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Stairway to Excellence Country Report: Bulgaria

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Abstract

In the frame of the Stairway to Excellence project, complex country analysis was performed for the EU MS that joined the EU since 2004, with the objective to assess and corroborate all the qualitative and quantitative data in drawing national/regional FP7 participation patterns, understand the push–pull factors for FP7/H2020 participation and the factors affecting the capacity to absorb cohesion policy funds. This report articulates analysis on selected aspects and country-tailored policy suggestions aiming to tackle the weaknesses identified in the analysis.

The report complements the complex qualitative/ quantitative analysis performed by the IPTS/KfG/S2E team. In order to avoid duplication and cover all the elements required for a sound analysis, the report builds on analytical framework developed by IPTS.

Contents

EXECUTIVE SUMMARY

The current country report on Bulgaria analyses various system and policy aspects in order to understand the reasons behind the R&I performance in the policy cycle 2007-2013, which remains below potential, and to draw attention to the policy lessons and the main R&I governance and policy changes for the period 2014-2020. Firstly, the governance system is described, given the proven importance of good governance to foster socio-economic development. Unfortunately, according to both external and internal assessments, the system lacks sufficient funding, capacity and key linkages. The weaknesses are rooted in the share of dedicated investments and in the tertiary education system gaps. The fragmentation stems from the financial system, the unclarities in the strategic orientation and the lack of integration incentives. RIS3 addresses both weakness and fragmentation of the system, while its objectives encompass the components of consolidation and excellence.

Secondly, factors that support or limit the national participation in R&D calls funded by SF/ESIF are examined to demonstrate that predictability and preparedness predetermine interest. The 2007-2013 chosen types of funding provoke integrative forces and lead to significant improvements, but prove insufficient in number and coverage and slightly biased towards either demand or supply side. Thirdly, push factors for FP/H2020 intensity include availability and reliability of funding, although the most effective element represents the interest of EU peers, colleagues and established partners from other projects and initiatives (such as COST for example) in involving their Bulgarian counterparts. Pull factors from FP/H2020 consist of a set of information, capacity, autonomous financing and point of access.

Fourthly, the report discusses policy instruments facilitating the participation in FP(H2020) and synergies with SF(ESIF). Two operational programmes, OPIC and OPSEIG envisage the possibility for sequential funding (respectively downstream for ESIF to build upon FP/H2020 results and upstream for ESIF to expand the participation of Bulgarian researchers in international cooperation), the thematic areas being in compliance with the country's RIS3. Raising interest in ESIF is envisaged through reduction of administrative burden, simplification and e-services, modification of the information tools, thematic focus on RIS3 and wider range of financial instruments. As adequate, appropriate and efficient tools, REGPOT under FP7 and similar calls under FP5 and FP6 are distinguished. The process within such calls, in addition to participation in the general ones, contributes to the restructuring the science and technology sector of the countries or regions concerned, which can hardly be completed using internal means only.

Fifthly, lessons learnt from 2007-2013 programming period are drawn, especially with respect to the need to improve the project proposal evaluation, which may undermine trust in the overall system. Clarity as to the appropriateness of evaluators (based upon specific knowledge, experience and integrity) and stronger procedures are recommended, as well as proper reward system for national and international evaluation experts, accompanied by proportional sanctions for breaches of confidentiality and impartiality. The most logical way to deal with internal dilemmas seems to lead to alignment of priorities and application process of national funds and operational programmes with H2020. Finally, the initial positive developments concerning clusters, Sofia Tech Park and TTOs need to be further improved and spread more widely, especially when they can demonstrate take up of public sector research results and willingness to replicate EU best practices.

Acknowledgements

The valuable assistance and huge information flow provided by the 3S Platform should be mentioned. I also need to offer my sincere appreciation for the learning opportunity provided by JRC, IPTS. In addition, the persons interviewed for the current report (representatives of administration, academia and business) demonstrated deep desire to witness the results of their long-term reform efforts. Their commitment to innovation as concept and practice is enviable.

The contributions and comments from DG-REGIO are also gratefully acknowledged.

Finally, the report on Smart Specialization Strategy of Bulgaria, prepared for the DG RTD division of the European Commission (EC) by Daniela Mineva and Lisa Cowey in October 2013, served as a stepping stone in the present effort on the stairway to innovation excellence.

Disclaimer

1 Introduction

Background of the "Stairway to Excellence" project

The European Commission Framework Programme (FP) for research and technology development has been vital in the development of European knowledge generation. However, there is considerable disparity across EU countries and regions in terms of FP participation and innovation performance.

Horizon 2020 has continued to provide funding on the basis of excellence, regardless of geographical location. However, it has also introduced novel measures for "spreading excellence and widening participation" by targeting low Research & Innovation (R&I) performing countries - most of whom are eligible for innovation funding under Cohesion Policy for the period 2014-2020.

In addition, the new regulations for ESIF aim to use funds more effectively to build regional/national excellence and capacities. By doing so, the key funding sources (ESIF and Horizon 2020) can complement one another along the entire innovation process.

Objective of S2E

The Stairway to Excellence (S2E) project is centred on the provision of support to enhance the value of the key European Union (EU) funding sources for research, development and innovation: European Structural and Investment Funds and Horizon 2020 but also the Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME), Erasmus+, Creative Europe, European Union Programme for Employment and Social Innovation ("EaSI") and the digital services part of the Connecting Europe Facility by actively promoting their combination. The project has two main objectives, namely:

- Providing of assistance to regions and countries that joined the EU since 2004 in closing the innovation gap, in order to promote excellence in all regions and EU countries;
- Stimulating the early and effective implementation of national and regional Smart Specialisation Strategies.

