Republic of Bulgaria

National strategy for development of scientific research in the Republic of Bulgaria 2017 – 2030

Better science for better Bulgaria

Contents

1. Preamble

The National strategy for the development of scientific research in the Republic of Bulgaria **determines the targets and the relevant measures and actions that are required by the state for the development of** the scientific research in the period 2017 – 2030. It is one of the required conditions for the achievement of the targets set in the Partnership agreement between the Republic of Bulgaria and the EC during the programming period 2014 – 2020 and in the Innovation strategy for smart specialization 2014 – 2020.

The present strategy goes outside the frames of the above mentioned documents, both in relation to the time-frame to which it is related and in relation to its purposes and the scope of the results for the country and the society which are foreseen to be achieved. The strategy has the ambitious purpose through quick, large-scale and long-term development of the scientific research system to transform Bulgaria into attractive center for advanced scientific research and new technologies` development, to keep young talents in Bulgaria, to strenghten the integration of the Bulgarian science in society, to increase the international reputation of the country in the science sector and as a finalresult, to achieve economic growth and significant improvement of the quality of life in the country. In that sense, a **beneficiary of the strategy is the Bulgarian society.**

The document presents a short analysis of the dynamics of the national system for scientific research during the recent years. The analysis takes into account a number of documents from national and international reviews, inspections and analyses as well as information from statistical sources and official data bases. The steady decline in the scientific development of the country is shown. The lack of consistent state policy (incl. funding) for support of the scientific research as well as the unsatisfactory performance of the previous National strategy for development of scientific research in the Republic of Bulgaria (2012-2020) and the commitments to EU are counted among the main reasons for that decline.

The vision set in the foundation of the present strategy represents the main targets set by the State for the development of the scientific research in Bulgaria. Specific policies as well as concrete measures and tools for their realization are defined based on these targets. Individual components of these policies are directly related and targeted to the support of the performance of the priorities of the Innovation strategy for smart specialization and the National higher education strategy as well as the performance of Operational program “Science and education for intelligent growth” and the European framework program. The innovations, although being organically connected to the scientific research and are logical continuation of some of them, are not reviewed in the current strategy, because they are subject of a separate document – the Innovation strategy for smart specialization.

The strategy implementation plan is organized, based on the specific targets, ensuring the achievement of the main target of the strategy, the relevant activities and the required concrete measures.

Three stages are provided for the strategy's implementation: recovery stage (2017 – 2022), accelerated development stage (2023 – 2026) and scientific research at world level (2027 – 2030). The time frame of the first stage is up to 2022. The implementation of the main mechanisms and activities for the recovery and modernization of the scientific research system in Bulgaria is foreseen for that period. Tangible results of the implementation of the strategy are expected towards the end of the stage. The second stage (4 years) foresees accelerated development of

the scientific research which should drive Bulgaria close to the average European level. The funding provided by OP "Science and education for intelligent growth" completes during that stage. Based on the successful implementation of the previous two stages, the third one – four years stage, would ensure stable and balanced development of the scientific research and their rising to world class.

This is the reason why the implementation of the strategy would result in the successful development of Bulgaria as a prosperous European country, although the main responsibilities of its realization lie within the hands of the Ministry of education and science and the scientific organizations and higher schools, its success must be a mission of all state authorities – from the National Assembly and the Council of Ministers to the Regional administrations and municipalities. Taking into consideration the absence of accountability and control of the implementation of the previous strategy as one of the main reasons for the unsatisfactory results of its implementation, the current document provides accounting mechanisms and update of the strategy as well as the establishment of International control council for its implementation, with clear functions and impact capabilities.

2. Analysis of the state of the scientific research activities in Bulgaria

2.1. Review of the implementation of the National strategy for the development of scientific research 2012-2020

The currentNational strategy for the development of scientific research 2012-2020 is adopted by a decision of the National assembly, dated 28.07.2011 (Published in SG, issue 62, dated 12.08.2011) and is updated by the government in October 2014. Its main strategic purpose is to support the science development in Bulgaria in order to turn it into a factor, contributing to the development of knowledge based economy, and innovation activities. A review of the strategy's implementation is performed by the Audit Office in July 2015. The results are summarized in audit report about the Implementation of the National strategy for the development of scientific research for the period from 01.08.2011 to 31.12.2014. A lot of problems with the strategy's implementation are noted. The general conclusion is: **"With the omissions and shortcomings in its operations, the structures within the system of the Ministry of education and science do not ensure the effective implementation of the National strategy for the development of scientific research and do not guarantee the achievement of the strategic target of turning the Bulgarian science to a factor for the development of** knowledge based **economy and the innovation activities."** [1] An indirect criticism towards the results from the implementation of the previous national strategy is contained in the report of the peer review as well. The severe consequences for the science in Bulgaria from the failure of the strategy and its inefficiency are also set out in the two documents and are apparent from the analyses presented below.

[1] Audit Office, Audit report No. 0700010614, Sofia, July, 2015.

Most of the obligations of Bulgaria, as a member state of the EU, in the research and development sector are not performed. They are mainly related to our participation in the establishment of the European research area, the provision of adequate support to the Bulgarian participants in the EU framework program for scientific research and innovations, intensification of the trans-border scientific programs and the absence of concrete measures for the attraction of researchers to work in Bulgaria.

2.2. Dynamics of the scientific results

Essentially, the science is international and its state/development must be followed based on internationally recognized indicators. According to the most authoritative database - Web of Science (WoS): during the last decades Bulgaria has been continuously and steadily losing positions in relation to the number of the internationally recognizable scientific publications (Fig. 1). From 35th position occupied by our country in 1990, it drops to 44th place in 2000, and as a EU member it reaches 51st position in 2007 and 59th position in 2016. The higher positions in the chart are occupied by a number of countries (Algeria, Tunis, Columbia, Nigeria and Vietnam), considered as the so called “third world” countries and countries that recently were subject to military conflicts. Similar is the trend in the chart of the number of citations, which is related to the quality of the scientific activities.

More careful analysis (Fig. 2) shows that during the last years the activity of publications of the country stays at the same level (about 3,500 documents per year in WoS and up to 2,500 referenced scientific works per year), which contrasts to the world tendencies for accelerated increase of the scientific production.

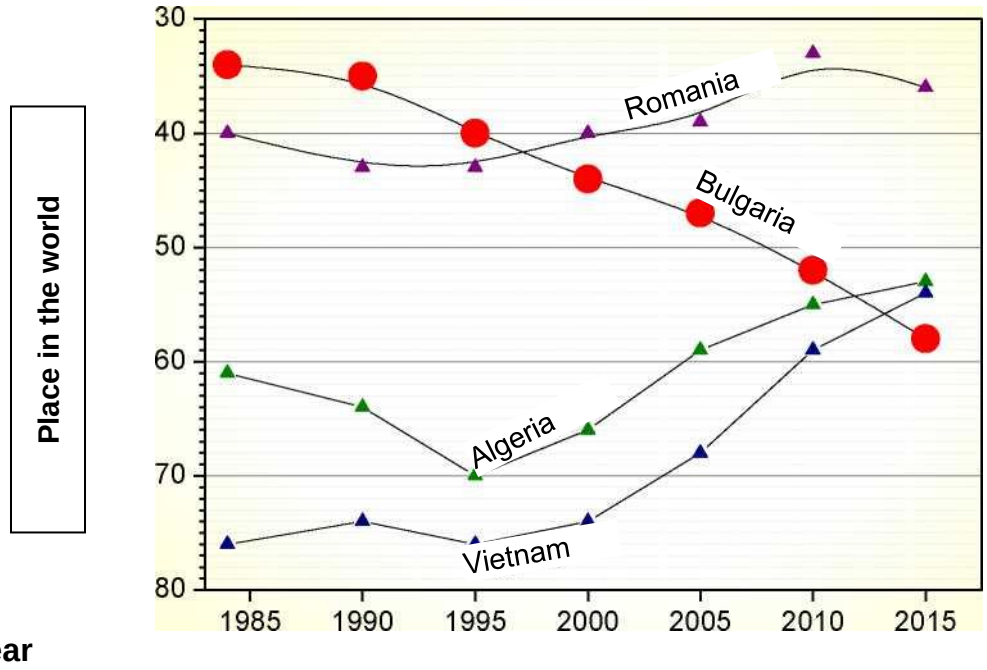


Figure 1: Place among the countries in the world as per number of scientific articles referenced in WoS during the years for Bulgaria and some other countries. Source: In Sites, Web of Science.

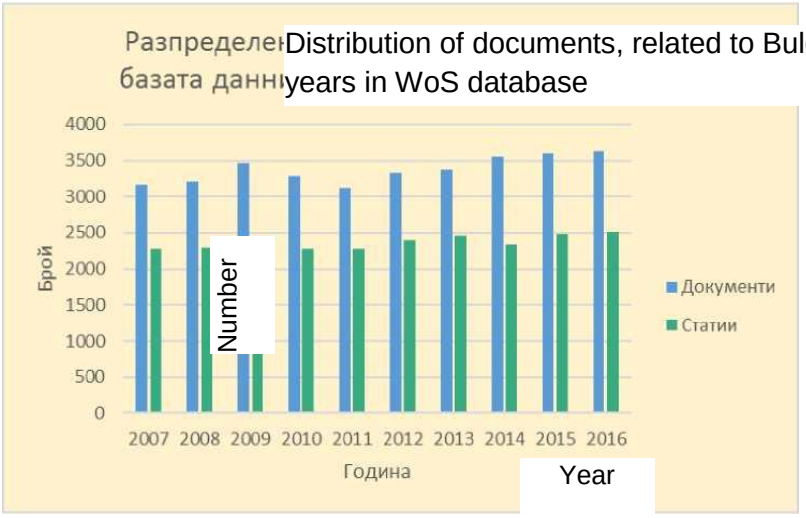


Figure 2: Distribution of documents, related to Bulgaria, per years in WoS database. Total number of documents (blue) and scientific articles, announcements and books (green).
Source: Web of Science

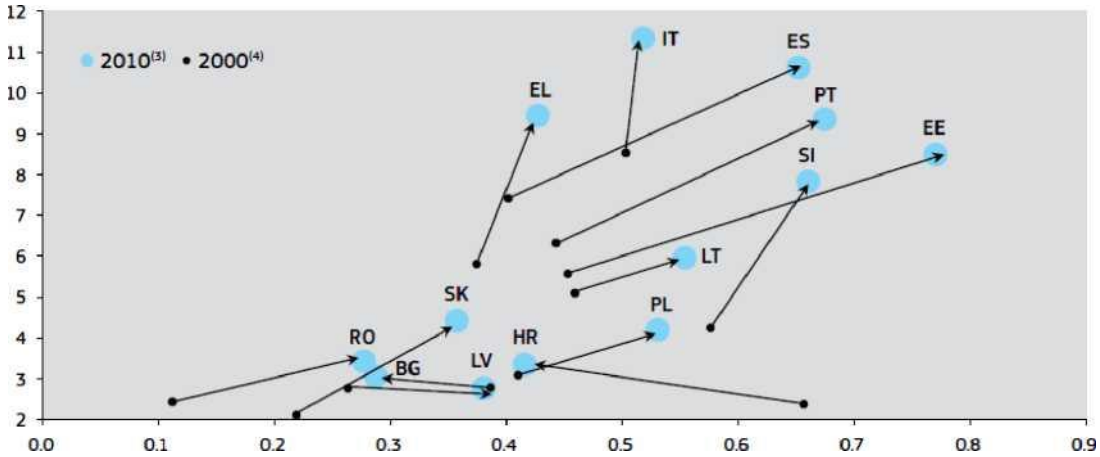
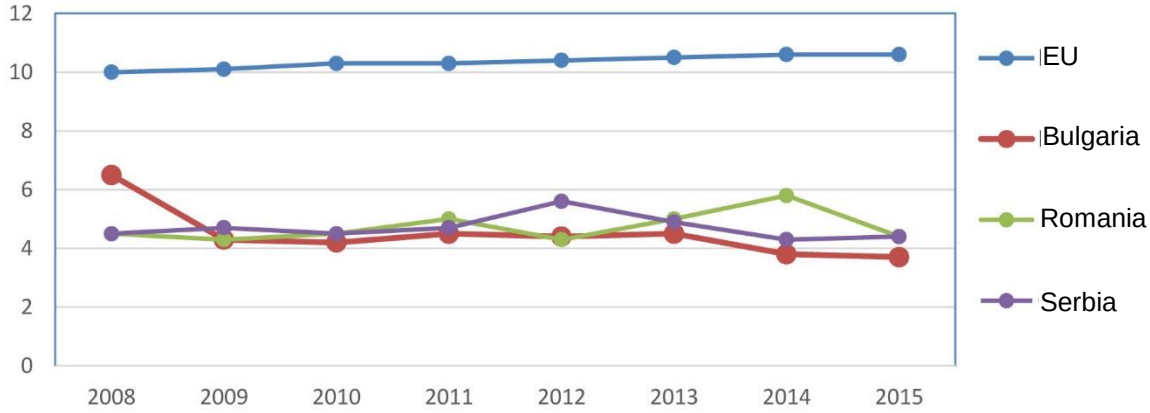


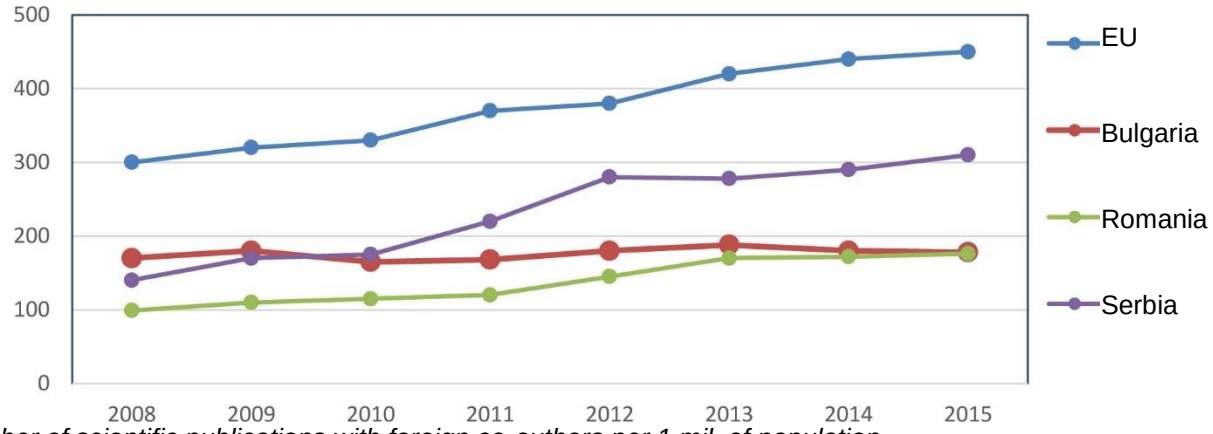
Figure 3: Change in the percentage of scientific publications in top 10% of the total number of publications and intensity of the public funding of research and development for EU countries for year 2000 and for year 2010. Source: Science, Research and Innovation of EU, 2016. Based on data from Eurostat, Science-Metrix (Canada), based on Scopus database

According to the report "Science, Research and Innovation of EU, 2016", the percentage of scientific publications in top 10% of the total number of publications for most of the EU countries grows from year 2000 towards year 2010 and the intensity of research and development funding is also rising (Fig. 3). Contrary to them, the direction for Bulgaria is the opposite – towards reduction of the intensity of funding. Based on data of the European Innovation Scoreboard, 2016, the share of scientific publications from Bulgaria, included in the top 10% of the most cited works has dropped by more than one-third from year 2008 to year 2015, respectively from 6.5% to 3.5%. As per this indicator, which is one of the main indicators

used for the evaluation of the quality of the scientific production, Bulgaria is behind Romania and Serbia, while in 2008 Bulgaria was before these countries (Fig. 4).

