European Commission

Specific support to Bulgaria – Background report

Horizon 2020 Policy Support Facility

EUROPEAN COMMISSION

Directorate-General for Research & Innovation
Directorate A — Policy Development and Coordination
Unit A4— Analysis and monitoring of national research and innovation policies

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Luxembourg: Publications Office of the European Union, 2017.

PDF ISBN 978-92-79-73424-3 doi:10.2777/976598 KI-AX-17-012-EN-N

Table of contents

1 INTRODUCTION

1.1 The H2020 PSF Specific Support to Bulgaria

This background report provides an overview of the Bulgarian science, research and innovation (R&I) system in the context of the Specific Support to Bulgaria within the Horizon 2020 Policy Support Facility.

The Specific Support to Bulgaria is a follow-up to the peer review of the Bulgarian research and innovation system undertaken in 2015 within the Horizon 2020 Policy Support Facility (PSF). The Bulgarian government requested further implementation of the peer review's recommendations, in particular in relation to the system for allocating institutional funding for research.

The objective of the Specific Support is to advise the Bulgarian authorities on the development of a performance-based research funding system (PRFS) and a model for evaluating and assessing public research institutions' performance. Recommendations on how to address these topics will be based upon an analysis and assessment of the current situation and identification of the main gaps and challenges in relation to implementing a PRFS and the evaluation/assessment mechanism of the public research institutions and universities. They will be inspired by international best practice, whilst taking the national context into account.

The background report is mainly targeted at those experts involved in the H2020 PSF Specific Support to Bulgaria. It summarises information in the literature on the Bulgarian R&I system and provides insights into how the system functions, including governance, funding streams, evaluation practices, major challenges in the R&I system that require public intervention, and reform efforts.

1.2 Socio-economic context of Bulgaria

Bulgaria experienced years of sustained growth in the 2000s which ended in 2008 when the economy contracted by 4.5 % (Figure 1). Prior to the financial crisis, growth was lower than in countries in a similar situation (Baltic and Central European countries) and the contraction was smaller. The economy started to grow again after the crisis but a strong, consolidated recovery has yet to occur, even though the Bulgarian gross domestic product (GDP) (current prices) grew by more than 3 % in 2016 to reach BGN 92.6 billion (EUR 47.49 billion). This equates roughly to EUR 6638 EUR per capita.

According to forecasts, growth is expected to decline slightly in 2017 and 2018. Private consumption has been the main driver of GDP growth while the contribution of net exports dropped in 2016 compared to 2015 (Figure 1). The expectation is for investments to pick up in 2017 compared to 2016, mainly because of the greater implementation of European Union (EU) funds[1] (EC, 2017). The EU budget contributes around 3 % of GDP annually and almost half of public investments.

Figure 1: GDP growth from 2005 to 2016 compared to Romania, Latvia and Slovenia

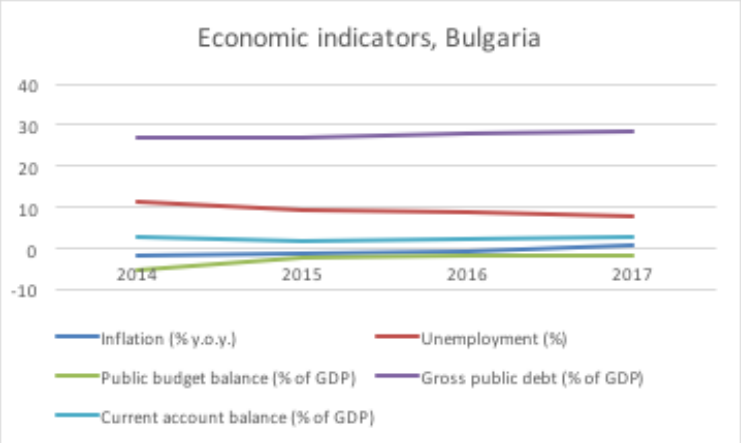
Source: Eurostat

[1] Commission Staff Working Document, Country Report Bulgaria 2017 {COM(2017) 90 final}

Since 1997, Bulgaria has had a relatively stable financial framework because of the currency board system whereby the local currency – Bulgarian leva (BGN) – is pegged to the euro. Bulgarian finances are relatively well balanced and the budget deficit fell to 0.4 % of GDP in 2016 and is expected to remain below 0.5 % until 2018 (Figure 2).

Bulgaria has made some progress on improving tax collection rates and reducing the share of the grey economy but it remains high (tax-to-GDP ratio is among the lowest in Europe). Very limited progress has been achieved in financial supervision and follow-up actions mainly with regards to the bankruptcy of one of the country's largest banks.

Figure 2: Economic indicators for Bulgaria



Source: European Commission, Institutional Paper 25, 2016

Bulgaria's economic growth is strongly dependent on **exports**. In the period January-November 2016, Bulgarian exports to the EU rose by 6.8 % compared to the same period in 2015, while imports increased by 1.9 %. Bulgarian export to third countries fell by 5.9 %, while imports declined by 7.1 %[2]. Although Bulgarian exports are diverse and include manufacturing goods, services, agriculture products and metals, to date, the country's competitive advantage has actually been in relatively low-value-added products.

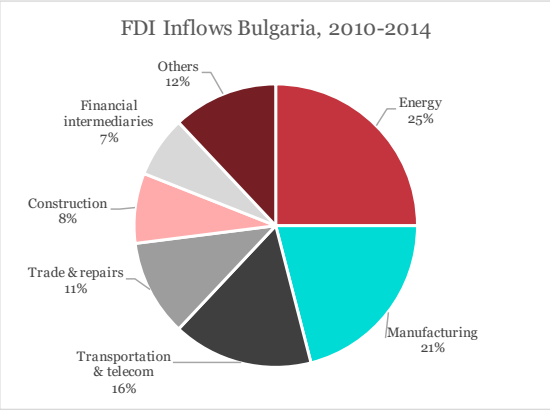
Bulgaria specialises predominantly in low-tech production, and the export structure is still biased towards raw materials and primary products rather than high-value-added products and knowledge-intensive services. The sectors that continue to have a competitive advantage are defined as (NACE definitions): food, beverages and tobacco; wood, paper, paperboard and articles thereof; furniture; basic metals and fabricated metal products except machinery and equipment; cars and other vehicles; computer and electronic products, electrical equipment; pharmaceuticals.

Foreign direct investment (FDI) is limited, although FDI inflows have benefited the economy as a whole. In the non-financial sectors, FDI inflows amounted to EUR 23.1 billion for 2015, which is 7.2 % higher than 2014. The largest share of investments was channelled to industry (EUR 9.9 billion)[3]. In the post-crisis period, in particular the energy sector, including renewable energy sources, has attracted investors' attention (25 %). Manufacturing has attracted 21 % of investment flows, followed by transport and telecom investments (16 %) (Figure 3).

The 2016 return on investment (RIO) country report states that there is no statistical evidence that FDI is being attracted by innovation-related incentive schemes or the existing science base, with the possible exception of ICT-related and outsourcing services. FDI presence seems to be linked to the affordable labour force (especially with foreign language skills) and the low flat level of corporate tax.

[2] National Statistical Institute (NSI)
[3] NSI

Figure 3: FDI inflows, 2010-2014 (Bulgaria)



Source: RIO report 2015 (data: Bulgarian National Bank)

The demographic picture in Bulgaria is not promising, which is hindering the supply of labour. The population is declining, the average age is rising while regional disbalances are growing. This adverse demographic development is due to both the low birth rate (high mortality rate) and high emigration levels. Mortality rate in Bulgaria is the highest in the EU – 15.3 per thousand. At the end of 2015, the population was 7 153 784 (NSI). People aged 65 and older represent 20.4 % of the population. The situation is even worse in certain regions such as the north west and north centre. Some 73.1 % of the population lives in cities and the rest in villages.

The unemployment rate dropped from a high of 13 % in 2013 to 7.7 % in 2016 and is expected to fall to 7.1 % in 2017.

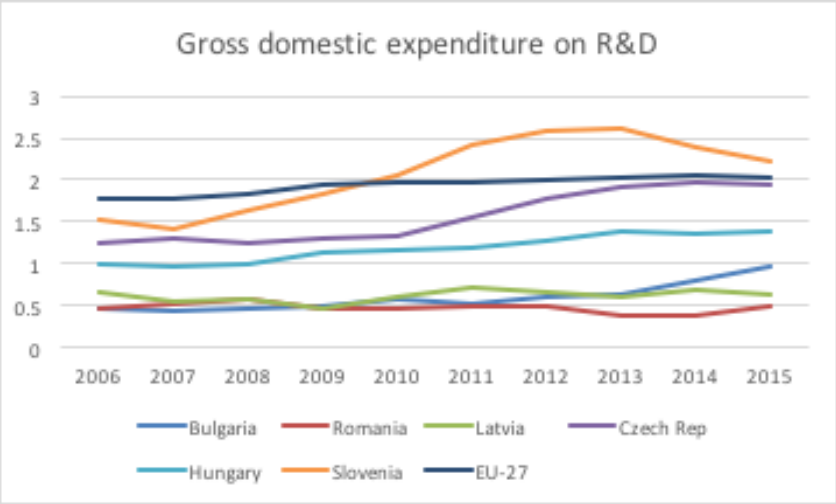
2 RESEARCH AND INNOVATION IN BULGARIA, AN OVERVIEW

2.1 Trends in R&D expenditure

The Bulgarian R&I system has been characterised by significant underfunding, of between 0.5-0.6 % of GDP in the last decade and rising to 0.8 % in 2014.

In 2014, the GDP on R&D (GERD) per capita in Bulgaria equalled EUR 46.3, while the EU-28 average reached EUR 558.4 (Eurostat, December 2015). Even though in 2014 the GERD was more than doubled that of 2006, it remains highly inadequate and less than half the EU average. Bulgaria ranks 23rd among all Member States in terms of GERD; it was higher than that in Romania and Latvia for the last three years but much lower than Slovenia, Hungary and the Czech Republic (Figure 4).

Figure 4: Gross Domestic Expenditure on R&D (GERD) compared to other CEE countries and EU-27

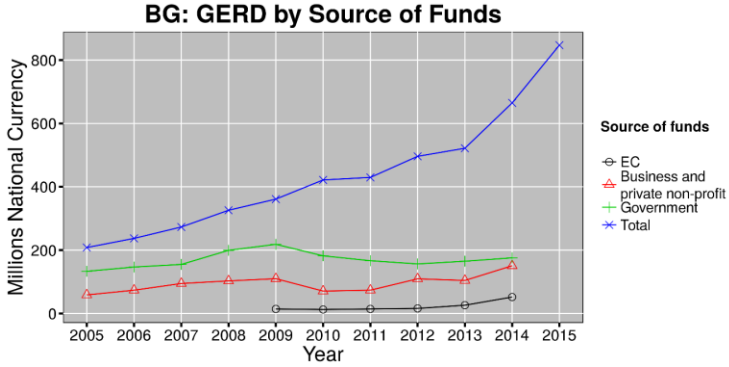


Source: Eurostat

Recent trends in R&I structural developments are characterised in particular by increasing foreign R&D investments (Figure 5). Thus, the main reason for the growing Bulgarian R&D intensity is foreign funding, both private and EU.

According to the 2015 EC RIO report, in 2013, financial support from abroad amounted to 48 % of the total GERD. Since Bulgaria does not systematically report on the detailed categories – i.e. business, governments, etc. – it is not possible to trace the real source. However, the report considers that for 2013 there is enough evidence to suggest that the external source of financing is the (foreign) business sector with R&D investments accounting for EUR 110.572 million, i.e. 41.4 % of the total GERD and 86 % of financing from abroad.

Figure 5: R&D expenditure (GERD) by source of funds

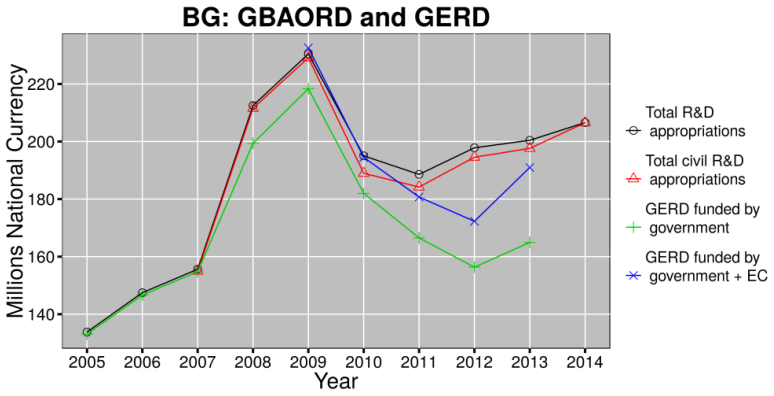


Source: RIO report 2016 (data: Eurostat)

There is evidence that the post-crisis fiscal adjustment process in Bulgaria has come at the expense of public support for R&D. **Public expenditure on R&D** as a % of GDP (public R&D intensity) fell from 0.34 % in 2009 to 0.25 % in 2015; for this indicator, Bulgaria ranked 28th among the EU Member States in 2015.

Figure 6 shows that after a sharp increase from 2007 to 2009, the total R&D appropriations (GBAORD), measured in national currency, dropped significantly in 2010 and 2011. Despite the increasing trend from 2012 onwards, GBAORD has yet to fully recover. It should be noted that in 2013, the total GBAORD as a percentage of total government expenditure dropped to the 2007 level.

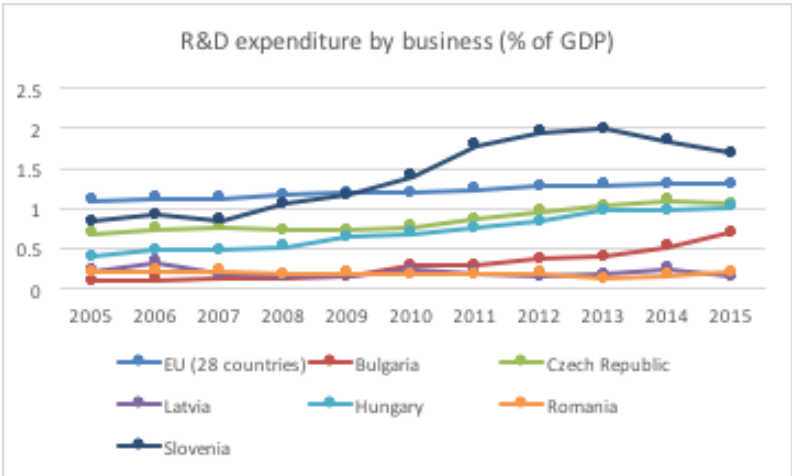
Figure 6: R&D appropriations and government-funded GERD in BGN millions (EUR 1 = BGN 1.95583)



Source: RIO report 2015 (Data source: Eurostat)

In the past three to four years in particular, there has been a positive trend in **business expenditure on R&D** as a % of GDP. Bulgaria ranks 15th in business enterprise expenditure on R&D (BERD) among the EU Member States. The R&D performed by the business sector (as a percentage of GERD) increased from 30 % in 2009 to 50 % in 2010, up to 61 % in 2013 (near the EU-28 average of 64 %). Bulgaria performs better than Romania and Latvia and is slowly narrowing the gap with the Central European countries (Figure 7). Reports attribute this rise in BERD mainly to the EU's Operational Programmes and instruments.

Figure 7: Business Expenditure on R&D (BERD) compared to other countries and EU-28



Source: Eurostat

The 2015 EC RIO report states that, in the last decade, BERD in the top manufacturing sectors in Bulgaria experienced some strong fluctuations. However, in the period 2009-2013, there was a growing trend in the manufacture of machinery and equipment n.e.c. (C28) (Figure 8). The pharmaceutical industry (C21) is another leading manufacture sector in Bulgaria, as is the

manufacture of computer, electronics and optical products (C26) (although at lower levels of BERD expenditure).

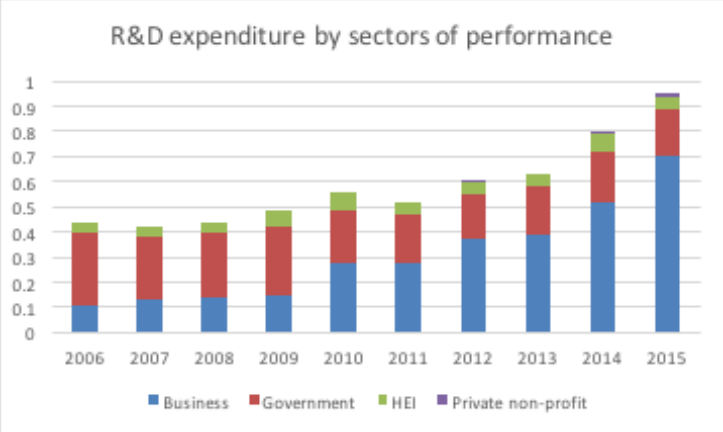
There is a lack of data on expenditure in the services broken down by sectors; however, it is clear that the driving force behind the intensity of growth in services are the professional, technical and scientific services. Funding from abroad, and more specifically EU funding sources, have been targeted at this sector.

Figure 8: BERD in top manufacturing sectors

Source: RIO report 2015 (data: European Commission)

In terms of R&D expenditure by **sectors of performance**, data show the increasing R&D activity in the business sector, and the persistently low level of research activity in the higher education sector (Figure 9).

Figure 9: GDP on R&D by performance sector, 2015 (% of GDP)



Source: Eurostat, 2017

The 2015 RIO report indicates significant structural changes in **thematic R&D expenditure** for the period 2000-2013, based on NSI data:

- R&D expenditure on medical sciences increased from 4-8 % during the period 2000-2008, to 44-43 % in 2011-2013;
- Contrary to this trend, R&D expenditure in agriculture science fell from 30 % in 2000 to 7 % in 2012 and 2013.

Government spending dominates the natural sciences (46 % for 2013), which are of primary importance in R&D spending for growth. However, R&D expenditure by the business enterprise sector is higher in medical sciences (68 % for 2013).

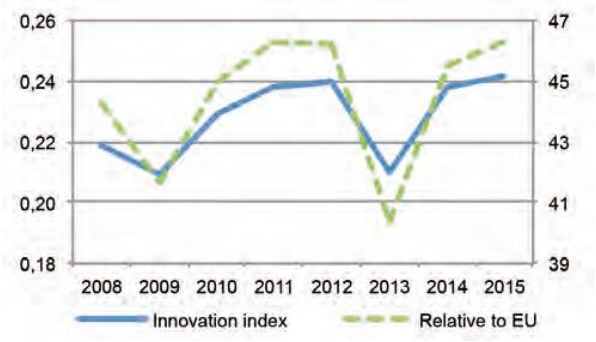
2.2 Current performance in R&I – trends and key challenges

2.2.1 Innovation performance

The 2017 EC European Semester report considers that low technological progress and innovation performance are limiting Bulgaria's growth potential.

According to the **European Innovation Scoreboard** (EIS) 2017 (which follows a slightly different methodology from the previous ones) in 2016 Bulgaria remains in the group of 'modest innovators' with an innovation performance at only 47.5 % of the EU average. Only Romania, Macedonia and Ukraine are behind Bulgaria among the countries covered by the survey.