Main purpose of the document

In the frame of the project, complex country analysis is performed for all 13 EU MS with the objective to assess and corroborate all the qualitative and quantitative data in drawing national/regional FP7 participation patterns, understand the push–pull factors for FP7 participation and the factors affecting the capacity to absorb cohesion policy funds. This report articulates analysis on selected aspects and country-tailored policy suggestions aiming to tackle the weaknesses identified in the analysis.

The report complements the complex qualitative/ quantitative analysis performed the IPTS/KfG/S2E team. In order to avoid duplication and cover all the elements required for a sound analysis, the report builds on analytical framework developed by JRC-IPTS.

2 QUALITY OF THE GOVERNANCE

2.1 Structure of the Governance System

Bulgaria is a parliamentary republic and a Member State of the European Union since 2007. The country is under a currency board (binding the national currency to the euro) and is characterized by an industrialized, free market economy, moderately developed private sector and a relatively small domestic market.

The highest policy-making body is the **National Assembly** of the Republic of Bulgaria (National Parliament). The Parliament exercises its power mainly through the state budget and its distribution. Related to Research and Innovation, there are Standing Committees on Economic Policy and Tourism, on Education and Science, and on European Affairs and Oversight of European Funds. Since 2012 the Parliament has also controlled the research output of the Bulgarian Academy of Sciences (BAS).

The Council of Ministers endorses the most important strategic documents. The **Ministry of Economy (MoE)** defines national innovation policy and provides (national) funding predominantly to private enterprises for applied research through the National Innovation Fund (NI Fund). The Executive Agency for Promotion of SMEs (EA PSME) at the ministry manages the NI Fund. At the start of the 2007-2013 programming period the Agency performed the functions of Intermediate Body, which was eliminated in 2012. Ministry of Economy, the General Directorate "European Funds for Competitiveness" is the Managing Authority of Operational Programme "Development of the Competitiveness of the Bulgarian Economy", co-financed by ERDF during programming period 2007-2013 and of Operational Programme "Innovation and Competitiveness" for 2014-2020 programming period.

The **Ministry of Education and Science (MES)** designs and carries out national science and scientific research policy. The National Council for Scientific Research at MES oversees the functioning of the main public research funding instrument – the financed through national budget Scientific Research Fund (SR Fund). MES also hosts the NCP for the EU framework programmes and Horizon 2020 (within the Directorate "Science"). During 2007-2013 period MES contained Intermediate Body under Operational Programme "Human Resources Development", co-financed by ESF and managed by the Ministry of Labour and Social Policy. For 2014-2020 programming period there is Directorate "Structural Funds and International Educational Programmes", Managing Authority of Operational Programme "Science and Education for Intelligent Growth" with dual funding from ESF and ERDF. The National Centre for Information and Documentation is responsible for providing supporting information on research to the Ministry.

Other ministries support policy-making with respect their specific competences. The Ministry of Agriculture and Food manages the Agricultural Academy, 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" (EA ECNIS).

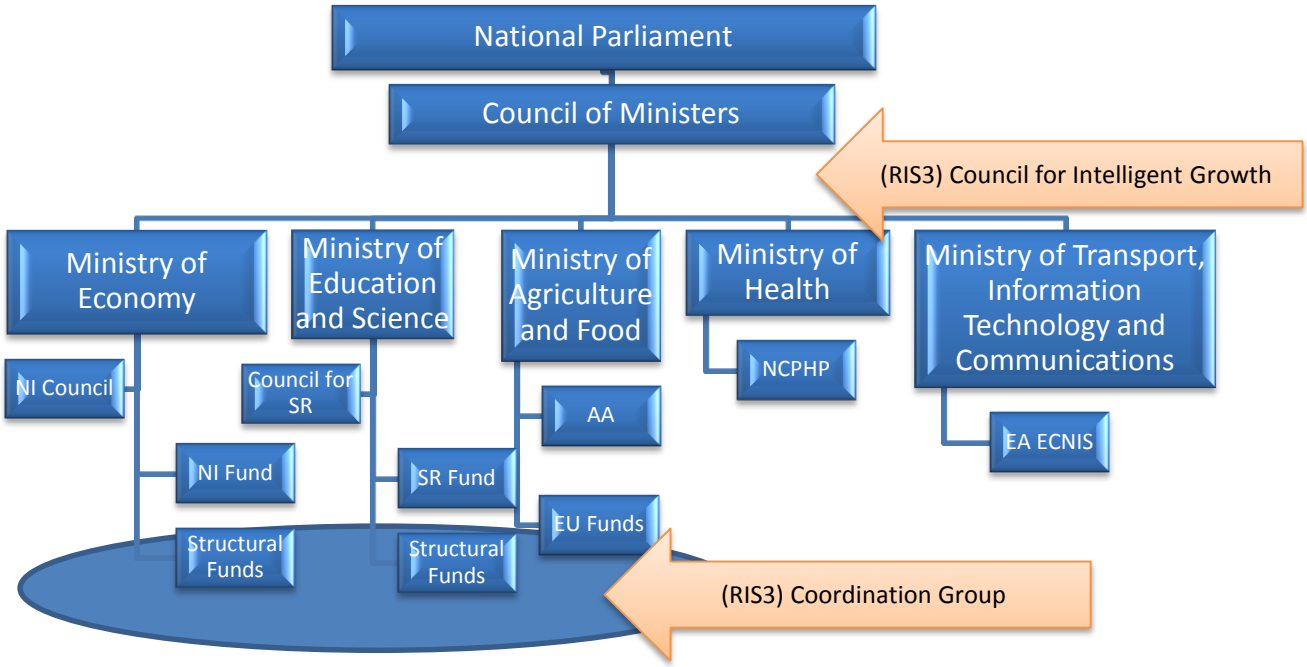

Figure 1. Organogram – governance of R&D funds (including structural funds for R&D)

