific strategy aims to create conditions and a suitable environment to provide quality research via the concentration of resources in priority areas and via measures for emergence of a new generation of scientists.

The government is aware of the necessity of long-term and consistent policy in the field of research and innovation to overcome Bulgaria's considerable delay compared to developed European countries. This "abyss" will grow unless timely and effective measures are taken to deal with acute problems in Bulgarian science – low level of funding; lack of young researchers; fragmentation of the system and weak relationship between the individual components of the system – educational and research institutions on the one hand and science and business, on the other hand.

By 2020, the Strategy guarantees:

- Concentration of resources in priority research areas, effective use of national and European funds and improvement of the ratio between institutional and programme-based funding;
- Development of modern competitive research centres and significant scientific tasks in which they will concentrate scientific staff, financial resources, modern scientific equipment needed for significant and interdisciplinary research;

- Introduction of an effective system for assessment of research activity to enable the state to analyse to what extent science policy is effective and to identify measures for its improvement on the basis of comparison of quality of research activity with world and European standards;

- Launch and promotion of the process of modernisation of research organisations and improvement of their potential in line with the increase of budget expenditure. This will ensure more efficient absorption of budget funds for science and will guarantee their more intensive growth to targeted levels.

- Emergence of a new generation of scientists, support for established scientists and enhancement of the prestige of the profession of the scientist;

- Enhanced involvement of the industrial partners in the process of innovation and improvement of the transfer of knowledge and innovation to the economy and society. By 2020, Bulgaria should have a modernised research environment and should be well-positioned as a competitive partner.

## PRINCIPLES OF IMPLEMENTATION OF THE NATIONAL RESEARCH DEVELOPMENT STRATEGY

The national research strategy will be implemented on the basis of several underlying principles:

1. **Partnership principle** on two main levels
    a. Partnership between institutions conducting policy in science and innovation and in particular the Ministry of Education, Youth and Science, the Ministry of Economy, Energy and Tourism and other sectoral policies such as healthcare, agriculture, defence and security;
    b. Partnership between the organisations in the research and innovation system -- universities, scientific organisations and business
2. **Complementarity principle** which will guarantee concentration of resources and instruments. Funding from national and EU funds and programmes will be subject to a more optimum use to ensure more noticeable effect from investments. The national strategy takes into account the government's economic priorities set in the MEET strategy for development of the economy. The strategy takes into account the goals and other national key documents by seeking to build upon them rather than overlap with already set measures. (For example: the Youth Strategy; the National Reforms Programme; economic analysis of Bulgaria, the Strategy for Development of Research in Agrarian Sector (2009-2018), etc). We aim to draft a complex document.
3. **The principle of equal involvement of all stakeholders –** the national strategy is a document which concerns the Bulgarian society in its totality. The strategy is subject to public debate and will seek to take into account all constructive proposals and measures. The MEET and MF will table together the National Strategy with a view to guaranteeing the cohesion of policies and resource provision.

## MAJOR OBJECTIVES, TASKS AND MEASURES FOR DEVELOPMENT OF RESEARCH IN BULGARIA

The active development of science and research is a priority of the Bulgarian government and plays a central role in the European Development Programme.

It defines the following objectives:

1. ESTABLISHMENT OF COMPETITIVE NATIONAL RESEARCH INFRASTRUCTURE AS AN ELEMENT OF THE EUROPEAN RESEARCH AREA.
2. IMPROVEMENT OF THE SERVICE AND CONTROL OVER RESEARCH INFRASTRUCTURE IN BULGARIA.
3. STRENGTHENING THE INTEGRATION BETWEEN SCIENTIFIC ORGANISATIONS AND UNITS OF PUBLIC SCIENTIFIC ORGANISATIONS AND UNIVERSITIES IN BULGARIA AND THEIR RELATIONS WITH THE BUSINESS IN COMPLIANCE WITH PUBLIC PRIORITIES.
4. MODERNISATION OF SCIENTIFIC ORGANISATIONS AND IMPROVEMENT OF THE STATUS OF THE SCIENTIST IN SOCIETY

The tasks and measures for research development aim to address the challenges the country faces in science and they all form the national science policy aimed at achievement of the above-mentioned objectives.

## TASK 1. TO ENHANCE THE INTENSITY, OUTCOME AND EFFICIENCY OF R&D ACTIVITY FOR THE BENEFIT OF THE ECONOMY AND SOCIETY

### Measure 1. Introduction of a financing model promoting competition and development and outputs to be applied in society and economy and increase of the funds for research and innovation.

Bulgaria's major challenge is not just to increase the funds earmarked for science in order to catch up with the EU average indicators, but also to introduce a financial model, which, through differentiated financing, can offer cost-effectiveness, promote the quality of research carried out and encourage competition between the scientific institutions.

The launch of sufficient incentives for consolidation of R&D entities and scientific potential is an important emphasis in the policy for development and improvement of the efficiency of research and innovation. The combination of financial resources, infrastructure and research staff should establish and strengthen strong R&D that will carry out quality research and will be competitive at European and world level.

Actions should be undertaken for decentralisation of research funding sources and involvement of various institutions in the use of various instruments.

The state will support the development of experimental research centres for carrying out competitive research and solution to important scientific tasks that will concentrate scientific staff, financial resources and modern R&D equipment necessary for carrying out significant interdisciplinary research.

Instruments:

1.1. Introduction of a financing model to promote competition and development that will be based on the quality of research carried out. Introduction of long-term contracts with universities and scientific organisations for effective allocation of public funds;

1.2. Increase of the funds for research and innovation to 1.5% of GDP by 2020, including at least 0.7% to be earmarked as public expenditure for science (see Annex 4);

1.3. Increase of the share of programme funding versus institutional financing in determining the budget of scientific organisations;

1.4. Support for the development of joint research centres for concentration of critical mass of scientific potential designed to service the state sectoral policies;

1.5. Promotion of establishment of new and maintenance of existing scientific teams of researchers from various scientific organisations.

**Measure 2. Introduction of research priorities**

The definition of priority scientific areas is of key importance for research and innovation development. Three major factors determine the selection of long-term priorities: Forecasts identifying which sectors of the Bulgarian economy will develop most actively within and beyond the strategy's period, including research and education needs; secondly, the existing capacity and potential of scientific organizations; and thirdly, world trends and priorities in the EU. The definition of such areas will enable the concentration of limited resources in order to boost the effectiveness of research and innovation activity and create conditions to achieve serious scientific outputs and a multiplier effect in the economy. The availability of priorities will strongly reduce the abrupt and frequent changes in the trends of research, relevant reallocation of funds as well as funding rules.

The selection of priority areas is based on (See Annex 5 – presented in a synthesised way priority areas defined in key national and European documents).

- The Bulgarian government's priorities laid down in the European Development Programme; [17]
- The Ministry of Economy, Energy and Tourism's sectoral strategy for attraction of investments in the country;
- Analysis of scientific activity in Bulgaria[18];
- economic analysis and export potential analysis carried out with the support of the World Bank[19];
- The EU scientific priorities when accounting for the Lead Market Initiative[20] - with a view to achieving better integration and full use of European Community instruments in research;
- Analysis of the Esko Aho Group of measures for creating Innovative Europe[21];
- Areas with enhanced presence of foreign direct investment[22];
- The priority areas of the Seventh Framework Programme[23];

17

18

19

20 http://ec.europa.eu/enterprise/policies/innovation/policy/lead-market-initiative/

21

22 Data of the Investment Agency as of March 2010, www.investbg.government.bg

- the need of promotion of applied research - with a view to meeting the needs of the business and strengthening the collaboration between the academic circles and the private sector;

With that respect, the priority areas of the Science Development Strategy of Bulgaria until 2020 are:

1. **Energy, energy efficiency and transport. Development of green and environmental technologies;**
2. **Health and quality of life, biotechnologies and organic food;**
3. **New materials and technology;**
4. **Cultural and historical heritage;**
5. **Information and communication technologies.**

It should be noted that with regard to research in the above-mentioned areas relating to security and defence and in particular the part concerning new materials and technologies, mostly the Ministries of Defence and Interior will seek support.