Percentage of the scientific publications in top 10% of the most cited publications out of the total number of publications





Number of scientific publications with foreign co-authors per 1 mil. of population

Figure 4 a) Percentage of the scientific publications in top 10% of the most cited publications out of the total number of publications b) Number of scientific publications with foreign co-authors per 1 mil. residents Source: European Innovation Scoreboard 2016, data from Web of Science.

Assessment of the participation of Bulgarian scientists in international scientific cooperation can be done, based on internationally visible scientific publications with foreign co-authors (Fig. 4b). For Bulgaria, this number, referred to 1 mil. residents is almost constant for the period 2008-2015 – 160-180 per year with increase below 10%[2]. For EU countries and for neighboring countries, like Romania and Serbia, this number increases, respectively by 55%, 81% and 126%, where for Serbia the absolute value goes above 300. These results show that the Bulgarian scientists gradually lose positions in the International scientific community.

[2] European Innovation Scoreboard 2016, data from Web of Science

The reduction in the field of scientific research is clearly seen also in the participation of Bulgaria in the EU framework programs. Bulgaria has received 12.8 Euro per person of the population from the 7th Framework program, while the average value for EU is six times higher - 78.9 Euro[3]. The success of the projects with Bulgarian participation is also lower, compared to the average success for EU, respectively 15.4% and 20.4%. The tendency during the first two years of the "Horizon 2020" framework program is even more negative. The funds received by the Bulgarian participants are 1.55 Euro per person of the population, while the average value for EU is almost ten times higher - 14.60 Euro[4]. For 2015, the success of the projects with Bulgarian participation is 5.6%, and the average value for the program is 11.6% (Figure 5).

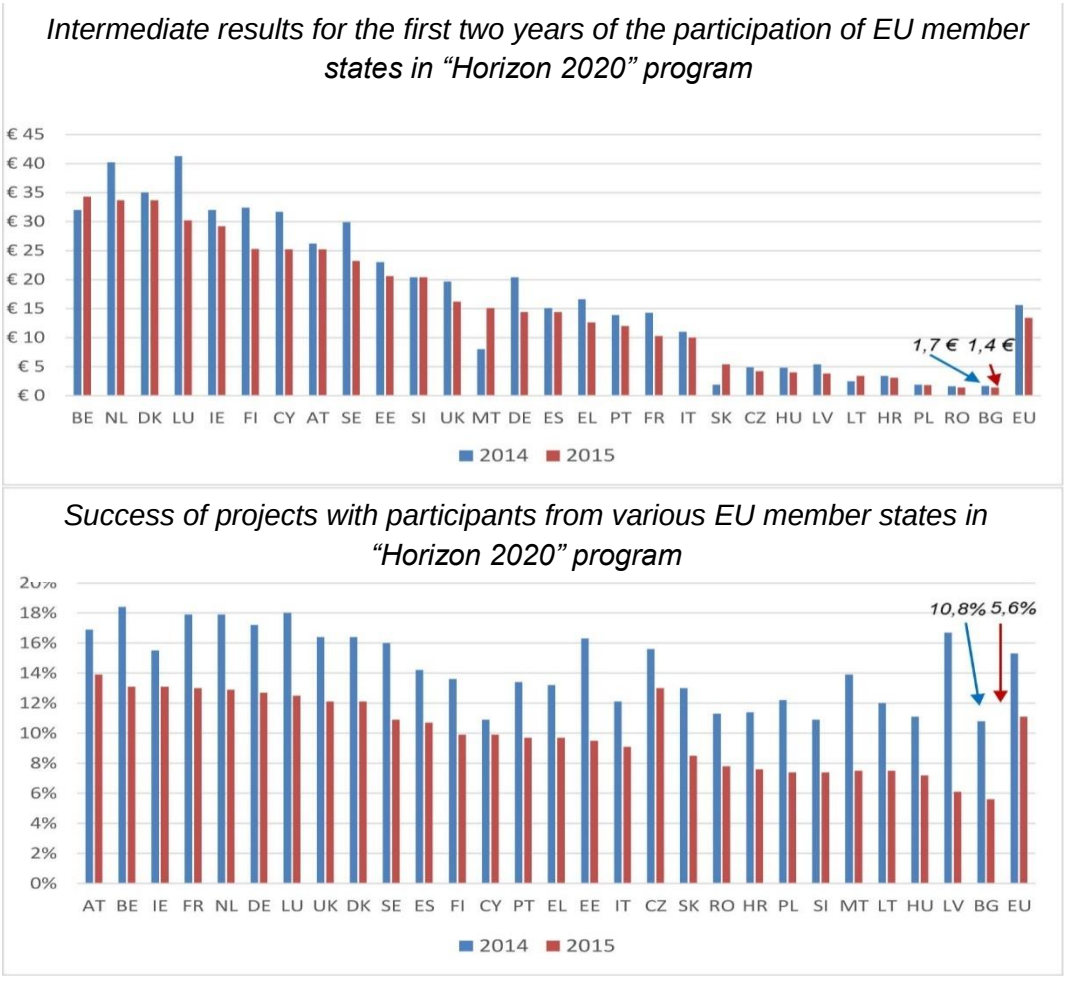


Figure 5. a) Funds received per person of the population for the first two years of the "Horizon 2020" functioning. b) Success of projects with participants from different EU member states. Source: Report Horizon 2020 Two years on, 2016.

The negative conclusions about the falling behind of the country in the research and development field arealso confirmed by the analysis from other databases and by many other indicators.

[3] European Commission, JRC-IPTS (2015), Stairway to Excellence Facts and Figures: Bulgaria

[4] Report Horizon 2020 Two years on, 2016

2.3. Analysis of the weaknesses of the scientific system in Bulgaria

The main reason for the decline of the science in the country is the absence of political will for interruptionof that tendency and the absence of lasting multiannual commitment for the support of the development of the scientific research. The above is expressed not only by the low level of public and private funding but also by shortcomings in the legal regulations and the maintenance of low social status of the scientists. Traditionally, the blame is transferred to the scientific community and its reluctance for change. On the other hand, the absence of strategic vision, adequate measures at national level and financial resources is an obstacle for the implementation of reforms in the scientific organizations and institutions that would like to do them.

After a quick drop in the intensity of the funding of scientific research and development activities in Bulgaria (combined public and private investments as a percentage of the GDP) from 2,16% in 1990 to 0,56% in 1995, the share of funding had a slight increase up to 0,79% in 2014. In this way Bulgaria leaves on the bottom of the chart in terms of investments of EU members states in scientific research and development activities (24th place out of 28 EU member states) and significantly below the average value for EU for intensity of funding of such activities of 2.03% for 2014. Especially troubling is the reduction of the public share of investments in scientific research and development activities (combined state sector and sector of the higher education), which has dropped from 0.35% in 2007 to 0.25-0.27% for the last four years. According to that indicator, Bulgaria is not only occupying the penultimate place in EU (Table 1), but is falling behind neighboring countries, which are not EU members, like Serbia and Turkey, with share of the public investments for scientific research and development of, respectively, about 0.60% and 0.50% for the last four years.

Table 1. Public expenses for scientific research and development as per 2015 of the EU member states

COUNTRY	Public expenses for scientific research and development per 2015 (% of GDP)	COUNTRY	Public expenses for scientific research and development per 2015 (% of GDP)
Austria	0.86	Latvia	0.45
Belgium	0.70	Luxembourg	0.59
Bulgaria	0.27	Malta	0.33
United Kingdom	0.57	Poland	0.50
Germany	0.92	Portugal	0.66
Greece	0.54	Romania	0.22
Denmark	1.08	Slovakia	0.56
EU	0.72	Slovenia	0.54
Estonia	0.80	Hungary	0.38
Ireland	0.40	Finland	1.00

Spain	0.58	France	0.76
Italy	0.54	Czech Republic	0.87
Cyprus	0.32	Sweden	1.04

The analysis of the expenses for scientific research and development (Fig. 6) shows reduction of the share funded by the state where the increase of the total costs is due only to private investments in science. The latter are predominantly made by foreign companies (88 %) and include mainly clinical trials and production. As per data, provided by the NSI, 95% of the funds declared by national companies as expenses for scientific research and development, remain in the companies and only 5% are used in the state sector and higher education sector. On its turn, the essence of the private funding for scientific research and development is targeted only towards applied research and experimental development and it does not provide funds for capital expenditures. According to an announcement of NSI[5], in 2015 the expenses for fundamental research are only 9.3%. The rest of the funds are for applied scientific research and experimental developments.

Expenditure for scientific research and development activities in Bulgaria per sectors (% of GDP)

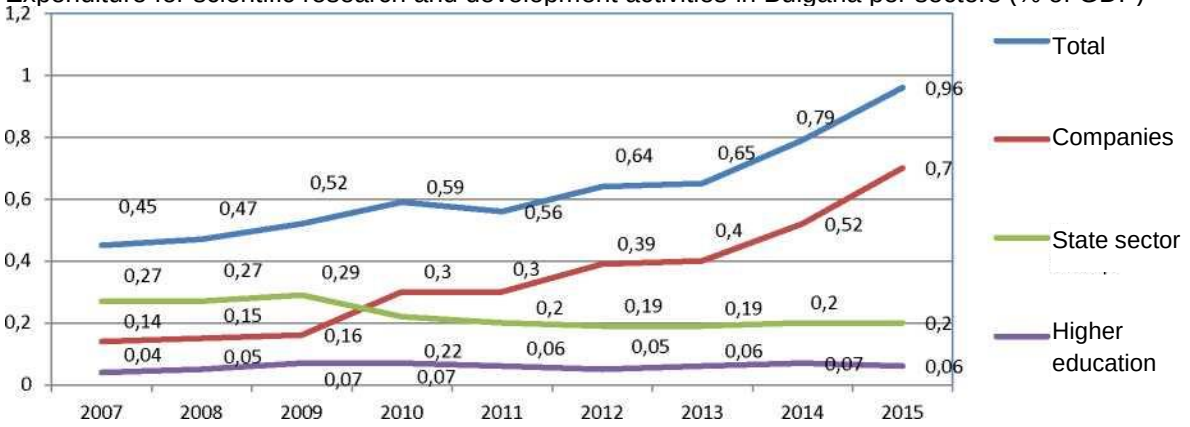


Figure 6: Expenditures for Scientific research and development activities in Bulgaria as a GDP percentage per funding sources (public and private) Source: Eurostat, 2016

The very low level of scientific research funding is a prerequisite for insufficient funding both at institutional and project levels. The above predetermines the utilization of funds from the institutional funding predominantly for salaries and general running costs and leads to a chronic insufficiency of funds for maintenance, capital expenditures and scientific research. On the other hand, the shortage of funds for project funding and their irregular provision leads to reduction of the quality of the scientific research, of the qualification of the scientists and as a consequence to lower quality of the preparation of students and PhD students.

Major instrument for funding of scientific researchbased on a competition principle, in the

[5] Press announcement of NSI "Scientific research and development activities" in 2015. Preliminary data".

country is the “National Science Fund (NSF). In a series of competition sessions of the Fund for the period 2008-2012 a lot of mistakes and violations were made. Problems with compliance with the EU norms in relation to state aid were found out Due to these problems, the funding of projects from that period was not continued and during 2013 and 2015 no competition sessions were announced and the budget of the fund was not utilized. All of the above resulted in distrust by the scientific society and the public as a whole towards the activities of the Fund and the procedures` transparency in the provision of funding by the Fund. At the same time the budget of the Fund was reduced from about 70 million BGN for 2009 to about 15 million BGN for 2016. After the adoption of amendments in the Law for encouragement of scientific research and a new Regulation for the Fund in 2016, the rules for the operation of the Fund were changed and competitions in various scientific fields were held. Many problems still remain unsolved – the insufficient budget for projects funding, inability for implementation of multiannual operational programs, delayed funding of evaluators, selection of evaluators and the quality of evaluations, the insufficient administrative personnel etc.

The restructuring of the industry, the shutting down of major industrial complexes and the absence of intensive trans-border trade relations are among the prerequisites for the delayed economic development of the country, which reflects in the lack of interest of the business to invest in science. This problem becomes more prominent by the absence of normative base encouraging the real private investments in scientific research.

The demographic collapse and massive brain-drain from the country, which has very negative impact over the existing human resources in science must be counted among the reasons.

After the cancelation of the unified national criteria for carrier growth in science, the incentives for implementation of high-quality scientific research suffered a drastic drop, which, naturally led to reduction of the quality of the scientific research.

Table 2 Indicators for the planning regions in Bulgaria with included funds for scientific research and development activities

Source: European Commission, JRC-IPTS (2015), Stairway to Excellence Facts and Figures:

Bulgaria and NSI

General macro-economic indicators per regions (2015)

Planning region	GDP per capita in BGN	GDP per capita in % to the average for EU	Expenses for scientific research and development activities in thousand BGN	Expenses for scientific research and development activities per capita in BGN
North-West (BG31)	7,606	15 %	33,265	42
North-Central (BG32)	8,627	17 %	37,218	45
North-East (BG33)	10,913	20 %	35,566	38
South-East (BG34)	10,256	20 %	36,413	34

South-West (BG41)	19,984	39 %	639,665	301
South-Central (BG42)	8,722	17 %	65,117	45

The imbalanced regional distribution of the scientific organizations and higher schools is also a significant problem of the current state of the scientific and research system in Bulgaria. The major part of the scientific institutes are located in Sofia. Despite the fact that significant part of the higher schools are located in different regions of the country, scientific research resulting in internationally recognized scientific production are performed only in few of them. The present disbalance is also clearly seen by the funds for scientific research and development activities as per individual planning regions[6]: the funds for the South-West region (including Sofia) are 301 BGN/person, while the funds for the rest of the regions vary between 34 and 45 BGN/person (Table 2).

The buildings and the conditions for scientific research in a large part of the scientific organizations and higher schools are outdated and physically obsolete and they require renovation and modernization.

The structural and investment funds and the framework programs of EU are among the most important instruments for funding of the scientific infrastructure and scientific research for the EU member states, joined after 2004. For 2007-2013 programming period, those countries have totally utilized about 5 billion Euro especially for the establishment of scientific infrastructure[7]. In Bulgaria this period was omitted, because no Operational program, related to the scientific research development was agreed on. A funding, in significantly lower scale, was received for the establishment of scientific infrastructure for applied scientific research with a potential interest for the industry. This was achieved through purchasing of modern equipment in scientific organizations and through the establishment in Sofia of a Tech Park under OP "Development of competitiveness of the Bulgarian economy". For the programming period 2014-2020, the development of the scientific infrastructure will be funded mainly through the instruments of the Operational program "Science and education for intelligent growth".

Without clearly declared and financially supported new policy concerning scientific research, the Bulgarian scientific institutions will continue to miss significant opportunities for attraction of funds under the Framework programs of EU. Thus, although we are among the poorest countries in EU, we will continue to receive significantly smaller funding from those programs in comparison to the richest countries in EU. This problem was discussed in 2011, when in information note of the Commission to the Council: Analysis of the low participation in FP 7, document 14728/11 of the Council of EU is stated that "the participation in the framework programs correlates with the national investments in scientific research and the personnel, participating in scientific research"[8]. The scientific results and the current state of the research in the applying scientific groups, present equipment and working conditions in the scientific institution are taken into consideration during the evaluation of the projects under the framework programs. So, the main reason for the insufficient utilization of the Framework program of EU is the reduced capacity of the Bulgarian scientific organizations. The reduced capacity is a result from multiannual minimum funding of scientific research in Bulgaria which is not allowing

[6] European Commission, JRC-IPTS (2015), Stairway to Excellence Facts and Figures: Bulgaria and data, provided by NSI.

[7] Page 114, http://ec.europa.eu/research/era/pdf/key-figures-report2008-2009 en.pdf

[8] Document 14728/11 of the European council, 2011

development, publication of scientific results in leading scientific magazines of the scientific groups and does not provide the required modern scientific equipment.

Another significant factor for the low success of the projects with leading Bulgarian participation in the Framework program is the insufficient number of instruments and programs appropriate for less developed countries. The state authorities and the representatives of these countries in EU and the European parliament failed to ensure within the frames of "Horizon 2020" as well sufficient special programs with adequate funding, that would allow countries, like Bulgaria, that are falling behind in the scientific area to have accelerated development, in order to be able to catch up with the leading countries.