Figure 10: Bulgarian innovation index



Source: European Innovation Scoreboard, 2016

Bulgaria's relative strengths are in human resources, intellectual assets and employment impacts. It is a weak performer in most indicators with several exceptions. For all EIS indicators, except broadband penetration and non-R&D innovation expenditures, Bulgaria is performing below the EU average. For intellectual assets and employment impacts the country is performing around the EU average while for the rest of the indicators the gap with the EU average is significant.

While the level of trademark applications is high (130.4% of the EU average), patent applications in Bulgaria remain low (41.8% of the EU average). Commercialisation of research appears to be a major weakness within Bulgaria's research system – both the EC RIO report and the EC 2017 European Semester report[4] point to insufficient cooperation between businesses and academia in this context.

The key technological areas where Bulgaria has some distinctive technologies, including high value added, are in particular products and services in the area of computer technology (Table 1). The 2015 EC RIO report considers that the wide spectrum of patents across 10 specific technology areas and the high volume of others (44.6 %) demonstrates the dispersion of technology capabilities across the economy. The report points out that there are no explicit policies to address the issue of the knowledge markets, either internally or externally. While the financial support offered to firms and research organisations for innovation includes patent registration, it does not provide explicit incentives to increase patent activity.

Table 1: Patent applications by top fields of technology (1999-2013)

Field of technology	Share
Computer technology	8.09
Engines, pumps, turbines	6.78
Other special machines	6.37
Civil engineering	6.19
Electrical machinery, apparatus, energy	5.93
Pharmaceuticals	5.00
Transport	4.64
Medical technology	4.41
Measurement	4.07
Basic materials chemistry	3.89
Others	44.63

[4] European Semester 2017 – Country report Bulgaria, European Commission

Source: RIO report 2015 (data: WIPO, December 2014)

The **Global Entrepreneurship Monitor** (GEM) 2015/2016 revealed that Bulgaria has a very small but dynamic innovation-oriented group of businesses and a large number of companies which do not undertake innovations. The biggest constraints on entrepreneurship include: lack of entrepreneurship education in secondary schools and universities; the time taken to get permits; a lack of one-stop-shop for SME support; access to finance; and low propensity to risk[5]. In addition, Bulgarian entrepreneurs demonstrate a low level of international orientation. Table 2 shows the rather low propensity among all innovative enterprises to cooperate in Bulgaria.

Table 2: Enterprises engaged in any type of cooperation as share in total innovation-active enterprises, by size of enterprise

Country	Total			Small enterprises (between 10-49 employees)			Medium enterprises (between 50-249 employees)			Large enterprises (more than 250 employees)			SMEs (less than 250 employees)		
	2008	2010	2012	2008	2010	2012	2008	2010	2012	2008	2010	2012	2008	2010	2012
Belgium	48,8	42,3	52,2	45,2	35,0	47,2	54,9	53,4	59,8	72,0	74,1	75,7	44,7	37,4	47,1
Bulgaria	16,6	22,4	16,6	14,9	19,0	13,5	16,8	22,3	16,9	28,4	44,5	34,5	14,1	18,2	13,2
Poland	39,3	33,5	31,3	29,5	23,8	19,6	45,1	35,6	37,2	66,1	59,0	58,3	31,0	24,6	23,0
EU (1)	:	25,5	31,2	:	20,6	26,8	:	32,8	37,9	:	54,0	56,9	:	22,0	27,5
Sweden	39,9	38,8	30,1	36,6	34,3	27,0	42,8	46,5	35,1	64,9	68,2	55,2	35,5	34,6	27,1
Norway	35,1	30,6	28,1	32,4	26,0	22,9	38,1	38,3	35,2	52,8	51,9	55,9	31,7	27,3	24,4

Source: DG RTD – Unit for the Analysis and Monitoring of National Research Policies; Data: Eurostat (CIS2012, CIS2010, CIS2008)

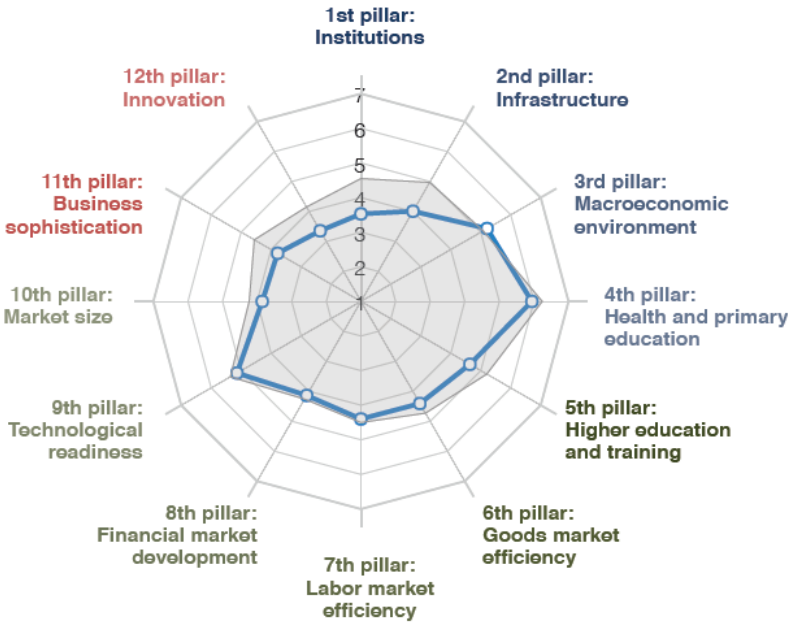
The World Economic Forum's **Global Competitiveness Report** 2016-2017 ranks Bulgaria in the 50th place out of 140, right after Latvia and ahead of Slovenia (59th), Romania (62nd) and Slovakia (67th).

Innovation and sophistication factors are a weak spot with Bulgaria ranking 71st in the world (Latvia is 66th and Romania is 100th) (Figure 11). Overall, Bulgaria's competitiveness remains based on low corporate and personal taxes (10 %) and the low cost of relatively skilled labour rather than on quality-related factors such as innovation and knowledge base.

- Bulgaria has a particularly low score for the 'institutions' indicator (97th), which is one of the biggest structural weaknesses in Bulgarian society. It performs slightly worse than Romania (92nd) and much worse than Latvia (64th) against this indicator.
- The inability of the educational system to provide students with relevant skills remains a major obstacle to economic development. In terms of quantity and quality of higher education and on-the-job training, Bulgaria ranks 56th which is worse than Latvia (39th) but much better than Romania (67th).
- Bulgaria is 41st in macroeconomic environment which again is much worse than Latvia (24th) and Romania (28th).
- With regards to financial markets development, Bulgaria comes 59th while Latvia is 34th and Romania is 86th.
- In terms of technological readiness, Bulgaria is 38th while Latvia is 34th and Romania is 48th[6].

[5] GEM National report on entrepreneurship in Bulgaria 2015/2016, Andonova, V. and Krusteff, M.
[6] World Economic Forum's Global Competitiveness Report 2016-2017

Figure 11: Bulgaria's position in the Global Competitiveness Index 2016-2017 (blue line)



Source: World Economic Forum, 2016

The most important factors hampering the economic development and competitiveness are the dysfunctional judiciary system and the weak institutions. This combination leads to **high levels of corruption**. In terms of the Corruption Perception Index 2016, Transparency International ranks Bulgaria 75th out of 176 countries with a score of 41/100. In comparison, Latvia is ranked 44th with a score of 57 and Romania is ranked 57th with a score of 48[7]. These problems are compensated for to a certain extent by the attractive taxation regime (flat profit and income tax at 10 %) and low wages, but significant economic growth is impossible in the long term without tackling the issue of corruption.

For several years, Bulgaria has had difficulties with **public procurement** due to low administrative capacity and corruption. A National Public Procurement Strategy 2014-2020 was adopted but its impact on the landscape remains unknown. There has been no progress in e-procurement.

2.2.2 Research performance

Bulgaria ranks 21st among the EU Member States on the JRC composite indicator of **research excellence**[8], with only a marginal improvement in the overall score in the 2007-2012 period (from 24.2 to 24.5). Figure 12 details the performance of Bulgaria's research system during that period.

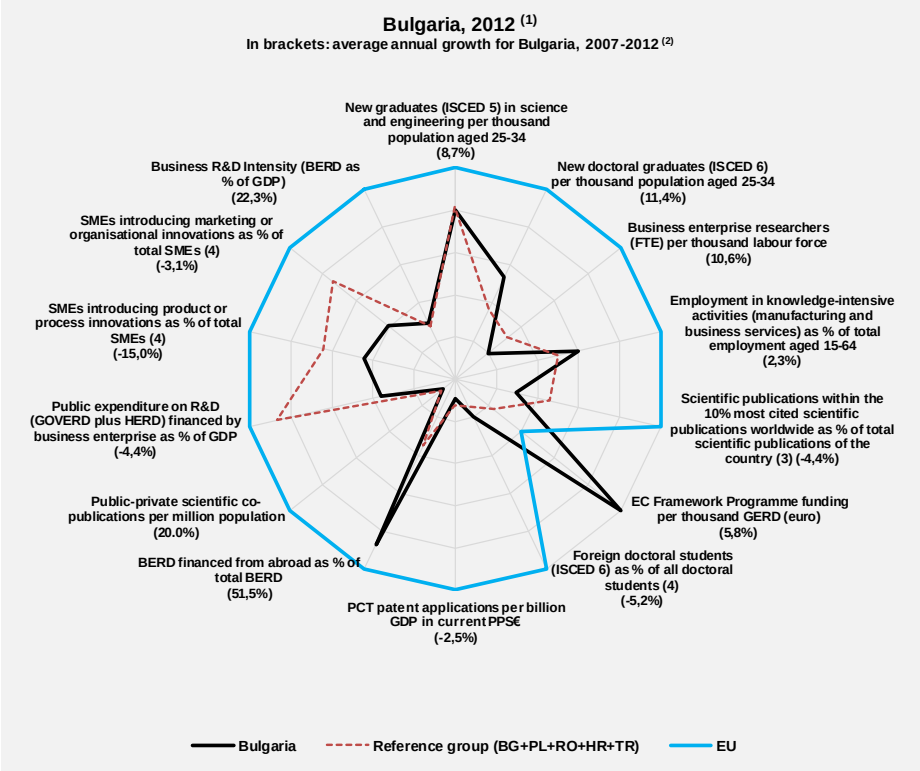
For all indicators related to research performance, Bulgaria is significantly lower than the EU average. Nevertheless, there has been an ongoing improvement for all sub-indicators, except for the share of highly cited publications per total publications. Public-private scientific co-publications, the number of business enterprise researchers (FTE), and patent applications are among the other main weaknesses. In addition, the European Research Area's progress report for 2016 indicates:

- The headline composite indicator is lagging behind the EU-28 average by 84 %;
- The growth of the composite indicator is lower than the EU-28 average growth;
- The growth of patent applications per 1000 researchers is an exception and is growing faster than the EU-28;
- The indicator on 'open-based hiring process', for which Bulgaria reports values at nearly half the EU average (2012), illustrates one of the main reasons for the lack of trust in the system;

[7] https://www.transparency.org/country/
[8] JRC Scientific and Policy Reports, 2012, Composite Indicators of Research Excellence

- In 2012, the share of doctoral students from EU countries was 3.1 %, some 88 % lower than the EU average[9].

Figure 12: Research performance in Bulgaria in the period 2007-2012



Source: DG Research and Innovation - Unit for the Analysis and Monitoring of National Research Policies
Data: DG Research and Innovation, Eurostat, OECD, Science Metrix / Scopus (Elsevier), Innovation Union Scoreboard
Notes: (1) The values refer to 2012 or to the latest available year.
(2) Growth rates which do not refer to 2007-2012 refer to growth between the earliest available year and the latest available year for which comparable data are available over the period 2007-2012.
(3) Fractional counting method.
(4) EU does not include EL.

From a **bibliographic and science metrics perspective**, the Scopus database contained 302 871 articles by Bulgarian scientists and researchers in 2015. By December 2015, Scopus contained 3028 articles written by Bulgarian scientists and researchers which were published in 2015. The Web of Science database contained 5266 publications by Bulgarian authors dated 2015 (RIO report 2015).

Out of 51 higher education institutions (HEI), only 17 have published articles and scientific reports that are reflected in Scopus. The leading institutions in terms of number of publications are the Bulgarian Academy of Sciences, Sofia University 'St. Kliment Ohridski', and the Medical University in Sofia. The RIO report 2015 notes that the disciplines with highest number of publications were:

- Medicine (667)
- Physics and astronomy (661)
- Engineering (496)
- Biochemistry, genetics and molecular biology (384)
- Agrarian science and biology (379).

In terms of citations, in 2014, 46 Bulgarian scientific articles were indexed in Scopus and 18 articles were indexed in Thomson Reuters (Science Citation Index Expanded – 17 articles and Art & Humanities Citation Index – 1 article). There were no Bulgarian articles in the Social Sciences Citation Index.

[9] ERA Progress Report 2016, Country Snapshot Bulgaria

The Bulgarian research community's ability to conduct excellent research is also demonstrated by its participation in the EU **Framework Programmes**. The level of Bulgarian participation in these Programmes is limited and current data suggest that its research competitiveness is declining.

The 2015 RIO report states that in the EU's Sixth Framework Programme for Research and Technological Development (FP6), Bulgaria participated in only 371 projects for EUR 42 million in EU funding, which is 0.24 % of total EU funding. Based on eCorda data, the 2015 JRC Stairways to Excellence report[10] calculated that in EU's Sixth Framework Programme for Research and Innovation (FP7), Bulgarian researchers received a total EU funding of EUR 97.4 million, with 697 participations in 671 projects.

Despite these higher numbers, Bulgaria's *share* fell in FP7 both in terms of EU funding (0.22 %) and in participations (0.53 %). However, the Stairways to Excellence report notes that many of the EU-13 countries were unable to maintain their funding shares from FP6 in FP7 and were outperformed by the Associated Countries. The FP7 Monitoring Report 2013 states that among the EU-28, Bulgaria ranked 20th in terms of number of participations as well as in the share of EU funding.

Based on data in the H2020 Monitoring Report 2015, Bulgarian researchers secured EU funding of EUR 22.2 million in the 2014 and 2015 calls. Bulgaria performed worse than most of the 'reference group' countries and other CEE countries, both in terms of number of participations and EU contributions; the one exception is Latvia (Figure 13).

Figure 13: Bulgarian participation and EU funding in Horizon 2020 (2014/15)

	Number of participations	Share of participations	EU funding (EUR million)	Share of EU contribution
Bulgaria	187	0.5 %	22.3	0.1 %
Poland	579	1.6 %	139.3	0.9 %
Romania	345	0.9 %	60.8	0.4 %
Croatia	164	0.4 %	27.5	0.2 %
Latvia	110	0.3 %	18.4	0.1 %
Slovenia	320	0.9 %	84	0.5 %

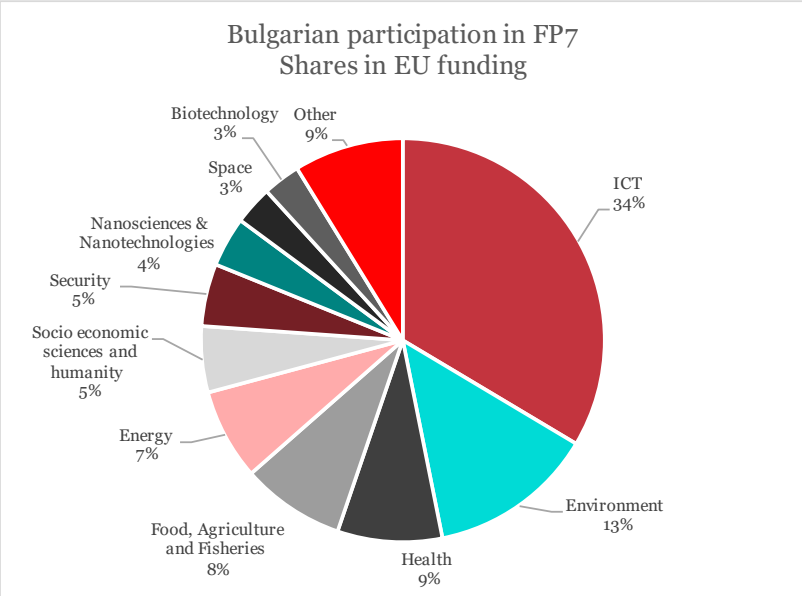
Source: Horizon 2020 Monitoring Report 2015, Directorate-General for Research and Innovation

In terms of **research areas**, Bulgarian researchers have shifted their focus in FP participation, although this may be partly influenced by the variegating overall success rates in the H2020 programmes so far (particularly the low success rates in areas such as ICT).

In FP7, Bulgarian researchers received higher levels of EU funding particularly for their research in the field of ICT and environmental technologies (Figure 14). In addition, the FP7 Monitoring Report 2013 states that seven researchers received ERC grants for a total of EUR 7.78 million and 219 Bulgarian Group Marie Curie Fellows benefitted from EUR 141.87 million.

[10] Stairway to Excellence - Cohesion Policy and the synergies with the research and innovation funds, Bulgaria (BG) Facts & Figures, JRC, 2015

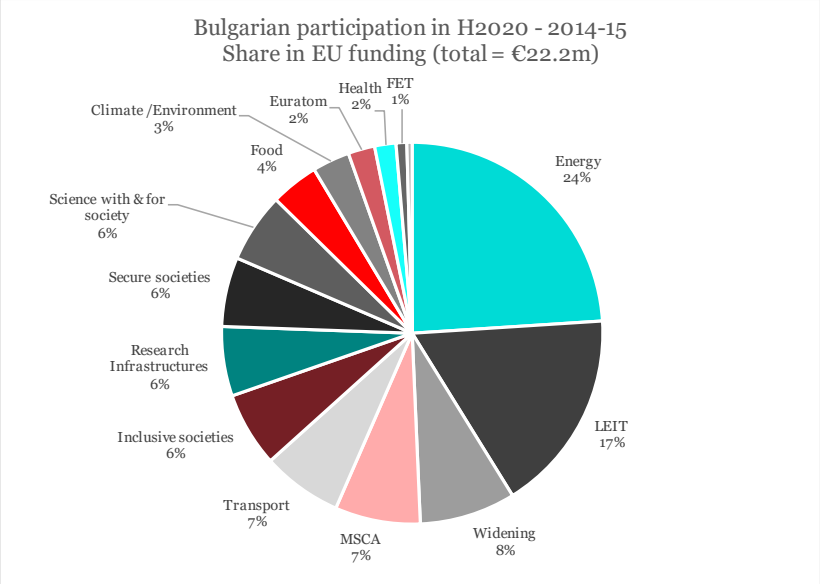
Figure 14: S&T specialisation areas based on FP7 EU funding



Source: IPTS/JRC calculated using the FP7 contracts database, June 2014

Figure 15 shows the H2020 programmes in which Bulgarian researchers are involved. Out of 187 participations, 23 % (i.e. 43 participations) are in the 'Secure, clean and efficient energy' societal challenge; the Marie Curie, LEIT and Innovation support actions are the second most important areas with 15 to 20 participations in each. No ERC grant has been awarded to date.