The biggest research performing institutions in Bulgaria are the **Bulgarian Academy of Sciences** (BAS), the **Agricultural Academy** (AA), i.e. public research institutions, and some of the Bulgarian universities (i.e. HEIs such as Sofia University and the Technical University in Sofia), though more and more applied research is carried out in smaller private sector organizations – private universities, private research institutions and private enterprises. Although a relatively new phenomenon (mainly due to Operational Programme "Development of the Competitiveness of the Bulgarian Economy", co-financed by ERDF during programming period 2007-2013), **clusters, TTOs, networks and platforms** in Bulgaria disseminate information and research results as well as facilitate the search for partners in Bulgaria and EU for joint innovative projects, promote cooperation and the development of scientific, technological and business collaborations.

The RIS3 process allows for three levels of governance and coordination, non-existent before. At the macro-level, Council for Smart Growth is established with reputable representatives from science and business community under the Chairmanship of the Prime Minister. The intention is to ensure high-level political commitment. At mezzo-level two networks (administrative and regional) function as integrative facilities for innovation policies. At micro-level, the two operational programmes in the programming period 2014-2020 with priorities within the scope of thematic objective 1 "Strengthening research, technological development and innovation" of the Common Strategic Framework (OPIC and OPSEIG) synchronize their efforts within a Coordination Group. Building-up quality governance system and managing effectively funding instruments in the sphere of innovation is more complex, but in any case the RIS3 approach of multi-layered coordination will hopefully play a key role in improving public policies.

2.2 External Assessment of the System

The Global Competitiveness Report 2014-2015 of the World Economic Forum ranks Bulgaria 113th out of 144 countries after assessing the university-industry collaboration in R&D and 108th based upon capacity for innovation. According to the same report, the country is at the 48th place in PCT patents, applications/million pop. Although 'islands' of excellence exist, **the system lacks sufficient capacity and key linkages**.

According to 2014 Innovation Union Scoreboard Bulgaria belongs to the fourth group of modest innovators, which includes Member States that show an innovation performance level well below that of the EU average, i.e. less than 50% of the EU average. This group includes Bulgaria, Latvia, and Romania. The relative strengths of Bulgaria are detected in some of the dimensions in the field of human resources, intellectual

assets and the economic effects. The **weakest dimensions are reported in 'financing and support' and 'innovators'**, and the practice of leading EU Member States in innovation shows that a balanced innovation system needs exactly support and innovators as a prerequisite for advancement.

The World Bank Report "Input for Bulgaria's Research and Innovation Strategies for Smart Specialization" (February 2013) describes the situation related to innovation performance of Bulgaria at the stage right before the start of the 2014-2020 programming period and the pending implementation of RIS3 strategy. To quote the report, Bulgaria's innovation performance over the last decade has fallen short of expectations. The **innovation system is operating below its potential**, whether measured by the system's inputs (based on R&D spending), outputs (according to the number of patents), or by the contribution of innovation to economic growth (as measured by high-tech exports). The report emphasizes the fact that still institutional support is predominant for a large number of research organizations, whilst the share of programme-based/project financing is low. There are weaknesses in the competitive environment and insufficient independent external (international) expertise of scientific ideas, developments and results. The practice of granting IP rights is yet to be established for management of this type of property to third parties, such as companies, clusters or other consortia, thereby intensifying entrepreneurship among academics and research investments from business. The major challenge for Bulgaria is to avoid the risks that typically weaken the governance system: the natural tendency of governments to focus on policies with short-term benefits; and the equally natural propensity of the multiple agencies responsible for implementing policies to establish their own, but uncoordinated agendas. In such fragmented systems without longer term strategic orientation and inter-institutional coordination, **public spending is typically inefficient and eventually marginal** in its effect on business behaviour.

The report also analyses the existing bias on the side of BAS and HEIs towards fundamental (as opposed to applied) research, which negatively affects interest from business side as concerns the research product. Building an **economically relevant research sector** is one of the main challenges, defining the importance of the RIS3 process in Bulgaria. To quote from the report, "the current funding environment does not sufficiently encourage researchers and research organisation to increase the quality and impact of their research. (...) The challenge for reinforcing the science base is not just publishing more, but making a great impact with each publication. Only a modest share of scientific research produced in Bulgaria has a significant impact in terms of knowledge creation and diffusion as proxied by citations." RIS3 Strategy itself confirms that the most effective instrument to stimulate (business) demand for research is increasing the quality and the relevance of its supply. The low level of R&D spending, in particular in the enterprise sector, along with the quality gaps and almost non-existent linkages between research and the needs of the productive sector, and the challenging demographics of the society as a whole, are key reasons for Bulgaria's comparatively poor record of innovation.