The absence of consistent and financially supported national policy of the state for the support of the Bulgarian participation in the framework programs, including through incentive pay of the participants is another reason for the low success of the Bulgarian participation. The pillar "Spreading excellence and widening participation" of "Horizon 2020", although directed in that direction has very limited funding – only about 1% of the funds of the program are provided for 15 countries. The low relative share of the funding for Bulgarian participants, compared to the average values for EU – six to ten times lower, is also a result of the rules for projects funding – up to 2016 for similar activities in the projects, the Bulgarian scientists can acquire up to ten times lower payment compared to their colleagues in EU, which results in the sustainable "brain-drain" from the country.

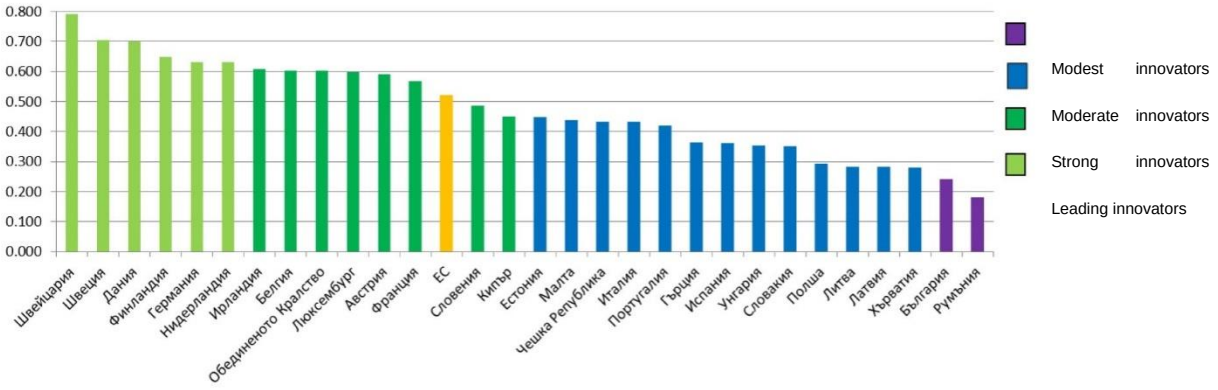
It is required for Bulgaria to actively participate in all possible EU authorities responsible for the European policies, strategies and instruments, related to scientific research and innovations, that consider the specific peculiarities of the country and ensure full participation of Bulgarian teams in framework programs projects.

The scientists and scientific schools which they establish and develop are the foundation of the scientific research. The traditions, experience, national and international contacts in scientific organizations and higher schools in Bulgaria accumulated during the years gradually are getting weaker or are getting lost and in various scientific areas, where Bulgaria was a leader, the continuity is interrupted and the scientific groups have disappeared. Furthermore, the number of researchers in all major categories in the country is smaller compared to the average values for EU. One of the main reasons is the migration of young researchers to other countries or to working positions outside the field of scientific research. The main reasons, presented in documents of scientific organizations and organizations of scientists as well as in the report of the peer review are the low payment and the low social status of the scientists in Bulgaria. An indicator for the low social status of the scientists is the fact that in most of the institutes of the leading scientific organization in Bulgaria – BAS, the average base salaries for a professor, associate professor and chief assistant for 2016 are, respectively 79, 67 and 55%[9] of the average salary for the country (962 BGN)[10]. The situation with scholarships for PhD students is similar - while up to the year 2007 they were twice **higher than the minimum salary**, from the beginning of 2017 **they are lower than it**. In these conditions, the incomes of a significant part of the scientists are not sufficient for proper living. Therefore less and less young people continue with PhD studies and scientific research.

[9] As per data, provided by NSI
[10] As per data, provided by BAS.

The problems with the absence of encouraging state policy in the field of scientific research reflect on the innovation index of the country, determined in the annual report European Innovation Scoreboard as well. For the last five years, Bulgaria has been steadily sitting on the bottom of the chart as a “modest” innovator (Fig. 7) and in the report from 2016 it is occupying the place before the last one among the countries in EU. We are overrun by Serbia and Turkey.

Innovation index for the EU countries for 2015



Framework for measurement of the European innovation index

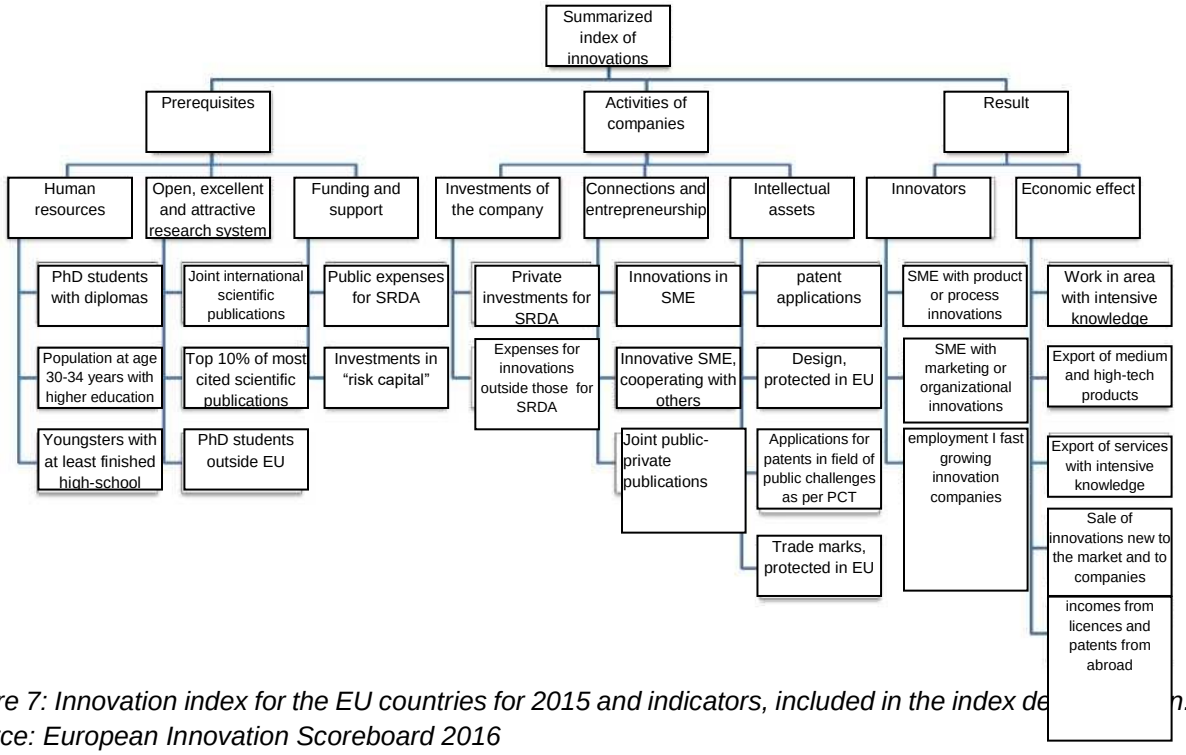


Figure 7: Innovation index for the EU countries for 2015 and indicators, included in the index de n.
Source: European Innovation Scoreboard 2016

Some of the indicators, used for the determination of the complex innovation index, providing the base for innovations, are related to the system of scientific research and development activities - high number of cited scientific publications, number of PhD students with diplomas, number of PhD students from countries outside EU, publications with foreign co-authors. An indicator, taking into consideration the public funding of the scientific research and development activities is also incorporated. Namely those indicators are among the main reasons for the low

value of the innovation index for Bulgaria. While the value of the complex innovation index for the last years has varied around 0.40-0.45 of the average value for EU, the values of the indexes for research system and for funding and support are around 0.20-0.30 of the average value for 2013-2015. In 2010, the index for funding and support for Bulgaria has reached up to 0.90 of the average value for EU, bur for the following years it has dropped five times due to the drastic reduction of the funding for scientific research and development activities in the country (Fig. 8).

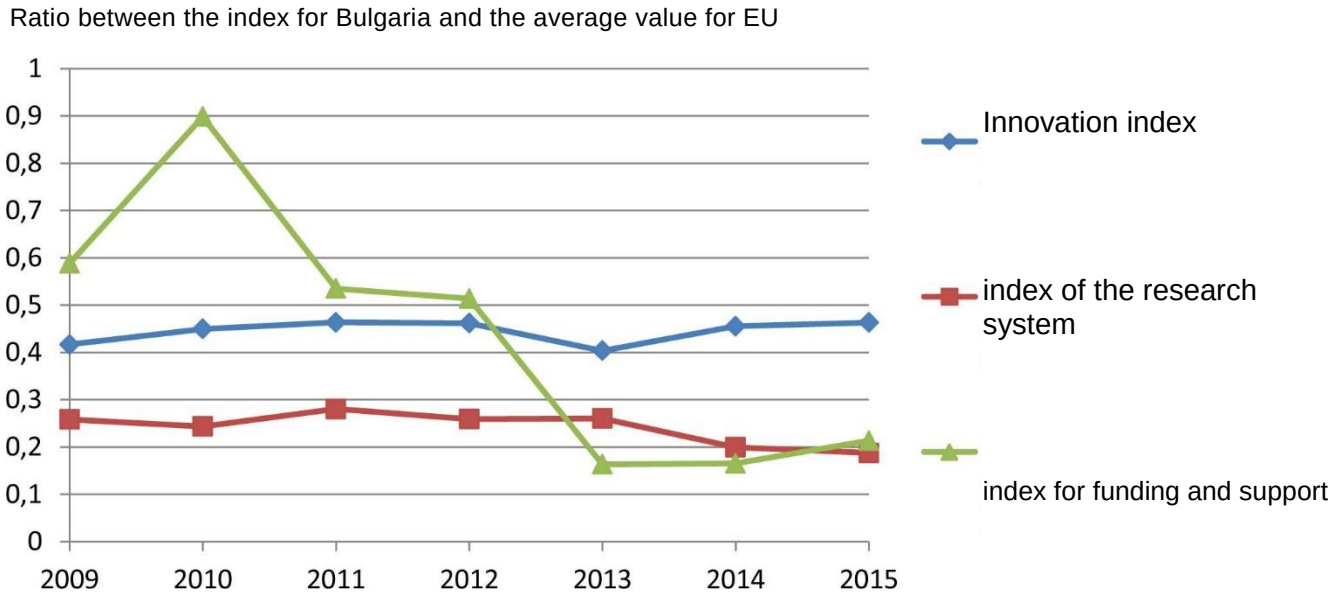


Figure 8: The ratio between the value of the index for Bulgaria and the average value for EU for the summarized innovation index (diamonds), index for the research system (squares) and the index for funding and support (triangles). Source: European Innovation Scoreboard 2016.

One of the key findings of the peer review under the program for support of policies is the lack of consensus in the society and in the business, as well as in the Parliament about the key role of the scientific research for the development of the country.

2.4. Strenghts of the scientific research system in the country

The strengths in the field of the scientific research in the country are related mainly to the human resources. Despite the chronical underfunding in the country, there are some strong centers and scientific groups both in scientific organizations and higher schools. Bulgarian scientists are still among the leading scientists in number of traditionally strong sectors, which, as per the number of publications in the last five years, referenced in the Web of Science are interdisciplinary chemistry, electrical and electronic engineering, applied physics, applied mathematics, physics and chemistry, physics of elementary particles and physics of the field, astronomy and astrophysics, interdisciplinary material science, optics, interdisciplinary physics,

biotechnologies and applied microbiology, biochemistry and molecular biology, environmental sciences, zoology, nuclear physics etc. Internationally recognized scientific teams work in the medical higher schools and specialized scientific institutes in the field of medicine. Various agricultural sciences are developed at the institutes of the Agricultural academy and the specialized higher schools. Bulgaria is a natural leader in some scientific and research subjects, related to the cultural heritage, arts science, history and ethnical development of the Balkans, Eastern Europe and Middle East (Thracology, Slavonic studies, Byzantium studies, mediaeval studies etc.). Strong research teams work in various areas of the public studies in various higher schools and scientific organizations. This potential must be maintained and be used as a base for the scientific research development in the country, which is planned in the strategy.

As per data, provided by NSI for 2015, there is approximate gender equilibrium among the scientists in Bulgaria, where the female scientists are 53% and the male are 47% of the total number of researches in the state sector and in the "Higher education" sector (Table 3). In that sense, Bulgaria is among the leading countries in EU. Due to the above fact, the present strategy does not incorporate special measures for increase of the share of the female researches but the even distribution, in terms of gender, when taking different academic and managerial positions in the scientific organizations will be monitored. The distribution of scientists, in terms of age, is almost even, where the lowest percentage – 21% is occupied by researchers at age up to 34 years and the highest – 27% is the percentage of scientists at age between 35 and 44 years. In the state scientific organizations and in "Higher education" sector there are working scientists at age above 65 years, who form about 5% of the total number of scientists. These data show that in relation to the age distribution, no collapse is expected if we succeed in keeping both the young and the experienced scientists in Bulgaria. But if Bulgaria wants to achieve the average European level for number of scientists, considerable efforts must be put towards attracting talented young people to scientific career. In order to achieve that, the strategy provides measures both for keeping the scientists in Bulgaria and for attraction of talented, predominantly young scientists.

Table 3 Distribution of the scientists in Bulgaria (state sector and "Higher education" sector) as per age groups and gender as to 2015[11]

Age groups	**Male**	**Female**	**Total**	**% per age groups**
up to 34 years	1,238	1,434	2,672	21%
35 - 44 years	1,441	2,034	3,475	27%
45 - 54 years	1,339	1,582	2,921	23%
55 - 64 years	1,516	1,493	3,009	24%
65 years and more	423	232	655	5%
Total	5,957	6,775	12,732	
% as per gender	47%	53%		

[11] As per data, provided by NSI: "Researchers as per age and gender groups in state sector and "Higher education" sector – 2015"

Although Bulgaria is economically lagging behind within EU, it is showing significant growth in some high-technology sectors, thanks to the accompanying traditions and competitive labor prices, as, for example, the IT sector. The development of high-tech companies, combined with the relatively low investments, required for research is an additional prerequisite for the development of science in the sectors, included in the Innovation strategy for smart specialization.

During the last 10 years, the scientific infrastructure was partially renovated through projects, funded by framework and other EU programs, OP "Development of the competitiveness of the Bulgarian economy" and projects of the National Science Fund, which allowed the purchasing of modern scientific equipment or modernization of the existing one. The diagnostic study performed not long ago[12], related to the infrastructures of scientific research in Bulgaria provided summarized information about the thematic and regional distribution of the infrastructure:

- The E-infrastructure for multidisciplinary research has the highest number of infrastructures with European significance, compared to other sectors of the scientific research. This is the area of research with the highest number of infrastructures, which are funded well during the last five years.

- The predominant part of the infrastructure for physical sciences, material science and engineering sciences is of national significance. These fields are with the highest percentage of outdated infrastructure and the highest percentage of infrastructure, modernized for the last three years.

- The medical and agro-biological sciences have the highest number of infrastructures with regional significance and are the fields of scientific research which provide the highest level of decentralization. The scientific research in the agro-biological sciences have the lowest funding for the last five years. The highest share of new research, equipment and apparatus is provided in the medical sciences.

- The scientific infrastructure in the public and humanitarian sciences is the most evenly distributed in the country but at the same time it has the lowest percentage of attracted funding based on competition principle for the last five years.

An important factor for the maintenance of the scientific capacity of the country during the last decade and for the provision of scientific achievements during the last years is the preservation of BAS and the Agricultural academy. These institutions have preserved the academic spirit and the scientific traditions and they concentrate the major part of the scientific potential of the country. All of the above helps to reach the critical mass for the performance of high-quality scientific research in areas that are with high priority for the country.

2.5. Summary of the analysis

The analysis shows that the absence of consistent positive national policy for science during the last decades results in gradual and steady destruction of the scientific potential of Bulgaria.