Figure 15: Areas of Bulgarian participation in H2020, 2014-2015



Source: Horizon 2020 Monitoring Report 2015, Directorate-General for Research and Innovation

2.3 The research-performing institutions

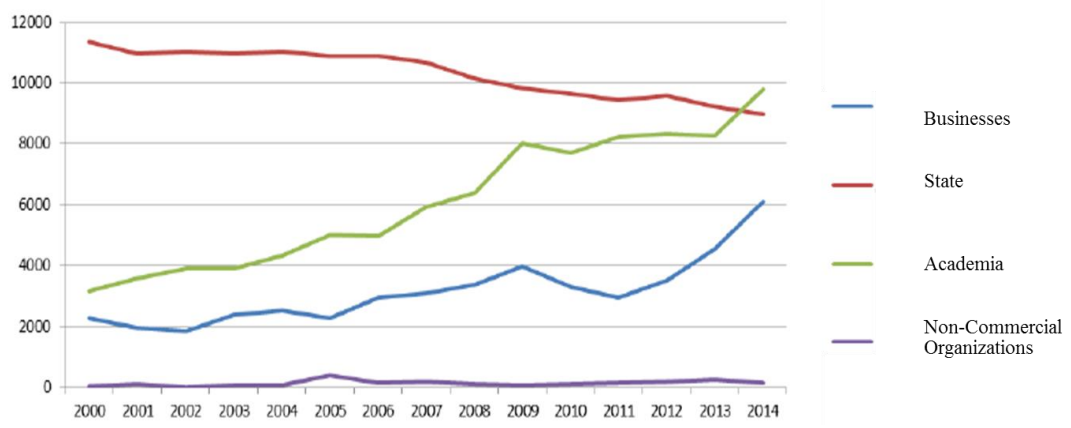
2.3.1 Overview

The Bulgarian National Research and Innovation System (NRIS) is characterised by the publicly funded 'research and development segment' on the one hand, and the private sector 'innovation segment' on the other:

- The public segment comprises: the state-owned higher (or tertiary) educational institutions; public research organisations, i.e. mainly the two leading academies - Bulgarian Academy of Sciences (BAS) and Agricultural Academy (AA); and the public research institutes (centres/labs) under different sectoral ministries or agencies;
- The private segment covers private performers, which could be higher institutions (i.e. private universities), private research organisations (including those registered as non-profit NGOs) or enterprises

In recent decades, the trends in **researcher employment** (Figure 16) shows an increasing number of researchers employed by industry and academia, while the number of 'state' researchers is in decline.

Figure 16: Number of researchers in Bulgaria



Source: NSI

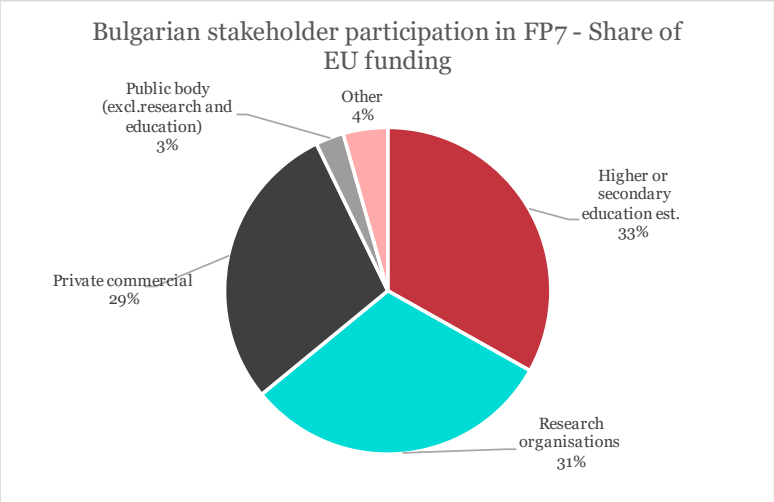
The **largest research-performing institutions** in Bulgaria are the BAS and the AA, i.e. public research institutions, and some of the Bulgarian universities (e.g. Sofia University and the Technical University in Sofia). However, the 2015 RIO report considers that applied research is increasingly being carried out in smaller private-sector organisations – private universities, private research institutions and private enterprises.

In FP7, the higher education sector benefitted from a higher share in EU funding than other actors in the Bulgarian research system, i.e. 33 % of the total EU funding for Bulgarian researchers (Figure 17).

Of particular interest here is the network analysis conducted in the context of the 2015 Stairway to Excellence study[11]. The study found that Bulgarian research organisations (i.e. the academies' institutes) are strongly linked to Bulgarian universities which are acting as an interface between other European universities (HES) and the other Bulgarian participants. A second finding was that the private enterprises participating in FP7 seemed to be isolated from the other Bulgarian participants and had stronger connections with other firms based in the EU Member States.

[11] http://s3platform.jrc.ec.europa.eu/documents/20182/117536/S2E_Report_BG.pdf/dc1285cb-e7f6-42ef-9252-44f201b11bbe

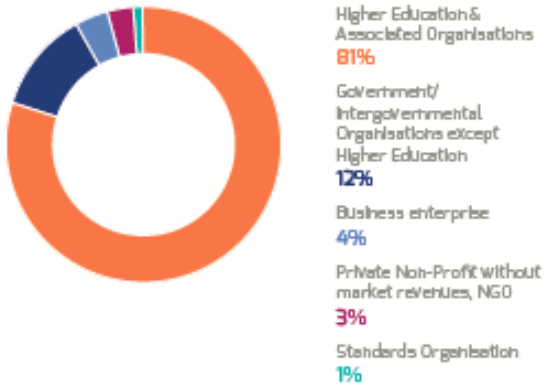
Figure 17: Distribution of FP7 EU funding across Bulgarian stakeholders



Source: data: FP7 contracts database, June 2014; processed by JRC-IPTS

In addition, in the EU **COST programme**, researchers in HEIs have the highest share of participation. Two universities are currently (vice)-chairs of COST actions: Sofia University (Advanced Global Navigation Satellite Systems tropospheric products for monitoring severe weather events and climate) and the Technical University of Sofia (Algorithms, Architectures and Platforms for Enhanced Living Environments).

Figure 18: Participation by Bulgarian researchers in COST

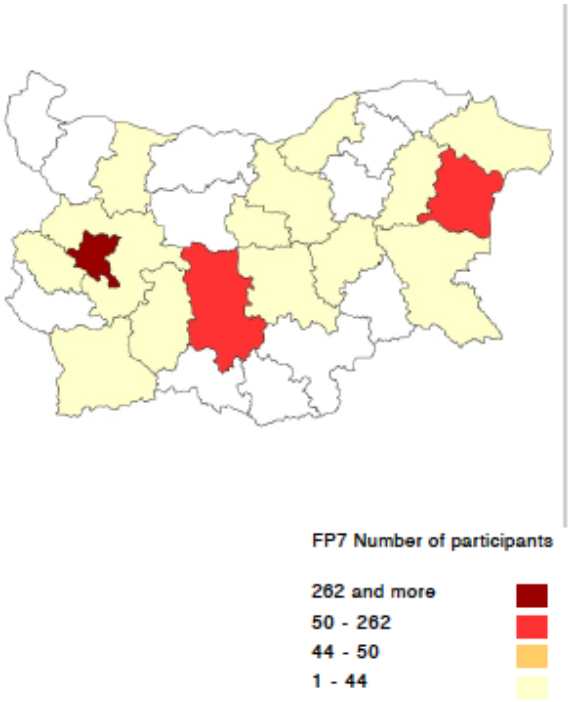


Source: Country Fact Sheets, COST – European Cooperation in Science & Technology, 2016

There is a **strong geographical concentration** of the research activities**.** The organisations most active and successful in attracting research funding are located in the capital: Bulgarian Academy of Sciences (BAS), Sofia; University 'St. Kliment Ohridski'; Medical University of Sofia; Technical University of Sofia, and some other universities. The Plovdiv region also houses some relatively active HEIs such as Plovdiv University 'Paisii Hilendarski', the Medical University of Plovdiv and the University for Food Technologies. Varna is the third largest centre of research in Bulgaria with the Technical University of Varna, the Medical University of Varna and the BAS Oceanology Institute.

The FP7 Monitoring Report 2013 plotted Bulgarian participation in FP7 as shown in Figure 19.

Figure 19: Geographical distribution of FP7 participation



Source: FP Monitoring Report 2013

Table 3 lists the most successful Bulgarian beneficiaries under FP7.

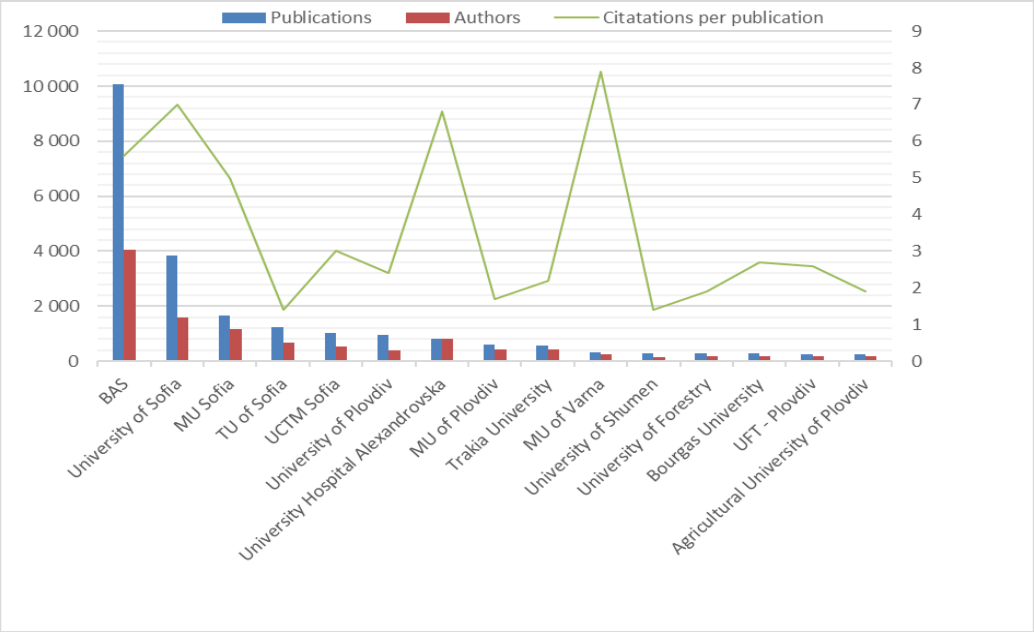
Table 3: Top 10 beneficiaries, EC financial contribution, granted in FP7 (Bulgaria)

Name	Number of Participations	EC Contribution (in million euro)
Sofia University 'St. Kliment Ohridski'	45	9.02
Institute of Information and Communication Technologies (IICT) – Bulgarian Academy of Sciences	35	6.86
Ontotext AD	15	5.00
Institute of Solid State Physics – Bulgarian Academy of Sciences	3	4.50
University of Plovdiv	11	2.75
Institute of Oceanology – Bulgarian Academy of Sciences	21	2.33
Institute of Polymers – Bulgarian Academy of Sciences	2	2.23
Pensoft Publishers Ltd (Pensoft)	8	1.81
Technical University of Sofia	22	1.77
New Bulgarian University	2	1.59

Source: Seventh FP7 Monitoring Report, 11 March 2015, Country Profile: Bulgaria

Figure 20 shows the 15 research organisations performing best against the bibliometric dimensions of number of publications, authors and citations, using Elsevier's SciVal tool.

Figure 20: Top 15 best-performing research organisations in Bulgaria



Source: SciVal, 2011-2016

2.3.2 Higher education institutions

Bulgaria has 37 public and 14 private higher education institutions (HEIs), including 30 universities, 14 specialised higher schools and 7 independent colleges. The average number per capita is higher than in countries in a similar situation.

The rapid growth in the number of universities has led to inadequate quality and efficiency. Furthermore, the built infrastructure is often not at a sufficiently high standard. The inadequate quality of education is the reason for the high number of people looking for education abroad, which is contributing to the brain-drain phenomenon. In addition, the education provided and market demand are not well aligned. Less than 30 % of university graduates find work in their specialisation (Strategy for the Development of Higher Education for the period 2014-2020, 2014).

The autonomy of HEIs was acquired in the period 1992-1996. In 2010-2011, the Higher Attestation Commission was dissolved and procedures of attestation and promotion were decentralised. This has led to multiple criteria for scientific quality and accomplishment and the non-comparability of degrees and titles. Hence, there is a lack of framework criteria for attestation in different disciplines[12].

2.3.3 The Bulgarian Academy of Sciences (BAS)

The Bulgarian Academy of Sciences (BAS) is the country's main research organisation. It is subsidised from the Ministry of Education and Science budget although the amount of the funding is defined by the parliament in the Budget Law. BAS comprises 54 scientific units, 42 of which have separate legal entities.

BAS has a staff of more than 6300, including over 3000 scientists. In 2012, around half of the scientists were older than 50 years, whilst slightly more than 3 % were under 30 years old. Budgetary support to BAS scientific institutes is very low, which is a major obstacle to fundamental and applied research.

The main scientific directions within BAS are: ICT; energy resources and energy efficiency; nano-technologies and new materials; biomedicine and quality of life; biodiversity and ecology; climate change, risks and natural resources; astronomy; and cultural and historical heritage.

The BAS is the only research organisation in Bulgaria that has undergone an institutional evaluation to date (2009). This evaluation concluded that BAS institutes conduct valuable research given their

[12] Presentation by Drozdstoj Stoyanov, MD, PhD, PgCert, Full Professor, Medical University of Plovdiv at the project kick-off meeting

difficult circumstances but research results can only be sustained if there is a real financial commitment from the Bulgarian state. It was also observed that research is often driven by available funding rather than research plans and strategies[13].

2.3.4 The Agricultural Academy

The AA is funded from the state budget through the Ministry of Agriculture and Foods. It comprises 25 scientific institutes and a staff of 2340, of whom 563 are scientists (in 2015). The main directions of research include: fundamental and applied research in food, agriculture and environment protection, as well as protection of plant variety. The Academy publishes seven scientific magazines indexed internationally.

2.3.5 Research institutes

Several sectoral ministries manage sector-specific research institutes, the so-called 'government labs', including:

- The Ministry of Health: the Public Health Protection Centres which conduct research and are involved in national and EU programmes. The National Centre of Infectious and Parasitic Diseases and the National Centre of Radiobiology and Radiation Protection are the most active;
- The Ministry of Interior: research institutes in the field of criminology;
- The Ministry of Culture: mainly via national museums and libraries;
- The Ministry of Agriculture and Food: the Institute of Plant Protection.

2.3.6 The private sector

The private sector performs few research activities, which is partly reflected in the low number of SMEs applying for grants from the National Innovation Fund. A small number of large high-tech companies have well-developed R&D departments dealing primarily with the transfer of technology[14].

[13] Research at the Bulgarian Academy of Sciences, A Report by the 2009 Science Review Committee, presentation delivered at the kick-off meeting to launch the Horizon 2020 PSF support to Bulgaria, 13 February 2017

[14] Bulgarian National Strategy for Development of Research 2020, 2011

3 THE BULGARIAN RESEARCH AND INNOVATION GOVERNANCE SYSTEM

This chapter presents an overview of the Bulgarian R&I governance structure, the most relevant national strategies in the context of this Specific Support action, as well as some of the key challenges in the R&I system.

Throughout this section, where relevant, references are made to the findings and recommendations made by the peer review, carried out during 2015 under the Horizon 2020 Policy Support Facility.

3.1 The R&I governance structure

3.1.1 Overview

The **parliament** approves laws and regulation and, most importantly, the budget for R&I. It also contributes to policymaking through its **standing committees**. These include the Standing Committees on Economic Policy and Tourism, Education and Science, and European Affairs and Oversight of European Funds. Since 2012, the parliament has also controlled the BAS' research output.

R&I policymaking in Bulgaria is carried out by the government through the **Council of Ministers**, which also performs a policy-monitoring role. The strategic policy framework in the area is discussed and decided within 10 consultative bodies in the Council of Ministers. Their narrow specialisation is one of the factors for the fragmentation of the system. They include the Council on Development; the National Council on Science and Innovation; the National Council on Loans to Students and Doctoral Candidates; the Council for Smart Growth; the Council for the Protection of IP rights; the Consultative Council for SME Promotion; the Council on Coordination and Management of EU; and the Council for European Affairs.

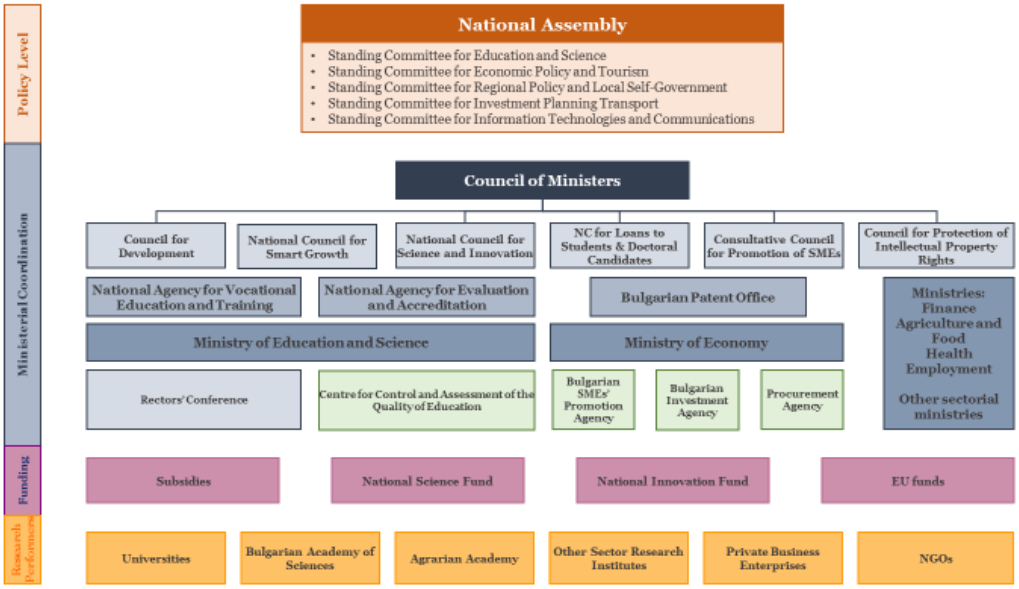
Two Councils involve multiple ministries as well as actors in the R&I system:

- The **National Council on Science and Innovation** is chaired by the minister of science and education. Members include relevant ministers such as the minister of economy, minister of finance, minister of agriculture and food, as well as representatives from the BAS, major universities, National Science Fund, Bulgarian Chamber of Commerce and the Association of Industrial capital in Bulgaria. Council members are listed in a regulation on structure and governance of the council (2013). They have a five-year mandate and their main responsibilities include: drafting the National Research Strategy; drafting opinions on HEI reports; and drafting analysis on Bulgarian research and international cooperation.
- The **Council for Smart Growth** was established in 2015. It is an advisory body to the Council of Ministers and coordinates the monitoring and implementation of the Innovation Strategy for Smart Specialisation of Bulgaria 2014-2020 (ISSS). The Council for Smart Growth determines the priorities in education, science, innovation and ICT; coordinates the implementation of IS3, reviews annual reports and proposes changes in priority technology areas; and coordinates the policy management functions of the National Innovation Fund and the National Science Fund. The Bulgarian Prime Minister is chair of the Council and members include the ministers of the leading ministries responsible for policymaking in education and science, directors of relevant associations, and representatives of the four major HEIs.