**Along with these priorities, thematic programmes which will cover sectoral priorities and/or will be in response to force majeure circumstances, disasters and pandemics will be drawn up.**

Particular attention should be paid also to **fundamental studies.** They will develop on a programme and competition basis in priority areas as well as in all areas of knowledge. **As the funding of basic research represents direct investment in world economy, public funding of such activities in Bulgaria is justified only by the goal of keeping the educational potential of higher education institutions.** The emphasis in the funding of basic research will be laid on inter-institutional teams and research groupings which work in close cooperation with established world centres and laboratories in the respective areas. Basic research will not exceed 15% of total expenditure on science.

The support for scientific activity will continue through institutional financing based on developed scientific programmes and plans in order to maintain the appropriate level of scientific knowledge and experts needed in various fields of the economy and governance, as well as creation of innovative solutions.

Instruments:

2.1. Introduction of targeted national thematic programmes in the priority areas;

[23] http://cordis.europa.eu/fp7/cooperation/home_en.html

2.2. Introduction of thematic sectoral programmes in cooperation with other ministries and agencies;

2.3. Development of scientific complexes in the priority areas; (This instrument is closely related to Measure 2 of Task 3 regarding the development of the national research infrastructure);

2.4. Ensuring specific mechanisms to carry out research in response to urgent needs;

2.5. Support for scientific development through institutional financing on the basis of drafted scientific activity programmes and plans in priority areas;

2.6. Bespoke studies of topical issues and problems and analysis of socio-economic trends.

**Measure 3. Development of the research potential through creation of attractive conditions for scientific career, professional growth, qualification and specialisation of scientists**

The quality of research depends primarily on the human potential -- highly qualified and motivated researchers.

The state will pursue a more efficient policy designed to improve scientists' economic and social status and to create attractive conditions for scientific activity that will give them sufficient professional self-confidence. The state will promote the comeback of highly-qualified Bulgarian scientists working for scientific institutions abroad. Actions for modernization of all aspects of the structure and management of scientific organizations in order to improve their scientific and human potential will be launched. This will ensure support for the joint work between the Bulgarian Diaspora and scientific organizations in the country through the introduction of specialized schemes thereof. The activity will continue in support of the participation of Bulgarian scientific teams and scientists in international and European programmes and initiatives. Meanwhile, there should be a mechanism for regular appraisal of scientific staff and scientists' work.

Particular attention will be paid to attracting and retaining young and talented people in science. Subject to further development will be programmes which will grant young scientists support on a project basis – including the introduction of project-based doctoral studies, post-doctoral programmes, funding of young people's participation in international conferences, provision of funds for publication in referenced journals, etc. Plans include measures for **increasing students' interest in R&D activity**, creation of conditions for

gaining up-to-date knowledge by the young generation and training of a new generation of scientists.

**Instruments:**

3.1. Introduction of horizontal programmes in support of the scientific potential, including targeted programmes for integration and re-integration of the Bulgarian scientific diaspora;

3.2. Promotion of research activity in Master's programmes;

3.3. Introduction of project-based doctoral studies;

3.4. Support for doctoral and post-doctoral programmes;

3.5. Promotion of scientist mobility and support for the development of career centres and regional scientist mobility units as part of the European Mobility Network;

3.6. Introduction of schemes for support of sabbatical leave (one-year leave from the base organisation when the scientist is obliged to carry out research at his/her own discretion at another organisation) for Bulgarian researchers at scientific and industrial organisations in the country and abroad and other short-term incentives for professional development of scientists.

**Measure 4 Integration of the Bulgarian science into the European research and university area**

The existing promotion schemes and introduction of new targeted activities in favour of Bulgaria's inclusion in various joint programmes and initiatives will continue to promote Bulgaria's participation in the European Framework Programmes. Attention will be paid to the establishment and development of scientific networks, in which scientific information, knowledge and technologies will be subject to free exchange. Emphasis will be laid on extending the participation in international networks in the country’s priority areas.

The state will make efforts to ensure and extend the access of the Bulgarian scientific community to major cutting-edge information platforms and databases.

The practice will be continued and further expanded for carrying out information campaigns and training on capacity strengthening at scientific teams with regard to absorption of funds under the national and European programmes, including the Research Framework Programmes and the EU Structural Funds.

Bulgaria will play an active role in carrying out activities under the regional strategies and programmes such as the Danube Strategy and the activities of the Regional Cooperation Council for South-Eastern Europe.

**Instruments:**

4.1. Coordination of national, regional and European policies and programmes;

4.2. Introduction of targeted schemes in support of the participation of the national scientific community in European programmes and initiatives;

4.3. Introduction of the complementarity principle for financial instruments and use of at least 15 % of the Structural Funds for science and innovation, including at least 8 % for development of research infrastructure (see Measure 2 of Task 3);

4.4. Reciprocal launch of national scientific programmes for participation in transnational programmes with shared financing by the Member States and the European Commission;

4.5. Access to European and international organisations and research infrastructure;

4.6. Maintenance, optimisation and extension of the access to state-of-the-art databases with referenced scientific editions and publications and communication infrastructure.

4.7. National support for the operation and extension of the partnership within the European Innovative Enterprise Network.

## TASK 2 ESTABLISHMENT OF A SUSTAINABLE EDUCATION-SCIENCE-BUSINESS RELATION AS A BASIS FOR DEVELOPMENT OF KNOWLEDGE-BASED ECONOMY

**Measure 1. Promotion of private sector involvement in scientific activity**:

The involvement of the private sector in research high on the EU's agenda. Almost all Community policy documents have identified it as activity. The business is projected to get involved not only through direct investment but also as a beneficiary of scientific knowledge and products and a stable partner in the knowledge triangle. The establishment of effective partnerships between scientific organisations, universities and business enriches all participants in the process with new knowledge and expertise and ensures high added value to the economy. The participation of the business in the scientific and educational process supports the emergence of a new generation of scientists and entrepreneurs that facilitates the establishment of a new market profile and conditions for attracting more investment. The balanced involvement of various partners, as well as the active role of the business in the scientific process generate new knowledge, lead to creation of innovative products and fixes up the condition of the economy. Science services and the participation in deployment or creation of new technologies in industry are necessary to guarantee intelligent, sustainable growth with more efficient use of resources.

Innovation in Bulgaria has[24] a small share of the added value of the Bulgarian industry -26% according to data of the Ministry of Economy, Energy and Tourism (MEET) and Eurostat, as compared to the 45% in EU average. Given the structure of the Bulgarian economy, i.e. a predominant share of small and medium-sized enterprises (SME), the efforts should be channeled into securing start-up capital for these companies and subsequently development of their market sustainability. The world trends are a prerequisite thereof - 80% of the R&D investment in the 1980s was bespoke and was provided by big companies with more than 25,000 workforce; over a 10-year period this percentage decreased by 20 points in favour of increase of the share of SME to 25%[25].

**Instruments:**

[24]

[25] http://www.crp-eut.org/2010_Chesbrough.pdf

1.1. Extension of the schemes providing start-up capital to finance risk research and to guarantee sustainability to the companies on the market;

1.2. Introduction of schemes for development of engineering disciplines at universities;

1.3. Introduction of employment promotion schemes for young researchers at companies;

1.4. Improvement of the coordination between the National Fund for Scientific Research and the National Innovation Fund, including through exchange of information and outputs;

1.5. Pro-active measures for intellectual property protection through regular and specific schemes of the Research Fund, the National Innovation Fund and OP Development of the Competitiveness of the Bulgarian Economy.

All instruments relating to the establishment of interaction between the elements of the knowledge triangle will be implemented under the guidance of the MEET.

**Measure 2. Strengthening the integration between the elements of the knowledge triangle**

The strong and stable relations between science and business are underlying for the development of knowledge-based economy. The integration of the educational and scientific process is an integral policy of the Bologna process and provides stable conditions for generation and use of scientific knowledge. The three elements of the knowledge triangle also provide for sustainability of the relation between a scientist and the educational process. The binding of various elements of knowledge in an integral environment is a prerequisite for sustainable and inclusive growth, as well as for promotion of an economy of high employment rate. This implies also the availability of adequate human resources to meet the needs in various areas, as well as the quick realisation of scientists and entrepreneurs. This will create conditions for modernisation of the labour market and will launch flexible educational bridges across various sectors.