[12] DIAGNOSTIC REVIEW "MAPPING OF THE MAIN RESEARCH INFRASTRUCTURES AND EQUIPMENT IN BULGARIA", Sofia, 25 March 2017.

The consequences are obvious – emigration of young, but also of recognized scientists abroad; destruction of scientific directions, in which the Bulgarian scientists used to be among the leading world scientists; maintenance of the number of scientific publications in referred scientific magazines practically at one and the same level (compared to the clear tendency to significant increase in the number of scientific publications not only in the world and EU but in our neighboring countries too); low amounts of attracted funds, provided by European framework programs etc.

The Disinterested attitude of the Bulgarian state towards the scientific research is well known to the European institutions and to our foreign partners and it definitely reduces the international authority of the country. Particularly worrying is the fact that the reduction of the scientific potential and the suffocation of the scientific research have negative impact over other key sectors for Bulgaria, such as all levels of education and innovations in industry. It can be seen also by the last place occupied by Bulgaria as per the innovation index among the EU member states and candidate states (including after Serbia and Turkey).

The keeping of a significant number of highly qualified researchers with good age distribution, the present international contacts, as well as the partially modernized scientific infrastructure in the country can be used as a base on which the scientific system in the country can be restored and developed during the coming years.

Table 4 shows the main elements of the SWOT analysis of the scientific research system in Bulgaria.

Table 4. SWOT analysis of the scientific research system in Bulgaria.

Strenghts	**Weaknesses**
Presence of national scientific research organizations and researching universities with international recognition, with maintained academic spirit and long traditions in scientific research, including research at world level.	Significant reduction of the number of scientists and insufficient funding for the scientific organizations for the implementation of their functions, for the preservation of the scientific potential and for the performance of scientific research at world level.
	Lack of evaluation system of the scientific achievements of the scientific organizations and the researching universities and correlation of their results with the funding.
Presence of good scientific schools and existing scientific traditions in various scientific areas.	Reduction in the number of scientific schools and loss of leading positions in some scientific areas. Absence of national criteria for the occupation of academic positions and acquisition of scientific degrees for various scientific areas.
	Absence of consistent national policy for the encouragement of the development of the scientific research for the last decades.

	Critically low percentage of funding from the state budget for funding of scientific research and development activities.
Good level of international cooperation and maintenance of partnerships with leading scientific teams/centers in EU and in the world. Presence of initiative scientists, ready for the establishment of new scientific partnerships.	Insufficient funding for the utilization of the full capacity of cooperation and for its implementation as equal partners.
Presence of internationally recognizable scientific production.	Maintenance of the level of internationally recognizable scientific production at a constant level, which leads to significant falling behind the other countries, where its level is continually growing
Presence of competent scientists in all main scientific fields.	Shortage of human resources and significant brain-drain. Low social status of the scientists and low payment.
Good distribution of scientists, in terms of gender, age and subjects.	Significantly uneven distribution of scientists and scientific organizations per regions.
Acceptable percentage of young scientists at age up to 34 years.	Unattractive payment for the implementation of PhD studies in Bulgaria and absence of incentives for attraction of talented young people to PhD studies. Absence of regulation and financial provision of post PhD studies. Absence of incentives and mechanisms for attraction of talents to science.
Partially improved infrastructure for scientific research. Presence of a map of the present scientific infrastructure. Adopted National roadmap for scientific infrastructure.	Significant part of the infrastructure is outdated. Absence of mechanisms and tools for effective and full utilization of the present infrastructure.
	Continuing problems with the performance of the functions of NSF.
Possibility for participation in EU programs for scientific research and innovations.	Weak success of the projects of Bulgarian scientists or collectives and low return of investments from those programs. Absence of mechanisms for funding of projects, appropriate for countries like Bulgaria.
Traditions in the relationships with business in previous periods. Increase of the percentage of private funds in companies, which are declared for funding of scientific research and development activities.	Weak connections of the scientific organizations with business. Passive position of the business towards the scientific research. Absence or ineffective incentives for real private investments in scientific research.
	Closed sector institutes for applied research and loss of traditions and contacts.

	Ineffective policy for coordination of activities, related to science and innovations.
Opportunities	**Threats**
Modernization and harmonization of the legal basis and its effective implementation.	Shortcomings and internal conflicts in the legal basis. Non-compliance with the legal basis and strategic documents, adopted by the National assembly or other state bodies.
Adequate funding, meeting the vision for science development.	Absence of political will for the provision of adequate funding.
Implementation of funding model, correlated to achieved results.	Preservation of the present model of funding or introduction of inadequate model for distribution of the funding.
Differentiated payment of the labor of the scientists, based on their scientific results.	Utilization of non-scientific criteria for payment of the labor of the scientists.
Strengthening of the role of the triangle of knowledge – education, scientific research and innovations.	Imbalanced and/or weak support for the individual components of the triangle of knowledge.
Significant improvement of the connections science - business and stimulation of innovations based on scientific results.	Absence of interest of the business in connections to science (absence of legal basis and effective state policy) Slowing of the cooperation with business due to limitations, related to state aid.
Improvement of the social status of the scientist and improvement of the integration of science in the society.	Maintenance of low social status of the scientist Isolation of the scientific research system
Increase in scientists` mobility	Limited mobility of scientists due to insufficient funds or time (for teachers)
Integration to the European research area and full participation in the Framework program of EC.	Isolation of the science in Bulgaria
Good age distribution of the researchers and influx of talented young scientists	Aging of the scientific personnel and continuation of the brain-drain. Demographic crisis
Achievement of balanced distribution of the scientific capacity per scientific areas and regions	Absence of personnel in key scientific areas Absence of stable structures for the implementation of scientific research per regions
High level of scientific research in strategic for the country scientific areas. Provision of critical mass of scientists.	Fragmentation of the scientific structures

Conclusion:

The analysis of the state of the national scientific research system and of the dynamics in the positions of Bulgaria in the field of the scientific research in international aspect shows steady falling behind of the country. This tendency is not just a consequence but also a part of the reasons for the **falling behind of Bulgaria** from the other EU member states in the field of

innovations and the development of high-tech industry and as a result, in the incomes and quality of life of the citizens.

The damages that have been caused during the last decades over the state of the science and by that over the entire country, are very serious and hard to be reversed. New traditional delay in the taking of urgent measures in the scientific research and development sector will result **in serious risk from lasting lagging of Bulgaria** both in its economic indicators and in quality of life.

3. Vision and targets

Bulgaria ranks last in the EU in terms of GDP per capita. The main real opportunity for accelerated increase of GDP is by producing competitive high-tech products for export, based on the constant flow of innovation and innovative technology solutions. The latter are only possible if there is a normally functioning system of research and transfer of scientific knowledge.

In this regard the main objective of the strategy has been formulated:

The main objective of this strategy is through a scale, rapid and long-term development of the system of research Bulgaria to become an attractive center for advanced research and development of new technologies, to recover and raise the international prestige of the country in science, to retain and attract talented scientists in Bulgaria. As a final result to achieve long-term economic growth and to significantly improve the quality of life in the country.

The development of the research set out in the strategy is not self-aimed. It will lead to a substantial positive effect on many areas of public life. First, scientific development will have a positive impact on education at all levels. The high level of research in the leading scientific institutions and universities in the country, combined with the positive results from the implementation of the Strategy for Higher Education, will attract more Bulgarian and foreign students to study and complete a doctorate in Bulgaria. This will help not only to development of new generations of scientists, educators and teachers, but will have a positive impact on the preparation of highly qualified specialists for the industry and retaining of qualified personnel in Bulgaria. The contribution of research to industry is associated with innovations and development of new or improved technologies. Whether relevant research were made in Bulgaria or abroad, the availability of highly qualified Bulgarian scientists competent in relevant scientific field, will allow rapid uptake of research results and their practical application in our country. As an additional result the increased state support for research will contribute directly and indirectly to increase the innovation index of the country and to the increase of foreign investments.

Undoubtedly, the development of science will be beneficial to industry, especially high-tech industry, by getting acquainted with the latest scientific developments / achievements, technology transfer, opportunities for high-quality advisory services and access to modern research infrastructure served by competent professionals.

Another very important function of researchers is to increase the scientific culture of the society and the fight against false science. Modern society is facing a number of challenges related to environmental, technological, social, cultural, ethical and other problems that require specific solutions. Only competent scientists familiar with the world achievements in the respective scientific field with the possible solutions and potential problems, can help both the society and the state. It is therefore necessary to strenghten the integration of Bulgarian science in society.

To have a successful strategy, it is necessary to restore the confidence in the system for research through openness and transparency in all actions and procedures in accordance with common European standards and best practices.

Another basic principle to implement the strategy is partnership. Of particular importance is it not to be only between institutions responsible for the implementation of this strategy, but also it should cover business, industry and social organizations, civil society structures and - most importantly - the scientific community.

It is envisaged the main objective of the strategy to be achieved by applying a set of interrelated and complementary policies affecting one or several components of research.

3.1. Human Resources

Human resources are a key factor for the development of science. To realize the vision of the strategy in terms of human resources it should be reached the following:

- gradual increase in the number of researchers to levels close to the EU average;
- maintaining highly qualified scientists by introducing uniform national criteria for academic positions and degrees tailored to the specific requirements of the respective professional field and a group of sciences;
- balanced distribution of researchers by age, gender, scientific fields and regions. Retention of the existing non-discrimination policy;
- good enough payment of the scientists` and scientific staff`s work, subject to achieving specific results;
- developing a system for raising qualification through specializations in the country and abroad;
- improve working conditions;
- increase the mobility of researchers;
- attracting the Bulgarian scientific diaspora to joint research;
- provision of sufficient in quantity and qualified scientific support staff.

All this will lead to increasing the social status of scientists, to creating conditions for creative work and stimulating high quality research. In this respect, the following interrelated specific objectives of the strategy directly related to human resources, have been defined:

Specific Objective 1. Providing high qualification and effective career development of researchers, based on high level research.

Specific Objective 2. Increase of the living standard and the social status of the researchers and specialists engaged in research activity through ensuring of adequate payment related to the accomplished results as well as of good working conditions.

Specific objective 3. Increase in the number of researchers to typical EU levels and their balanced distribution by age, gender, scientific fields and regions

3.2. Infrastructure

The vision of the strategy is that Bulgaria maintains a modern and sustainable research infrastructure for conducting high-quality research and training focusing on the priority areas of ISSS. In addition to that to be provided an access for researchers to key unique scientific infrastructure that is not possible or not appropriate to be established in the country. At the same time to emphasize on the following principles:

- avoiding of unjustified duplication of unique and expensive scientific equipment;
- providing of high workload of research infrastructure and access for interested users;
- maintaining the existing infrastructure in good functional status;
- balanced distribution of research infrastructure in institutions and regions in accordance with the priority directions of ISSS;
- continuation of the existing access to global scientific databases and gradually expanding its scope.
- integrating in the scientific infrastructures of the European Union.

The development of research infrastructure is subject to scrutiny by the National Roadmap for the development of scientific infrastructure. Improving the infrastructure will significantly expand the possibilities of Bulgarian scientists to conduct high-quality research and will directly support the high-tech industry. In this context is defined the following specific objective of the strategy directly related to the scientific infrastructure:

Specific objective 4. Development, maintenance and effective use of modern scientific infrastructure, balanced on thematic areas and regions, and providing the necessary access to European and international scientific infrastructure.

3.3. Balance in scientific research

The vision of the strategy is to provide a balance between both: (1) directed fundamental clear fundamental and applied research, and in terms of (2) research in various areas of science and (3) in the regions.

Bulgaria is a relatively small country that can not afford a significant presence in all scientific fields. Through state policy will be supported areas where there are traditions and successes, areas related to smart specialization, cultural heritage, as well as areas of national and public interest (national security, etc.). The priority development of new, non-traditional national scientific fields will be linked to the current priorities of ISSS and the priorities in strategic documents for the next programming periods.

Ensuring balance in research is crucial to create a comprehensive and effective scientific system in the country. Many years of global experience show that applied research can not be developed without the existence of fundamental science. Increasing demands for interdisciplinary research are a prerequisite for the development of all major research areas in which Bulgaria can build the necessary scientific capacity. Last but not least, the regional balance of science will contribute to the balance in regional development in accordance with the national interests of the country and the EU's vision.

Within the frames of the Strategy a core support will receive the targeted fundamental research that can contribute to the development of both the application-oriented research and the pure fundamental research. Targeted fundamental research are inspired by the clear expectation of benefit and possible long-term applications. They will be funded on programming or project basis, as the programs themselves contain requirements and ideas about what should be done with regard to the societal challenges and needs of the society.

For the purposes of this strategy scientific priorities for targeted fundamental studies are tied to the current societal challenges:

- increasing competitiveness and productivity of the economy in line with the thematic areas of ISSS;
- solving the demographic problem and poverty reduction;
- improving the quality of life - food, health, biodiversity, environmental protection, urban environment and transport, etc .;
- energy and energy efficiency;
- social development, cultural heritage, national identity and cultural development of society;
- national security and defense

Since the development of science is characterized by considerable dynamism and interdisciplinarity, fixing the priorities for this type of research can lead to serious delay in the

country, especially in advanced and emerging key research areas. Therefore, the priorities will be updated and can be supplemented by tactical priorities.

Pure fundamental studies will be of relatively lower value , but will receive regular support. For the success of this kind of research is necessary scientific freedom and they will be stimulated not by priority areas, but based on their high scientific quality.

Applied research is one of the main components of research performance. Their implementation in the priority areas is key factor in the innovation process for further technological development of the Bulgarian economy. The National Research Strategy 2017-2030 defines six priority areas for applied research. Four of these areas are very similar to the priority areas of IS3. An additional priority area in the National Research Strategy (environmental protection, ecological monitoring, utilization of sources and bio-resources, waste management technologies) faces the ecological challenges of the country. The sixth priority area (materials science, nano- and quantum technologies) is horizontal, as it encompasses the scientific basis of the modern materials science which finds applications in most of the modern and emerging technologies (incl. medical, pharmaceutical, food, quantum computing, etc.). Bulgarian science has its strengths and traditions in all these research priority areas and they provide the scientific basis for further technological development of the Bulgarian economy.

Priority areas for research development in Bulgaria are:

1. New energy sources and energy efficient technologies.

2. Mechatronics and clean technologies.

3. Health and quality of life. Prevention, early diagnostics, therapy, green, blue and eco-technologies, biotechnologies, eco-foods.

4. Environmental protection. Ecological monitoring. Utilization of sources and bio-resources. Waste management technologies.

5. Materials science, nano- and quantum technologies.

6. ICT.

In addition to balance between fundamental and applied research, the strategy envisages maintaining the existing balance in scientific fields.

An important challenge for the country is the balanced regional distribution of scientific capacity. At present, although there are individual successes in regional development research, they are highly concentrated in the capital. The vision of the strategy is the development of research also in the regions, as a first step in this regard will be supporting the applied scientific research in accordance with regional priorities of ISSS by setting up rRgional research centers. In perspective - in the third stage of implementation of the strategy it is providedfor planning and implementation of scientific innovation complexes in less developed regions of the country.

One of the most anticipated by the public relations of science is this with industry. Regardless of the many existing fruitful cooperations in this area there are still major challenges. Since the process is two-sided, the state should establish effective regulatory mechanisms to stimulate private investments in science. Of particular importance is the development of both applied science and effective intermediate brokerage units such as centers for technology transfer (to scientific institutions) and research and development departments (to industry plants).

Based on the analysis are defined the following specific objectives:

Specific objective 5. Sustainable recovery of the international positions of the country in quantity and quality of the internationally visible scientific production up to and beyond the level typical for the beginning of the century.

Specific objective 6. Raising the quantity and quality of research related to issues of national importance.

Specific objective 7. Promoting the applied research and focusing them on the priority areas of ISSS.

Specific objective 8. Stimulating the private research investments.