At this level of the governance structure, there are also three independent governing and executive agencies: the National Agency for Evaluation and Accreditation (NAEA), the National Agency for Vocational Education and Training (NAVET), and the Patent Office (PO). The **National Agency for Evaluation and Accreditation** was founded in 1995. Since 2004, NAEA has also been the specialised governmental body for the evaluation, accreditation and quality control of (public and private) HEI activities and for post-accreditation monitoring and control[15].

[15] Presentation by the Ministry of Science and Education, kick-off meeting of the PSF support to BG on 13 February 2017

Figure 21: Institutional structure of the Bulgarian R&I system



Source: JRC Rio Report, 2014

The two ministries in charge of the R&I system are the Ministry of Science and Education and the Ministry of Economy.

The **Ministry of Education and Science (MES)** oversees defining policy in research, science and education, including tertiary education. It drafts policy documents and coordinates implementation measures, and is responsible for the allocation of funding among HEIs, including funding through the National Science Fund (NSF). The MES is also the managing authority for the Operational Programme Science and Education for Smart Growth (OP SESG).

The Centre for Control and Assessment of the Quality of Education is an MES agency. The MES and the National Agency for Evaluation and Accreditation supervise public and private HEIs.

The MES initiates and subsequently implements the key legislative acts which constitute the legislative framework of the whole education and science system, each element of which is governed by a separate legal act. The 2015 RIO report considers that strategic policymaking and implementation (including the set-up of administrative structures and the evaluation of strategic policy documents) reflect this fragmented focus on the individual elements.

The MES constitutes a dual division of competences. The Directorate General Structural Funds and International Educational Programmes (former Intermediate Body under OP HRD 2007-2013) manages OP SEIG 2014-2020, while DG Science is the key policymaking body in science, R&I, as well as national coordinator with respect to FPs/Horizon 2020. DG Science is responsible for monitoring the NSF, projects under FP6 and FP7, and the development of the National Roadmap for Research Infrastructure. It coordinates all bilateral science partnership, investment and sponsor agreements, and coordinates the 'science-business link' on behalf of the government.

The **Ministry of Economy (ME)** is responsible for defining the national policy for the business sector and in innovation. Its objective is to promote innovation within SMEs, to invest in innovation infrastructure (e.g. Sofia Tech Park) and to attract the research activities of foreign firms. The ME is in charge of the National Innovation Fund (NIF) and the Operational Programme Innovation and Competitiveness (OPIC). ME, supported by the SMEs and Innovation Directorate, is the leading institution in the implementation of the RIS3 strategy. Subordinate agencies are the Bulgarian SME Promotion Agency (BSMEPA), the Bulgarian Investment Agency, and the Procurement Agency.

BSMEPA was an intermediate body for OP Competitiveness until the May 2012 reform, but the functions are now performed by the managing authority. BSMEPA still manages budgetary resources within the NIF framework.

In the ME, two directorates under different deputy ministers manage the funding (DG European Funds for Competitiveness) and coordinate policy (Directorate Economic Policies for Promotion).

The DG European Funds for Competitiveness is part of the ME's specialised administration, acting as the managing authority of Operational Programme Competitiveness 2007-2013 and OPIC 2014-2020 (and recently OP SME Initiative 2014-2020).

Other ministries support policymaking in R&I according to their specific competences:

- The **Ministry of Agriculture and Food** participates in the work of the National Council on Innovation and the National Council on Science and Innovation. It manages the AA which champions Bulgarian research policy in agriculture.
- Similarly, the **Ministry of Health** oversees the National Centre for Public Health Protection.
- The **Ministry of Transport, Information Technology and Communications** is responsible for the Digital Agenda and e-government, especially through its executive agency 'Electronic Communication Networks and Information Systems'

The national R&I system appears to be characterised by vertical coordination with insufficient linkages and coordination mechanisms. So far, there have been few incentives for ministries, agencies and R&I funds to collaborate. Due to the 2014-2020 *ex-ante* conditionality related to Research and Innovation Strategies for Smart Specialisation (RIS3), joint planning has started for public investments in R&I. In March 2015, the government created an **Inter-institutional Working Group for the coordination of the measures for the development of innovation, applied research and research and development activities**. This working group mirrors the Smart Growth Council and should act as a regional network for the place-based implementation of the Smart Specialisation strategy. Members are representatives from the CoM Administration, the MES (MA and DG Science), and the Ministry of Economy (MA and DG Economic Policies for Promotion).

The two main instruments for funding R&I are:

- The **NSF**, which sponsors basic and applied research activity and public sector training. It is also responsible for the Bulgarian Research Information System (BulCRIS) as a single register for detailed information about Bulgaria's research, development and innovation resources;
- The **NIF**, which finances applied research, development and innovation activities, including technology transfer.

The two funds have different management models: while the NIF is a programme under BSMEPA (Bulgarian SME Promotion Agency), the NSF has a complex structure, quite similar to a funding agency.

Accusations of malpractice against the NSF and a lack of transparency in the two funds have seriously damaged trust among both the national and international communities.

According to the 2015 RIO report, the NSF does not have the capacity and competences of an international standard funding agency. There is no multi-annual planning capacity and researchers cannot predict when they would be able to submit an application for funding, which reduces their ability to plan and coordinate their research activity with partners. Reimbursements and payment mechanisms are similarly irregular with long time lags occurring between approval to expenditure and reimbursement. The quality in reporting is also lacking: there are no details about the distribution of funds across the research performers – i.e. universities, scientific institutes, or NGOs, or the success rate of bids within and across these categories.

The lack of multi-annual planning capacity is also an issue for the NIF. According to the 2015 RIO report, the NIF does not systematically report the details about the size and composition of the private-sector research community, or the number and type of its beneficiaries, i.e. multinationals, SMEs, high-tech firms, NGOs, or public-sector actors that contribute to commercial R&I activities.

Finally, the two (limited resource) funds are managed independently and have autonomous objectives and targets, without any mechanism in place for coordination. Thus, the 2015 RIO report sees a need for dialogue between the two (national budget) funding bodies to ensure complementarity and coordination.

In 2015, the MES issued Regulations on the monitoring and evaluation of research activities performed by higher education institutions and science organisations, as well as the activities of the National Science Fund. These regulations were drafted with the aim of restoring trust in the activities and functioning of the NSF.

The Regulation stipulates that the NSF will be evaluated annually against the following criteria: contribution to strategic objectives; effectiveness and efficiency; results of prioritising the funding of programmes and projects in scientific fields; efficiency of the implementation control and reporting of the financed projects; socio-economic impact of the results of the financed projects; and quality of work processes and practices, applicable to the fund during the evaluation period.

Information to be provided annually by the Fund includes:

- Competitions conducted for funding programmes and projects and tender documentation;
- Reports of temporary scientific expert committees on the results of competitions conducted and the ranking of projects;
- Decisions of the executive council to determine the projects for financing;
- Rules for current financial control and accountability in the implementation of contracts for research funding;
- Reference for the implementation and reporting of financed projects;
- Constructed scientific infrastructures as a result of the implementation of programmes and projects financed by the Fund;
- Research results (patents, publications, models, algorithms, programmes, methodologies, etc.) as a result of the implementation of projects financed by the Fund;
- A list of research results used in innovative projects during the reporting period.

In line with the regulation, a six-member evaluation committee was established, made up of prominent researchers in the Bulgarian research system. Based on the outcomes of the evaluation, the committee is expected to formulate proposals for improvement[16].

The evaluation committee conducted a pilot evaluation of the NSF in line with the evaluation criteria described in the regulation. The overall conclusions indicate that the NSF had functioned suboptimally prior to 2015 for administrative and political reasons. The major pitfalls are listed in Table 4 below.

Table 4: Results of the NSF pilot evaluation

Criteria	Issues
Compliance with regulations and resource capacity	Insufficient human capacity and administrative capacity – e.g. updating data in the software (online database for each project) Insufficient completeness of the information on the approved projects and call for proposals (the process of decision-taking)
Institutional organisation	The NSF procedure of adopting Annual Operational Programme 2015 was not completed in time Large gaps in archives of project documentation, i.e. lists of working teams, lists of publications, evaluation reports
Impact and efficiency of implementation of the NSF Annual Operational Programme	A small number of the scientific publications were published in impact-factor and impact-rank journals
Quality of NSF work processes and practices	Missing online access to data on each project, evaluators and NSF researchers IP management not clear Equipment register is not made public Rules for the NSF executive board activity are not published online

Source: Presentation by Prof. Vladislav Popov, Member of the NSF Evaluation Committee; delivered at the kick-off meeting of the PSF support to BG on 13 February 2017

[16] Rules for monitoring and evaluating research undertaken by universities and scientific organisations, and the 'Science Fund' activities, issued by the Minister of Education and Science (promulgated, SG No.72 of 18/09/2015)

However, the committee also noted that after changes in NSF management, some positive trends have emerged. The committee endorsed the recommendations made in the NSF annual report:

- To increase funding and staff
- To improve transparency mechanisms for NSF activities, including decisions on funded projects
- To improve accountability of projects by using the project database software
- To improve coordination between NSF and MES, including synchronisation of the scientific infrastructure register
- To provide regular analysis and evaluation of scientific potential and demand from business and society
- To improve criteria for evaluation of ongoing projects
- To increase partnerships with international scientific organisations[17].

3.1.2 Issues and challenges

The studies consulted for this background report are quite critical about the R&I governance system. According to the 2015 RIO report, the Bulgarian R&I system is characterised by insufficiently coordinated priorities and ongoing concerns about project funding. There is **no obvious horizontal coordination** in the system. The report considered that the Bulgarian R&I system was fragmented because of the lack of cooperation between its different elements, governance by multiple ministries, and the lack of a broad strategic platform bringing together research, innovation and education.

The H2020 PSF Peer Review came to similar conclusions. It considered that the Bulgarian R&I system seemed to be characterised by **silo thinking**, often uncoordinated priorities, and ongoing concerns regarding alleged malpractice. It saw the need for the development of a broad consensus on the strategy for R&I reform – at the political as well as research-performing levels – and the clear need to set up a funding agency with the necessary management capacities and able to take a leading role in connecting the funding for the relevant policy fields, both horizontally and vertically. Its recommendations were:

- To establish long-lasting support for science and innovation investments and reforms by seeking broad political consensus in matters of science and innovation, and to launch a structured, committed and sustained dialogue with the Bulgarian science and innovation community. This dialogue should lead to a 'national science agenda' capable of rebuilding trust in the system. The Council for Smart Growth is best placed to take leadership in this process.
- To set up a professional, independent and robust national research agency to design and manage R&I funding programmes and support the successful implementation of the RI structural reforms package.

The 2015 RIO report endorsed the PSF Peer Review recommendation for the creation of an independent funding agency (PARI) with stable funding sources and the ability to design and implement multi-annual programmes. The authors considered that, apart from the OP managing authorities, there is a clear lack of professional bodies with administrative capacity and motivated staff to support the policymaking processes, namely in the design of policies and programmes.

However, the authors of this report warned that the mere creation of an independent funding agency, 'merging' the NSF and the NIF, would not solve the problem. They stressed that transparency, predictability and the involvement of high-level expertise/international peer review is critical for restoring confidence and trust among researchers. This means adequate regulation to prevent conflicts of interest, stable and proficient enforcement of these regulations as well as regular feedback to the project developers and researchers. They considered that outsourcing the evaluation of project proposals under NIF and SRF (to EC or European Science Foundation) was an option, but only for a limited amount of time, while building national capacity.

[17] Presentation by Prof. Vladislav Popov, Member of the NSF Evaluation Committee

3.2 National R&I strategies and priorities

3.2.1 National Research Development Strategy 2020

The **National Research Development Strategy** (NRDS) 2020, adopted in 2014, provides scientific organisations, universities and the whole academic research community with the necessary framework within which they can formulate their views and plans for participation in national R&D activities, by prioritising programme funding. Furthermore, the strategy provides both society and the legislator with information about the government striving for the effective use of public funds for R&D. It also reflects on Bulgaria's efforts to raise investments in science and technological development to 1.5 % of GDP (from the current 0.8 %), in line with the Europe 2020 objective (3 % of EU GDP).

The NRDS has the following key objectives:

- To contribute to the transformation of Bulgarian society into a 'knowledge society';
- To contribute to the development of a national economy based on eco-technologies;
- To formulate national science policy that will provide opportunities and define prospects for achieving the targets set out in the Europe 2020 strategy; and
- To contribute to the creation of an integrated European Research Area (ERA).

Six important obstacles are identified in the NRDS in relation to R&I development:

- Bulgaria has lacked strategic vision and stable policy for the development of science;
- There is an unfavourable ratio between public and private investment in contrast to developed systems whereby 'non-state sector' investments predominate;
- An unfavourable expenditure structure still exists in the public sector along with a lack of resource concentration. Widespread institutional support for numerous scientific organisations prevails at the expense of performance-based and project financing. There is no effective competitive environment involving independent and external (international) expertise in scientific ideas, developments and results;
- The residues of the 'binary' model lead to the artificial separation of science from higher education and difficulties in overcoming the perception of universities as purely educational structures;
- National instruments provide limited budget, while specialised national programmes in a specific scientific field and support for scientific infrastructure are inadequate;
- The various sources of funding available are used inefficiently in terms of both absorption and ability to solve specific scientific tasks or significant economic or social problems.

The NRDS 2020 identified the following preconditions for strengthening research in Bulgaria:

- Improved funding for Bulgarian R&D up to 1.5 % GDP in 2020;
- Improved regulatory framework introducing public control to HEI management;
- Introduction of standards for academic positions;
- Stimulate business-research connections;
- Regular evaluation of research activities in universities and research institutions;
- Improved quality of doctorates.

3.2.2 Bulgarian Innovation Strategy for Smart Specialisation

The **Bulgarian Innovation Strategy for Smart Specialisation (ISSS)**, adopted in 2015, covers the period 2014-2020 and is managed by the National Innovation Council. The strategic goal is for Bulgaria to move from the group of 'modest innovators' into the group of 'moderate innovators'.

The ISSS addresses the challenges facing Bulgaria's industry: exports include mainly low-tech products (5.6 % of high-tech goods in 2012); low internationalisation of Bulgarian enterprises; limited contribution of FDI to technology transfer; extremely energy-intensive industrial production; and low labour productivity.

One of the main challenges that ISSS came across is: "how to mobilise limited internal sources through various forms of international research, technology and innovation partnership and how to integrate the country into the supply chains at international and global level". Limited available resources require investments to be concentrated on the development of innovation potential in the thematic areas identified, taking into consideration the needs of industry.

The NRDS 2020 and the ISSS both identified priority areas, listed in Table 5 which also shows the level of alignment.

Table 5: Priority areas defined in the NRDS 2020 and the ISSS

NRDS scientific priority areas	ISSS thematic priority areas
Energy, energy efficiency and transport, development of green and eco-technologies	Mechatronics and clean technologies
Biotechnologies and biofoods, health and quality of life	Biotechnologies Pharma Food processing
New materials and technologies	Nanotechnologies
Cultural and historical heritage	Creative industries
Information and communication technologies as enabling technology affecting all spheres of life and economy	Informatics & ICT

The ISSS also identified several 'horizontal' topics, including: effective research-business partnerships; high-quality human resources; adequate environment and infrastructure for innovation; innovation for resource efficiency; and innovation for the implementation of ICT applications. Table 6 indicates the funding instruments foreseen in the ISSS for the thematic and horizontal topics.

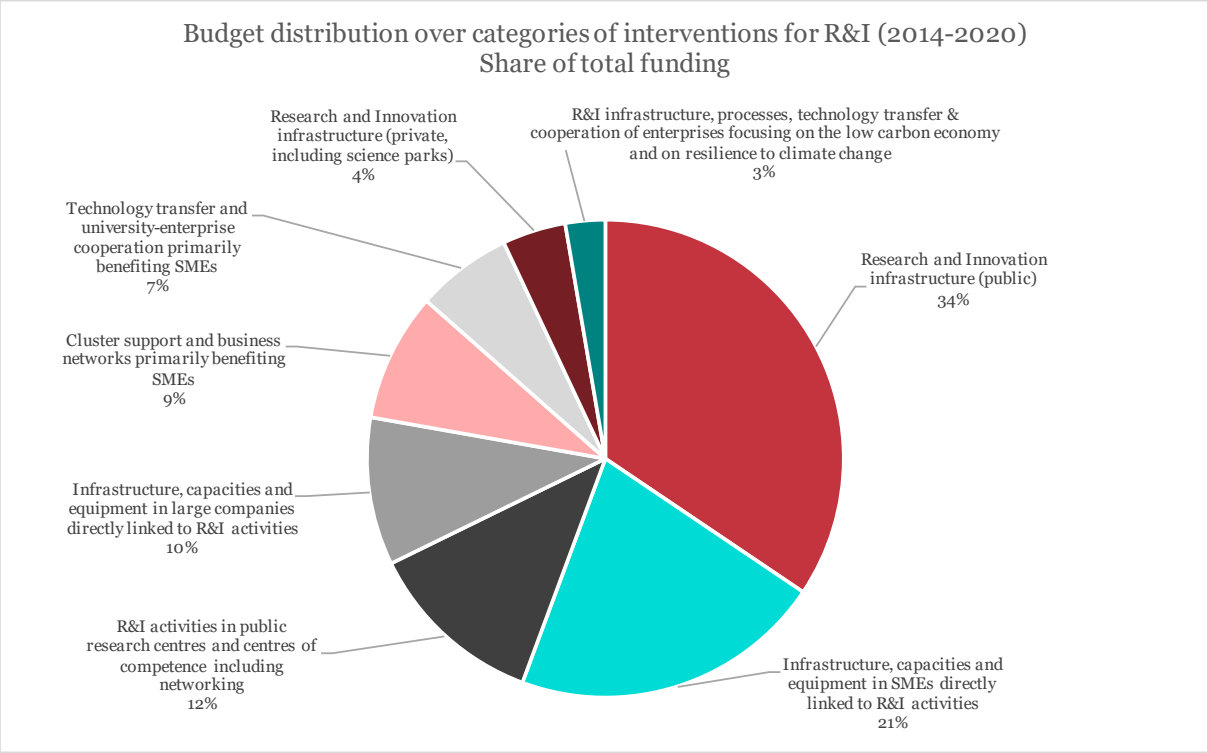
Table 6: Thematic focus of the funding instruments in the ESIF 2014-2020

Domain	Support models	Funding source
Mechatronics, clean technology	Incentives for cooperation and setting up partnerships across the value chain Access to finance Project financing for internationalisation Support for the adoption of good practices from the EU	OPIC, OPSESG, state budget
ICT	Grant schemes for collaborative science – business Financial instruments, including venture capital funds Support for educational institutions in ICT area, for instance, vouchers for attracting specialists and online education Support for governance and entrepreneurial capacity, for instance, vouchers for participation in internationally recognised accelerators Support for certification and other laboratories	OPIC, OPSESG, state budget
Healthy life and biotechnology	Grant schemes/vouchers for science-business cooperation Support for marketing and export activities Support for governance/management capacity Certification, quality control Funding of laboratory equipment	OPIC, OPSESG, state budget
Creative industries including cultural industries	Grant schemes/vouchers for innovative technologies, business models and cooperation Digitalisation of cultural heritage Support for marketing and export activities Media Technology Park	OPIC, OPSESG, state budget
Effective research-business partnerships	Innovation vouchers Support for clusters and technology centres Grant schemes for joint projects	OPIC, Horizon 2020
High-quality human resources	Schemes for vocational education and training Involving international participants in the evaluation of projects in the field of innovation	OPSESG, OPHRD, OPIC
Adequate environment and infrastructure for innovation	Support to Sofia Tech Park Thematically focused laboratories and other services for business in the field of innovation	OPIC

Source: ISSS for Bulgaria

Figure 22 shows the distribution of funding over the core R&I categories.