In light of the subject matter of the current report which puts an accent on the **synergies between ESIF and FP/H2020 funding possibilities**, the findings of the DG RTD peer review report (October 2013) also offer concrete and constructive guidance as regards the need to (i) align better research infrastructure, scientific priorities with economic sectors emerging from RIS3; (ii) foster impact and market orientation of research. Bulgaria's participation rate in the Framework Programmes is assessed as 'much below potential' and below the EU27 average in applications, success rates, signed agreements and SME performance and participation. The expert panel concludes that "it is important that research infrastructures in Bulgaria are not seen as island for academic or fundamental research but as potentially strong contributors to the local economy". It is therefore pertinent to examine **synergies between the research institutions and the emerging priority sectors of the economy within the RIS3 process**. It is also recommended that Bulgaria takes further advantage of European Strategy Forum on Research Infrastructure (ESRRI) as a strategic instrument to scientific integration. The term 'research infrastructures' is used by EC to refer to "facilities, resources and related services used by the scientific community to conduct top-level research in their respective fields, ranging from social sciences to astronomy, genomics to nanotechnologies"[1]. At European level they are seen as instrumental in enabling some of the greatest scientific breakthroughs and technological development, not least because they attract the best researchers from around the world, help to build strong bridges between different research communities and encourage multi-disciplinary research. Examples of successful RIs show that diverse models are possible with some being 'single-sited' (a single

[1] http://ec.europa.eu/research/infrastructures

resource at a single location), others 'distributed' (a network of distributed resources), or 'virtual' (the service is provided electronically).

Unfortunately, quality shortcomings in the Bulgarian national innovation system gradually lead to reductions even in quantity. During the June 2015 session of the Partnership Instrument – Policy Support Facility (PSF) for Bulgaria, the figures shown for **human capital** in the research system appear to be disturbing, e.g. the number of PhD students in Bulgaria being about half the EU average. In other words, efforts to increase quality and market-orientation of research are inextricably linked to the system incentives to retain and further attract talent. The current vicious circle needs a radical twist, such as the RIS3 approach, to turn into a virtuous circle of excellence leading to higher number of projects and younger scientists, itself bringing about additional excellent results.

2.3 Key Features of the System

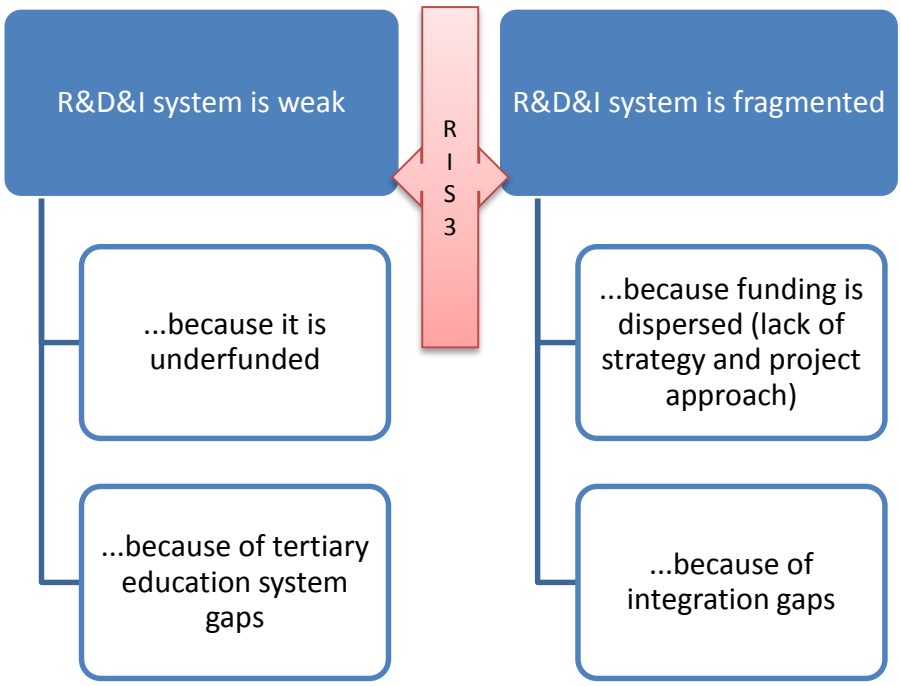

Figure 2. Key Features of the National R&D&I System

The Bulgarian national Research, Development and Innovation System suffers from two fundamental features, which constrain its contribution to the economic development of the country. These very same features have affected negatively the participation of the R&I performers in SCF and FP calls and the synergy between them in 2007-2013 programming period.

Firstly, **the system is weak**, mostly because of significant underfunding in absolute and relative terms (approx. 0.65% of GDP), but also because of unclosed gaps within the tertiary education system. According to the S2E Facts&Figures for Bulgaria, levels of R&D expenditure by Business Enterprise Sector and Government Sector are close to EU13, but the same indicator for the higher education sector is three times lower, i.e. the root of the problem lies there. University autonomy is established in principle and numerous private universities function. Yet, public Higher Education Institutions (HEIs) are financed by centrally allocated budgets per number of accepted students (from home or abroad)[2]. The HEI management then decide upon the distribution of funding per faculty. In other words, multilevel institutional and sub-institutional financing predominates instead of project-based approach. In addition, teaching and credit acquisition remain the focus of the system, instead of quality (overall or measured by research results). The staff salaries are also based

[2] Law on the Higher Education

upon teaching, while additional staff fees and payments replicate the salary model. The latter is both imprecise (as the type of work differs substantially) and unfair (as the staff is chronically underpaid compared to colleagues from other EU countries). In summary, higher education system needs further reforms in two main directions: 1.) incentives for autonomous financing and strengthening of project participation and research (including financial stimuli for research staff); and 2.) incentives for consolidation and focus on quality (concerning both teaching and research).