3.4. Integration into the European Research Area and the international scientific community

The main factor for the development of science is the constant exchange of ideas and knowledge, which is performed by the mobility of scientists, participation in scientific conferences and scientific cooperation. The vision of the strategy in this aspect comprises:

- providing opportunities of Bulgarian scientists for distribution of research results through participation in national and international scientific forums;
- supporting the organization of national and international scientific forums in the country;
- participation of Bulgarian scientists in national, European and international research networks;
- raising the qualification and exchange of ideas through regular scientific specializations;
- development of attractive international postdoctoral programs, including through legislative amendments;
- providing information to assist the mobility of researchers;
- maintaining bilateral and multilateral scientific cooperations;
- maintaining an operational information portal assisting in the preparation of international projects and organizing international conferences;

- participation in the EU initiative "European cloud for open science."

The implementation of the above elements of the vision will strenghten the existing major international contacts of Bulgarian scientists and will expand their scope and effectiveness. In this connection the following specific purpose has been defined:

Specific objective 9. Deepening the integration of the Bulgarian scientific community in the ERA and expansion of the international scientific cooperation

3.5. Relations between science and other social spheres

Yet, for science in the country is characteristic a certain isolation and underdeveloped relationships with other social spheres. The relationship between science and business is fundamental and is viewed in details in the preceding text. The relationship science - higher education is organic in the research universities, but still in many universities the science element is insufficiently covered while in most of the research institutes the relationship with education refers mainly doctoral training. Despite some successful projects for the link science - secondary education in this area is also required considerable intensification of activities.

An important function of researchers is to provide science-based competent advice to the public administration and in particular to the so-called "decision makers". This process is bilateral and can hardly be controlled by separate specific mechanisms. However, it can be partially solved by legislative means. This can lead to an increase in the number of scientific projects of national importance funded by different state structures.

Ultimately, the development of science is subject to the overall development of the society and it can not remain isolated from it. Measures are needed to promote science, anti-false science and education of the public on a range of pressing and current issues.

Last but not least, of particular importance is the intensification of relations with the Bulgarian scientific diaspora, which can have a major positive impact on various aspects of the development of science: the qualification of Bulgarian scientists, the success in European projects, the quality of scientific production and others.

The vision of the strategy envisages strenghtening the relations of science with:

- higher education and education at all levels;
- public administration and decision makers;
- society as a whole.

Specific Objective 10. Significant intensification of links between science and education, businesses, governments and society as a whole

4. Policies, actions and measures for their implementation

Program to achieve the objectives of the strategy is comprised by major policies outlined based on the vision and specifying mechanisms for their implementation, which will be used by

public authorities. Each policy is associated with certain specific objectives that will contribute to the success of the strategy as well as activities and specific measures to achieving the targets. Thanks to the interdependence of policies, part of the activities and measures contribute to the achievement of several goals or policies.

As the main measures of the state are financial and regulatory, originally two separate horizontal policies have been defined, related to these activities. In describing these policies are outlined general principles while the details of the concrete measures are spelled out in other policies. Effective implementation and combination of the two horizontal policies is crucial to the achievement of the main objective of the strategy:

Through large-scale, fast and long-term development of the research system, Bulgaria is to become an attractive center for advanced research and development of new technologies, to recover and raise the international prestige of the country in science to retain and attract talented scientists in Bulgaria and as a result to achieve long-term economic growth and significantly improve the quality of life in the country.

4.1. Horizontal policy for adequate and effective funding

Essential to fulfillment of the objectives of the strategy is enhanced and sustained research funding from the state through a series of interconnected and efficient financial instruments. It is important to emphasize that financial instruments should be balanced and complementary. Investing funds in isolated activities will have a negative effect. In developing the financial instruments is necessary to comply with various funding sources such as the state budget, operational programs, European and international programs and anticipated private sector funding.

Horizontal activity 1. Increasing of public funding for research.

In the Strategy for smart, sustainable and inclusive growth Europe 2020, the European Union has set itself the aim for its Member States to invest 3% of their GDP in R & D by 2020 (1% public funding and 2% private sector investment). The Bulgarian national target, set in the National Reform Program, is significantly lower - 1.5 percent. In the previous strategy adopted by the National Assembly, the country had set task state R & D funding to increase gradually to 0.60% for 2015 and 0.70% of GDP in 2020. Despite the decision of the National Assembly within three budget estimates of the country annually validated by the Council of Ministers, from adopting the strategy to present, has not been forecast increasing of the public funding in the sector and the real value for 2015 is 0.27%, more than twice lower than planned.

This strategy provides the following increase of direct R & D funding from the state budget per year (Table 6) for the first two stages:

Table 5. Planned consolidated fiscal programme, excluding the expenditure from ESIF, on R&D as a percentage of GDP

Year	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***	***2024***	***2025***

% of GDP	***0.38***	***0.45***	***0.50***	***0.60***	***0.70***	***0.80***	***0.90***	***1.00***

By adopting the strategy of the National Assembly, Council of Ministers will be required to monitor the implementation of the adopted budget financing in the adoption of three-year budget estimates the country.

Public funds should be distributed between institutional and project / program funding as well as for the implementation of international commitments and participation in international programs (incl. EU Framework Program).

As public and private investment are interconnected, it is expected an increase in public funding to have a catalytic effect on private funding to reach a value of 1.5% in 2020 and 2.0% of GDP in 2025

It is important to emphasize that for the success of the strategy it is necessary not only to increase the investment, but also the intelligent distribution and effective management in view of expected and achieved results.

1(a) Enhanced institutional funding covering different components.

Institutional funding is basic to public research organizations and should provide normal conditions for successfully carrying out the research. Widely proclaimed ideas that funding of science should only be on a project basis, are inconsistent, since they can lead to the destruction of authoritative scientific schools and flourish pseudoscience in their place. World experience clearly shows that not only is necessary balance between institutional and project financing, but that they are interrelated.

Institutional funding should provide the necessary resources for:

- salaries and social security contributions of scientists and employees engaged in research, corresponding to their qualifications;
- improving of working conditions;
- operation, maintenance and renewal of infrastructure;
- government commitments and national activities;
- stimulate research at a high level and other types of incentives provided in the policies of the strategy;
- fundamental research of researchers and trainees (basic resources that can be allocated on a project basis).

Of particular importance is the amount of institutional funding for science to be bound to actual scientific results achieved by scientific organizations and universities. Based on this principle, it is necessary to develop a system for additional institutional funding for research at

universities with internationally recognized scientific excellence, which is not bound by the subsidy for training students.

1(b) Enhanced project and programme financing as a tool for reception of social challenges and realization of state policies.

Project and programme financing are main tools of the state for maintenance of the scientific capacity and development of the scientific research in the country, as well as for reception of social challenges and implementation of state policies and also for influencing the balance between separate components of Research and development activity. Although at the moment the correlation program-project/institutional financing is above the levels, characteristic for the EU, the project financing must be increased in its absolute value and realized regularly.

When defining the funds, directed to the particular policies, activities and measures in the strategy, the specifics of the different finance sources must be taken into account – funds from the state budget (through competitions of the Bulgarian National Science Fund), funds according to operative programs and framework programs of the EU, as well as private financing. Since private financing is directed exclusively to applied researches of particular problems which are of interest to the financial source, the funds from the state budget must be directed anteriorly to the development of the human potential and to directed fundamental researches.

The program financing by Operational Programme “Science and Education for smart growth” will be focused on thematic areas of the Innovation strategy for smart specialization, which will contribute to the development of the applied researches and thence for innovations in the areas which are of economic importance to the country.

4.2. Horizontal policy for legislation changes

Another type of activities, which the state can use in order to realize the set goals, are the changes of valid legal acts and the passing of new laws and other legislation documents. The strategy envisions synchronized legislation changes which will regulate the legal part of the organization, financing and development of the science in the country, as well as will provide reformation of the management and administrative entities, related to the scientific researches.

Horizontal activity 2. Synchronized changes in the legislation acts, related to the implementation of the strategy

These changes aim at implementation of minimal national criteria for the academic positions and scientific degrees as well as guaranteeing of the minimal payment for each position. It is necessary to define synonymously different terms such as “scientist”, “young scientist”, “researcher”, “post-doctoral student” and others, the definitions should be synchronized with the ones in the EU. The implementation of the periodic attesting through objective scientific and metric indicators will be a legal ground for the differentiated institutional financing as well as for differential payment of the scientists. This activity also includes changes of different laws and other legislation acts through the implementation of incentives for private investments in Research and development activity, regulating the relationship – science – state media and etc.

4.3. Horizontal policy for modernization and reformation of the research system.

According to the recommendations of the peer review for better and more competitive financing of the research it is necessary to re-structure the National Science Fund into one agency for financing of scientific researches, which is politically and operatively independent. It must significantly increase the multiannual programmes for provision of gratuitous funds for scientific researches assisted by a transparent, responsible, quality-based competition, the criteria for that must be envisioned based on the international standards and practices. This recommendation will be realized within the framework of the horizontal activity.

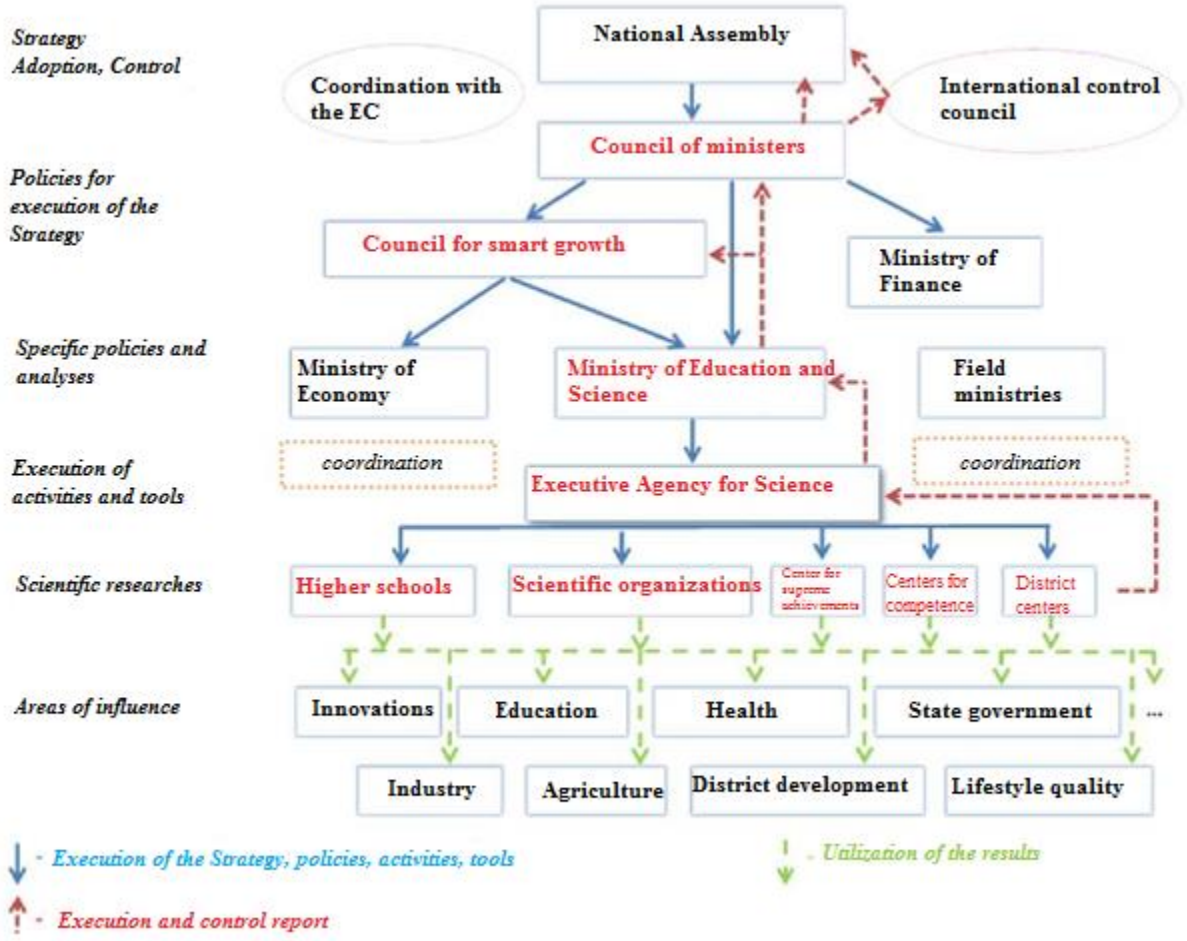
The reformation of the state structures for management and administration of the scientific researches will be realized through the establishment of Executive agency for Science within the Ministry of Education and Science. The Ministry of Education and Science will continue to execute the functions of a main body for formation of state policy in the field of scientific researches, and will present the national interests in the development of European programmes, related to scientific researches and will supervises the work of the agency. The scheme further in the text indicates the place of the Executive Agency for Science within the national system for scientific researches and in the implementation of the present strategy. The agency will perform management, support and monitoring of the activities, related to the science and research process in the scientific organizations and the higher schools.

For the implementation of the project financing functions, the agency includes National Science Fund, which will enlarge its activity towards programmes for financing of career development of the scientists, special and sectoral programmes for scientific researches, programmes for applied scientific researches, for development of the scientific centers, for international cooperation, support of the participation of Bulgarian scientists in international and European programs and others, indicated in the present strategy.

The Agency will implement methodical functions related to the application of the criteria for attesting of scientists and will organize the periodic evaluation of the scientific organizations.

Within the Agency, there will be established special support units for participation of Bulgarian teams in European programmes, for coordination of the activity of the main scientific centers and of the main scientific infrastructure. There will also be the coordination units with the National Innovation Fund within the Ministry of Economy and with specialized units of other field ministries.

The agency will also coordinate the activities for popularization of the science and the results from the scientific researches.



Scheme of the state authorities, that perform management of the scientific researches and their involvement for the execution of the strategy, reporting and control.

In red – main authorities for execution of the strategy.

4.4. Policy for development of human potential

The success of the strategy is related mainly to the provision of sufficient number of motivated and highly-qualified researchers. Neither developed infrastructure, nor increased financing, nor structural reforms or ambitious strategies will be effective without a competent scientists. It is also important to secure balanced distribution of the scientific potential according to age and gender, as well as according to scientific areas and geographic districts, including attracting Bulgarian scientists working abroad.

It is a critical point to attract to scientific career talented and motivated young people.

The specific goals, related to this policy are subordinated to the provision of high qualification of the scientists and establishment of work conditions, competitive to the ones in the other EU

countries, including through increase of the lifestyle standard and the social image of the scientists.

The differentiated remuneration is an important stimulus for the maintenance of a high scientific level of the researches, directly related to the scientific results achieved during a previous period (after periodic attestation).

The remuneration of the scientists must be high enough so that it can secure them a high social status. Therefore it is necessary to have an effective system for control of the quality of the scientific researches and the scientific level of the researchers. It is also important for the prevention of the occupation of scientific positions by unqualified persons – the scientist cannot occupy an academic position after more than one negative attestation evaluation.

The aim is the number of scientist in Bulgaria to reach the average level for the EU. Therefore it is necessary to establish new positions for scientists within existing scientific organizations and higher schools or in new research groups, institutes or centers. The enlargement of the existing organizations and the opportunities for establishment of new ones depends to a great extent on the policies for development of researches which are strategic for the country and their balance.

The goals, activities and measures, related to this policy are:

Specific objective 1. Provision of high qualification and effective career development of the scientists, based on high level scientific researches.

Activity 1.1. Introduction of minimal national criteria for scientific degrees and academic positions for the different scientific areas.

Main prerequisite for securing of a high level of scientific research and high competence of the scientists in Bulgaria is the development of a unified national mechanism for tracking of the career growth of the scientists and for the acquisition of scientific degrees which must correspond to unified minimal criteria valid for all scientific organizations in the country.

Measures

1.1.1. Development, acceptance and application of a legislation act (Low for the development of the Academic Staff) with minimal requirements for acquisition of scientific degrees and occupation of academic positions in the Republic of Bulgaria, conforming to the specifics of the different scientific areas and professional fields. The scientific criteria will be higher for researchers, working in science institutes, on account of criteria related to education activities in the higher schools.