Figure 22: Budget allocation among the core intervention categories for R&I



Source: RIO report 2015

3.2.3 Strategy for the Development of Higher Education in Bulgaria 2014-2020

On 26 February 2015, the parliament adopted a Strategy for the Development of Higher Education in Bulgaria 2014-2020 (SDHE). The Strategy foresees an increasing role for evaluation in the allocation of funds to HEIs, based on the quality of the education and graduate employment in the labour market.

At the core of the SDHE is a concern that the national R&I system has been weakened, mainly by significant underfunding in absolute and relative terms (approximately 0.65 % of GDP in 2013), but also because of gaps remaining in the tertiary education system. Increasing the R&D expenditure potential involves focusing on HEIs and the quality of their R&I activities. Data on the total stock of researchers reinforce that conclusion. Bulgaria has 4.43 researchers per 1000 active labour force (Eurostat, 2011) compared to an EU average of 10.55. The number of new doctoral graduates per 1000 population (aged 25-34) is only 0.6 whereas the EU average is 1.7 (Eurostat, 2011), even though the number of doctoral candidates almost doubled between 2000 and 2015. The lack of researchers demonstrates most clearly the need to stimulate human resource development policy in HEIs as well as public and private investment in R&D, performed by those HEIs with research capabilities.

The Strategy highlights the need to improve the quality of higher education in Bulgaria, increase financial flows, improve the connection with the labour market, stimulate scientific research in universities, and overcome the negative trends in academic career development.

The SDHE defined the following eight specific objectives:

- Improve access and increase the share of graduates;
- Significantly improve the quality of higher education and its compatibility with European higher education systems in order to occupy a respected place in the European Higher Education Area (EHEA);
- Build a sustainable and effective link between higher education and the labour market and match demand and supply of specialists;

- Promote research activities in HEIs and the development of innovation oriented towards the market economy;
- Upgrade HEIs' management and clearly define types of degrees in Higher Education
- Increase funding for higher education and science and their efficient use by implementing an advanced funding model;
- Overcome the negative trends in lecturers' career advancement in HEIs and promote the best ones;
- Expand and strengthen the lifelong learning (LLL) network; broadly apply the various electronic formats for distance learning.

These strategic priorities are linked to: reform of the institutional and programme accreditation framework; the introduction of differential funding for universities and HEIs which takes into account the quality of graduates and research outputs; strengthening the scientific skills in HEIs, BAS and regional actors; improving the collaboration between HEIs and businesses; new ways of financing doctoral research; and financial incentives for scientific publications.

In accordance with the Law for Higher Education, a **competitive** component was defined for the educational and tuition component of higher education institutional funding. It was based on: a differentiated norm for professional fields (subjects), approved by the Council of Ministers; the number of students enrolled; and the complex evaluation of quality and of compliance with labour market needs, based on criteria approved by Council of Ministers and including the results from the accreditation of the HEI. The weight of the different groups of indicators is: education - 30 %, R&D - 28 %, and labour market realisation - 42 %.

3.2.4 'Better Science for a Better Bulgaria 2025 – Vision for a research policy strategy in support of society and economy' (2016)

In October 2016, Bulgaria adopted the strategy 'Better Science for a Better Bulgaria 2025 – Vision for a research policy strategy in support of society and economy'. It is based on several principles: partnerships; complementarity and synergy; equal involvement of stakeholders; and trust.

The strategy sets out "an ambitious reform of the public research sector" in terms of organisation and methods for distributing funds and human resources management. The goal is to make the public research sector more competitive and future-oriented, more innovative and better linked with businesses.

The strategy is based on four pillars:

- **Pillar 1: Renewed commitment to raising public investment in research:** in total, up to 1.5 % of R&D intensity in 2020, including raising the share of public investments in R&D to 0.45 % in 2020. OP SESG would be the main source of funding and will be implemented through *Activities 1 and 2* from the strategy's operational plan available in the Annex.
- **Pillar 2: Reforms in the R&D system**:
  - Shift to performance-based funding for a greater part of the funding for each organisation; introduction of multi-annual plans and performance contracts linked to regular evaluations through objective international criteria and indicators. This will be implemented through the independent evaluation of the scientific R&I operations and a model for rating HEI in terms of the quality of scientific research. In practice, this will be done through *Activities 3 and 4* of the operational plan.
  - In addition, the reform will be linked to gradually increasing the share of project- and programme-based funding to all research actors as opposed to generic institutional funding (*Activity 4* from the operational plan).
  - Strengthening the NSF's capacities is also a key measure within this pillar.
  - Reform of the R&D system entails setting up centres of excellence with the aim of reducing fragmentation by focusing research priorities and ensuring a connection with industry.
  - The strategy also foresees a stronger connection with the ERA.
- **Pillar 3: Strategic priorities, alignment with smart specialisation and beyond:** research will be focused on strategic priorities in line with the ISSS and societal challenges in the Horizon 2020 programme.

- **Pillar 4: Human resources**: the strategy foresees increasing the number of researchers, improving their economic and social status and encouraging the return and integration of highly qualified Bulgarian scientists working at research institutions abroad. In practice, this will be implemented through *Activity 15* of the operational plan.

3.2.5 'National strategy for the development of scientific research in the Republic of Bulgaria (2017-2030) – Better science for better Bulgaria' (2017)

The latest strategy related to scientific research was adopted by the Council of Ministries on 17 May 2017 and submitted for approval by the parliament.

The strategy document starts with an overview of the steady decline in Bulgaria's scientific performance. The lack of a consistent state policy (including funding) in support of scientific research as well as the unsatisfactory performance of the National strategy for development of scientific research in the Republic of Bulgaria (2012-2020) and commitments to the EU are among the main reasons for that decline. The report states: "The main reason for the decline of science in the country is the absence of political will for interruption of that trend and the absence of a lasting multiannual commitment for the support of the development of the scientific research. This is expressed not only in the low level of public and private funding but also in shortcomings in the legal regulations and the maintenance of a low social status of the scientists."

The strategy sets out and defines activities and measures for seven policy areas:

- Horizontal policy for adequate and effective funding;
- Horizontal policy for legislative changes;
- Policy for human potential development;
- Policy for developing a modern scientific infrastructure;
- Policy for development of fundamental scientific research and stimulating scientific excellence;
- A policy for stimulation of applied scientific research;
- Integration policy in the European Research Area and expansion of the international scientific cooperation.

The paragraphs below are extracts from this strategy document; they comprise statements, considerations and indications that are of particular interest in the context of the Specific Support action.

On the public funding of research

It is particularly important to link the amount of institutional funding for science to actual scientific results achieved by scientific organisations and universities. Based on this principle, it is necessary to develop a system for additional institutional funding for research at universities with internationally recognised scientific excellence, not linked to the funding for education.

Although the correlation programme-project/institutional funding is currently above standard EU levels, the absolute value of project funding must be increased and regularly achieved.

Since private funding is directed exclusively to applied research into particular problems that are of interest to the contractor, funds from the state budget must be directed anteriorly to the development of human potential and to targeted fundamental research.

On the management and administration structures related to research

Reform of the state structures for management and administration of scientific research will be realised by establishing an **Executive Agency for Science** within the MES. The agency will manage, support and monitor activities related to the science and research process in research organisations and higher education institutions.

The agency includes the NSF for the implementation of project-funding functions. The NSF will expand its activity towards programmes for funding researchers' career development, special and sectoral programmes for scientific research, programmes for applied scientific research, the development of the scientific centres, international cooperation, support for participation in international and European programmes, etc.

It will implement the functions related to the attestation of scientists and will organise periodic evaluations of scientific organisations.

On the development of human potential

Differentiated remuneration is an important stimulus for maintaining a high scientific level of research, directly related to the scientific results achieved during a previous period (after periodic attestation). Remuneration of the scientists must be high enough to secure them a high social status.

Therefore, an effective system for controlling the quality of scientific research and the scientific level of individual researchers is necessary. This will be implemented through **periodic attestation of the scientists** in the scientific units.

It is also important that, to prevent scientific positions being filled by unqualified personnel, a scientist cannot occupy an academic position after more than one negative attestation evaluation.

Measures in this context are:

- Development and application of a system for the periodic attestation of scientific organisations and high schools, financed by the state budget. The system will be based on internationally accepted scientific metrical indicators (reported scientific works, quotations, patents, projects, etc.) as specific criteria will be worked out for each professional area and group of sciences;
- Legislative obligation of those scientific organisations and high schools financed by the state budget to accept and apply the internal rules for the attestation of their separate units, as well as of the scientists based on the institution's attestation criteria;
- Integration of the attested information and attestation results with the information on a particular scientist and scientific organisation in the scientific activity register;
- Adoption of an effective procedure for the release of an academic position in case there is an unsatisfactory attestation result;
- Adoption of an order to limit or discontinue the funding of science units or organisations in case of the unsatisfactory outcome of their scientific evaluation;
- Conducting an independent international evaluation of scientific organisations – institutes of the BAS and AA, the scientific institutes that are responsibility of the ministries and departments and the research universities, according to established international practices and the accumulated experience of European Commission bodies.

Introduction of a system for **differentiated payment to scientists,** including two components: (1) main work salary – with a fixed amount for individual scientific positions, doctors and post-doctors in the budget for science organisations and universities; and (2) additional financial stimulus linked to particular scientific results.

The second component will depend on the results of both the organisation's attestation and the individual scientists as well as on achieving particular programmes. To achieve a more significant effect, the total amount of the second component on the national scale cannot be less than half the total amount of component 1.

Enhancing the **social prestige** of both the scientist and the scientific and research activity is linked to giving suitable publicity to the scientist's work. It is necessary for society and the state authorities to realise the benefits from carrying out scientific research.

Measures in this context are:

- Implementation of the legislative requirements for popularising scientific research results, achieved by projects financed by the state budget and EU funds, through modern communication media;
- Encouraging scientific organisations and HEIs to work to promote science and scientific research in society.

On the development of fundamental research and stimulating excellent science

The current strategy has planned a purposeful state policy for the development of world-class fundamental research by applying internationally recognised standards for assessing scientific results. The qualitative and quantitative results from fundamental research will be used as criteria

for assessing the research organisations and universities and their units and as an indicator for implementation of this programme.

The plan is to encourage publications in renowned and internationally referenced scientific journals by means of earmarked funds based on the results achieved.

Measures in this context are:

- Annual reporting of the number of articles from the country that were included in the main databases (Web of Knowledge or Scopus) during the previous year and their allocation in Bulgarian research institutions. 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 will be reported on the grounds of information from other international (ERIH PLUS, MathSciNet, VINITY, ResearchGate and others), national or institutional databases as well as via the respective bibliographical information about the editions.
- Establishing a system for assessing the contribution of the article, which includes elements such as an impact factor/rank, share of the participation of Bulgarian scientists, scientific area and others, and its link with the respective financial incentives.
- Including indices in the attestation systems measuring the rating of the scientific journals that published the work of the scientific institution/the individual researcher in a previous period.
- Including indices in the attestation systems measuring the response [citation?] of the published work of the scientific institution/the individual researcher in a previous period.

On the organisation and control of the strategy implementation

Control of strategy implementation is carried out by the National Assembly and the International Control Board on strategy implementation. An **International Monitoring Board** has been set up for specialised control over strategy implementation. 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 (ERC) and its staff will be approved by the National Assembly sectoral committees.

A **Public Council for development of Science** will be created to support the activities of state bodies in implementing the strategy. It will include leading and young scientists – representatives of the various fields of science with proven performance according to the criteria of the relevant science field. The Council will be associated with union representatives of scientists, businesses, industry and trade unions, journalists, public figures and others.

During the third stage of the strategy implementation, the Council will organise a broad public discussion to achieve national consensus on long-term objectives and priorities for the development of Bulgarian science after 2030 and on the main measures and tools for achieving them.

3.2.6 Issues and challenges

In its 2017 European Semester[18] , the EC indicates structural weaknesses in the R&I system that limit the impact of the European Structural and Investment Funds (ESIF) and the development of the science base. It considers that policy initiatives, such as the updated National Strategy for the Development of Scientific Research and changes to the Law on the Promotion of Scientific Research do not sufficiently address the systemic shortcomings of R&I. The EC considers that the key bottlenecks remaining are:

- Poor administrative capacity and insufficient reliance on performance-based funding allocation;
- Fragmentation of the R&I system and the lack of systematic dialogue and incentives for stronger cooperation between academia, research and business;
- The lack of a comprehensive update of research infrastructure mapping with systematic prioritisation; and
- The lack of synergies with the smart specialisation process.

[18] European Semester 2017 – Country report Bulgaria

The 2015 RIO report notes that the Bulgarian R&I system appears over-regulated due to a lack of systemic trust, and that at the same time policymaking is often divisive, volatile and unable to survive governmental changes. The authors considered that while current legislation mirrors the good intentions of many consecutive governments to make decisions more objective and transparent by creating a strong legal base, the high legislative output may be counter-productive and may support systemic inertia. They noted that anecdotal evidence given to the PSF panel seemed to suggest a growing weakness and unpredictability in the system due to a considerable turnover of fragmented legal initiatives and an incomplete implementation of legal acts. The laws and regulations might be approved but may have a low level of both institutionalisation and irreversibility. The RIO report authors recommended that trust needed to be restored, in part by the authorities being seen to be tackling allegations of malpractice and taking steps to restore trust at all levels, even between public agencies and programmes.

Researcher recruitment and career management

The 2015 RIO report considered that while the principles of open, merit-based and transparent recruitment appear to be increasingly recognised in the regulations and legislation, difficulties persist in implementing them. Researchers' recruitment and career structure are largely regulated at the national level, but the institutions' autonomy and decentralisation implies that processes within the institutions have become hard to monitor and control. Autonomous institutions select staff without substantive checks or enforceable appeal procedures. The RIO report considered the situation was one of an over-regulated environment with hardly any enforcement or a practically implemented unified approach. It also considered that employment conditions vary remarkably between researchers with permanent contracts and those without.

The PSF Peer Review stressed the importance of both the Bulgarian authorities and all public research organisations in ensuring that the recruitment, promotion and funding of new researchers is performed in an open, transparent and merit-based manner and based on research excellence, using the necessary metrics and international peer-review practices.

The peer review set this recommendation within the context of the overall recommendation to "take rapid action to rebuild incentives for research careers at all stages and to retain and attract young talent from Bulgaria and from abroad into science and innovation".

Science-industry collaboration

The 2015 RIO report considered that there are very few frameworks for collaboration between public research establishments, universities and the private sector. Sharing and support systems are insufficiently developed to facilitate knowledge transfer and the creation of university spin-offs and to attract (venture) capital and business angels. The report stated that public policies were still not fostering enough long-term sustainable partnerships among innovation actors.

The peer review experts concluded that a better 'policy mix' for innovation was needed; one that supports both the funding and the development of Bulgaria's science base and the emergence of demand-led innovation. One recommendation was "to incentivise the opening up of Bulgaria's science base to businesses and step up the schemes to support public-private cooperation". The experts considered that policy instruments were primarily supply-oriented, i.e. focused on traditional research funding and not on building human capacity around knowledge-transfer activities or on creating the necessary framework conditions for business R&D activities or innovation to flourish. The business absorption capacity for publicly generated R&D appeared poor while, at the same time, public policy did not provide the business sector with the set of incentives it required to embrace innovation more often as a strategy for their competitive development.

The 2015 RIO report considered that the national system can overcome the public-private collaboration gap by further developing:

- Cooperation tools and frameworks (e.g. public-private partnerships);
- Consolidation mechanisms and intermediaries (such as clusters, technology parks, etc.); and
- Clear legislation to protect and transfer knowledge, research results and IP rights.

The peer review experts also highlighted the importance of ensuring the long-term sustainability of new and emerging ecosystems, such as the SofiaTech Park, through adequate use of public funding to develop business R&D and innovation activities. They also mentioned the emergence of strong local demand for innovation from the business sector, including from SMEs and new start-ups. In this context, the peer review experts considered that the lack of a critical mass in skilled human capital to support business R&D and innovation activities in regional and local ecosystems was exacerbated by the fact that public universities usually follow traditional curricula which do not

respond to emerging business needs. In addition, they are curtailed by the lack of proper pathways for researchers who wish to operate in both the public and business sectors.

Regional innovation

One of the PSF Peer Review panel's key recommendations was to "create the conditions for specific regional and local innovation ecosystems to develop in Bulgaria using the Sofia Tech Park as a strategic innovation testbed".

The peer review experts considered that Bulgaria was taking a positive approach by planning the establishment of regional centres of excellence (CoEs) and competence (CoCs) with SF earmarked for the different regions and centres. They considered, however, that to strengthen the initiative Bulgaria should strongly link it to other activities such as RIs and clustering.

A major consideration in this context was also the availability of research infrastructure. The experts noted that SofiaTech and other regional initiatives are often also hampered by a systemic lack of shared research infrastructures. They considered that although Bulgaria struggles to invest in modern research infrastructure, and in view of concerns among the panel about the feasibility of implementing the national research infrastructures roadmap, and even Bulgaria's participation in the ESFRI roadmap, there is arguably scope for better use of existing facilities and for more strategic investment into future ones, in line with the Smart Specialisation strategy.

They also warned about focusing on infrastructure and equipment when developing an R&I ecosystem, not forgetting that no ecosystem will function well unless it also includes human capital with the necessary competencies to extract the envisaged potential. This can easily result in underutilised facilities and a lack of results and impact. The panel considered that human capital needs to include both the next generation of young researches, trained in modern infrastructure complexes, as well as intermediaries who can help stimulate and manage the relationships between public and private partners.

4 THE RESEARCH FUNDING SYSTEM

4.1 Competitive funding from public sources

National public funding for research distributed based on competition comprises:

- State subsidies for scientific research from the MES, distributed through the NSF;
- State subsidies for R&I from the ME, distributed through the NIF;
- EU ESIF, with the main sources for R&I being the OPSESG, managed by the MES, and the OP Innovation and Competitiveness (OPIC), managed by the ME.

The main funding mechanisms for scientific R&I in Bulgaria come from EU funding, i.e. the ESIF Operational Programmes and the FPs/H2020. The budget of the two national funds, NIF and SRF, is negligible (approximately EUR 15 million planned for both in 2015), compared to the EU and other external funding possibilities.

4.1.1 MES funding for scientific research

The budget set aside by the MES for "development of the science potential" fell over the period 2009-2014, with exception of 2012 when it saw a marginal recovery (Table 7). There is a significant downward trend in the budget for the "promotion of scientific research based on programme-based funding", which was EUR 41.5 million for 2009, EUR 16 million for 2013, and nil for 2014.

Table 7: MES budget by policy framework related to R&I (in EUR million)

MES budget by policy framework	2011	2012	2013	2014
Higher education and development of the science potential, including:	37.482	45.552	33.899	25.951
Student support	0.813	4.618	4.602	4.598
International exchanges	1.411	1.403	1.506	1.375
Monitoring and development of the science outputs and building a knowledge-based link between education-science-business	0.440	0.286	0.679	12.136
Coordination and monitoring of the science potential for integration in the European science space and the global information network	11.284	11.378	9.434	6.132
Promotion of scientific research based on programme-based funding	18.647	18.604	16.054	0

Source: RIO report 2015, based on the national budget

The **NSF** funds both basic and applied research as well as training for public-sector institutions. It provides financial support for universities and scientific organisations based on programmes and projects, as well as projects and the work of young scientists. Approximately 30 % of NSF resources is dedicated to young researchers.