The introduction of schemes in support of the academy-education-industry relation and the demand for staff by the business imposes the introduction of differentiation of educational institutions and on this basis - definition of those that will develop strong

scientific activity. The latter will guarantee the reproduction of a new generation of scientists in the science and innovation system.

The MEET will play a leading role in the application of some of the instruments under this measure.

**Instruments:**

2.1. Introduction of targeted programmes in support of scientific activity at SMEs and creation of managerial culture for collaboration with scientific institutions;

2.2. Bespoke training of young staff and with the financial contribution of the business and promotion of the achievements of young researchers;

2.3. Establishment of networks of regional institutions and scientific organisations for implementation of targeted regional tasks and programmes;

2.4. Development and intensification of transfer of knowledge through schemes for creation of incubators for scientific ideas;

2.5. Maintenance of a national interactive platform for the interaction of education, science and business.

## TASK 3 CREATION OF FAVOURABLE ENVIRONMENT FOR SCIENTIFIC ACTIVITY

### Measure 1. Introduction of evaluation of scientific activity

The introduction of an efficient system for research evaluation is a component of every contemporary science policy. This system allows for monitoring of the process of absorption of funds, the performance level of scientific tasks and outputs of scientific activity. The evaluation is important because it enables the state to analyse to what extent scientific policy is efficient and to identify measures for its improvement based on comparability and commensurability of R&D quality with world and European standards.

Evaluation is an important instrument of the state in the introduction of new policy measures in various areas, including in the scientific and innovation system. It helps decision-makers with a preliminary situation analysis of the situation and extrapolates the effect and benefits of applying new decisions over time.

Furthermore, companies could use the results of this evaluation and search for forms of collaboration with certain research entities. The evaluation enables scientific organisations in turn to formulate their future research goals and optimise their activity. The evaluation of research quality guarantees publicity and transparency in public resource spending and provides an opportunity for targeted public debate on the key issues of the national scientific policy.

**Instruments**

1.1. Impact assessment regarding the application of new solutions and measures in science and innovation;

1.2. Introduction of mandatory, regular international evaluation of the organisations providing financing to and carrying out scientific R&D and innovation;

1.3. Regulation of long-term objective criteria for evaluation and monitoring of scientific programmes and outputs;

1.4. Regulation of a system for regular objective evaluation of scientific organisations carried out according to a external methodology with clear, objective and long-term criteria.

**Measure 2. Development of research infrastructure:**

The development of research infrastructure is one of the main priorities of the European 2020 Strategy. Research infrastructure is key to the knowledge triangle and is a linkage element between the three components of this triangle. Establishment, maintenance of and access to modern research infrastructure guarantees high quality of research, cutting-edge training process and opportunities for attracting intellectual potential, promotion entrepreneurship through the potential generation of new knowledge and its transfer to the national economy. Research infrastructure creates serious prerequisites for establishment of regional scientific complexes to carry out area-specific tasks. Research infrastructure is a natural site for establishment and development of public-private partnership and for maintaining sustainable relations between the parties involved in it. It is fundamental for the construction and development of traditional infrastructure and for offering new employment opportunities requiring specific competences. Furthermore, research infrastructure encourages international scientific collaboration, hence enriching and extending the experience and knowledge gained by various scientific teams. The availability of cutting-edge facilities creates favourable conditions for scientists and their families while guaranteeing their free movement and circulation and prevents loss of intellectual potential.

The efficiency of this type of activity significantly improves the performance of research that is measured by means of various indicators such as publication activity, patent activity, utility models, etc.

The European Commission's report on the key science, technology and competitiveness data says that the Structural Funds are the most important instrument for funding research infrastructure in new Member States. In the 2007-2013 programming period, these countries allocate a total of EUR 5 billion to support infrastructure construction, in particular[26]. Unfortunately, Bulgaria is one of the countries that do not have such priority areas and respectively currently does not receive such financing.

[26] page 114,

An important step for the Bulgarian government will be to link the national strategic documents with the use of Structural Funds for scientific and research activity and in particular for the elaboration of a National Roadmap for Research Infrastructures (NRMRI).

**Instruments:**

2.1. Elaboration of a National Roadmap for Research Infrastructures in line with the priorities of the scientific strategy;

2.2. Use of Structural Funds for construction of national research infrastructure for effective participation in the European Roadmap for Research Infrastructures;

2.3. Creation of a new scientific landscape through concentration of scientific equipment and facilities for achieving noticeable scientific outputs;

2.4. Support for the publication activity, communication networks, digitalisation of depositories and unique scientific collections, etc.

**Measure 3. Strengthening the social dimensions of science**

The new trends of the European Strategy are meant to raise awareness of the public as to scientific and innovation achievements, as well as their opportunities for improving the quality of life. It is important to guarantee ethic standards for various types of research and increase confidence in carrying out novelty research. In this respect the role of the media and non-governmental organisations is important for provision of reliable information channels for various scientific novelties The early-age encounter with the capabilities of science suggests greater interest in dealing with research and creates an environment for a new highly educated generation. Science should become part of popular culture in society and should occupy a regular place in public life. In this respect, the establishment of specialised *science shops* at various scientific public organisations is highly advisable. Science shops are specialised structures, which ensure the link between the needs of society and research. They provide access of the non-governmental sector to scientific works and are the place where students realise community and significant research as part of their curriculum.

3.1. Extension of the scientific activity register with a platform for publication of the outputs of publicly funded research projects and programmes, linked to the European platform for free access to publications and results;

3.2. Introduction of a Laboratories of Quality prize as a targeted support of most effective and best-performing scientific groups;

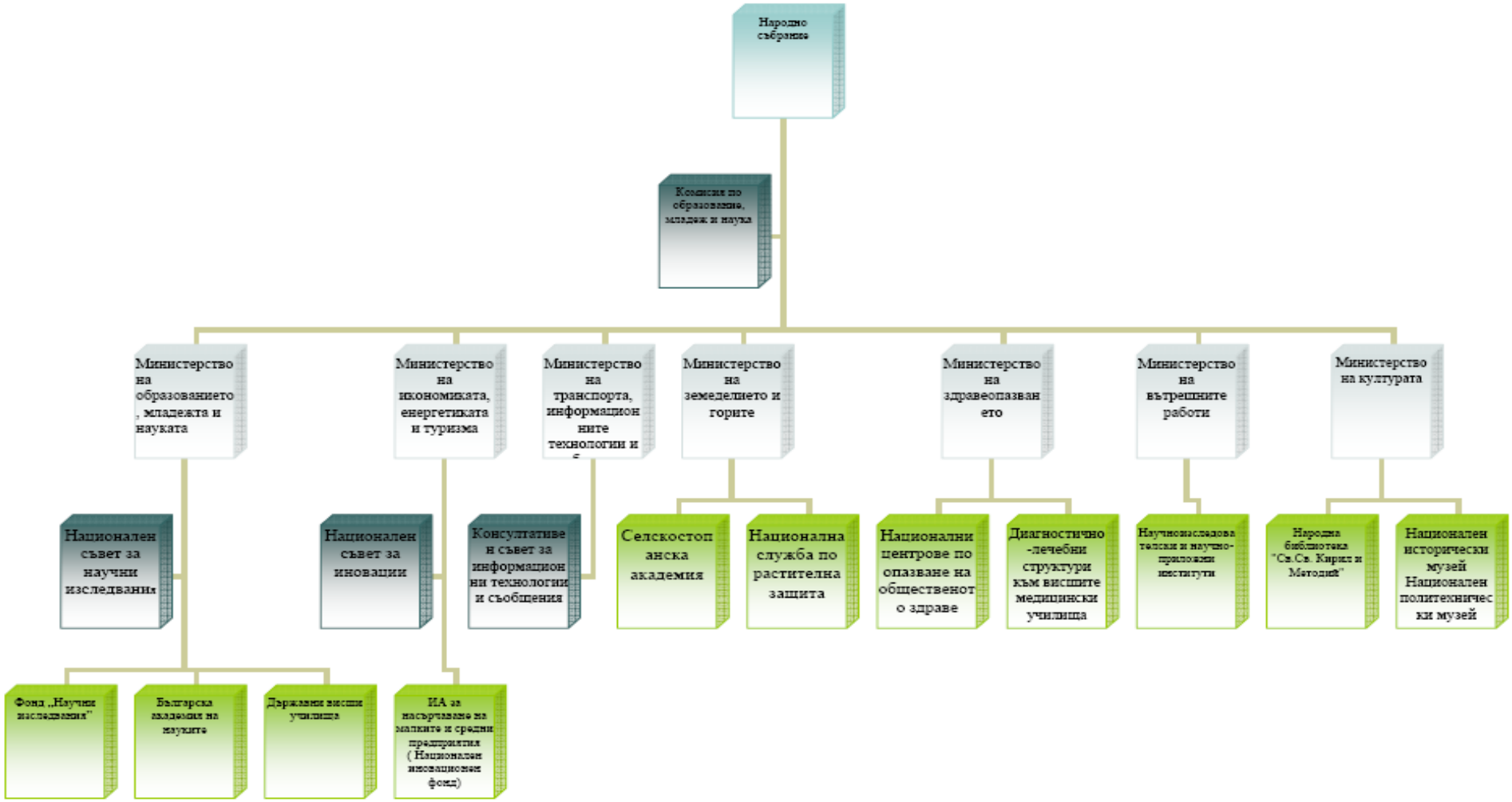
3.3. Implementation of the dialogue with the public on the role of science and establishment of *science shops*;