The most serious defect of the functioning of the R&D&I system is the shortage of human capital in science and innovation, and the continuing long-term trend of outflow of young people from scientific career and the "brain drain" abroad. However, these shortcomings are closely related with two factors: one, the *quality and the applicability of the research* undertaken, as already mentioned above; and two, the *outdated research facilities and inadequate equipment* to compete in science at EU and global level, as well as the *unequal distribution* of these facilities over the territory (i.e. the high concentration in Sofia). As far as HEIs are concerned, the publishing and patenting activities vary immensely across the currently totalling over 50 and growing in number universities and higher educational colleges. In fact, only eight of them registered patents between 2001 and 2012 and only 17 published in SCOPUS data base, according to Innovation Union Scoreboard 2014. The situation with infrastructure is similar – only a small number of HEIs possess and manage adequate research facilities, and mostly thanks to EU and other donor programmes. Practically, the predominant share of Bulgarian universities represent educational and training centres of local importance with neither scientific and research orientation, nor any significant research activities and results. The remaining restricted share of HEIs need fast investments in infrastructure and quality improvement, not to be additionally 'emptied' of talented scientists and researchers, who can only lead the way to excellence.

Secondly, **the system is fragmented**, mainly due to the lack of strategic focus so far and the overall funding system, which stimulates whole institutions to compete against each other for institutional budgets[3], instead of competing within themes to support excellence and quality research results on a project basis. The fragmentation also stems from the incentives rooted in the system. The three distinctive components of the system (HEIs, PROs and private sector) exist with hardly any interaction between them and a lack of overarching policy frameworks that can facilitate their integration. The private sector itself is dominated by SMEs (the largest share of which in trade), and they are at difficulty to allocate funds to R&D, do not have their own technologies and capabilities to develop innovations which are crucial for individual industries or group of industries. The strengthening of relationships PROs/HEIs with business requires overcoming the current low interest of the business in setting research and innovation tasks to research organizations. This results predominantly from three factors: the informal nature (and sporadic character) of linkages; the suspicion about quality; and the unreliability of timeliness and scale of the results. Good practices of some universities and institutes in the implementation of joint projects with Bulgarian and international companies, as well as in the creation start-ups, need to be further developed and spread over the entire national science world. Clusters, networks, TTOs and cooperation platforms need optimisation and additional support, especially when they can demonstrate external orientation and willingness to follow EU models and best practices.

The Innovation Strategy for Smart Specialization 2014-2020 analyses the current state of play and the challenges of the R&D&I framework, as well as the approaches for the improvement of institutional set up and governance and the need for entrepreneurial discovery process. The strengthening of the relationship between the participants is of key importance for enhancing the capacity and the results of the R&D&I system. Infrastructure cannot be identified as the key element. Nonetheless, the appropriate combination of infrastructure with professional research (and project) management, qualified staff and up-to-date equipment and other networks and facilities is still missing at the centre, let alone at regional level. Only concentration of financing in the RIS3 areas can lead to the support of the full range 'infrastructure – qualified (and motivated) staff – modern equipment'. *De facto* the RIS3 approach tries to encompass both system failures (weakness and fragmentation). It defines four thematic areas (two strongly technological and two technological with focus on employment), which allow for 1.) strategic focus of funding; and 2.) incentives for all participants to cooperate in these areas. The objective is to foster simultaneously consolidation and excellence, two mutually reinforcing mechanisms to develop the Bulgarian national R&D&I system.

[3] Law on Promotion of Scientific Research, while BAS is governed separately by the Law on the Bulgarian Academy of Sciences

The Action Plan annexed to the RIS3 Strategy as part of the fulfilment of the *ex ante* conditionality, concerning Thematic Objective 1 of the ESIF in Bulgaria, as reflected in the Partnership Agreement 2014-2020, foresees a set of key measures scheduled to be complied with by October 2015, such as:

- The continuation of the entrepreneurial discovery process (EDP) at national and regional level;
- The longer term setting up of the R&D&I governance structures;
- The prioritization of research infrastructure and the alignment of the research infrastructure roadmap and national research development strategy with priorities emerging from the smart specialisation process.

Collaborative development has been a deliberate aspect of the RIS3 development process. This has been largely successful, but still demonstrates some limitations. 'Collaborative' development seems to have worked best when there are clearly demarked responsibilities and associated activities. Unavoidably, some issues require the ongoing coordination of more than one ministry, for example ensuring optimum complimentary use of Horizon 2020 and Cohesion Policy funding. Inter-ministerial collaborations (among other collaborations between key plyers in the national innovation system) must therefore remain a strong priority for the stairway to excellence to be achieved.

3 FACTORS THAT SUPPORT OR LIMIT THE NATIONAL PARTICIPATION IN R&D CALLS FUNDED BY SF/ESIF

In practice, R&D activities during 2007-2013 programming period could receive only two types of ERDF support, both under Priority Axis 1 "Development of a Knowledge-based Economy and Innovation Activities" of OP Competitiveness. Although the expectations during the programming period included integrative forces, the two types of financing ended up as one extremely supply-driven and the other extremely demand-driven:

a.) support for the creation and commercialization of innovations in enterprises (with start-ups or existing enterprises with innovative potential as beneficiaries);

b.) improvement of the pro-innovative infrastructure (focused on creating favourable conditions for development of innovative enterprises and strengthening the capacity of the Bulgarian research organisations to conduct applied R&D activities).

The **first type of funding** aimed to bridge the gap between enterprises and research institutions. The key factor supporting participation was the desire of enterprises to improve their productivity, to develop new or improved products and services with high added value, as well as to improve the production methods, processes and their penetration to new markets. Innovative start-ups were offered support in their initial stage of existence. The key factor affecting participation negatively related to high administrative burden. For instance, start-up support with JEREMIE instrument proved faster and more efficient, while grant schemes for innovative start-ups could not bring about high participation and high quality results. Existing companies were offered financial support towards the costs of their R&D activities, including engaging PhDs and other R&D specialists for implementation of own R&D projects. The participation rates were high, especially towards the end of the programming period. However, most collaborations could not extend beyond the duration of the project (in addition to the fact that a number of them were constructed entirely for the purpose of admissibility for grant support). Also, enterprises tended to prefer innovation support, which involved only internal company resources (i.e. the beneficiary was the enterprise, not a consortium of business and research entity). Focus was continuously transferred to non-R&D based innovations. The S2E Facts&Figures demonstrate that shares of R&D personnel (as % of active population) employed by Business Enterprise Sector in Bulgaria are two times lower than EU13 and eight times lower than EU15.