In 2013 and 2014, the NSF disbursed just over EUR 11 million per year (**Table 8**). This figure is three to four times lower than the values for 2009 and 2008. In 2016, the available funding was EUR 9 million.

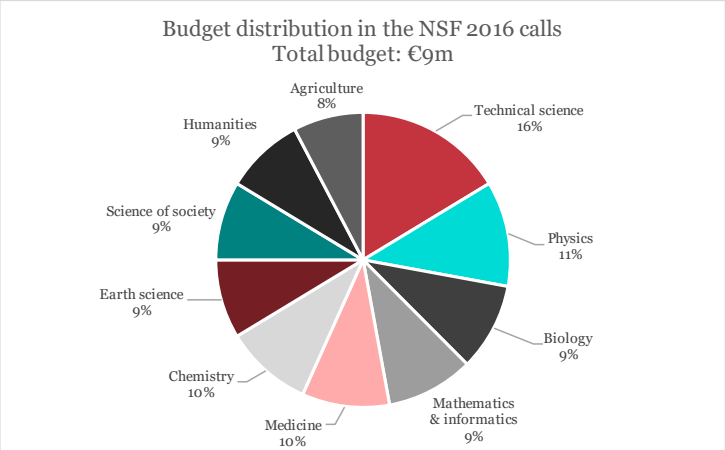
Table 8: Funds disbursed through NSF programme funding (in EUR million)

State subsidy for programme funding	2008	2009	2010	2011	2012	2013	2014	2015
NSF	43.868	30.098	4.431	2.082	7.837	10.559	10.545	10.74*

*Notes: *programmed funding; Source: RIO report 2015, based on NSF data*

Figure 23 shows how the budget for the 2016 call was distributed across the scientific research areas. Young researchers were supported with a budget of about EUR 400 000; their project proposals were evaluated by national independent expert teams.

Figure 23: Funding from the NSF by areas in 2016



Source: NSF

The **OPSESG (2014-2020)** governs the investment of over EUR 673 million, of which EUR 596 million comes from the EU.

The Programme's two major goals are "strengthening research and innovation and enhancing education and social inclusion at all educational levels"[19]. OPSESG priorities related to R&I include:

- Investment in modern research infrastructure and equipment, including improving territorial distribution with a view to regional smart specialisation;
- Supporting HEI and research organisations in their efforts towards internationalisation and their integration in the ERA; adapting HEIs to the labour market;
- Attracting and retaining researchers in the fields of high technology and reversing the trend of shrinking numbers of researchers.

A significant amount will be invested in supporting students and a higher quality of education, including researchers' skills and mobility.

The approved OPSESG is seen as an important mechanism for reviving and stimulating growth in the poorly funded and poorly performing Bulgarian science, education and innovation system. It will operate within three priority areas, as shown in Table 9.

[19] http://ec.europa.eu/regional_policy/EN/atlas/programmes/2014-2020/bulgaria/2014bg05m2op001

Table 9: Priority areas in the OPSESG (2014-2020)

Priority area	*Description*	*Funding (in EUR million)*
Research and technological development	*Investment in: a) centres of competence, centres of excellence and research infrastructure; and b) strategic and applied research, staff training, access to technological platforms*	*279*
Education and lifelong learning	*Investment in: a) quality of school education; b) access to high-quality higher education; c) lifelong learning; d) professional education and links with the labour market; and e) complementary horizontal measures*	*258*
Educational environment for active social inclusion	*Investment in: a) enlarging active participation; and b) socio-economic integration*	*136*

The programme is expected to create **11 new CoEs and CoCs**, support 20 regional laboratories and pilot centres, and involve over 1500 researchers in activities under the programme. It should be noted that in contrast to other Member States, Bulgaria did not make use of the SF in the preceding funding period to create centres of excellence and/or competence.

The **National Roadmap for Research Infrastructure** was adopted in 2014. Nine infrastructure projects were approved and five additional projects have been put forward as a national priority.

The National Research Infrastructure (NRI) Roadmap in Bulgaria was created in 2010. The infrastructure projects included in the approved selection from 2012 and the amendments from 2014 ensured a stronger co-alignment with European infrastructure consortiums and good representation of scientific coordinators and participants from Bulgaria.

The implementation of the NRI Roadmap envisaged complementary financing from the state budget, from NSF, Horizon 2020, as well as the OP 'Science and Education for Intelligent Growth' and the private sector. Although the 2014 NRI Roadmap has completed all stages of national and European-level consultations and has approved a budget for its implementation, the level of coordination and guarantees for sustainable investment in individual projects are still being developed. There are concerns regarding the feasibility of implementing the NRI Roadmap and even Bulgaria's participation in the ESFRI Roadmap[20].

Table 10: Research infrastructures in the NRI Roadmap

Status	Research infrastructure
Approved RI projects	• *National University Complex for Biomedical and Applied Research (BBMRI)* • *Centre for Fundamental and Applied Microscopy Research in Biology, Medicine and Bio-Technology (EuroBioImaging)* • *Sea and Ocean Research and Marine Technologies for participation in collaborative research under EURO-ARGO* • *Technologies for Renewable Energies and for Improved Energy Efficiency* • *Integration and Development of Digital Resources in Bulgarian for Language and Cultural Heritage under the European programmes CLARIN (Common Language Resources and Technology Infrastructure) and DARIAH (ClaDa)* • *European Social Survey for Bulgaria (ESS)* • *Supercomputer Research, Computer Modelling, Simulations and Applied Research for the Industry, Pharmaceuticals, Medicine, Energy, Transportation and Environmental Science (EGI.eu and PRACE)* • *National Cyclotron Centre for applied research in nuclear medicine, nuclear physics, nuclear energy research, radiochemistry and radio pharmacy*
National priority RI	• *Advanced Material Technology Research and Manufacturing Facility with Application to Conservation Technologies (INFRAMAT)*

[20] RIO report 2015

Status	Research infrastructure
for development	• *Innovation Research in Agriculture and Food* • *Alliance for Cell Technologies (EATRIS)* • *National Geo-Information Centre (EPOS)* • *Eco and Energy Saving Technologies*

The MES in the Republic of Bulgaria undertook a new mapping of research infrastructures, equipment and apparatus across the country between December 2015 and February 2016. In October 2016, senior government officials from the MES met with senior officials from the European Commission (DG Regional and Urban Policy and DG Research and Innovation) to discuss updating the NRI Roadmap. Follow-up discussions were organised in December 2016 which required that a 'Diagnostic review mapping of research infrastructures and research equipment in Bulgaria is undertaken by the MES. This led to a second review of the research infrastructures and research equipment between December 2016 and February 2017 in four broad research fields. As a result, the following 161 research infrastructures were identified: 57 in the physical, material science and engineering fields; 61 in the medical and agro-bio sciences field; 29 in social science and humanities, and 14 infrastructures in the E-infrastructure for multidisciplinary research field. On the base of the new diagnostic review, the NRI Roadmap will be updated.

4.1.2 Funding by the Ministry of Economy

In general, R&I funding from the ME is programme based and is managed predominantly by the Bulgarian Small and Medium Enterprises Promotion Agency (BSMEPA). This Agency manages NIF, Eureka and Eurostar projects and networks, and cluster policy implementation measures. These funding mechanisms mainly encompass the final stage of the R&I cycle, i.e. close-to-market R&D.

EU and other external funding platforms directed at private actors are also within the scope of ME responsibility: the Operational Programme 'Development of the Competitiveness of the Bulgarian Economy' 2007-2013 (OPC), including JEREMIE; the Operational Programme 'Innovation and Competitiveness' 2014-2020 (OPIC), the Operational Programme 'SME Initiative' 2014-2020, COSME, Eureka, Eurostars, European Space Agency (ESA) cooperation and others.

The ME budget for its policy framework on competitiveness and sustainable economic development marginally increased from EUR 15.5 million in 2011 to EUR 18 million in 2014 (Table 11). ME has a specialised programme for promotion of innovation in small entrepreneurial firms, which is part of this policy framework. The budget for this programme has also increased over the years, but overall remains very small (EUR 0.310 million for 2014).

Table 11: ME budget by policy frameworks related to R&I (EUR million)

	2011	*2012*	*2013*	*2014*
Policy 1 'Sustainable economic development and competitiveness', incl.:	*15.547*	*16.501*	*16.145*	*18.375*
Programme 2 'Promotion of entrepreneurship and innovation'	*0.174*	*0.208*	*0.260*	*0.310*

Source: RIO report 2014, ME Budget 2010, 2011, 2012, 2013, 2014

The **NIF** is a programme under the Bulgarian SME Promotion Agency which finances applied research, development and innovation activities, including technology transfer.

While the NIF has a clear scope of action, its gaps in funding make it difficult to predict. NIF's budget for 2008 was EUR 3.7 million (Table 12). Due to concerns for overlaps with EU Structural Funds, there are no calls between 2009-2011, and in 2012, the NIF invested EUR 4.7 million.

The budget for 2014 was marginally increased to EUR 5.1 million, disbursed among 52 new projects in 9 sectors, including instrumentation, electronics, pharma, chemicals, furniture, food processing, ICT, and creative industries. The specific selection criteria were linked to the capacity to develop and finance the project; project innovativeness; societal benefits; scientific and technology achievement level; readiness for the market and market potential; and economic

perspective. The size of the allocated grant depends on the category of applicants and the type of activity.

There was no call for projects in 2015. During the period 2015-2020, there is a fixed budget of about EUR 5 million to be directed each year to support for the innovation environment.

Table 12: ME funding through NIF (EUR million)

State subsidy for programme funding	2008	2009	2010	2011	2012	2013	2014	2015
NIF	3.681				4.658		5.103	

Source: RIO report 2014 calculations, based on NIF data

Support for increasing the innovation activities of undertakings is also envisaged under **OPIC 2014-2020**.
OPIC (2014-2020) is managed by the ME. The total EU contribution is almost EUR 1.1 billion. SMEs are the main target group, and the priorities include: 1) technological development and innovation; and 2) entrepreneurship and SME capacity. In its first priority axis, OPIC will contribute to more public and private investments in R&D and innovation, especially in the manufacturing and services sectors. It will also target one of the other structural weaknesses in Bulgarian business, namely the business-to-business partnership and research-industry collaboration.

Table 13: Priorities and amounts of funding relevant to R&I within OPIC

Priority axis	Topics	Amount (EUR million)
1	• Creation and commercialisation of innovation • Improvement of the pro-innovative infrastructure	251

Source: OPIC

In parallel, implementation of the projects launched under the OP Competitiveness 2007-2013 continues, including:

- Projects improving the innovation infrastructure, i.e. the setting up and development of technology transfer offices, technology centres, clusters, development of the Sofia Tech Park;
- Projects increasing the innovation activities in companies; and
- The JEREMIE initiative.

JEREMIE (Joint European Resources for Micro to Medium Enterprises) was launched as a joint initiative by the European Commission and the European Investment Bank (EIB) Group to improve access to finance for micro, small and medium-sized enterprises (SMEs) in the EU, within the Structural Funds framework for the period 2007-2013.

In Bulgaria, the JEREMIE initiative's investment strategy envisaged – and is in process of implementing – a balanced mix of private equity, venture capital, debt and guarantee instruments with a target of enhancing access to finance for Bulgarian SMEs and thereby addressing the market gaps between the supply and demand of financial engineering instruments.

The First Loss Portfolio Guarantee (FLPG) is a guarantee product. Equity products include: the Accelerator and Seed Fund; the Risk Capital Fund; the Co-investment Fund; and the Mezzanine Fund. The Portfolio Risk Sharing Loan (PRSL) is a debt product. These are managed by private financial intermediaries. In addition, the Risk Capital Fund supports innovative SMEs in the technology sector in their early phases of development. The goal is "to foster innovation and stimulate the knowledge-based economy".

The JEREMIE budget has been increased to approximately EUR 350 million, thereby becoming the most reliable and diverse (including through funds and banks as financial intermediaries) source of funding for enterprises in Bulgaria. As of October 2016, support had been given to 723 start-ups

through the FLPG instrument, totalling EUR 42.14 million, and 404 start-ups via the PRSL instrument (EUR 78.20 million).

The European Investment Fund (EIF) is a specialised provider for risk finance for SMEs across Europe. Major stakeholders include the EIB and the EC. Developing entrepreneurship, growth and innovation in SMEs are among the main objectives. In Bulgaria, the EIF has selected Eleven and LAUNCHub to manage a EUR 21 million Entrepreneurship Acceleration and Seed Financing Instrument under the JEREMIE Holding Fund. **Eleven** manages a EUR 12 million acceleration and seed fund with the aim of making around 200 investments in innovative young businesses. **LAUNCHub** manages a EUR 9 million ICT-focused fund, aiming to make around 120 investments over the next four years[21].

These two funds have helped to create almost from scratch an early-investment market in Bulgaria in a period still dominated by the financial and economic crisis[22]. In practice, Eleven and LAUNCHub have marked a step change in the Bulgarian start-up eco-system by establishing a model replicating the best global examples (e.g. from the US and UK) for making investments at early business stages, with market orientation and professionalism that can build companies with a global reach. According to the 2015 RIO report, in 2014, for a second consecutive year, Sofia was ranked among the top five European capitals for supporting start-up businesses with risk finance.

The result is active (financial and soft) support for over 170 companies and technology-based businesses in sectors which are strategically important for Bulgaria, including ICT, mobile, software and hardware and engineering. The challenge now is to expand the same model to other sectors with innovative potential, such as agri-business.

In terms of outputs, currently EUR 16.3 million has been invested in developing enterprises and about 263 jobs have been supported. The total amount of follow-on capital invested by third-party investors in Eleven and LAUNCHub portfolio companies has surpassed EUR 11 million. Private investment is attracted at individual company level, not at the funding level. In this way, the investment decision is substantially more informed and targeted, and individual companies receive the maximum stimuli to excel.

4.1.3 Other EU and international funding

EU-funded programmes and initiatives

Apart of the Framework Programme and COST (see Section 2.2.2 above), Bulgaria's participation in ERA-NET is relatively strong. As regards the Joint Programme Initiatives, the country participates as an observer in only one of the 10 ongoing initiatives, i.e. 'Cultural heritage and global change: a new challenge for Europe'.

Through the BSMEPA, the ME coordinates Bulgaria's participation in two Article 185 initiative(s) – EUREKA and Eurostars.

- For Eurostars, the match-funding and participation costs are covered by the NIF budget.
- In EUREKA, three successfully completed projects include Bulgarian participation, and seven projects currently running, three of which are looking for new partners. The successful EUREKA projects are in the fields of electronic devices, health care and medicine, environmental treatment, as well as IT management systems, agri-food, advanced materials, technological innovation in tourism, leisure and cultural sectors.

Bilateral and multilateral initiatives

Bulgaria participates in several transnational cooperation initiatives, strengthening both the competitiveness of the national research performers and their collaborative capabilities. One of the leading strategic co-alignment projects is the EU Strategy for the Danube Region (EUSDR) – in practice, a multilateral (and macroregional) strategy developed by the EC in cooperation with 14 countries in the Danube region. Significant results are expected in the innovation-related areas, especially Priority Area 07 'To develop the Knowledge Society (research, education and ICT)', Priority Area 08 'To support the competitiveness of enterprises', Priority Area 09 'To invest in people and skills' and Priority Area 10 'To step up institutional capacity and cooperation', coordinated by the City of Vienna (Austria) and Slovenia. Bulgaria has been involved in 30 joint calls (NETWATCH).

[21] http://www.eif.org/what_we_do/resources/jeremie/news/2012_news/Bulgaria_launchhub_eleven.htm?lang=-en
[22] RIO 2014 report

Bulgaria also supports a number of bilateral and multilateral initiatives. Under the collaborative Swiss programme for scientific exchange with the new EU Member States, for example, about CHF 6 million have been invested in thematic priorities, such as: eco-farming, agriculture and forestry and waste management, social disparities and regional inequalities, and research into new forms of medication. Norwegian grants are stimulating green industry innovations.

The country has several bilateral and multilateral scientific agreements with 12 countries among which joint research programmes are running with Ukraine, India, China and Switzerland.

4.1.4 Other allocation mechanisms

There are a limited number of public R&D funding programmes, predominantly in the form of competitions, award schemes (e.g. through Sofia Tech Park) or theme funds. An example is the **Fund for Innovations in Culture**: coupling private and public investment for cultural projects (within the Sofia Development Association, a public-private partnership). This fund supports cultural and creative industries in Sofia as an engine for urban regeneration, encouraging citizen (particularly young artists) participation and creating cross-sector partnerships (e.g. with education, science and social services).

Establishing the Fund for Innovations in Culture is part of the city of Sofia's wider strategy to support the cultural and creative sectors. This public fund is the first of its kind in Bulgaria. It proposes a public-private partnership model to provide access to funding for more innovative and risky cultural and creative projects: all private funding collected is doubled by the Sofia Municipality. The fund was created in the context of the city's candidacy for the title European Capital of Culture 2019 (won by Plovdiv), but also with the aim of becoming a successful and sustainable practice that helps to encourage new business models, innovative products and services in the field of cultural heritage and cross-sectoral collaboration[23].

4.2 Institutional funding for research

The information in this chapter is limited to HEIs and the BAS as no information could be found which relates to the other public research institutes (the government labs). Likewise, only limited information could be found for the AA.

4.2.1 Overview

In Bulgaria, the MES directs the funding for scientific research on an institutional basis for HEIs and the BAS.

- The BAS public research institutes receive their budget as approved by the parliament, where the MES is an intermediary without supervisory power;
- For the HEIs, the amount of institutional funding for scientific research and artistic activities in the HEIs cannot, by law, be lower than the equivalent of 10 % of the institutional funding for education. However, the institutional grant for HEIs is subject to a ministerial decision by the MES, and for 2014, public universities and HEIs received a total of EUR 4.1 million, or 2.77 % of their institutional funding

One special case is the funding mechanism applied to the AA which is funded by the sectoral Ministry of Agriculture and Food (MAF), but is under the dual subordination of MES and MAF.

[23] Todorova, A. and Slavcheva, M., (2016) RIO Country Report 2015: Bulgaria, JRC Science for Policy Report, Joint Research Centre

Table 14: MES budget by policy framework related to RDI (EUR million)

MES budget by policy framework	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*
HEI budget (education and research)	*170.282*	*176.521*	*192.271*	*192.141*		
HEI budget – research only				*4.1*		
BAS budget	*31.478*	*31.767*	*31.857*	*38.371*	*37**	*42.86*
AA budget					*17**	

Notes: estimate for 2015; Source: RIO report 2014, based on MES budget: 2009, 2010, 2011, 2012, 2013, 2014; Budget Law: 2009, 2010, 2011, 2012, 2013, 2014

4.2.2 Distribution of institutional funding among and within institutions

The Academy of Sciences

Following a decision on the complex governing structure within BAS, the institutional funding is distributed across all research institutes.