3.4. Promotion of a series of contest-based information initiatives for demonstration of scientific achievements;

3.5. Introduction of a programme for promotion of scientific activity of school and university students with an emphasis on natural sciences and mathematics;

3.6. Regulation of scientific activity awards for improving the prestige of scientists.

ANNEX 1: ORGANISATIONAL CHART OF THE STATE INFRASTRUCTURE OF THE RESEARCH AND INNOVATION SYSTEM



National Assembly
Education, Youth and Science Committee
Ministry of Education, Youth and Science
Ministry of Economy, Energy and Tourism
Ministry of Transport, Information Technology and Communications
Ministry of Agriculture and Food
Ministry of Health
Ministry of Interior
Ministry of Culture
National Research Council
National Innovation Council
Information Technology and Communications Consultative Council
Agriculture Academy
National Plant Protection Service
National Public Health Protection Centres
Diagnosis and treatment centres at the higher medical schools
Research and Applied research institutes
Cyril and Methodius National Library
National History Museum, National Technical Museum
National Fund for Scientific Research
Bulgarian Academy of Science
State-owned universities
Small and Medium-Sized Enterprises Promotion Executive Agency

## ANNEX 2: National goals of EU Member States as regards Europe 2020 strategic goal for R&D investment of 3 % of the GDP by 2020

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| Austria | 0.78 | 1.89 | **National goal by 2020: 3.76 % of GDP**<br><br>Key measures:<br>- innovative potential building at companies<br>- research strengthening<br>- information society |
| Belgium | 0.57 | 1.35 | **National goal by 2020: 2.6-3 % of the GDP**<br><br>Key measures:<br><br>- development of non-technological innovation and social dimension of innovation<br>- public support and elimination of obstacles for innovation funding;<br>- restructuring of the industrial sector on the basis of competitiveness/ innovation/ infrastructure<br>- definition of 5 priority areas for science and R&D: sustainable development, long and quality life, health, renewable energy, technologies.<br>- establishment of an excellence centre for sustainable development and funding of *green* research<br>- development of applied doctoral studies and financial support for small innovative businesses |
| Bulgaria | 0.33 | 0.16 | **National goal by 2020: 1.5 % of GDP**<br><br>Measures:<br>- Introduction of research and development (R&D) priorities<br>- Use of Structural Funds for research infrastructure development<br>- HR development in research, including doctoral, post-doctoral students and young researchers;<br>- Active involvement in framework programmes and new initiatives of the European Commission |
| Cyprus | 0.32 | 0.15 | **National goal by 2020: 0.50 % of GDP**<br>Measures:<br><br>- scientific potential strengthening |

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| | | | - prioritization in science<br>- introduction of innovation in the public sector |
| Czech Republic | 0.55 | 0.91 | **National goal by 2020: 2.7 % of GDP**<br><br><u>Measures:</u><br><br>- introduction of direct and indirect incentives for the private sector to invest in science and R&D (voucher scheme for SME in work public scientific organizations, deduction of tax upon the purchase of goods and services related to scientific and R&D activity by universities and scientific organizations);<br>- provision of investment in science and R&D by public funds in the amount of 1 % of the GDP and supporting investments via Structural Funds within this and the future programming period;<br>- promotion of coordination of policies within the knowledge triangle and at various levels – national, European and global. |
| Germany | 0.79 | 1.84 | **National goal by 2020: 3 % of GDP, including 2 % from the private sector and 1 % from the public spending** |
| Denmark | 0.80 | 1.92 | - |
| Estonia | 0.71 | 0.59 | - |
| Greece | 0.42 | 0.16 | **National goal by 2020: 2 % of GDP**<br><br><u>Measures:</u><br><br>- new institutional framework for science, technological development and innovation |

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| Spain | 0.61 | 0.74 | **National goal by 2020: 3 % of GDP, including 2 % private investments and 1 % in public spending**<br><br>Measures:<br>- improvement of the interaction between universities and the industry<br>- considerable increase of the science and R&D budget with an emphasis of new scientific programmes, cooperation between the academic community and business and establishment of a network of unique research infrastructure<br>- programmes in support of recruitment of scientists<br>- reduction of the obstacles for the opportunities for operation and transfer to the industry<br>- improvement of financing and market opportunities for companies of innovative potential |
| Finland | 0.94 | 2.78 | **National goal by 2020: 4 % of GDP**<br>Measures:<br><br>- improvement of the effectiveness of scientific, R&D and innovation polities, including in the public sector<br>- development of incentives for science, development and innovation<br>- orientation of education and science to the needs of society and business<br>- enhancement of competitiveness and in particular in the services sector |
| France | 0.72 | 1.3 | **National goal by 2020: 3 % of GDP (IG4 and B5)**<br><br>Measures:<br><br>- improvement of the effectiveness of public spending<br>- Investment in Future initiative for the science and R&D programme, including infrastructure, thematic areas for excellence competencies, for example equipment, health and biotechnologies and energy, including nuclear<br>- tax credits from investment in science and R&D activities in the private sector<br>- |
| Hungary | 0.46 | 0.53 | **National goal by 2020: 1.8 % of GDP**<br>Measures:<br><br>- renewal and implementation of the national strategy for science, technological development and innovation<br>- restructuring of institutions in science and innovation |

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| Ireland | 0.49 | 0.93 | - |
| Italy | 0.54 | 0.64 | - |
| Latvia | 0.46 | 0.15 | - |
| Luxembourg | 0.30 | 1.32 | **National goal by 2020: 2.6 % of GDP**<br>Measures:<br><br>- strategic partnership initiative with US institutes in thematic areas<br>- establishment of a Science City at the university of Luxembourg, including scientific institutes, an incubator and scientific laboratories (2015) |
| Lithuania | 0.61 | 0.19 | **National goal by 2020: 1.5 % of GDP**<br>Measures:<br>- consolidation of state scientific institutions and strengthening of their infrastructure and human resources;<br>- marketing of scientific outputs via the support of the cooperation between the academic and private sectors |
| Malta | 0.19 | 0.35 | **National goal by 2020: 0.67 % of GDP**<br><br>Measures:<br>- national scientific and innovation strategy 2011-2010<br>- scientific programmes and their application for marketing purposes<br>- a scheme for doctoral and post-doctoral students |
| The Netherlands | 0.73 | 0.89 | **National goal by 2020: 3 % of GDP**<br>Measures:<br>- innovation fund in support of the relations between science, applied research and innovation<br>- development of top economic areas in sectors such as water, food, high-tech, life sciences, energy, etc |