The **second type of funding** covered various types of Business Support Organisations (technology transfer centres, technology incubators, technology platforms, technology parks, etc.) that offered pro-innovative tailor-made advisory services to innovative start-ups and existing innovative enterprises. In order to ensure the flow of innovative ideas to the economy, research organisations were financed to acquire and or upgrade existing applied research equipment. Despite the condition of '*a clearly indicated business demand in their particular research field, proven necessity of such equipment, and potential for wide application of the expected R&D results in the national economy*', large number of small-scale projects received support (based

on UMIS[4] data). Thus, these interventions hardly led to major changes: excellent science and improvement of enterprises' access to innovative products and services, at least as measured by Union Innovation Scoreboard 2013, where Bulgaria's innovation performance is ranked as weakest among EU27. On the one hand, delays in implementation impeded the visibility of the results and the benefits for enterprises and society as a whole. On the other hand, without the full package ('infrastructure – human resources – equipment') the programme achievements could not correspond to the high expectations, which is demonstrated by the programme indicators, even after OP modification. Of course the negative effects of the global economic and financial crisis from 2008-2009 onwards should also be taken into consideration.

The fundamental issue for potential participants was the unpredictability of the system, related to the timing of calls and the one-off, clear-deadline approach. According to the OP Competitiveness mid-term evaluation report (concerning Priority Axis 1 and 2), the analysis of the procedures, subject to evaluation, showed some "campaign-like" trend in announcing the grant procedures as far as the timing aspect was concerned. After the initial massive opening up in 2007 and 2008 there was a period of nearly two years, during which only one grant procedure was announced under Priority Axes 1 and 2. The one large-scale project of international importance, Sofia Tech Park, contracted in 2012, effectively started in 2014. The long time periods with no new calls announced had a direct impact on the rate at which the OP was running and carried out the risk of delaying the planned absorption of funds.

Following that period, a series of calls for a great number of procedures followed within a short timeframe. The evaluation process was a challenge in any case (innovation expertise being insufficient), let alone when several calls run in parallel and with strict deadlines. The concentration of grant schemes with application deadlines within the same time frame incited the question of the availability of sufficient, in terms of both quantity and quantity, administrative resources for the formation of the necessary number of evaluation committees within the same period and led to a risk of aggravation of their work, excessive workload, and hence a greater likelihood of errors and (additional) delays in the evaluation of proposals.

One of the key issues identified during the mid-term evaluation in 2011 relates to the lack of statutory obligation of preliminary analysis of the changes in the external environment, the attitudes and the actual needs of target groups' representatives during the procedure programming stage. This need for evidence-based policies brings in two kinds of risks. The lack of a preliminary analysis increases the risk of programming procedures which are not well-adapted to the business environment, launching procedures with an overt lack of interest by potential beneficiaries towards them, or alternatively declaring procedures with a budget inconsistent with the interest towards them, where as a result a significant number of proposals remain on "reserve" lists and are not funded despite the fact that they have passed all stages of evaluation. The final result is that significant human resources are committed to the administration of the procedures programming process and for the evaluation of proposals without an effect towards the objectives of the OP, while directly affecting the motivation of potential beneficiaries and their trust in the system.

4 Unified Management and Information System for the EU Structural Instruments in Bulgaria

Factors that support the national participation in R&D calls funded by SF/ESIF	Factors that limit the national participation in R&D calls funded by SF/ESIF
Established institutions with target groups (ME for business and MES for academia)	Artificial divisions of research (into fundamental and applied; and into business and academia) Lack of focus on market-driven research and synergies between different types of funding
Available general information and publicity	Lack of specific information Insufficient capacity and experience of beneficiaries Low technology readiness levels
Availability of funding Existence of financial instruments[5] and other funds, esp. for start-ups [The success of JEREMIE may precisely relate to the fact that the designed products correspond to business needs and impose less administrative burden]	Programming restrictions on the programme beneficiaries and type of funding Detachment from market dynamics and business needs
Financial and economic crisis accentuates importance of SF	Conservative bank lending system Financial and economic crisis increases cost of pre-financing, co-financing, need for bank guarantees for advance payments, etc.
Multiple HEIs and research organizations	Weak links between business and HEIs/research organizations Outdated infrastructure and research facilities
Available funding for pro-innovative infrastructure	Slow implementation Lack of full range funding possibilities 'infrastructure – human resources – equipment'

Table 1. Factors affecting the national participation in R&D calls funded by SF/ESIF

The interventions that may lead to more effective management/investment of ESIF, specifically related to R&D&I, are the following:

- Although institutional coordination is improving, especially due to the RIS3 process, it would benefit the system to possess institutional leadership, i.e. 'motor' of the reform processes. Both business and academic stakeholders need high level representation to support the development of the innovation potential of the country, but not separately. Alignment of interests and closer cooperation can be achieved within a unique structure and management.
- Wide-spread evidence-based policy making would be able to close the programming gaps. Justified proposals followed by multilateral dialogue need to be ingrained in the system. Timely strategic (tough) decisions are required to focus the financing in key socio-economic priority areas backed by country's strong fields in science.
- Fostering performance-based research funding through focus on RIS3 areas (market-orientation) and impact metrics would present a serious challenge, but only such an approach could guarantee the proper functioning of the scientific and research system and the missing set of incentives for BAS and HEIs reform.