1.1.2. Introduction of a system for administrative and public control of the execution of the minimal requirements based on the register of the scientific activity in Bulgaria.

Activity 1.2. Periodic attesting of the scientific organizations and the higher schools, conforming to the specifics of the individual types of science as well as periodical attesting of the scientists.

The implementation of an effective system for evaluation of the scientific and research activity is a component of each contemporary science policy. This system allows observation of the process of assimilating of the funds, the level of the execution of the science tasks and programmes and the results from the scientific activity. The evaluation allows to the state to analyze how effective was the scientific policy and to outline measures for its optimization based on comparability and co-measurement of the quality of the scientific and research activity with the global and European standards. In order to achieve high scientific results, it is necessary to stimulate those teams who implement high quality scientific activity. That is why it is necessary to periodically map the scientific achievements of the higher schools and research institutions and the best of them to be stimulated by the state. Simultaneously, it is necessary to take measures for these incentives to reach not only the institutions but the scientific teams and the individual scientists. This will be implemented through period attestation of the scientists in the scientific units and binding the reimbursement with the achieved scientific results.

For evaluation of the execution of the strategy in the beginning of the second stage of its implementation, it is planned to conduct an independent international evaluation of the scientific organizations and the research universities, which can provide recommendations for their development and for improvment the system for evaluation and attestation of the scientific organizations.

Measures

1.2.1. Development and application of a system for periodic attestation of the scientific organizations and higher schools, financed by the state budget. The system will be based on the internationally accepted scientific metrical indicators (reported scientific works, quotations, patents, project and etc.) as specific criteria will be worked out for each professional area and group of sciences.

1.2.2. Legislative obligation of the scientific organizations and higher schools, financed by the state budget to accept and apply the internal rules for attestation of their separate units, as well as of the scientists based on the attestation criteria of the institution.

1.2.3. Integration of the attested information and the attestation results with the information for the particular scientist and scientific organization in the Scientific Activity Register.

1.2.4. Adoption of an effective procedure for release of an academic position in case there is an unsatisfactory attestation result.

1.2.5. Adoption of an order for limiting or discontinuing of the financing of science units or organizations in case of unsatisfactory results from their scientific evaluation.

1.2.6. Conduction of an independent international evaluation of the scientific organizations – the institutes of the Bulgarian Academy of Science and Agricultural Academy, the scientific institutes

to ministries and departments and the research universities, according to the established international practices and the accumulated experience of the European commission bodies.

Activity 1.3. Increasing qualification of the scientists in the scientific organizations and higher schools.

The successful scientific activity is related with constantly increasing of qualification. Although this measure is related to all scientists and specialists, a special attention has to be paid to the qualification increase for young scientists and for scientists from institutions in areas with weak economic development.

Due to the expected decrease in the number of students during the first period of the strategy execution, it will be utilized for qualification increase of the scientists in the higher schools through broadening of the opportunities for specializations and provision of more time and funds for scientific research. This will lead to a significant increase of the scientific level of the scientists-teachers and respectively of the level of the higher school. Therefore the envisioned measures for this activity must be implemented as soon as possible. It is recommended that higher schools develop their own programs for increase of the qualification of teachers and decrease of the workload.

Measures

1.3.1. Development and implementation of programs for increase of the qualification of the regional scientists through specializations in leading science centers in the country.

1.3.2. Organization of competitions and provision of information for specialization programs in leading science centers in the country, Europe and other parts of the world.

1.3.3. Legislative regulation of the distribution of the workload of the scientists in universities, allowing them time, necessary for scientific research.

1.3.4. Legislative regulation regarding the utilization of leave (sabbatical) years for specialization/work of the scientists in a leading science center.

1.3.5. Supporting the participation of the scientists in science forums through project financing.

1.3.6. Inviting of world-famous scientists as lectors to national science institutions and giving the event broad centralized publicity.

Specific objective 2. Increasing the lifestyle standard and the social status of the scientists and specialists engaged with scientific and research activity, through securing of adequate and conformed to the achieved results payment, as well as good work conditions

Activity 2.1. Introduction of a system for differentiated payment to scientists, including two components: (1) main work salary – with fixed amount for the individual scientific positions, doctors and post-doctors in budget science organizations and higher schools and (2) additional material stimulation bound to particular scientific results.

The first component of the payment is differentiated according to positions. The minimal sum of the main work salary for each position will be defined according to the average work salary in the country for the previous year, and the salary of a chief assistant should exceed it.

It is also necessary to regulate minimal amounts for the additional payment for scientific degree.

The funds for provision of this payment will be secured as a component of the subsidy for the particular science organization or university according to the number of scientists on the respective position, who are eligible according to the legally regulated national criteria for the position or scientific degree. In case that the institution defines higher main salaries for particular positions they are not provided by the state budget.

The second component – additional payment will depend on the results of the attestation of the organization and of the individual scientists as well as on the realization of particular programmes. For achievement of a more significant effect it is necessary for the total amount of the second component on national scale to be not less than half of the total amount of component 1.

The funds for the second component also will be secured from the subsidy for the respective scientific organization or university. The organization should secure the distribution of the additional material stimulating according to the results achieved by the scientists.

Measures

2.1.1. Development and approval of a legislative act, regulating the minimal salaries of the scientists according to the respective positions, doctoral candidate and post-doctoral students in budget scientific organizations and higher schools as well as the additional payment for scientific degree and the updating mechanism.

2.1.2. Development of a system for definition of the distribution of the additional material stimulation funds for the scientists according to organizations based on the attestation results and the implementation of specific programs, envisioned in the strategy.

2.1.3. Annual inclusion in the state budget of the Republic of Bulgaria of the necessary funds to the subsidies of the respective organizations, securing the payment of the scientists in accordance to the acts in points 2.1.1 and 2.1.2.

2.1.4. Realization of control on behalf of the state and the social partners for correct and effective spending of the funds, provided through the subsidy for payment of the scientists, doctoral candidates and post-doctoral students.

2.1.5. Development of an attractive system for payment to the specialists and the specialized support staff, based on their qualification.

Activity 2.2. Improvement of the working conditions for scientists and specialists.

Working conditions in many scientific organizations and higher schools are far from the usual in the EU. In this respect, it is necessary to take urgent centralized and de-centralized .

Measures

2.2.1. Establishment of a joint committee with participation of social partners and competent authorities, reviewing the work conditions, which will suggest reasoned inclusion of purposeful funds in the budget of the respective organizations.

2.2.2. Approval of the establishment of new scientific units/scientific centers only if there are suitable work conditions available.

Activity 2.3. Increase of the social prestige of the scientist and of the scientific and research activity.

The increase of the social prestige of the scientist and of the scientific and research activity is related to giving suitable publicity of the work of the scientist. It is necessary for the society and the state authorities to realize the benefit from conduction of scientific researches in Bulgaria. That is why, this activity includes measures for popularization of science and scientific researches, putting an emphasis on the training of highly qualified professionals for the economics and administration, increase of the scientific culture of the society, on the contributions of science for understanding of world and humans as well as on the scientific approaches for solving of current challenges – ecological, technological, social, cultural, ethical and etc.

Measures

2.3.1. Development, approval and implementation of a program of the Ministry of Education and Science for popularization of science and scientific researches for the society with participation of leading scientists from the different spheres of science. The programme should be developed in tight cooperation with the major scientific institutions and research universities in the country.

2.3.2. Popularization of significant scientific achievements on the internet pages of the Ministry of Education and Science, National science Fund, Bulgarian Academy of Science, Agricultural Academy and higher schools and through social networks.

2.3.3 Implementation of legislative requirement for popularization of scientific research results, achieved through projects, financed by the state budget and EU funds, through modern communication media.

2.3.4 In the state media programmes - implementation and support of rubrics for increase of the scientific culture of the society and for scientific achievements.

2.3.5 Encouragement of the scientific organizations and higher schools to work for promotion of science and scientific researches amongst the society.

Specific objective 3. Increase of the number of scientists up to the levels characteristic for the EU and their balanced distribution according to age, gender, science fields and regions.

Increasing of the total number of scientists is a long-term strategic goal. The first step in this regard is to attract and detain talented and motivated young scientists, on which depends the future of research in Bulgaria. In addition to the urgent activities, envisioned for achievement of specific goal 1, the present specific goal envisions additional activities for attracting of young people to scientific researches. There are also envisioned activities, aiming at utilization the potential of the Bulgarian scientists working abroad and attracting them to work in Bulgaria.

Activity 3.1. Significant enlargement of the doctorate as a first step to scientific career

Particular care should be taken for attracting of qualified and young scientists in the fields where there is a critical minimum of scientists and even complete lack of scientists, as well as for better balance in the regional distribution of scientific centers in the country.

Measures

3.1.1. Legislative regulation of the minimum amount of scholarships for PhD students, comparable to the average salary in the country.

3.1.2. Providing of conditions for increase of the number of doctorates under state order, observing high criteria for the applicants and securing the necessary funds.

3.1.3. Providing of funds for conduction of the scientific researches and their presentation to science forums during the doctorate through purposeful subsidy of the respective scientific organization or university.

3.1.3. A requirement for successful tutoring of doctoral candidates to be included in the minimal national criteria for occupation of the academic position professor.

3.1.4. Legislative regulation of the administrative and financial responsibility of the scientific unit, the doctorate supervisor and the doctoral candidate for a doctorate that has not been defended up to a certain period after its termination.

3.1.5. Legislative regulation of doctorates, financed or co-financed by industry or private sources.

Activity 3.2. Involvement of more young people to doctorate and post-doctorate.

The opening of the borders stimulates many young people from the country to seek success abroad. Particularly this is relevant for doctorates and the reasons are not only in the high level

of a number of foreign scientific institutions but also in the better remuneration and the perspective for scientific work abroad. On the other hand, the term post-doctorate student, regardless being part of some programs, is not officially regulated in the legislative documents.

Measures

3.2.1. Legislative introduction of the position “Post-doctorate student” in the National classification of professions and positions and support for opening of such positions in the scientific organizations and higher schools.

3.2.2. Regulation of the requirements and the ways for conduction and financing of the post-doctorates.

3.2.3. Recovery and updating of the programmes/schemes for financing of the doctorates and post-doctorates through projects of the applicants or the admitting organizations, including through utilization of the opportunities given by European and international programmes. Regulation of a fast procedure for selection of doctoral candidates and post-doctoral students with provided project financing for the period of the doctorate/post-doctorate. The project supervisor has leading role in the selection process

3.2.4. Ensuring of the existing ones and provide of additional social benefits for doctoral candidates and post-doctoral students.

3.2.5. Regulation of the utilization of part of the subsidy for scientific research and artistic creative activity of the higher schools for stimulate the participation of students in scientific project activities.

3.2.6. Providing of specialized courses for doctoral candidates and post-doctoral students that will be beneficial to them if they continue their career in a scientific organization, university, industry, administration etc….

3.2.7. Providing of specialized courses in Bulgarian language for foreign doctoral candidates and post-doctoral students.

Activity 3.3. Attracting of young doctoral candidates for scientific work in the country.

Many young people, interested in science, find realization abroad or in other social spheres. Main reason for this is the low payment. Even with successful realization of the present strategy the base payment of a newly admitted young scientists is relatively low and they are not eligible for additional material stimulation due to lack of previous results. Therefore it is necessary to take special measures for attracting of young people to scientific career. This can happen through additional material stimulation in the early stages of the scientific career and through securing of attractive perspectives for career growth.

Measures

3.3.1. Maintaining and expanding competition for projects of young scientists in the scientific organizations and higher schools and National Science Fund.

3.3.2. Change the procedure for conducting competitions for assistant professor on the basis of scientific results of the candidate, including thesis without conduction of contest examination.

3.3.3. Providing career development subject only to the results of research.

Activity 3.4. Implementation of joint research together with Bulgarian scientists abroad and attracting leading scientists from other countries

One of the few positive outcomes of the flight of talented students and scientists from Bulgaria towards various parts of the world over the last quarter of a century is the emergence of a **strong Bulgarian scientific diaspora abroad**. Bulgarian scientists are currently working in leading research and development centres in Europe, America, Asia, Australia . Many countries effectively use the potential of their scientific diasporas for both research and development and also for preparing students and PhD students.

The measures included in this activity are aimed at providing conditions for utilizing the potential of the Bulgarian scientific diaspora abroad for the purpose of achieving the objectives of the strategy. One of the main aspects in this direction is a programme for working with the Bulgarian scientific diaspora abroad, which includes the mechanisms listed below. This programme shall include provided funding or co-funding of the respective activities, programmes and projects.

Measures

3.4.1. Development and implementation of a programme for working with the Bulgarian scientific diaspora abroad with provided funding or co-funding.

3.4.2. Development and implementation of projects for reintegration encouraging the return to Bulgaria and the involvement in research and teaching activities of highly-qualified Bulgarian scientists working in various scientific institutions abroad.

3.4.3. A scheme for maintaining contacts and exchanging information with scientists; a programme for periodic visits of Bulgarian scientists from abroad to the scientific organizations or universities in Bulgaria in order to establish contacts or conduct certain specialized lecture courses for young scientists, PhD students and students.

3.4.4. Regulating the possibility for partial appointment of a Bulgarian scientist from abroad in a Bulgarian scientific organization or a university for a limited period of time.

3.4.5. Regulating doctoral or post-doctoral studies under the joint supervision of a Bulgarian scientist from abroad and a scientist from a scientific organization or a university in Bulgaria.

3.4.6. Introducing a scheme for joint scientific projects between Bulgarian scientists from abroad and scientists from a scientific organization or a university in Bulgaria.

3.4.7. Adopting some normative changes facilitating the involvement of highly-qualified foreign scientists in research and teaching activities in Bulgaria.

Activity 3.5. Stimulating more balanced regional allocation of the scientific potential

What is typical of our country is the concentration of the scientific potential in the capital to a large extent, which does not correspond to the policy for balanced regional development. An important step in the process of stimulating the regional development of the research will be the establishment of important regional scientific centres intended for applied research that will have a critical number of scientists, which will serve as a core for the development of the research in the separate regions.

Measures

3.5.1. Target schemes for improving the qualification of scientists in existing or newly-established regional scientific centres in the leading scientific centres around the country in the respective scientific area.

3.5.2. Regulating the establishment of strategic partnerships between regional scientific centres and leading scientific centres around the country for joint scientific studies, joint doctoral and post-doctoral studies, conducting specialized courses for improvement of the qualification and others.

3.5.3. Stimulating more balanced allocation of the scientific potential by providing preferences of the respective regional administrations or municipalities.

4.5. Policy for developing a modern scientific infrastructure

The development of a modern scientific infrastructure is a necessary condition for conducting high-quality research activities. The modern infrastructure contributes to keeping the highly-qualified employees in the country and attracting young scientists and also stimulating the international scientific cooperation. A completely new element in the national scientific infrastructure and the national system for scientific research, which has been stipulated in the National programme for reforms for the current programme period and the Innovation strategy for smart specialization, is the establishment and development of modern scientific complexes that will focus the scientific potential on the priority areas of the Innovation strategy for smart specialization. The complexes, in accordance with the specific objectives they pursue, are Centres of Excellance (CoE), Centres of Competence and Regional Science Centres. The establishment and the initial development of these centres will be conducted with funding from the Operational Programme “Science and education for smart growth”. The scale of the investments in the infrastructure of these centres significantly exceeds the funds that have been invested in scientific infrastructure over the last 25 years and the ensuring of their effective and

adequate utilization is a serious challenge for the administration of the centres, the scientific community, the state and local authorities and the economy.

The national roadmap for research infrastructure is the key instrument that the state will use to support the development of infrastructure which is unique for the country. The current strategy has stipulated funding from the Operational Programme “Science and education for smart growth” and the state budget for the infrastructure included in the roadmap as well as participation in European research infrastructures.