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| | | | - decentralization of regional policy<br>- improvement of the effectiveness of the educational and research infrastructure via reduction of the fragmentation and partnership development |
| Poland | 0.42 | 0.19 | **National goal by 2020: 1.7 % of GDP** |
| Portugal | 0.62 | 0.89 | **National goal by 2020: 2.7-3.3 % of GDP, including 1-1.2% of public spending and 1.7-2.1 % of private investment**<br><br><u>Measures:</u><br>Attraction of more EU funds, improvement of the cooperation between business and universities<br>- international cooperation and development of the participation in various international initiatives<br>- implementation of 2015 digital plan |
| Romania | 0.41 | 0.18 | **National goal by 2020: 2 % of GDP**<br><u>Measures:</u><br>- qualitative and quantitative improvement in human resources;<br>- incentives for increase of private investment in science and R&D<br>- participation in European programmes, new initiatives and infrastructures of the European research area |
| Sweden | 0.97 | 2.78 | **National goal by 2020: 4 % of GDP**<br><u>Measures:</u><br>New Science and Innovation Act and National Innovation Strategy |
| Slovenia | 0.59 | 1.07 | **National goal by 2020: 3 % of GDP** |

| STATE | PUBLIC EXPENDITURE ON R&D, 2008 (% of GDP) | PRIVATE INVESTMENTS IN SCIENCE, 2008 (% of GDP) | EUROPE 2020 GOAL: 3 % OF THE EUROPEAN GDP TO BE INVESTED IN SCIENCE AND INNOVATION |
|---|---|---|---|
| Slovakia | 0.27 | 0.20 | **National goal by 2020: 0.9-1.1 % of GDP** |
| The UK | 0.63 | 1.25 | **-** |

**ANNEX 3**

**SWOT and PEST ANALYSES OF SCIENTIFIC AND INNOVATION SYSTEM**

## *1 SWOT ANALYSIS*[27]

***2***

| **Strengths** | **Opportunities** |
|---|---|
| Good tradition in natural sciences<br>Good science schools<br>Cultural diversity and specific national identity<br>Orientation towards internationalization and collaborationism<br>Positive public attitude to science<br>Intense publication activity in various areas | New financing system<br>Introduction of priorities in science<br>Concentration of resources<br>Increase of the inflow of doctoral students<br>Enhanced inter-sectoral mobility<br>Independent international assessment<br>Involvement in international research networks and infrastructure complexes |
| **Weaknesses** | **Threats** |
| Lack of coordinated policy of science and innovation-related activities<br>Lack of state-of-the-art research infrastructure<br>Fragmented institutional environment<br>Small share of funding on a competition basis, and small total percentage of funding<br>Unfavourable age profile<br>Passive position of business | Slowing activities of the science system, negative public attitude to the image of the scientist<br>Slack market of scientific products and small absorption capacity<br>Declining innovation capacity<br>Loss of intellectual potential<br>Lack of inflow of young people in the system |

[27] Analysis of the condition of research in Bulgaria, MEYS

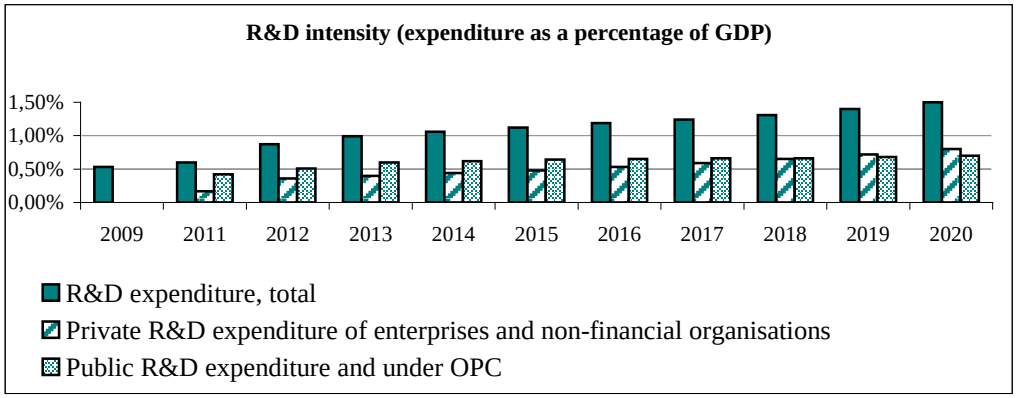
## 2. **PEST ANALYSIS**

| Political factors | Economic factors | Social factors | Technological factors |
|---|---|---|---|
| • Change in the state aid rules;<br>• Simplification of procedures for project funding;<br>• Enforcement of the Investment Promotion Act;<br>• Innovation Act;<br>• Taxation policies, including introduction of special regimes for research infrastructure and scientific activity at companies;<br>• Environmental standards and environmental protection;<br>• Regional dimension and necessity of establishment of *regions of knowledge;*<br>• Development of transport infrastructure;<br>• Dependence of import on energy resources;<br>• Modernisation of career advancement system under the Academic Staff Development Act | • GDP growth<br>• Rise in inflation rate<br>• Monetary policy (interest rates)<br>• Growth of FDI in innovative sectors of economy<br>• Specialisation of the economy in sectors dependent on innovation and knowledge<br>• Policy in the field of unemployment/ employment of young university graduates;<br>• Strengthening export potential of medium and high-tech products | • Change in methods of researchers' labour remuneration<br>• Number of graduates with engineering and technology majors<br>• Number of graduates with mathematics major;<br>• Steep decrease in the number of scientists as a result of retirement;<br>• Mobility of scientists;<br>• Emigration of the young generation;<br>• Ageing of the population and decrease of students (resultant from the 1996-1997 demographic crisis);<br>• Increase in the illiteracy rate among students;<br>• Employment in high-tech sectors;<br>• "Healthy ageing" (early diagnosis of socially significant diseases) | • Public spending on research;<br>• Speed of the transfer of technologies;<br>• ICT development;<br>• Definition of a small number of national technological priorities;<br>• Introduction of e-government;<br>• Climate change;<br>• Green technologies and green innovation;<br>• Clean and low-emission energy;<br>• Use of modern highly effective and low-emission technologies with CO2 capture and storage |

## ANNEX 4

R&D expenditure in Bulgaria amounted to 0.53 % of the GDP in 2009, including 0.37 % of GDP in public spending and 0.16 % of GDP in private investments (compared to barely 0.1 % of GDP in 2005). In 2010, 0.7% of all budget spending was allocated for science (of which 2.6% for capital expenditure, including research infrastructure). In 2011, 0.8% of total budget spending is projected will be channeled into science, of which 2.8 % will represent capital expenditure.

### Upward trend in R&D funding




*OPT - Operational Programme Transport

**ANNEX 5**

| SOURCE DOCUMENT | PRIORITIES DEFINED |
|---|---|
| 1. Bulgaria's economic strategy | • ICT<br>• Health-related technologies<br>• Environmental and energy-saving technologies |
| 2. 2020 Strategy | • **Innovation Union initiative:**<br>o Key technologies<br>o Energy safety<br>o Transport<br>o Climate change and resource efficiency<br>o Healthy ageing<br>o Environmental production methods<br>• **Digital Europe initiative:**<br>o ICT and ICT infrastructure<br>o E-government<br>o Online health<br>o Smarthomes<br>o Digital skills<br>o Security |
| 3. EU priorities for key markets | • E-health<br>• Sustainable construction<br>• Protective textile<br>• Organic-based products<br>• Waste<br>• Renewable energy |
| 4. 7FP priorities where Bulgaria performs well (funding obtained for 2007-2010 in the amount of over EUR 2 million) | • Health<br>• ICT<br>• Environment |
| 5. Areas of strong FDI levels | • Chemical products<br>• Metal production<br>• Industry and energy<br>• Telecommunications |
| 6. Prospective sectors of the Bulgarian economy based on analysis worked out by the Ministry of Finance and a work group therein, 2010, incorporated in the analysis of scientific activity in the Republic of Bulgaria | • energy, electricity, energy generation, gas;<br>• healthcare, medicine and biotechnology development<br>telecommunications, information technology and information services |
| 7. Areas of high publication activity (according to the analytical part of the Strategy) | • Chemistry<br>• Physics<br>• Medicine |