According to the Academy, for 2014, 80 % of BAS' institutional funding was distributed across all institutes for employee salaries. The remaining 20 % was allocated primarily to cover the costs of patents (EUR 5000 per patent), and then according to measurable R&D outputs, such as 40 % for publications, 20 % for citations, 20 % for completed doctoral theses, 15 % for R&D project income, and 5 % for outreach or expert and societal contributions.

Higher education institutions

To date, institutional funding for research has been distributed over all public HEIs as a share of the institutional funding for education, thereby spreading the limited research budget thinly over all HEIs.

The Higher Education Act (HEA) stipulates that the institutional funding for education is based on the number of students. Since 2014, HEIs have received additional differentiated funding based on a complex performance evaluation, using 68 indicators to measure the quality of education, the volume and value of research and publication outputs, the educational environment, services, the direct contribution to the labour market, and the evaluation from accreditation (see Section 3.2.3 above).

As for the **internal allocation of the funding**, as from 2003, funding for scientific research and artistic activities in Bulgaria's HEIs has been guided by Ordinance No.9/08.08.2003, regulating the planning, distribution and spending of state budget subsidies. Given the universities' autonomous status, the academic council of each HEI could determine the internal allocation of the funding and the nature of the activities. The intention was that the institutional funding for research would be allocated internally on a competitive basis and ideally would be entirely project-based. However, the academic councils have aimed at maintaining a relative balance among departments, faculties, natural and social sciences.

According to the audit of the National Research Development Strategy carried out for the period 2011-2014, on average, all public universities and other HEIs distributed 2.6 % of their funding targeted for research.

The 2016 Ordinance for conditions and order of assessment, planning, allocation and expenditure of funds from the state budget for financing the activities of state universities established a direct link between funding and performance as well as for the internal distribution of institutional funding. It therefore considerably reduces the universities' autonomy in the matter.

Each university can now direct up to 30 % of its funds to: support of current international programmes; international programmes and projects, for which the value added tax (VAT) charged is not recognised as an expense; paying licences for software products in current scientific projects; subscriptions for access to international databases; maintenance of patents and other IP rights on current or successfully completed projects; payment of a membership fee in international scientific and professional organisations in current or successfully completed projects; preparing strategies and programmes for developing R&I, for internationalisation of research and artistic

capacity; rents for exhibiting in scientific or art exhibitions in current or successfully completed projects; and technology and knowledge transfer.

The remaining funds are to be disbursed through competition among different types of projects:

- Scientific research/artistic activity, in which the university prepares students and PhDs;
- Preparation for participation in international scientific programmes;
- Additional scientific support to current scientific/artistic projects, financed by national or international scientific organisations;
- Co-financing of scientific or artistic forums;
- Conducting cultural and other events;
- Infrastructural projects for conducting qualitative and competitive research and artistic activity;
- Demonstration projects;
- Support for specialised publications in referenced editions and editions with an impact factor;
- Publishing scientific work.

The ordinance also defines the rules of competition for projects organised within a university, including ranking, eligibility, requirements and review process. Contracts with awarded projects are signed for a period of between one and three years. Project funding should not cover: purchase of furniture, household appliances, telephones and other; purchase of work clothing and shoes; subscriptions to newspapers and non-specialised magazines; payment of fees for participating in competitions for classification, computer literacy, language skills, etc.; additional payments for telephones and repair of premises (except infrastructural projects). Overheads can be up to 10 %.

Reporting by the HEIs is semi-annual, with an annual overview. The state university rectors submit information to the MES concerning: the objectives; activities and amount of financing of the internally approved projects or of the additional agreements in the respective year; implementation progress in the financed projects; and the funds expended on the approved projects. They are reviewed and evaluated according to common criteria for monitoring, performance evaluation and accounting. Receiving public funding depends on the timely submission of the report.

4.3 The competitive balance – institutional funding

No information was available from the official sources who provided an overview on the balance in the R&I system between funding for research based on competition and institutional funding.

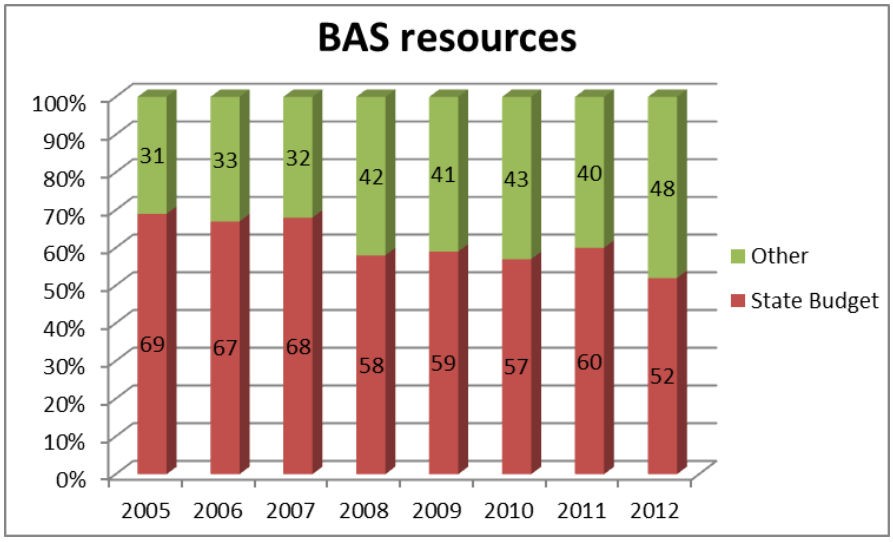
While all studies, reports and strategies recognise that the overall funding for research from national public sources is highly inadequate, opinions are diverging on whether the balance between the two funding sources need to be adjusted.

While national strategies emphasise the need for an increased share of project funding – and consequently a smaller share of institutional funding – the RIO reports highlight the trend emerging from the financial budget data in the BAS of increasing reliance on competitive funding (Figure 6).

Based on BAS data, in 2012, 52 % of the resources for research came from institutional funding, while 48 % was funding secured on a competitive basis. The RIO report 2015 considered the increasing project orientation to be the result primarily of a BAS internal reform. The authors stated that as a whole BAS is shifting towards a model combining state and external funding.

It should be noted that universities are allowed to generate income from other sources (i.e. project funding), provided the fees only cover the direct costs.

Figure 24: Bulgarian Academy of Sciences funding model



Source: BAS budget and annual financial reports

In 2016, the state budget represented 70 % of BAS' overall funding[24].

[24] BAS Annual Report, 2016

5 DEVELOPMENT OF A PERFORMANCE-BASED RESEARCH FUNDING SYSTEM

5.1 Recommendations of the H2020 PSF Peer Review panel

During 2015, the peer review, carried out under the Horizon 2020 Policy Support Facility, developed 10 policy messages, each supported by several detailed recommendations presented in the PSF Peer Review panel's report.

One such recommendation was to "increasingly concentrate funding for institutions that perform research, so as to reward high performance". The panel considered that the fragmented and dispersed Bulgarian higher education and research system would profit from a progressively higher concentration of resources for research, based on the allocation of public funding to institutions using measures rewarding high quality, such as performance-based funding schemes or performance contracts.

The panel also recommended that the binary nature of the education system be recognised and suggested the creation of a binary research support policy: one pillar focusing on top research performing organisations supporting them towards the stairway to excellence, including access to European research funding; and a second pillar focusing on higher education teaching establishments.

The panel noted that public research organisations in Bulgaria seem unable to deal with many of the challenges currently facing a modern university or research institution. Most universities and research institutes are still impeded by old bureaucratic practices and a lack of professional management for their daily effective and efficient administration. It is recommended that Bulgarian public research organisations professionalise their management, and develop and implement (their own) research strategies, including priority-setting. Such strategy development should only take place against the background of their funding, according to proven performance. Integration and synergies between the various public research institutes should also be encouraged to build critical mass and avoid overlaps and duplication of resources.

Although performance-based funding will increase motivation and trigger competition, the panel cautions that when embarking on a similar reform "it is vital to obtain a broad political consensus" leading to stable and predictable funding conditions. This would enable the PROs to develop longer-term research strategies.

The panel mentioned again that the introduction of performance-based funding to facilitate the transparent, fair and competitive allocation of resources, and to enhance performance incentives is a long-term and complex process. Next to stakeholder involvement, it requires expertise in research metrics and research evaluation.

For the system to be successful, there is a need to develop nuanced/sensitive indicators and adequate management systems and databases for the performance metrics. At stake is the ability to bring trust back into the system.

Taking the 10 principles in the Leiden Manifesto for research metrics as a guideline, the peer review experts assessed the Bulgarian draft of criteria and indicators for evaluating the research organisations. They considered these criteria and indicators to be inadequate for several reasons, including:

- Indicators based on simple citation counts or h-index do not account for variation by research field. Field- or journal-normalised indicators would be needed;
- There is a need for an open, updated and quality-ensured database of performance indicators rather than requesting reporting via hard copies;
- There is a note of caution about comprehensive annual evaluations which would become labour intensive and expensive.

The peer review also emphasised that when introducing performance-based funding, it is most important to maintain a base level of funding to enable all institutions to pursue research and scholarship activities. Reducing the institutional funding implies depriving the institutions of the ability to make any progress in research. They regard as an option, in a fragmented HEI landscape like the Bulgarian one, to focus (new) performance-based research funding on concentrated research activities (e.g. in terms of multi-year centre schemes) or to urge the PROs to collaborate or merge.

They reiterated that a key issue for the introduction of performance-based funding is how to balance the need for the concentration of resources against the need to ensure predictable funding and general good conditions for research performance.

Finally, they emphasised that the funding implications needed to be properly analysed in advance to avoid unintended impacts, and that stakeholder involvement was required.

5.2 The institutional funding component

In 2016, the Ordinance for conditions and order of assessment, planning, allocation and expenditure of funds from the state budget for financing the activities of state universities was adopted. This **directly links the size of the HEIs' institutional funding for research to performance**.

The ordinance stipulates that preparation of the state budget will be based on the average estimate of the results achieved in the scientific/artistic activity of each state university for the previous three years. The assessment is based on indicators for measuring science/artistic achievements and is carried out by the MES.

Annual distribution over the universities will be based on the average results of the evaluation in the previous three years (the bibliometric indicators are listed in Table 15 below). The universities will receive a percentage of the funds for their research activity, determined by the State Budget Law for each year, as follows:

- In final assessment above 1.50 – 100 %
- In final assessment from 0.40 to 1.50 – 90 %
- In final assessment from 0.01 to 0.,39 – 80 %

The remaining funds will be apportioned between the state universities with a final assessment above 1.50.

Table 15: Scientometric indicators for assessing scientific activity in state universities

Indicator	Coefficient of weight (a)	Formula	Final estimate
1. Number of scientific publications in scientific magazines, presented in world secondary literary sources (Na)	a	A=a*Na/N	
2. Number of scientific publications, published in editions with impact factor (Web of Science) and/or impact rank (Scopus) (Nb)	2a	B=2a*Nb/N	
3. Number of treatises (Nc)	4a	C=4a*Nc/N	
4. Number of quotes from scientific publications in the previous three years of data from Web of Science and/or Scopus (Nd)	a	D=a*Nd/N	
5. Number of articles in collections of scientific conferences, published in conference proceedings in Thomson Reuters and/or Scopus (Ne)	2a	E=2a*Ne/N	
6. Number of Bulgarian and international patents (registered patent applications, patents, as the result of contracts concluded with companies) (Nf)	4a	F=4a*Nf/N	

a = 1
N – number of research staff at the state university on a basic employment contract

Source: Ordinance for conditions and order of assessment, planning, allocation and expenditure of funds from the state budget for financing the activities of state universities

5.3 The evaluation component

5.3.1 The evaluation culture in the R&I system

The RIO report 2014 considers: "The main challenge for building a robust assessment framework is the fragmentation of the system for distribution of funding, and the weak monitoring and evaluation practice across all mechanisms." The report states that the R&I system in Bulgaria is characterised by a weak policy-evaluation practice. At present, there are some monitoring and evaluation procedures, but the results from the assessment exercises are not publicly circulated to all stakeholders, and are not used to influence policy design and programme implementation, or to improve the funding mechanisms.

The picture emerging is one of fragmentation in the evaluation practice, too, with specific monitoring and evaluation frameworks developed for different areas in the R&I system and programmes, and with no adequate legal framework for coordinating evaluation procedures across MES and ME, NSF and NIF, or the two evaluation agencies under the Council of Ministers – NEAA and NAVET. According to the report, the two ministries directly involved in R&I policies have different procedures for monitoring and evaluation:

- In ME, the main distribution of funds is managed by the BSMEPA and evaluation and assessment procedures are designed at programme level. NIF has its own approved 'rules' for management, stipulating monitoring and evaluation procedures prescribed at individual project level, while the procedure for its accountability refers to an annual report. *Ex-ante* evaluation is undertaken according to the monitoring rules stipulated under the EUREKA and Eurostars programmes.
- In MES, DG Science and DG Higher Education supervise the evaluation procedures. There is currently no established monitoring system to assess the outputs from individual funding programmes. The 'rules' for NSF stipulate criteria for self-assessment by beneficiaries, monitored by a "permanent scientific expert commission".

All budgets and policy implementation activities financed under MES and ME are supervised at the Council of Ministers level by the National Council for Science and Innovation, National Council for Innovation, or the Council for Coordination and Management of the EU Structural Funds. There is no clear and unified monitoring strategy or procedure at this level.

The report also states that the system for monitoring and evaluating the R&I performance of public-sector HEIs includes two disconnected elements:

- The Bulgarian university ranking system, developed by MES. The methodology developed by an independent consortium (OSI–MBMD–S) includes output-based indicators and the ranking has been operational since 2010. The Bulgarian university ranking system was developed to help students choose an educational institution. The system holds information on all 51 accredited HEIs in Bulgaria, categorised in 52 professional fields. There are pre-defined rankings of HEIs based on a set of indicators which cannot be modified. Users have the possibility to produce their own custom rankings based on needs and by selecting indicators of their choice and assigning weights. The system allows for a comparison between different universities in one field as well as between different fields. For example, it is possible to compare universities in terms of graduates' career development across different professional fields. The ranking system is built on more than 100 indicators covering different aspects of university activity, including science and research, relevance to the labour market, etc.[25].
- Second, this concerns the Register of the scientific activities in Bulgaria (BulCRIS), applying the Common European Research Information Format. This Register is under the supervision of the Science Directorate at MES. Information for it is supplied by public organisations and the funding agencies (NSF, NIF and others), and includes data on publications, public funds for science and innovation, scientific programmes, financial instruments, and research infrastructure.

BAS is the only research performer that has undergone a thorough international evaluation (in 2009) by the ESF and European Federation of Academies of Sciences and Humanities (ALLEA). The law for BAS stipulates a complex self-assessment procedure and accountability before the Parliament.

[25] http://rsvu.mon.bg/rsvu3/?locale=en

NRDS does not articulate specific indicators for monitoring at project or programme level. The Strategy for the Development of Higher Education emphasises the role of the Bulgarian universities ranking system and the National Evaluation and Accreditation Agency (NEAA), responsible for the legal framework and operational procedures for institutional and programme assessment and accreditation of the HEIs, as well as post-accreditation monitoring and control.

Currently, the R&I system does not collect systematic data on specific outputs from funding and does not have established evaluation tools for benchmarking and impact analysis.

5.3.2 The research monitoring and evaluation framework

The Regulations on the monitoring and evaluation of research activities performed by HEIs and science organisations, as well as the activities of the NSF were issued by the MES in 2015.

The monitoring and evaluation system aims to improve the quality of research by introducing international quality standards applicable to research activities as well as enhancing the governance of research activities. It will also help report research results and the Fund's activity to the scientific community, the relevant state bodies and other institutions which finance it, as well as to the public. Furthermore, the aim is to create an "effective and efficient national policy on research". The regulation's specific objectives include:

- To evaluate research organisations' activities and analyse their positioning in the European and global research area;
- To identify and support research activities that have proven potential of national significance and/or international recognition;
- To stimulate organisations to reach high, internationally recognised results for research activities, based on a system of objective, measurable and transparent evaluation criteria;
- To analyse the effectiveness of investment in R&I and economic growth and planning the budget funds for organisations and the Fund;
- To ensure publicity in the process of implementing the national policy on research and the transparency of their funding.

Evaluation of the research organisations will take place annually and will be carried out by an independent committee composed of a chair and 12 members to evaluate all fields.

The **main sources** for carrying out the monitoring and evaluation will include: international scientific databases (Scopus, Web of Science, Harzing's Publish or Perish (Google Scholar)); the NSI and Eurostat; Bulgarian Current Research Information System (BulCRIS); databases maintained by the National Centre for Information and Documentation, Patent Office of the Republic of Bulgaria and international patent databases; and the Fund's activity reports.

In addition, research organisations are obliged to provide information to MES each year on their research activities (in hard and soft copy):

- A list of the research staff members hired under the main employment contract, along with their publishing names, their science degrees and academic positions;
- The average salary of the research staff members at the relevant organisation for the reporting period;
- A list of national and international projects, under which cash funds have been received during the relevant reporting period from competition/project-based funding, with the amount of the funds received;
- A list of contracts with Bulgarian or overseas enterprises and/or organisations under which cash funds have been received during the reporting period, and the amount of the funds received;
- A list of doctoral students successfully defending their dissertation theses during the relevant reporting period;
- A membership list in international editorial boards of journals registered in the international databases;

- A membership list of the organisations' units and the units' research staff members in international science networks and/or science companies;
- A list of textbooks, learning accessories, popular science publications of anticipated social significance, which have been published during the relevant reporting period;
- Several textbooks, learning aids, popular science publications, with the expected social significance, as published during the relevant reporting period.

The evaluation will be conducted against three **main criteria**: research output, research capacity, and national and international distinction. The indicators defined for these criteria are listed in Table 16. For each indicator, the data are divided by the number of research staff in the organisation.

Table 16: Evaluation criteria and indicators

CRITERION	*INDICATORS*	
	No	*INDICATOR*
1.Research output (U1)	*1.1. (a)*	*Number of science publications referenced and indexed in global secondary literary sources (A)*
	1.1.1 (b)	*Number of science publications forming part of 1.1, which have been published in publications with impact factor, IF (Web of Science) and impact rank SJR (Scopus) (B)*
	1.1.2 (b1)	*Number of science publications published in the top 10 % of impact factor journals in the relevant science area (B1)*
	1.2. (d)	*Number of monographs (D)*
	1.3. (g)	*Number of citations/references of science publications by the science organisation's research staff, as published in science literature during the reporting period (G)*
	1.4. (h)	*Averaged h-index according to Scopus data, vis-à-vis the number of research staff*
	1.5. (f)	**Number of patents:* *registered patent applications* *patents* *patents resulting from contracts concluded with companies (F)*
2.Research capacity (U_2)	*2.1. (n_d)*	*Number of the science organisation's fellows who hold the educational-science 'Doctor' degree (N_d)*
	2.1.1. (n_s)	*Number of fellows forming part of 2.1 who hold the 'Science Doctor' degree (N_s)*
	2.1.2. (n_p)	*Number of fellows forming part of 2.1 who hold the academic position of 'Professor' (N_p)*
	2.2. (m)	*Funds received during the reporting period via the project-based funding system in Bulgaria and abroad (K BGN)*
	2.2.1. (q)	*Funds received during the reporting period from project funding external to the organisations, under national and international projects (P)*
	2.2.2. (v)	*Funds received during the reporting period from contracts concluded with Bulgarian or overseas enterprises (V)*
	2.3. (r)	*Number of doctoral students who defended their thesis during the reporting year (R)*
3. National and international distinction	*3.1. (s)*	*Number of memberships on editorial boards of science journals included in the global referencing, indexing and evaluation system (S)*
	3.2 (t)	*Number of memberships of the organisations and members of the organisations' research staff in international science networks*
	3.3. (k)	*Number of memberships of the organisations and members of the organisations' research staff in international science companies*

The evaluation methodology categorises the scientific fields in 'science areas', as shown in Table 17.