An important component of the policy for the development of scientific infrastructure is its effective utilization, the maintenance and renovation of the existing equipment. On the one hand, this is related to access regulations and conditions for using the equipment (in particular the equipment that is unique for the country and the expensive equipment) by scientists of the organization, scientists and/or companies from the country or from other countries, including against payment, if applicable. On the other hand, the effective utilization, maintenance and renovation of the equipment requires current funding which will be obtained from various sources: economic activities within a limited scope, scientific projects and programmes within the scope of the measures of the subsequent policies of the current strategy and also by means of a specific programme for effective use of the scientific equipment.

In addition to the modern scientific equipment, modern conditions for conducting the research, including the necessary buildings, laboratories, libraries, working premises, standard and specialized devices and equipment (outside the scope of those included in the roadmap), Internet access to world data bases and others are also necessary in order to conduct high-level research. Therefore, one of the specific objectives of the strategy, which is related to that policy, is the provision of such conditions. The main source of funding for the renovation of the buildings and other repair works is the earmarked increase of the subsidy from the state budget intended for the scientific organizations and universities, which will gradually be used to provide the necessary renovation of the equipment and the working conditions. The funds from the Operational Programme “Regional Development” can also be used for such activities, in case such funds have been planned for this or the following programme period.

Specific Objective 4. Development, maintenance and effective use of modern scientific infrastructure allocated in thematic fields and regions and provision of the necessary access to the European and international scientific infrastructure

Activity 4.1. Establishment and development of Centres of Excellance, Centres of Competence, Regional Science Centres

The establishment of leading science centres in the priority spheres of the Innovation strategy for smart specialization is a new approach for providing conditions for performing world-class research and development activities in directions that are strategic for our country. During the current programme period, the support for the implementation of research and development in the strategic areas of the Innovation strategy for smart specialization will be provided using the tools of the Operational Programme “Science and education for smart growth”. The centres established with funding from the Operational Programme “Science and education for smart

growth" will be important scientific complexes uniting the scientific capacity that has been kept in the country in spheres related to the respective priority of the Innovation strategy for smart specialization and will provide conditions for the effective utilization and increasing of this capacity by conducting high-level research and development activities having a positive impact on the development of the economy.

Measures

4.1.1. Establishing Centres of Excellance in the priority spheres of the Innovation strategy for smart specialization with funding from the Operational Programme "Science and education for smart growth".

4.1.2. Establishing Centres of Competence in the priority spheres of the Innovation strategy for smart specialization with funding from the Operational Programme "Science and education for smart growth".

4.1.3. Establishing Regional Science Centres in the priority spheres of the respective regional Innovation strategy for smart specialization with funding from the Operational Programme "Science and education for smart growth".

4.1.4. Establishing a Council for coordinating the activity of the centres, establishing contacts with the state authorities and providing normative, administrative, financial and other conditions for their effective utilization. Upon completion of the Operational Programme "Science and education for smart growth", the Council will assume the functions of control over the centers.

Activity 4.2. Development of a national roadmap for research infrastructure and active participation in the European roadmap for research infrastructure.

The basic instrument for the concentration of resources for establishing an strategic infrastructure for the country is the National roadmap for research infrastructure which is adopted and updated by the Council of Ministers and provides co-funding for the establishment and the development of important scientific complexes. The current National roadmap is presented as an instrument for implamentation of the strategy.

Measures

4.2.1. Reviewing and updating the National roadmap for research infrastructure by taking into account the priorities of the Innovation strategy for smart specialization, the opportunities for participation in the European roadmap for research infrastructure and the regional balance.

4.2.2. Establishing, renovating and extending of the research infrastructure with funding from the Operational Programme "Science and education for smart growth" for effective participation in the European roadmap for research infrastructure.

4.2.3. Coordination of funding opportunities for R & D infrastructure through other programs: operational, European and international.

4.2.4. Assessment, public discussion and updating of the programme for Bulgarian participation in unique international infrastructure projects.

Activity 4.3. Ensuring the effective functioning and development of the research and development centres and research infrastructure.

A major part of the current strategy is the provision of conditions for effective and adequate use of the scientific devices for research and also for training specialists and supporting the industry. This measure includes activities enabling the effective utilization of the research infrastructure included in the European roadmap for research infrastructure as well as participation in unique international infrastructure projects.

Measures

4.3.1. Discussing and adopting common country principles, conditions for utilization and reporting on the use of the available infrastructure for research and development of national and regional significance (above a certain value) that has been acquired using public funds.

4.3.2. Establishing an information portal that will be common for all the centres set up under the Operational Programme “Science and education for smart growth”, the national and regional infrastructures, research and technological centres under other operational programmes (including Sofia Tech Park) for the available infrastructure, the offered scientific and technological services and the opportunities and the conditions for conducting research and development activities in them.

4.3.3. Developing and applying a programme for funding the access of scientists from scientific organizations and universities in the country to the scientific equipment in the country and to European research infrastructures.

Activity 4.4. Providing a modern conditions for research within the research organization and the universities around the country

The main source of funding for the modernization of the buildings and the working premises as well as for other repair works is an earmarked increase of the subsidy from the state budget intended for the research organizations and universities, which will enable the gradual renovation of the existing necessary equipment and working conditions. The modernization shall include a completely new information infrastructure and ensure the observance of all the requirements for safe and modern working conditions, including the requirements that are specific for a certain scientific area. The funds from the Operational Programme “Regional development” can be used for these activities provided that such funds have been stipulated for the current or the forthcoming programme period. The renovation and purchase of standard and specialized devices and equipment, outside the scope of the unique and expensive equipment included in the National roadmap, will be conducted through research projects and programmes included in the activities under the subsequent policies of the strategy.

Measures

4.4.1. Reviewing and analyzing the condition of the buildings, the laboratories, the specialized and other working premises for research and development activities and also the working conditions within the research organizations and universities funded by the state budget.

4.4.2. Developing a national plan for overall renovation and expansion of the buildings and the conditions for research and development activities in the country with funding from the subsidy of the research organization and universities provided by the state budget, the allocation of earmarked funds in operational programmes during the following programme period and other sources.

4.4.3. Access to databases and the complete texts of scientific publications of the scientists in Bulgaria by giving an account of the priorities, the interests of the scientific community and the financial capacity, which has been provided by the state budget and the Operational Programme “Science and education for smart growth”.

Activity 4.5. Establishing scientific and innovation complexes as leading scientific centres.

The experience of a number of countries has shown that the purposeful concentration of scientists and scientific and social infrastructure in scientific and innovation complexes not only stimulates the scientific research and applied development and innovations but also gives a strong impetus towards public and economic development of the entire region. Using this experience and taking into account the uneven distribution of the research centres in the regions of the country, the third stage of the strategy has planned the development of the research and innovation complexes in different regions around the country as research centres. These complexes will be developed with the active participation of the municipal and district administrations and leading partners from abroad and will be funded by various sources, including the structural funds of the European Union. The planning of these complexes will be performed on the grounds of a thorough analysis of the positive and negative aspects in the building up and the development of the European and world experience and the Regional Science Centres as well as the experience of other countries. A useful approach could be the binding of the science and innovation complexes with a leading foreign partner by means of an intergovernmental agreement for technical, expert and financial support. Taking into account the strategic importance of these complexes for the respective regions, for the country and the binding of their establishment with international cooperation agreements, the programme for their establishment shall be adopted with a decision of the National Assembly.

Measures

4.5.1. Developing the concept for the establishment of science and innovation complexes, which includes the overall planning – selecting a region, specific problems, negotiations with potential leading partners and others.

4.5.2. Adopting a programme for the establishment of science and innovation complexes with a decision of the National Assembly.

4.5. Policy for the development of fundamental research and stimulating excellence science

The fundamental research provides a basis not only for applied research and innovations but also for the training of qualified specialists and scientists in the respective scientific area that are necessary for the reproduction of the scientific potential and also for teaching at the universities around the country. Despite not having an intended direct practical application, most of the fundamental research (the targeted fundamental research) has been inspired by certain problems that are important for the society or the industry. Back in 2004, the European Commission concluded that "almost all technologies, products and achievements that have led to economic and commercial success and/or to certain improvements in the quality of life are based on fundamental research"[13]. Therefore, there is great likelihood that the high research achievements in the sphere of fundamental research will open new horizons for research development and will lead to substantial social benefits.

The fundamental research is also the major source of internationally visible research production based on which the scientific level of the country is assessed. The research organizations and the universities around the country have been structured on the grounds of the research areas. Therefore, the current strategy has planned a purposeful state policy for the development of world-class fundamental research by applying internationally recognized standards for assessment of the scientific results. The qualitative and quantitative results from the fundamental research will be used as a criterion for assessing the research organizations and universities and their units and also as an indicator for the implementation of this programme. The basic ways of supporting the fundamental research include the institutional and project funding based on the principle of competition as well as the various measures for specialization or improvement of the qualification.

Specific objective 5. Sustainable recovery of the international positions of our country in terms of the quantity and the quality of the internationally visible science production to and above the level typical of the beginning of this century.

Activity 5.1 Introducing a temporary programme for encouraging the publication in leading international magazines with an impact factor/rank and increasing the visibility of the published results.

The reversing of the tendency for progressive and sustainable backlog of the country on the world chart based on the quantity of the referenced scientific production requires urgent and effective measures to be taken. For that purpose, we have planned to encourage the publications in renowned scientific magazines by means of earmarked funds on the grounds of the achieved results. The programme will have a limited duration (during the first two stages of the strategy)

[13] European Commission 2004. Europe and basic research. Brussels: COM (2004) 9 final, p. 5.

and aims at regaining the positions our country used to take in the beginning of this century. We also need measures to increase the visibility of the published results.

Measures

5.1.1. Annual reporting of the number of articles from the country that were included in the main database (Web of Knowledge or Scopus) during the previous year and their allocation in Bulgarian research institutions. Establishment of a system for assessing the contribution of the article for the country, which includes elements such as an impact factor/rank, share of the participation of Bulgarian scientists, scientific area and others and its binding with the respective material incentives.

5.1.2. Increasing the visibility of the scientific results published in renowned scientific magazines by means of providing free access to the readers.

Activity 5.2. Encouraging the publications in internationally referenced scientific magazines.

Measures

5.2.1. Including indices in the attestation systems measuring the rating of the scientific magazines which have published the works of the scientific institution/the individual researcher for a previous period.

5.2.2. Including indices in the attestation systems measuring the response of the published works of the scientific institution/the individual researcher for a previous period.

Specific objective 6. Increasing the quantity and quality of research related to issues of national importance.

Activity 6.1. Encouraging the creation of works related to national identity and problems of national and social importance.

Some of the scientific studies in the country are aimed at problems of national importance and for that reason they are characterized by a low level of visibility. However, these studies are to be considered as far as important social challenges such as migration and terrorism, demographic crisis, inequality and social inclusion, ethnic and religious tolerance, corruption, social deviations, development of the civil society and other required adequate measures to be taken, based on high-quality research and expertise. When the results of these studies are published in scientific magazines outside the scope of those mentioned in item 5.1.1, in books or patents, they shall be reported on the grounds of information from other international (ERIH PLUS, MathSciNet, VINITY, ResearchGate and others), national or institutional databases as well as through the respective bibliographical information about the editions.

Measures

6.1.1. Development and utilization of adequate quantitative criteria for reporting the scientific activity related to national identity and problems of national importance and their inclusion in the set of criteria for assessment of the scientific activity and attestation.

Activity 6.2. Extending the scope of the project and programme funding of scientific research.

Measures

6.2.1. Annual competitions for projects related to scientific activities with increasing funding from the National Science Fund or recipient organization.

6.2.2. Introducing new types of competitions similar to the Ideas programme of the European research council aimed at developing scientific groups with internationally recognized reputation.

6.2.3. Developing and implementing national research programmes and thematic sectoral programmes for conducting research on social challenges in cooperation with the National Science Fund, sectoral ministries and institutions, public national and local structures.

6.2.4. Developing and adopting a normative document regulating the conducting of research at the request of state or local authorities and stipulating the managerial decisions that necessarily require preliminary targeted research to be conducted or a statement of the competent scientific organization, unit or a scientist.

6.3.5. Establishing specific mechanisms for prompt assignment and conducting of research in response to urgent needs and problems of national or regional significance.

4.6. Policy to stimulate of applied research

In the sphere of applied research, the leading trends will be those determined as priority in the Innovation strategy for smart specialized of the Republic of Bulgaria for the period 2014-2020. The thematic linking of the two strategies will contribute to the achievement of a stronger synergic effect in the stimulation of applied research in Bulgaria, by synchronizing the measures stipulated in them. At the same time, this ensures good coordination with the priority called “Enhancing competitiveness and productivity of the economy – in accordance with the priorities of the Innovation strategy for smart specialization”, which has been stipulated in the vision of the current programme and enables us to direct the targeted fundamental research to reach the stage of “applied research and development”.

Specific objective 7. Encouraging the applied research and focusing it on the priority areas of the Innovation strategy for smart specialization

The establishment and the effective functioning of the Centres of Excellence, the Centres of Competence and the Regional Scientce Centres described in Activity 4.1 will significantly contribute to the achievement of this particular objective. These centres will focus on research under the priority areas of the Innovation strategy for smart specialization and will be funded by the Operational programme “Science and education for smart growth”.

Activity 7.1. Improvement of the legal basis for conducting applied research.

Measures

7.1.1. Supporting the existing, establishing new and utilizing the Centres for transfer of technologies.

7.1.2. Developing a system for protection of intellectual property in all organizations dealing with research and development, including a system for providing support for the patenting of applied research results.

7.1.3. Including adequate quantitative indices related to applied research activity when attesting the scientific units and the scientists.

Activity 7.2. Introducing specific programmes for conducting applied research.

7.2.1. Developing and implementation of strategic programmes for applied research in priority areas of the Innovation strategy for smart specialization.

7.2.2. Taking part in initiatives for joint research programmes for applied co-funded research with the EU Member-states and the European Commission and participating in European and international networks for such research.

Specific objective 8. Stimulating the private investments in the science.

The low level of private investments in the science in Bulgaria has been repeatedly emphasized in a number of documents but there are no practical measures to overcome this problem. The behaviour of the businesses is usually determined by the economic benefits. Therefore, it is necessary to adopt adequate legal measures. Another specific issue related to the conducting of research for the industry or other private organization is the reporting on the rules regarding state benefits of the EU for the development of mechanisms and programme for stimulation and project funding of the research.

Activity 8.1. Improving the legal basis for stimulation of private investments in research and introduction of mechanisms for research on problems of the industry

Measures

8.1.1. Ensuring legal prerequisites for stimulation of the industry when funding research and purchasing scientific devices.

8.1.2. Normative settling of procedures and mechanisms (for example, a voucher system) for conducting applied research that may be beneficial for the industry with partial funding from private sources complying with the state benefits rules.

8.1.3. Regulating the rules, the financial and other provisions for using research infrastructure purchased entirely and partially using public funds, from the industry or private organizations, which comply with the state benefits rules.

8.1.4. Introducing incentive schemes for employment in the enterprises of young researchers who have acquired a doctoral degree.

8.1.5. Developing and implementing a competitive programme for training young scientists at their request and with the financial participation of the business and also for joint doctoral studies between scientific and business organizations.

8.1.6. Developing and applying mechanisms for conducting and stimulating “outsourced research” (outsourcing) at the request of the industry or other organizations from the country or abroad.

8.1.7. Establishing networks (clusters) of regional institutions, research organizations and high-technology enterprises for executing target regional tasks and programmes.

4.7. Integration policy in the European Research Area and expansion of the international scientific cooperation

The Bulgarian scientists actively participate in an international scientific cooperation and the joint publications with researchers from abroad as a share of the total internationally visible scientific publications is close to the average for the EU. The purpose of this policy is to create the necessary conditions for more active involvement of scientists from Bulgaria into the European Research Area and expanding the scope and effectiveness of the international scientific cooperation. One of the key elements of this policy is to fully exploit the opportunities of EU programmes in the field of R & D.

Specific objective 9. Strengthen integration of Bulgarian scientific community in the European Research Area and expansion of the international scientific cooperation.