[5] in fact also funded by the Structural Funds

- R&D&I projects require substantial preparatory phase, i.e. it would assist potential beneficiaries if the system works in a predictable manner and if funding possibilities can be planned in advance. Knowledge of forthcoming calls additionally supports collaborations and partnerships. Periodic calls stimulate higher quality project proposals and also reduce the tension on the evaluation process' outcomes.
- As already required for 2014-2020 programming period, reducing administrative burden and the introduction of electronic project submission and reporting would fight the negative attitudes of past and potential beneficiaries. The innovation project evaluation process needs 'purification', which could hardly happen without introducing English language, international evaluators and proper compensation for the high-expertise evaluation work. Impartiality, confidentiality and protection of IP rights should be treated with special attention.
- The transformation from information dissemination to project preparation support and capacity building, esp. at regional and local level, would additionally raise the number of interested participants and the chances for their success. The availability of alternative paths to the funds for the recipients outside administration-managed grant schemes (such as financial instruments through banks and investment funds) could strengthen the efforts in this direction.
- Fast investments (only into the limited number of institutions that produce research results and participate in international research projects) to ensure the building/reconstruction of modern infrastructure with adequate equipment would be needed in support of excellence and would apply an effective tool to retain and attract talented researchers.

4 PUSH – PULL FACTORS FOR R&I PERFORMERS TO PARTICIPATE IN FP7/H2020

The knowledge and the attitude concerning FP/H2020 programmes in Bulgaria differ substantially from those related to SF/ESIF and that explains why the factors affecting participation in the respective instruments also diverge. The two types of funding instruments (national EU funds and EC programmes) cannot be claimed to function in competition. Even when they target the same potential beneficiary group, which rarely happens, they address needs of specific character in a pre-defined manner (eligibility, partnership, types of project models, types of costs, etc.). In other words, the complementarities match the functioning of the Bulgarian national R&D&I system, although the concept of synergy has remained impracticable up to the present moment.

In practice, relatively few **'push' factors** can be identified for R&I performers to participate in FP7/H2020, among which are the availability of funding even during times of financial and budgetary restrictions and the reliability of the FP/H2020 system (in terms of both timing and evaluation expertise). The most effective 'push' factor recognized by the research community itself represents the interest of EU peers, colleagues and established partners from other projects and initiatives (such as COST for example)in involving their Bulgarian counterparts in joint research work and collaborative efforts. Without the information coming from other EU MS and the project elaboration and management support, the country's performance under FP7 would have suffered tremendously. The obvious conclusion leads to the need for further integration of the Bulgarian research community in the EU research space and the internationalization of the R&D&I system, including through promotion and reputation-building.

At this stage, one important particularity should be mentioned. Partners from other EU countries assist in increasing the programme participation of Bulgarian HEIs and research organizations. However, based on the interviews performed by the co-author with research-performing representatives of Bulgarian universities at the level of forthcoming or approved FP/H2020 projects, national researchers are not stimulated to stay in Bulgaria, whilst they can work even within the same project for the partner institution and receive higher compensation (as well as access to up-to-date infrastructure and facilities and opportunities to develop). The salary 'gap' visible throughout the economy is also affecting researchers, given the motivational factors and overall conditions, especially the gap in the fees. Given the already identified 'brain-drain' problem in Bulgaria, FP/H2020 projects should be prevented from additionally exacerbating the issue. Since the mobility of researchers positively stimulates EU scientific and economic development as a whole, the solution should

tend in the direction of equalization of fees[6], at least within one project, irrespective of the partner countries (not in any restrictions or mobility prevention measures).

Based upon the S2E Facts&Figures for Bulgaria FP7 absorption per capita rate is extremely low. Numerous impediments can possibly explain this fact on the side of the **'pull' factors**. Firstly, the quality and timeliness of information remain an issue. The typical administrative practice is to upload a document on the institutional web-site without a banner or other special visibility aspects and to assume that the obligation to inform the general public and potential beneficiaries is fulfilled. Alternatively, there is a practice to forwarding links/bulletins, etc. to previously-used mailing lists. Events focus on general information about funding possibilities, without sufficient attention to effective dialogue, capacity-building or support for individual project ideas. The approach can be viewed as formalistic, because it treats information as a constant (not an interactive process) and recipients as gatherers (not users). In other words, there are deficits of tailor-made information, specific to the timing and the needs of the different target group, and of QandA and/or designed feedback systems and interactive methods.

Secondly, the National Coordinator and the NCP network need further strengthening and development in the direction of a network of collaborating and mutually complementing bodies with thematic and regional expertise and/or branch structures. At present, based on the interviews performed by the co-author with beneficiaries and consultants, reporting activity itself has turned into a predominant exercise of programme coordinators. The working conditions for the NC staff include low salaries, lack of bonus system related to performance, high degree of uncertainty and staff turn-over. Training options are inadequate for the staff in the MES, for the network members and for the potential participants. Tendency exists to discourage direct contacts between administration and 'clients', in order not to interfere with competition and equal treatment. The perception that prevails is that discussing individual project ideas may lead to unfair advantage. The most serious aspect of the current situation is that the NCP is expected to perform without pre-defined objectives. At strategic level, the importance of the NCP network perhaps is underestimated, as well as the need to clarify and substantiate its meaning and role. For instance, targets for national performance (e.g. leading to benefits or bonuses for staff) would greatly amplify the incentives in the direction of quality NCP support. Also, legitimate mechanism allowing review of project ideas can be designed, approved and implemented serving both research community and project developers from enterprises.