Table 17: Categorisation of the scientific fields

SCIENCE AREAS	*SCIENCE DIRECTIONS*
1. Liberal sciences and arts	*Philology; History and Archeology; Philosophy; Religion and Theology; Theory of Art; Visual Arts; Music and Dance Art; Drama and Film Art*
2. Social, business and legal sciences	*Sociology, Anthropology and Culture Sciences; Psychology; Political Sciences; Social Activities; Public Communications and Information Sciences, Law, Administration and Management, Economy, Tourism, Theory and Management of Education, Pedagogy, Pedagogy of Training*
3. Natural sciences, mathematics and informatics	*Physical Sciences, Chemical Sciences, Biological Sciences, Earth Sciences, Mathematics, Informatics and Computer Sciences*
4. Technical sciences	*Mechanical Engineering, Electrical Engineering, Electronics, and Automatics, Communication and Computer Equipment, Energy, Transport, Navigation, and Aviation, Materials and Materials Science, Architecture, Civil Engineering, and Geodesy, Surveying, Mining, and Processing of Minerals, Chemical Technologies, Biotechnologies, Food Technologies, General Engineering*
5. Agrarian sciences and veterinary medicine	*Horticulture, Plant Protection, Animal Husbandry, Veterinary Medicine, Forestry*
6. Healthcare and sport	*Medicine, Dental Medicine, Pharmacology, Public Health, Healthcare, Sport*

5.3.3 Pilot of the evaluation of public research organisations (PROs): main messages

In line with the regulation, a special 12-member committee was set up to conduct a pilot to test the methodology within five organisations: the Medical Institute (Plovdiv), Veliko Tarnovo University, Economic Academy (Svishtov), the Nuclear Research Institute of the Bulgarian Academy of Sciences and the Agrobioinstitute. The test demonstrated that implementation of the rules does not allow for an "in-depth, objective evaluation of universities and research organisations".

Based on these suggestions, the evaluation committee made comments and recommendations in a report addressed to the MES[26].

The committee informed the minister that "the application of the criteria and indicators of the regulation did **not** allow for an objective and in-depth evaluation of the quality of the scientific activities of the higher schools and scientific organisations". Thus, the committee agreed that the regulation needed modification and amendment in order to improve the methods and indicators used for the evaluation.

The committee proposed to consider the adoption of an assessment system similar to the AERES/HCERES (France) or REF (UK). Other suggestions were:

- **Evaluation committee:** the size of the evaluation committee should be much larger than 12 members and in addition the members should have previous evaluation expertise[27];
- **Frequency of evaluations:** according to the current regulation, a large number of universities and research organisation need to be evaluated each year, which is not realistic. It would be better to carry it out every three years to achieve a more in-depth evaluation of the research quality[28];

[26] Draft report on the activity of the Ministry of Education and Science Committee on monitoring and evaluation of research activity implemented by research organisations and universities, 23.01.2017
[27] Presentation by Nikolay Vitanov, Prof., D.Sc., Dr.rer.nat., PhD at the project kick-off meeting, 13.02.2017
[28] idem

- **Human factor issue**: the information required from universities and PROs is not sufficient to evaluate their performance in-depth. Therefore, a large amount of additional information would need to be collected which would significantly overload the work of the evaluation committees. The requirements should be changed according to the information to be reported.
- **Rating system**: the evaluators propose to adopt the rating system used in the French system (AERES – Evaluation Agency for Research and Higher Education), based upon the classification of the organisations' performance against each criterion in five categories:
  - T - international leadership;
  - A – international recognition;
  - B – significant national impact;
  - C – international visibility;
  - D – significant improvement is needed.
- **Threshold indicators**: one of the suggestions by the evaluation committee is to implement an evaluation system based on minimum levels of performance and to make a very good connection between research results and funding. Organisations with a rating above BBB should receive a significant increase in funding.
- **Differentiation between scientific fields**: evaluation indicators should be adapted to different sectors, starting with three groups: natural and engineering sciences; social and humanitarian sciences; and mathematical and agricultural sciences.
- **Principle of self-assessment**: it is recommended that in future the organisations calculate the indicators themselves – make 'a self-assessment' – and there will be random checks on the accuracy of the outcomes by the evaluation committee. In case of a difference larger than 5 %, a fine should be imposed and the evaluation grade reduced by one unit.
- **University versus faculty**: as information provided will be at university level, it is not possible to evaluate individual faculties. It is often the case that there are strong faculties in relatively weak universities. The solution would be to require the information at faculty level so that they become the evaluated unit. This will increase the committee's work load but will benefit successful faculties.
- **Risk of inflating degrees**: measuring scientific capacity based on the number of PhDs is dangerous as this will lead to inflation of the degrees;
- Introduce an information system whereby research organisations will fill in the information.

6 ANNEXES

6.1 Annex 1 – Targets within the operational implementation plan of the National strategy for development of scientific research 2025

Table 18: Targets within the operational implementation plan

Indicator	Unit	Base value	Target value 2020	Target value 2025
The target of R&D expenses of 1.5 % of GDP reached, as per the national target of the EU strategy for smart, sustainable and inclusive growth 'Europe 2020'	Share of the expenses for R&D as a % of GDP	0.80 %	1.5 %	2 %
Expenses for R&D from the state sector and the higher education sector, as a percentage of GDP	Share of the public expenses for R&D as a % of GDP	0.27 %	0.45 %	0.90 %
Developed national scientific networks/Number of scientific teams which work on the joint research programme, and share scientific equipment and expertise	Pcs.	25	50	115
Long-term institutional programmes in priority areas (funding of scientific organisations' research operations based on a long-term scientific programme)	Pcs.	1	5	10
Optimisation of the share of funds for scientific research in relation to the funds for training in state high schools (differentiated approach according to the results)	%	2.5	up to 6 %	10 %
Introduction of regular international evaluation of scientific research operations and scientific organisations	Number of procedures with participation from independent international experts (every six years)	1	2	3
Participation of Bulgarian scientific organisations in European scientific programmes, initiatives and networks funded by European science instruments	% growth annually	220 pieces	30 %	35 %
Share of programme-project funding	%	40	60	80
Supported centres for top achievements	Pcs.	-	4	4
Supported competency centres	Pcs.	-	8	12

6.2 Annex 2 - Summary of Better Science Operational Implementation Plan and Indicative Investments

Objective	Activity	Instruments	Period of implementation	Source of funding	Indicative investment (in BGN) EUR 1 = BGN 1.94
Pillar I: Increasing public investments in research					
Operational goal 1 Increasing R&I funding to 1.5 % of GDP by 2020 and reaching 0.50 % of public funding	**Activity 1** Adoption of operational plan	1.1. Analysis of budget for research and adoption of recommendations for optimisation of investments, including institutional funding, programme instruments, increase of research funding due to university rating system, etc. 1.2. Coordination of alternative scenarios for reaching the goal by 2025.	End of 2017	State budget	60 million
	Activity 2 Wide public consultation on Science Agenda 2030	2.1. Establishing a scientific council based on Bulgaria's fully-fledged participation in the ERA.	Ongoing	State budget	400 million
Pillar II: Reform in the research system					
Operational goal 2 Increasing dynamism, effectiveness and efficiency of research activity	**Activity 3** Independent evaluation of R&I activity in line with international standards and the Leiden Manifesto	**3.1.** Sustainable implementation of the regulation for monitoring and evaluation of scientific activities (SG, issue 72/18.09.2015) in 2016 and 2017 and development of a model for rating high schools (including the rating system) and scientific organisations in terms of quality of the scientific research, supported by the relevant targeted funding, based on objective indicators for scientific results.	Ongoing	State budget	160 million
		3.2. Independent evaluation of the efficiency and applicability of the regulation (SG, issue 72/18.09.2015) within the framework of the instrument for policy support (PSF), funded by	End of 2017		

		Horizon 2020 and an update of the regulatory acts. **3.3.** Evaluation of the efficiency and applicability of the regulation (SG, issue 72/18.09.2015) in 2017 with the support of the EC (within the framework of the instrument for policy support (PSF), funded by Horizon 2020 or other European programmes) and an update of the normative base, if required. **3.4.** Introduction of a system of external monitoring and evaluation of the implementation of scientific programmes and projects funded by the public. **3.5.** Introduction of a system for analysis, forecasting and evaluation of the impact during the drafting of new policies and measures for R&I.			
	Activity 4: Improvements to the financing system for research in scientific organisations, based on priority sectors, incentivising the competition, developing and achieving impacts useful for society and business	**4.1.** Carrying out an independent international evaluation of scientific organisations and universities in line with international standards and practice in EU Member States and within the EC.	By the end of 2018 г	State budget	1 430 000
		4.2. Increasing the share of programme-based financing in overall institutional funding for scientific organisations and universities.	By the end of 2020	State budget	80 million
	Activity 5: Increasing result-based funding based on clear criteria and significant results useful for society, as included in the	**5.1.** Adding to Law on Promotion of Scientific Research the role of scientific research and transfer of results and technologies to universities as activities which are	By the end of 2017	State budget	40 000

	Law on Stimulation of Scientific Research	equal to education **5.2.** Introduction of three-year public agreements with universities and research institutions (2019 г.), for implementing institutional strategies (including on a faculty level,), improving the quality of scientific research, strengthening scientific potential and the transfer of results and knowledge.			
		5.3. Modernisation of the system of planning and distribution of public funding for scientific or creative activities within universities, including regulations.	Ongoing	State budget	120 million
		5.4. Optimisation of university networks and research organisations through planned resources from the state budget and OP SESG and support for participation in Horizon 2020 programmes.	Ongoing	OP Science and Education for Smart Growth (SESG)	3 525 000
	Activity 6: Construction of modern administrative structure for quality management of policies and programmes for scientific R&I and building up experts' capacities	**6.1.** Creation of an independent Agency for the Stimulation of Research through the transformation of the 'Scientific Research' Fund to develop a structure capable of designing and implementing multi-annual programmes for funding scientific research. **6.2.** Restructuring of leading departments in the ME in charge of implementing scientific and research policies.	By the end of 2018	State budget	55 000
Total pillar 2: BGN 208 895 000					
Pillar III: Concentration of scientific infrastructure and research capacity in sectors important for the economy, and the synergy between them					
Operational goal 3: Concentration of a critical	**Activity 7:** Development of modern university and	**7.1.** Designing programmes and regulations for setting up excellency	By end of 2020	OP SESG	140 000

mass of researchers and scientific infrastructure through the creation of excellency centres and competency centres	research centres for implementing competitive scientific research and solving scientific tasks, and concentrating scientific staff, financial resources, and modern equipment necessary for important scientific tasks	centres and competence centres, concentrating critical mass of scientific potential and servicing public-sector policies.			
		7.2. Building regional capacity for specialisation in line with ISSS for the creation of critical mass, support for local innovation system and creation of new/support of existing scientific teams with researchers from different organisations.	By end of 2020	OP SESG	100 000
		7.3. Designing national scientific programmes, together with other ministries and agencies.	By end of 2018	State budget	7 million
		7.4. Planning, approval and implementation of thematic programmes in priority sectors in partnership with industry and public national and local structures.	By end of 2020	Fund for Scientific Research	10 million
		7.5. Securing specific mechanisms for scientific research in response to urgent needs, including on a national level and within the industry	Ongoing	State budget	3 million
		7.6. Implementing market-based scientific research in priority sectors of ISSS.	By end of 2019	State budget	10 million
		7.7. Building strategic partnerships and common research programmes with leading European scientific centres.	By end of 2020	Horizon 2020 OP	10 million 5 million
	Activity 8: Creating incentives for Bulgarian researchers to participate in Horizon 2020, including common scientific programmes, technological initiatives, ERA-NET and	**8.1.** Participation in common scientific programmes with joint financing between business, Member States and the EC.	By end of 2020	State budget Horizon 2020 Fund for Scientific Research	2 million 13 million 12 million

	COST			Private investments	15 million
		8.2. Design and implementation of schemes for project preparation and application in Framework Programmes.	By end of 2018	State budget Horizon 2020 Fund for Scientific Research	30 000 400 000 300 000
		8.3. Design and implementation of multilateral research programmes, including support for developing capacity to carry out scientific R&I in European and international networks.	Ongoing	OP SESG Fund for Scientific Research	5 million 20 million
	Activity 9: Implementation of a National Roadmap for scientific infrastructure			State budget OP SESG NIF	432 million
Operational goal 4: Development of electronic governance of scientific and research activity in Bulgaria	**Activity 10:** Creating an environment for introducing information and communication technologies			State budget OP SESG Horizon 2020	32.7 million
	Activity 11: Introduction of open access to scientific information and data			State budget OP SESG NIF	50.1 million
	Activity 12: Strengthening social dimensions of science				18 040 000
Operational goal 5: Building a sustainable link between education, science and business as a basis for the	**Activity 13:** Strengthening integration between the elements of the 'knowledge				7 070 000

development of a science-based economy	triangle’				
	Activity 14: Stimulating the transfer of knowledge and technologies from universities and scientific organisations to the benefit of the economy and society				51 230 000
Operational goal 6: Developing human capacity	**Activity 15:** Developing human capacity by offering attractive conditions for career development, professional growth, qualification and specialisation of scientists				41 million
	Activity 16: Change in researchers’ age profile				20.2 million
	Activity 17: Stimulating scientific organisations and universities to create favourable conditions for career development and mobility, including increasing scientific potential				110 060 000

6.3 Annex 3 - Criteria for monitoring and accounting for the achieved results related to the state universities' scientific or artistic activity

1. Approved internal institutional priorities for scientific work:

1.1. number of projects financed under the relevant priorities, total amount.

2. Scientific results:

2.1. list of the scientific publications, which are refereed and indexed in world secondary literary sources;

2.2. number of scientific publications, published in editions with impact factor (Web of Science) and impact rank (Scopus);

2.3. number of quotes in scientific publications (during the two previous years) from state universities in the research team's accounting period on the basis of data from Web of Science and Scopus;

2.4. list of the registered patent applications, patents and patents, resulting in contracts concluded with companies;

2.5. number of articles in scientific conference collections, introduced in Conference Proceedings in Thomson Reuters and/or Scopus;

2.6. list of treatises published;

2.7. list of spectacles performed;

2.8. list of concerts performed;

2.9. list of the exhibitions organised;

2.10. list of movies filmed;

2.11. list of other artistic performances (e.g. broadcast radio- and/or TV-programmes, written scores, etc.);

2.12. list of artistic performances gaining international recognition, proven with a relevant document (diploma, certificate, etc.);

3. Number of research team members on a basic employment contract in a state university (in accordance with § 1, p. 2 from the Statute for monitoring and estimating the research work, implemented by universities and scientific organisations, as well as the activity of the 'Scientific Research' fund (SG 72/2015):

3.1. number of educational and scientific 'doctoral' degrees awarded during the respective year;

3.2. number of researchers attracted from outside the state university structure (from Bulgarian and foreign universities and scientific organisations);

4. Problems detected during implementation of the financed projects and measures taken to overcome them.

5. Measures to ensure results receive publicity.

6. Annual financial reporting for the funds received and expended, released intentionally from the state budgetfor state universities' scientific or artistic activities.

Note. The information from p.2.7 to p.2.12 applies only to the state universities with artistic activities.

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ABBREVATIONS

AA	Agricultural Academy
ALLEA	European Federation of Academies of Sciences and Humanities
BERD	Business expenditure on R&D
BGN	Bulgarian leva (currency)
BAS	Bulgarian Academy of Sciences
BSMEPA	Bulgarian SME Promotion Agency
BulCRIS	Bulgarian Current Research Information System
CEE	Central and Eastern Europe
CoCs	Centres of Competence
CoEs	Centres of Excellence
CoM	Council of Ministers
DG	Directorate-General
EC	European Commission
EHEA	European Higher Education Area
EIB	European Investment Bank
EIS	European Innovation Scoreboard
ENID	European Network of Indicators Designers
ESIF	European Structural and Investment Funds
ERA	European Research Area
ERC	European Research Council
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EUSDR	EU Strategy for the Danube Region
FDI	Foreign Direct Investments
FLPG	First Loss Portfolio Guarantee
FP	Framework Programme
FTE	Full-time equivalent
GBAORD	Government budget appropriations or outlays on R&D
GDP	Gross domestic product
GEM	Global Entrepreneurship Monitor
GERD	Gross domestic expenditure on R&D
JEREMIE	Joint European Resources for Micro to Medium Enterprises
JRC	Joint Research Centre
ICT	Information and communication technology
IP	Intellectual Property
ISSS (IS3)	Innovation Strategy for Smart Specialisation
HCERES	Haut Conseil de l'Evaluation de la Recherche et de l'Enseignement Supérieur
HEA	Higher Education Act
HEI	Higher education institution
LEIT	Leadership in Enabling and Industrial Technologies
LLL	Lifelong learning
MA	Managing authority
MAF	Ministry of Agriculture and Food
ME	Ministry of Economy
MES	Ministry of Education and Science
NACE	Statistical nomenclature of economic activities in the EU
NEAA	National Evaluation and Accreditation Agency
NAVET	National Agency for Vocational Education and Training
NCP	National contact point
NGO	Non-governmental organisation
NIF	National Innovation Fund
NRDS	National Research Development Strategy
NRI	National Research Infrastructure
NRIS	National Research and Innovation System
NSF	National Science Fund
NSI	National Statistical Institute
OST	Observatory on Science and Technology
OPHRD	Operational Programme for Human Resource Development
OPIC	Operational Programme Innovation and Competitiveness
OP SESG	Operational Programme 'Science and Education for Smart Growth 2014-2020'
PO	Patent Office
PRFS	Performance-based research funding system
PROs	Public research organisations
PSF	Policy Support Facility
PRSL	Portfolio Risk Sharing Loan

PARI	Promotion Agency for RI
RIS3	Regional Innovation Strategy for Smart Specialisation
R&I	Research and innovation
R&D	Research and development
SDHE	Strategy for the Development of Higher Education in Bulgaria 2014-2020
SG	State Gazette
SME	Small and medium-sized enterprise
S&T	Science and technology
VAT	Value-added tax

KI-AX-17-012-EN-N

The Background Report provides an overview of the Bulgarian science, research and innovation system in the context of the Specific Support to Bulgaria within the Horizon 2020 Policy Support Facility. The report begins by elaborating on the country's socio-economic context and addresses, in a comparative way, the R&D trends, including financial flows. Research performance indicators are also presented along with information on governance of the R&D system, the research-performing institutions and the higher education institutions. The report provides an overview of relevant strategic and policy documents, including the latest developments. It also sketches the process of introducing a performance-based research funding system with its institutional funding component and an evaluation component. Finally, it provides insights on the pilot evaluation by the public research organisations.

Studies and reports

Publications Office

doi: 10.2777/976598
ISBN: 978-92-79-73424-3