**MONITORING INDICATORS FOR ACHIEVEMENT OF THE OBJECTIVES AND IMPLEMENTATION OF THE TASKS AND MEASURES OF THE NATIONAL RESEARCH DEVELOPMENT STRATEGY**

**2020**

## I. Main indicators

| Indicator | Description | Valuation method | Initial value | Target value -2020 |
|---|---|---|---|---|
| R&D expenditure as a percentage of GDP | Eurostat data<br>http://epp.eurostat.ec.europa.eu/tgm/web/table/description.jsp | Council of Ministers Decision passed regarding the National Reforms Programme in accordance with the objectives of Europe 2020 Strategy | 0,53 % | 1,5 % |
| Public R&D expenditure as a percentage of GDP[28] | Public R&D expenditure is the amount of R&D expenditure covered by the governmental sector and the higher education sector | European Commission estimates pursuant to Note RTD.C3/PV/PBD (2010) 521583 to the members of the Science and Technology Committee and of the Research Working Group | 0,35 % | 0,7 % |
| Private R&D expenditure as a percentage of GDP | Private R&D expenditure is the amount of R&D expenditure covered by the business sector and the private non-profit sector | MEET estimates and projections | 0,17 % | 0,8 % |
| Percentage for R&D of Structural Funds | Percentage of funds, separation of codes 01 and 02 according to the single classification of activities | Interim review of programmes, initial values | 1% | 15% |

[28] In case of sustainable economic development, the target value can be increased to achieve the European goal of 1 % of public R&D expenditure.

## II. Monitoring indicators

| Indicator | Description | Valuation Method | Initial value | Target value - 2020 |
|---|---|---|---|---|
| Percentage of public resources for science allocated for priority scientific areas | Expenditure on institutional programmes and scientific projects allocated for developments in one of the identified priority areas | Assumptions are based on the estimated number of projects to be financed (The base year is the year of Strategy adoption because so far no national priority areas have been defined) | 0 (For the 2006 – 2009 period through targeted programmes this percentage is about 10% of public expenditure) | 60 % |
| Number of modern research infrastructures constructed per priority scientific areas | Number of projects under the National Roadmap for Research Infrastructures (NRMRI) falling under the priority areas which obtain funding for facilities | Assumptions are based on the idea that by 2013 some of the measures of OP Competitiveness may be restructured and after 2013 there will be specialised priority axes under this OP | 0 | 5 |
| Number of participations in the European Roadmap for Research Infrastructures | Number of projects, in which Bulgaria participates as an official partner and pays a membership fee | Based on the update of the NRMRI | 6 | 10 |
| Number of institutional programmes under the priority areas | Financing of research activity of scientific organisations based on a long-term research programme | Assumptions are based on the fact that a system for evaluation of the national research activity will be introduced | 0 | 3 |
| Number of joint research centres | Establishment of joint research centres with modern equipment for interdisciplinary research and developments based on project funding. | Assumptions are based on the fact that after 2013 within the new programming period there will be a specialised scheme under the OP Competitiveness supported via various programmes under the national R&D | 0 | 2 |

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| | | funds. | | |
| Number of national research networks established | Number of informal groups working under a joint research programme and sharing research equipment and expertise (able to collaborate for a certain period of time under a national research infrastructure or joint research centre) and exchanging knowledge, scientists and experience. | Based on annual scientific reports by the scientific organisations | 25 | 115 |
| Number of consortia involved in European research programmes, initiatives and networks | Number of groupings of Bulgarian scientific organisations involved in projects financed under European research instruments | European Commission databases and data from scientific organisations | As of 2010<br>320 | Until 2013<br>550<br>For the 2013-2020 period<br>750 |
| Number of electronic databases with access for scientists | Number of licences of the Ministry of Education, Youth and Science (MEYS) for access to electronic databases | MEYS data | 3 | 5 |
| Number of projects for collaboration between science and business | Number of joint R&D projects commissioned by the business | OP Competitiveness data and assumptions about the subsequent programming period | 30 | As of 2013<br>110<br>For the 2013-2020 period<br>250 |
| Number of persons with a doctoral academic degree | Number of doctoral graduates | NSI | 580 | 1150 |
| Share of natural and engineering graduates on an annual basis | Percentage of natural and engineering graduates | NSI | 21% or 62 838 | 31 % or<br>90 000 if assuming that total number of students will remain at 300 000 until 2020 |
| Number of patents and industrial designs defended registered at the European Patent Office | Number of certificates issued | European Patent Office, EUROSTAT | 9 | 30 |

## TASKS AND MEASURES OF THE NATIONAL RESEARCH DEVELOPMENT STRATEGY

| Task | Measures | Description | Outcome from task fulfillment |
|---|---|---|---|
| **To increase the intensity, performance and efficiency of R&D activity for the benefit of economy and society** | 1. Introduction of a financing model promoting competition and development of results to be applied in society and economy and increase of the funds for research and innovation. | The ratio between institutional financing and competition-based and programme-based financing will be improved. Introduction of long-term contracts with universities and scientific organisations for effective allocation of public funds.<br>Gradual increase of R&D investment is provided for coupled with the use of existing resources -national funds, European programmes and Cohesion instruments. | Concentration of resources and scientific potential;<br><br>Interdisciplinary programme opportunities;<br><br>Efficient use of national and European funds; |
| | 2. Prioritisation of research | Definition of 5 national priorities, in which at least 70% of R&D financing will be concentrated. Specialised thematic programmes will be supported in these areas; critical mass of intellectual potential and infrastructure will be concentrated, strong scientific directions will be formed, which will be the basis for development of modern trend schools; | Definition of priority areas, which will be reference points for the business regarding the scientific competences and potential;<br><br>Restoring the prestige of the scientist's profession |
| | 3. Development of the scientific potential through creation of attractive conditions for scientific career, professional growth, qualification and specialisation of scientists | Addressing the brain-drain issue and the small number of young people interested in and having qualities for a scientific career. A set of actions is needed to cover various policies within the competences of MEYS, MEET and Ministry of Labour and Social Policy. An integrated approach must be applied - starting with promotion and extension of mathematics and scientific knowledge as early as the school age; encouragement and creation of conditions for doctoral studies and easy access to professional growth.<br>It is also important to ensure opportunities for qualification | Establishment of Bulgaria as a desired partner under the European programmes for the Western Balkans, Danube Region and Black Sea countries; |

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| | 4. Integration of the Bulgarian science into the European research and university area<br><br>5. Development of sectoral scientific programmes | and development of competences of well-established scientists and support for their participation in European and international forums.<br><br>The EU membership has offered new opportunities and commitments to Bulgaria. The interrelation of national programmes between various Member States is a priority for the European Commission. This will channel resources, scientists, research infrastructure and will ensure higher added value of outputs. Bulgaria has to operate and introduce new schemes to support and expand the opportunities for Bulgarian scientists to attend and take part in various scientific initiatives of the Community.<br><br>This will guarantee complementarity of resources and will ensure the necessary scientific knowledge for solving major social and economic issues. | Participation in at least two joint programmes/ initiatives and extension of the country's presence in the projects such as ERA-NET for coordination of national programmes in priority areas set out in the Strategy. |
| **Establishment of a sustainable education-science-business relation as a basis for development of knowledge-based economy** | 1. Promotion of private sector involvement in scientific activity<br><br>2. Strengthening the integration between the elements of the knowledge triangle | Scientific activity outputs have an impact on the academic circles, society and business. They facilitate the maintenance of high level of research, development of new promising areas, improvement of the quality of life of citizens; they are present in each segment of state governance and of course are crucial for the economy and competitiveness development. For the purpose of generation of new scientific knowledge, mechanisms should be created for its profitability and marketing opportunities. This requires also better integration between the institutions creating and offering scientific knowledge and those that demand it. In addition, an emerging trend shows that the economy should be based on novelties and innovation as a result of their demand and necessity. | Increase in the business investment in R&D;<br><br>Increase in expenditure on science in the higher education sector;<br><br>Opportunities for establishment of start-ups, including the availability of innovation mediators supporting innovative ideas and their implementation; |