Activity 9.1. Using the potential and opportunities from the EU programs in the field of R & D

The analysis of the participation of Bulgarian scientists and teams from Bulgaria in EU framework programmes showed significantly lower success rate of the Bulgarian projects and thus much less received funds compared to the EU average values. So as an important component of the strategy is to be the active participation of the Bulgarian authorities and Bulgarian representatives in the EU institutions (European Commission, Committees of the European Commission, Council of Ministers of the EU, European Parliament and others.) in the preparation of European policies, strategies and tools related to R & D, taking into account the specificities of the country. Bulgaria is necessary to use actively the opportunities from EU presidency. Following the experience of most EU countries as a tool for implementation of such policy should be used the Representation of Bulgaria to the European Commission, representatives of Bulgaria in the program committees of the "Horizon 2020" and members of the national contact network. The added value of this activity is hidden in the special communication channels between the major research participants from the country and the authorities of the European Commission who are familiar with the latest funding opportunities and cooperation. There is also an expansion of the mechanisms to support the preparation of projects from Bulgarian scientists on European programmes as well as

opportunities for national funding or co-funding of projects and programmes related to the European Framework Programs.

Measures

9.1.1. Elaboration of a mechanism and a programme for active participation of the Bulgarian authorities and Bulgarian representatives in the EU authorities in the whole process of preparation of European policies, strategies and tools related to R & D, taking into account the specificities of the country.

9.1.2. Use the potential of the Representation of Bulgaria to the European Commission for assistance in the process of preparation of EU policy in the field of R & D and supporting the participation of Bulgarian scientists and research teams in the EU Framework Programs.

9.1.3. Active participation in multilateral cooperation programmes funded or co-funded under the European Framework Programs - ERA-NET, COST, research networks, joint research centers, etc..

9.1.4. Supporting the participation in regional R & D programs - the Danube Strategy, the activities of the Regional Cooperation Council with the countries of South East Europe, Programme "Black Sea" and others.

9.1.5. Maintaining of interactive information portal providing up to date information and advice in the preparation, execution and reporting of projects under the European Framework Programmes and organizing the system of NCP with secured funding of their activities.

9.1.6. Elaboration and implementation of a programme for supporting the preparation of project proposals under the European Framework Programmes through information campaigns, training for preparation of projects under the European Framework Programmes and providing funding for project preparation.

9.1.7. Promoting bilateral and multilateral institutional cooperation through its inclusion as a factor in institutional appraisal.

9.1.8. Elaboration and implementation of a scheme for funding projects of the European Research Council, remained below the ranking, but received a grade "A" (according to the system "Seal of excellence " of the EC).

9.1.9. Synchronization of the national tools for research funding with operational programmes and European programmes and tools for R & D funding.

Activity 9.2. Strengthen the participation of Bulgarian scientists and research teams in bilateral and international research cooperation.

Measures

9.2.1. Use the opportunities for joint projects under the signed agreements for bilateral scientific and technical cooperation and their geographic expansion. Adding new activities - new types of

projects, bilateral workshops, postgraduate programmes, joint doctoral and postdoctoral programmes, etc.

9.2.2. Elaboration and implementation of a programme for funding research specializations and postdoctoral programmes on a competitive basis as for the Bulgarian scientists abroad and the foreign scientists in Bulgaria.

9.2.3. Use the possibilities for European and international mobility programmes for scientists and extension the promoting of these opportunities through the European network of mobility and the national Euraxess portal.

9.2.4. Strengthen the programme for financial support for organizing national and international scientific forums in the country, including promotional campaign for Bulgaria.

9.2.5. Supporting and expanding the participation of Bulgarian governmental organizations in international organizations in the field of R & D.

Activity 9.3. Introduction of monitoring on the compliance with the principles of scientific ethics based on the European Charter of the scientist and the Code of Ethics of the scientist.

Measures

9.3.1. State support for creating, regulating the activities and functioning of the National Appeal Commission for Scientific Ethics emitted by the science community, research organizations, and social partners.

9.3.2. Methodological assistance from Ministry of Education and Science for the adoption and implementation of the principles of the European Charter for researchers, Code of Conduct for the recruitment of researchers and the Code of Ethics of scientists from the research organizations and Universities.

Activity 9.4. Intensifying relations with Bulgarian scientific diaspora.

Some of the measures associated with this activity are also described in activity 3.4.

Measures

9.4.1. Creation of an information database with Bulgarian scientists working abroad.

9.4.2. Informing the Bulgarian scientists who is working abroad about the current issues related with research and social challenges in the country.

9.4.3. Attracting Bulgarian scientists as external experts in the preparation of national and regional strategic documents, development of programmes and development plans for evaluating projects , etc.

9.4.4. Organization of specialized scientific events with the participation of Bulgarian scientists who is working abroad.

Specific objective 10. Significant intensification of relations between science and education, businesses, governments and society as a whole.

Activity 10.1. Strengthening the relations between science and education at all levels.

Measures

10.1.1. Stimulating the presentation on the achievements of leading Bulgarian scientists and scientists from the Bulgarian diaspora in secondary schools and universities.

10.1.2. Stimulating the promotion of science and researches by young scientists among students.

10.1.3. Organizing a study circle activity by leading research groups for students at the high schools in the country that are not "research universities ".

10.1.4. Establishing a system of partnership between research organizations and universities.

10.1.5. Establishing a system of partnership between research organizations and high schools.

Activity 10.2. Increasing the public awareness of the science achievements and scientific aspects of the current issues

Measures

10.2.1. Establishing a programme for the promotion of science in the society and fight against false science of using traditional and modern means of communication.

10.2.2. Organizing the presentation of the world's scientific achievements (eg. of scientists awarded with the Nobel Prize) to the students and society.

10.2.3. Encouraging specialization of journalists from media and journalism students on the problems and achievements of research.

10.2.4. Promoting the achievements of Bulgarian research organizations, research groups and scientists.

10.2.5. Encouraging of competent research organizations and universities to identify scientists which will be able to giving the advice and positions to public authorities about the problems of the country and society.

5. Organization and control on the strategy implementation

5.1. Organization of the strategy implementation

Considering the nature of the national strategy and its crucial importance for the successful development of Bulgaria as a prosperous European state, a government body responsible for its implementation is the Council of Ministers, which has the following functions in connection with the strategy:

- adopting a multiannual operational plan for implementation of each stage of the strategy, including the activities to prepare the implementation of the next steps;

- at the end of each stage accepts report on implementation and a proposal for updating the strategy and submit them to the National Assembly and the International Control Board on strategy implementation;

- include objectives, activities and measures identified in the strategy for the development of the National Development Programme, the Agreement for partnership with the European Commission for the programming period, long-term and short-term budget forecasts, the State Budget Act and other programming, legal and financial state documents;

- coordinate the implementation of the operational plan by state authorities;

- adopt an annual report on the implementation of the operational plan and an updated plan for the next year and submiting them to the International Control Board on the implementation of the strategy and the responsible committee of the National Assembly;

- ensuring active participation of government authorities and the Bulgarian representatives in the EU bodies for developing programmes and adopting solutions to ensure the implementation of the objectives and activities set out in this strategy.

Operational activities for implementation of the strategy is carried out by the Ministry of Education and Science, which:

- preparing drafts of documents related to the implementation of the strategy, which presents to the Council of Ministers, including projects for updating the strategy;

- preparing proposals for changes in laws and regulations related with strategy implementation;

- preparing in coordination with the Ministry of Finance a proposal for change in the financial framework in line with the strategy;

- preparing proposals and coordinates them with other concerned ministries, public authorities, research organizations and universities, social partners and the science community;

- provides methodological support and facilitates the activities of other ministries and state, regional and municipal authorities in the process of strategy implementation.

To ensure the strategy implementation through funding from the state budget the responsible institution is Ministry of Finance, which:

- reflects, the provided in the strategy, increase of the research funding from the state budget in projects of long and short-term budget forecasts, the State Budget Law and other financial documents;

- supporting the Ministry of Education and Science in the process of preparation of financial instruments for Strategy implementation.

The Sectoral Ministries in coordination with the Ministry of Education and Science carried out the activities for the development of research in the respective sector, by supporting the development of existing or the creation of new specialized research units and use the measures envisaged in the strategy.

The coordination of national, regional and sectoral policies and programmes will be implemented by the Council for smart growth. The Ministry of Economy and the Ministry of Education and Science, as well as the relevant regional or municipal governments will work at the operational level to carry out researches related to the implementation of national and regional priorities of Innovation Strategy for Smart Specialisation.

Within its competences the Ministry of Foreign Affairs will assist the Ministry of Education and Science and the research organizations and universities for effective bilateral and international scientific cooperation as well as to attract PhD students and scientists from abroad. The Ministry will support the implementation of the strategy through expert or technical assistance at European or international programmes or in within the intergovernmental agreements.

To support the activities of state bodies in implementation of the strategy will be created a Public Council for development of Science. The Council will include leading and young scientists - representatives of the various fields of science with proven performances under the criteria of the relevant science field. The Council will be associated with representatives of unions of scientists, businesses, industry and trade unions, journalists, public figures and others. The Council will promote the effective dialogue of the science community with the state authorities, with the society and EU institutions, it will ensure the successful implementation of the strategy and its update for the optimal participation of Bulgaria in the European Research Area. In the third stage of implementation of the strategy the Council will organize a broad public discussion to achieve national consensus on long-term objectives and priorities for the development of Bulgarian science after 2030 and for the main measures and tools for achieving them.

5.2. Stages, and indicators for Strategy implementation

The Strategy implementation is divided into three stages to ensure effective operational planning, implementation of planned activities and control over them, and to report on performance. Each stage is associated with the implementation of some of the specific objectives of the strategy and contributes to the realization of its vision. To evaluate the performance of each stage are given values of selected indicators which is necessary to be achieved. The work on each stage begins with the elaboration and adoption by the Council of Ministers of a multiannual operational plan for the implementation of the stage, including the activities to prepare the implementation of the next stages. The control over the current implementation of the plan is implemented through an annual report on its performance to be submitted to the National Assembly, accompanied by an opinion from the International Monitoring Board for the implementation of the strategy. Copies of the report and the opinion of the International Monitoring Board are granted to the European Commission. At the end of each stage the Council of Ministers presents an analysis of its performance and a proposal for updating the Strategy. Since this strategy has been developed based on current strategic documents - National Development Programme, Innovation Strategy for Smart Specialisation and others, the update of the strategy

for each of the next stages should reflect the changes in the respective national strategic documents.

I. Recovery Stage (2017 - 2022 r.)

This stage envisages the restoring the normal functioning of the national research system by applying the bulk of the measures provided for in the activities of individual specific objectives and reaching to a R & D funding from the consolidated fiscal programme, excluding the expenditures coming from the ESIF, amounted to 0.70% of GDP. The aim is at the end of the stage the research activity to be assessed correctly, to be attractive for scientists and young people and to have favorable conditions for research and their potential applications. In terms of the performance indicators it must be changed the direction of divergence of Bulgaria by number of scientific publications to climbing in the world ranking. At the end of the stage the innovation index components related to research should reach values corresponding to "moderate innovator".

II. Stage of an accelerated development (2023 - 2026 r.)

The second stage provides accelerated development of researches by continuing the implementation and the expansion of policies envisaged in the strategy, including a sustained increase in funding. To assess the success of the strategy in the early stages is provided a conducting of an independent international evaluation of the research organizations – Bulgarian Academy of Science and Agricultural Academy institutes, research institutes to Ministries and departments and research universities, according to the established international practice and experience in the authorities of the European Commission. During this stage the newly created centers of excellence and competence and the regional centers must be reached using the full capacity for R & D. At this point it should be reached a level of research on key indicators at average European level. To achieve this goal it is necessary the research in Bulgaria to grow faster than other countries in Central and Eastern Europe. This can be done only through sustained national policy provided for in the strategy. Thus Bulgaria will become attractive enough for researches to be able to retain talented young people for careers in the country.

III. Stage of research at global level (2027 - 2030 r.)

After the restoration of the level of research in the first stage and the subsequent accelerated development through involvement in the research system of centers of excellence and competence, at the last stage of the strategy it will be reached world-class research. A qualitative leap in the development of R & D in this stage will be achieved with the establishment of scientific innovation complexes in less developed areas of the country with the active participation of leading partners from abroad. The end of the stage provides that Bulgaria will significantly improves its positions in research and innovation in terms of key indicators as values for them to match those of "strong innovators".

Indicators for strategy implementation

The indicators for strategy implementation at the individual stages are summarized in Table 7.

Table 7. Target values of indicators which is necessary to be achieved at the end of each stage of the strategy implementation

Stage		**Recovery**	**Accelerated development**	**World level**
End of the stage, year	**2015**	**2022**	**2026**	**2030**
Indicator				
Bulgaria's position in the world ranking by number of publications indexed in WoS	58	56	51	47
Percentage of top 10% articles of the total articles (a)	3.6%	3.8%	5.0%	7.0%
Total R & D costs as % of GDP	0.96%	2.40%	3.00%	3.30%
R & D funding from the state budget as % of GDP	0.23%	0.85%	1.00%	1.10%
R&D personnel in FTE as % of total working force	0,6	0,8	1,0	1,5
Total number of researchers in full time equivalent	14 224	15 000	17 000	19 000
Number of defended at the year PhDs	1 442	1 600	2 000	2 200
Innovation Index as a percentage of the average index for the EU[6]	24%	30%	50%	80%
Allocated funds under Framework Programme of an year in euro per capita.	1.4	3.0	7.0	15.0
Age balance [c]	0.73	0.76	0.90	1.05
Policy on Gender Equality [d]	1.13	1.0 ± 0.15	1.0 ± 0.15	1.0 ± 0.15

a) according to the European Innovation Scoreboard

b) through the components associated with Science (according to the European Innovation Scoreboard)

c) ratio of the number of researchers up to 34 years to researchers over 55 years in the state sector and the "Higher Education" sector (according to NSI)

d) the ratio of the number of women researchers / men researchers.

The implementation of the indicators refers to the last year of the stage, taking into account the first year of the next stage. The target indicator values are determined in accordance with the target position of the country at the end of each stage and then compared with those of EU countries in the respective position.

5.3. Control over the strategy implementation

The control over the strategy implementation is implemented by the National Assembly and the International Control Board on strategy implementation.

The National Assembly shall consider and approve the reports of the Council of Ministers to implement the various stages of the strategy and the reports of the International Control Board and, if necessary, to update the strategy. The sectoral committee of the National Assembly shall consider the annual reports of the Council of Ministers for the implementation of the strategy and the reports of the International Control Board and shall accept an evaluation of the implementation. In serious breach of the Strategy, the Committee may propose to the Council of Ministers some changes in the organization of strategy implementation, including the composition of the responsible state authorities.

For specialized control over the strategy implementation is set up an International Monitoring Board. Members of the board include no more than six leading foreign scientists from different fields of science (including prominent Bulgarian scientists working abroad). The Board members are nominated by the European Research Council and its staff shall be approved by the sectoral committees of the National Assembly. The International Monitoring Board shall meet at least once a year and:

- examine the drafts of the documents – the multiannual operational plan for the implementation of each stage of the strategy, the proposals for updating the strategy and the operational plan and updated annual plan. For each document it makes recommendations to the Council of Ministers;

- examine the reports of the Council of Ministers to implement the various stages of the strategy and annual reports, issues an opinion on them with assessment of the implementation and with recommendations for solutions submitted to the National Assembly, to the Prime Minister and to the President of the Republic of Bulgaria;

- sending opinions on the reports of the Council of Ministers to the sectoral departments of the European Commission and published them.

During the meeting the board members can attend public institutions engaged in the strategy implementation, research organizations and universities and to meet with representatives of the science community, social partners and etc…

“Science”Direcorate at Ministry of Education and Science supported the activity of the International Monitoring Council and receives the necessary funding for implementation of all activities of the Council.

Public control over the implementation of all strategy activities, can be implemented by scientists, the science community, the social partners and representatives of society and industry.