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| | | | Increase in the SME capacity for technological development |
| **Establishment of favourable environment for scientific activity** | 1. Introduction of scientific activity evaluation<br><br>2. Development of research infrastructure | Evaluation is an integral part of the process of provision and increase of investment in a certain field. Research does not make an exception from this rule. Evaluation of the results from introduction of new policies and measures is the basis for the effective and efficient implementation of this Strategy.<br>The expert evaluation of the results and of operators in the scientific system will provide the grounds for concentration of more resources or the withdrawal of the state support from non-promising areas.<br>Criteria and evaluation system will be designed with the main issue being the availability of international benchmarking and competences;<br><br>It is necessary to create an environment for carrying out quality research. This cannot happen without the construction of modern infrastructure, i.e. cutting-edge installations, access to electronic databases and networks, availability of standard laboratory premises and an opportunity for carrying out competitive research and for provision of unique and/or new services, technology transfer, etc.<br>As such facilities are very expensive and a single state cannot afford them, even a strong economy such as Germany, for example, Bulgaria has adopted the approach of establishing regional partnership structures to be linked to | International evaluation of scientific activity at higher education institutions;<br><br>Regular review of research activity outputs;<br><br>Implementation of the projects of the National Roadmap and international evaluation of efficiency;<br><br>Access to European infrastructures through direct participation in European consortia and through targeted programmes supporting Bulgarian teams in carrying out mid-term research at unique European complexes;<br><br>Establishment of a research activity prizes; |

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| | 3. Strengthening the social dimensions of science | the large-scale European infrastructures. Hence, the country will not be isolated and the actions will be commensurate with the capabilities of the national economy - the development of the national infrastructure and the participation in European consortia relates to the Strategy priorities, to the solid scientific competences of our country and to the geographic location, e.g. a Black Sea region state, or the so-called Danube region<br><br>The society-related role of science is often neglected in Bulgaria. In practice only over the past 3 or 4 years, the need of to *advertise* science and its capabilities came to the fore. This is a product that has no value and its benefits cannot be measured and presented in a quantitative manner. Meanwhile, a large part of the general public underestimates it as it regards it as an area of the elite, intelligible and accessible to few people.<br>Communication of science and its achievements is subject to fast development as a profession in Europe. For the time being Bulgaria lags behind in terms of activities and opportunities. | Awareness raising as to research results and achievements;<br><br>Initiatives for drawing the interest of young people toward science, exact and natural sciences, in particular;<br><br>Greater publicity of results |

## ACTION PLAN FOR IMPLEMENTATION OF THE NATIONAL RESEARCH STRATEGY 2011-2013

The action plan constitutes the framework for particular actions, programmes and initiatives to be implemented by the government by 2013 with regard to the application of the National Research Strategy.

The action plan takes into account the European programming periods and in 2013 it will be subject to closure report and another action plan covering the medium-term period until 2020 will be drafted together with short-term implementation programmes.

The action plan covers policies, priorities and programmes of Ministries and institutions central for the scientific and innovation system.

The action plan takes into account and complies with Council of Ministers Decision No 558 of 29 July 2010 concerning the approval of major assumptions in the budgetary forecast for the 2011-2013 period, acceptance of the ceiling expenditure of first-level spending units, except for municipalities, for the 2011-2013 period and approval of the update of the State Debt Management Strategy.

The action plan takes into account also the possible application of **§ 39 of the Transitional and Final Provisions of the State Budget Act for 2011.**

The action plan puts forward a combination of measures and actions supported by various national funds, European programmes, Cohesion instruments and special support schemes from third countries.

The action plan includes also implementation indicators to be reported by 31 March 2014 at the Council of Ministers and in case of implementation of national scientific programmes – at the National Assembly as well.

| Measure laid down in the National Research Strategy | Implementation Programme/ Instrument | Leading institution | Funds | Implementation indicator |
|---|---|---|---|---|
| Introduction of a financing model promoting competition and development of outputs to be applied in society and economy and increase of the funds for research and innovation. | Operational programme of National Fund for Scientific Research | MEYS, Research Fund | 2011-2013 – BGN 80 million | Number of support schemes developed for research projects<br>Number of long-term programmes supported by the National Fund for Scientific Research schemes |
| | CERN membership fee and participation in CERN experiments | MEYS | 2011-2013 – BGN 18 million | Number of scientists working for CERN<br>Number of scientists receiving training/ internship/ qualifications at CERN<br>Number of experiments in which Bulgarian institutions are involved<br>Number of companies carrying out CERN public procurement<br>Number of young researchers approved for CERN grants<br>Number of joint publications relating to CERN experiments |
| | Research Fund for Coal and Steel membership fee | MEYS | 2011-2012 – BGN 14 million | Number of submitted projects with Bulgarian participation<br>Number of funded projects with Bulgarian participation |
| | Licences of international databases with referenced | MEYS | 2011-2013 – BGN 25 million | Number of licences<br>Number of publications with Bulgarian |

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| | publications | | | participation per year<br>Improvement of the use of electronic databases |
| Prioritisation of research | Support for thematic scientific programmes in priority areas | National Fund for Scientific Research at the MEYS | Until 2013- BGN 12 million | Number of projects financed in the priority areas<br>Number of partnerships between academic institutions and scientific organisations and the business |
| | Ordinance No 9 of 2003 concerning the procedure for planning, allocation and spending of funds, granted in a targeted way from the state budget for scientific and creative activity intrinsic for higher education institutions | MEYS | Until 2013- BGN 16 million | Based on reporting indicators laid down in Ordinance 9<br>Number of university projects financed in priority areas of the National Research Strategy |
| | Bulgarian-Swiss programme, thematic research fund | MEYS, Science Directorate | 2013-2013 – BGN 3.5 million | Number of funded projects<br>Number of funded projects in line with national scientific priorities |
| Development of the scientific potential through creation of attractive conditions for scientific career, professional growth, qualification and specialisation of scientists | Support scheme for doctoral and port-doctoral programmes at scientific organisations and universities | MEYS, Structural Funds and International Educational Programmes Directorate | Until 2013- BGN 8 million | Number of supported projects<br>Number of doctoral and post-doctoral students at training programmes and schools |

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| | | General | | |
| | Science and Business scheme, support of the studies of young people at scientific complexes abroad | MEYS, Science Directorate | Until 2013 – BGN 1.8 million | Number of young researchers receiving support for their studies at high-tech complexes abroad |
| | Bulgarian-Swiss programme, Grants Fund | MEYS, Science Directorate | Until 2013 – BGN 2.8 million | Number of supported projects<br>Number of joint publications |
| | Preparation, signing and implementation of new bilateral scientific and technical cooperation agreement with Austria, Albania, Bosnia and Herzegovina, Moldova, Italy, Turkey | MEYS, Science Directorate and National Fund for Scientific Research | 2011-2013 – BGN 1.5 million | Number of funded joint projects with partner countries |
| Integration of the Bulgarian science into the European research area | Co-funding of projects supported by the Seventh Framework Programme and the COST Programme for cooperation in science and technology | MEYS, Science Directorate and National Fund for Scientific Research | Until 2013- BGN 3 million | Number of projects co-financed under EU programmes<br>Number of projects co-financed in priority scientific areas<br>Number of young researchers involved in supported projects and representing Bulgaria |
| | Schemes for preparation of projects for application under the European Framework Programmes | MEYS, Science Directorate and National Fund for Scientific Research | Until 2013- BGN 0.1 million | Number of supported projects for preparation and application under the European Framework Programmes<br>Number of supported projects above the |

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| | | | | pass level of approval by the European Commission<br>Number of successful projects within the Framework Programmes and other Community initiatives |
| Promotion of private sector involvement in scientific activity | Procedures launched for *Development of Innovation by Start-up Companies,*<br>*Development of Start-Up Innovative Companies via Support for Deployment of Innovative Products, Processes and Services,*<br>*Support for Deployment in Production of Innovative Products, Processes and Provision of Innovative Services, Support for Establishment of Technological Parks, Establishment of New and Strengthening of Existing Offices for Technological Transfer*<br>*Establishment of New and Strengthening of Existing Technological Centres* | MEET | Until 2013 BGN 159 million | In line with the Project Selection Criteria (www.eufunds.bg ) |
| | The following procedures | MEET | Until 2013 – BGN | In line with the Project Selection Criteria |

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| | will be launched:<br>*Support for Research and Development Activity of Bulgarian Companies, Establishment of Technological Parks, Applied Research Development at Research Organisations in Bulgaria, Innovation Network - BG* | | 176 million | (www.eufunds.bg ) |
| Strengthening the integration between the elements of the knowledge triangle | Science and Business scheme, support of the studies of young people at scientific complexes abroad | MEYS, Science Directorate | Until 2013- BGN 1 million | Establishment of a national interactive platform for the interaction of education, science and business.<br>Number of thematic schools for interaction between science and business<br>Number of joint concept projects of the academic community and industry |
| Development of scientific infrastructure | Feasibility studies scheme for implementation of national complexes under the National Roadmap for Research Infrastructures | MEYS, Science Directorate | Until 2013- BGN 1.4 million | Number of feasibility studies<br>National databases and a platform for presentation of national complexes<br>Number of foreign experts involved in the management and monitoring of national complexes |
| | Involvement in European infrastructures | MEYS, Science Directorate | Until 2013- BGN 0.5 million | Number of European infrastructures which Bulgaria has signed memorandums of understanding for<br>Number of joint projects of national academic institutions with European |

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| | | | | infrastructure organisations |
| | Launch of a scheme under OP Development the Competitiveness of the Bulgarian Economy, Priority Axis 1, intervention area, 1.2.2. Support for Renovation of Equipment for Application Purposes | MEET with the support of MEYS experts | Until 2013- BGN 20 million | Number of successful projects in areas identified in the National Roadmap for Research Infrastructures<br>Funds earmarked for the purchase of new research equipment<br>Number of partnerships implemented in partnership with the business |
| Introduction of scientific activity evaluation | Organisation of independent external evaluation of scientific activity of state-run higher education institutions | MEYS | Until 2013- BGN 0.5 million | Number of universities which passed international evaluation<br>Number of performance indicators applied |
| | Issue of the MEYS Ordinance concerning the organisation of evaluation of scientific activity of organisations funding and conducting research | MEYS | Until 2013- BGN 0.1 million | Number of evaluations carried out<br>Number of rules of procedure for evaluation organisations funding and conducting research |
| Strengthening the social dimensions of science | Science and Business scheme, publication activity to be accepted for print in high-impact journals | MEYS, Science Directorate | Until 2013- BGN 0.87 million | Number of supported publications<br>Number of publications in priority scientific areas |
| | Organisation of Pythagoras scientific | MEYS, Science Directorate | Until 2013- BGN 0.25 million | Number of categories of awards |

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| | awards | | | Number of applying scientists |
| | Organisation of a national contest for young talents | MEYS, Science Directorate | Until 2013- BGN 0.2 million | Number of children taking part in the national contest<br>Number of applicants in natural, engineering sciences and mathematics |

## TERMINOLOGY USED

**RESEARCH AND DEVELOPMENT**
**(**FRASCATI MANUAL 2002 – ISBN 92-64-19903-9 –OECD 2002)

Research and experimental development cover a creative activity carried out systematically to enhance the quantity of knowledge, including knowledge on man, culture and society and the use of this corpus of knowledge to create new applications. The terms *research* and *development* cover three activities: basic research, applied research and experimental development.

1. **Basic research –** experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts without any particular application or use in view.
2. **Applied research** – original investigation undertaken to acquire new knowledge. This knowledge is of practical goal and of particular application.
3. **Experimental development --** systematic work, drawing on existing knowledge gained from research and/or practical experience, that is directed to producing new materials, products or devices; to installing new processes, systems and services; or to improving substantially those already produced or installed.

**HUMAN RESOURCES IN SCIENCE AND TECHNOLOGY (**CANBERRA MANUAL, **OECD and ECSC-EC-EAEC, 1995)**
People having with third-level education in science and technology or employed in science and technology but without the necessary qualification

**INNOVATION (**OSLO MANUAL , OECD/EUROPEAN COMMUNITIES 2005)

New or significantly improved processes, products or services, developed new technology and new scientific outputs achieved on the basis of newly created and/or adapted existing knowledge and know-how.

**RESEARCH INFRASTRUCTURE** (European Roadmap for research infrastructures, 2008 http://ec.europa.eu/research/infrastructures/pdf/esfri_report_20090123.pdf)

Research infrastructure is facilities, resources or services that have been identified by research communities to conduct top-level activities in various fields and consisting of large-scale scientific equipment or associated instruments, science-based resources such as collections, archives or structures for scientific information, infrastructures based on information and communication technologies such as GRID networks, computers, software and communications or nay other structures which are unique and can contribute to achieving top-level research. These infrastructures can be located at the same site (for example nuclear reactors, synchrotrons) or dispersed (an organisational and connected network of resources).

**INNOVATION CLUSTERS** (Community framework for state aid for research, development and innovation, **Official Journal C 323/1 of 30.12.2006)**

Groups of independent companies – innovative start-ups, small and medium-sized and large companies as well as scientific organizations, thematically and geographically related and set up to carry out innovative by active cooperation, resource-sharing and exchange of knowledge and know-how, effectively contributing to the transfer of technology, networking and dissemination of information between the component companies.

**SCIENCE SHOPS** (SCIPAS project funded by the European Commission)
Entities, normally units of universities, scientific institutes or non-governmental organizations providing independent scientific support in response to needs, problems and issues of civil society.
Science shops: provide society with necessary knowledge and skills through research and training, support and promote public access to science and technology, create partnerships with civil society organisations, facilitate the interaction with politicians and educational and scientific organisations, support the active involvement of students and young people in the work for promotion of science and technology.

## TABLE OF COMPLIANCE WITH KEY EUROPEAN REGULATORY DOCUMETNS IN SCIENCE AND TECHNOLOGY

| European document | Compliance with tasks/ measures laid down in the National Research Strategy | Need for amendment to or update of legislation |
|---|---|---|
| **COUNCIL DIRECTIVE** 2005/71/EC **of 12 October 2005 on a specific procedure for** | Task 1, Measure 3 Development of the scientific potential through creation of attractive conditions for scientific career, professional | Transposed in the Bulgarian legislation; the necessary procedures for admitting third-country scientists have been |

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| **admitting third-country nationals for the purposes of scientific research** | growth, qualification and specialisation of scientists | developed |
| Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC) | Task 1, Measure 4 Integration of the Bulgarian science into the European research and university area<br>Task 3, Measure 2 Development of research infrastructure | Direct effect |
| Regulation (EC) No 294/2008 of the European Parliament and of the Council of 11 March 2008 establishing the European Institute of Innovation and Technology | Task 2 Establishment of more effective interaction between the elements of the knowledge triangle | Direct effect |
| Communication from the European Commission on adoption of Europe 2020: A strategy for smart, sustainable and inclusive growth COM(2010) 2020 of 3 March 2010 | The goals set out in the National Science Strategy comply with the key recommendations in the EU stratgy<br>1. proposal for gradual increase in spending on science;<br>2. introduction of priorities harmonised with the priorities of the European strategy such as energy | No |

**LIST OF FIGURES AND TABLES IN THE DOCUMENT**

***Figure 15***
Exports from Bulgaria of medium- and high-tech products

***Figure 16***

Imports of medium- and high-tech products to Bulgaria

***Table 1***

Funds allocated to Bulgaria under the Fifth, Sixth and Seventh Framework Programmes for 1999-2010