Thirdly, within the context of system underfunding, co-financing and pre-financing most seriously affect possibilities for project participation, as well as the extent to which approved projects succeed. BAS and a number of project-oriented research organizations have managed to incorporate co-financing and pre-financing into the structuring of their budgets, although with difficulty. Nevertheless, HEIs stand in a particularly disadvantaged position with the financial dependency and inflexible budgetary regulations. For example, expenditures cannot be incurred before availability of funds and budgets cannot be transferred from one into the next financial year, while the whole logic of EU support schemes is based upon: 1.) reimbursement of actual expenses; and 2.) budgeting of project activities within projects of varying time periods. Financial reasons also impede the free and convenient access of Bulgarian researchers to international databases of scientific information and publications, without which effective FP/H2020 participation cannot happen. Unsurprisingly, approximately 80% of FP7 funding in the country goes to the one region (BG41) with the highest GDP/capita.

Finally, significant negative factor for R&I performers relates to the misleading perception that framework programmes only allow for 'closed club membership'. In this respect, there is a positive signal in 2014-2020 programming period, highly appreciated by potential participants from Bulgaria as evident from the level of interest and participation, whereby under Phase I of Horizon 2020's SME Instrument, grants are possible for feasibility assessment purposes (exploring the technical side and commercial potential of a breakthrough innovation). Such options to receive funding at the stage of business planning encourage first-time entrants (without prior project experience) to attempt to join and understand the functioning of the system and to aspire for higher technology readiness levels (TRL) at a later phase. In addition, the evaluation process should under no circumstances resemble a 'black box' (as it is often the case with national instruments) and even if the funding opportunity is lost, the learning opportunity is not wasted. Project proposals can be re-submitted after improvement. As detailed as possible evaluation feedback, combined with the possibility to re-submit

[6] Perhaps a positive example in this respect is the fact that under Marie Curie Actions underpayments are not allowed. Even if the employment contract of a recruited researcher is based on a national rule of the host organization that is setting an amount of allowances different from the one established in the Grant Agreement and its Annexes and the researcher has been underpaid, a corrective payment is to be made by the host organization in order to compensate the previous payments.

the project proposal within the next cut-off date, serves as sufficient reward for the project preparation effort to be worthwhile.

5 POLICY INSTRUMENTS FACILITATING THE PARTICIPATION IN (FP7)H2020/(SF)ESIF

5.1 Policy instruments for 2014-2020 programming period

For 2014-2020 programming period **the importance of H2020 participation** and even synergies between types of funding is recognized in two operational programmes, at least theoretically. OP "Innovation and Competitiveness" quotes directly the EC guide on synergies[7] that although "there has been a substantial increase in the budget of Horizon 2020 (almost EUR 80 billion) compared to the previous research framework programmes and although there has been a steep increase of the innovation and competitiveness-related budgets under cohesion policy over the past decade, it is of utmost importance to ensure optimal synergies between the funds to face the ever increasing competitive pressure from global markets and maximise impact and efficiency of public funding. The European Parliament and Council made it clear that this approach is no more a "nice to have" but a "need to implement". From the options provided in the afore-mentioned guide, OP "Innovation and Competitiveness" chooses the downstream sequential possibility. The strategy of the 2014-2020 OPIC intends to build upon the results achieved by projects under the framework programmes and H2020. Proposals involving the follow-up of achievements under the 5th, 6th, 7th Framework Programme and Horizon 2020 (*and similarly ECSEL Joint Undertaking*) are encouraged by the principle of advantage or 'bonus' points in the project evaluation process. It is clearly added that in providing any kind of financing EU legislation on state aid will be respected and all projects and activities will be checked for the absence of double financing.

OP "Science and Education for Intelligent Growth" (SEIG) 2014-2020 also identifies the challenge that the level of **Bulgarian participation in the EU framework programmes is limited**. Both the applicant success rate of 16.5% and the EC financial contribution success rate of 10.5% are much lower than the EU averages (21.9% and 19.7% respectively). According to the composite indicator for research excellence[8], Bulgaria has been ranked 21st in the EU. The conclusion in OP SEIG confirms the need to notably intensify investments in R&D activities by mobilizing public and private resources, with proper arrangements for market-orientation and excellence. Potential funding is devoted to expanding the participation of Bulgarian researchers in international cooperation. Supporting activities are planned with respect to pan-European infrastructures, EU technology platforms, as well as projects and networks for European partnership. In order to involve actively Bulgarian researchers in the European Science Space, centres and consortia may receive financing, if they possess potential for approval under H2020 and/or play a role in the implementation of the ESFRI Roadmap, the thematic areas being in compliance with the country's RIS3.

Efforts are exerted to improve additionally the **ESIF participation rate** of R&D&I performers. One, already information and publicity measures have moved from general statements in technical language to more specific information, especially case studies, good practice and examples of successful activities under previously implemented projects and schemes. Two, the prevailing consensus connects the need of policy focus with RIS3, not only as *ex ante* conditionality, but also as an instrument to accumulate critical mass and exponentially increase the number and quality of activities. Three, additional measures to reduce administrative burden are introduced, including early stage clarity of procedures and application conditions, indicative annual working programmes (published before the start of the year in question) and transfer of 'the burden of proof' from the applicant to administrative checks in respective registries. The option of fully electronic application process is expected in 2015. Four, the share of financial instruments has been preserved relatively high, while their number and coverage has been augmented. The positive Bulgarian

[7] SWD(2014)205 - Enabling synergies between European Structural and Investment Funds, Horizon 2020 and other research, innovation and competitiveness-related Union programmes
[8] Research and Innovation Performance in the EU, Country Profile Bulgaria 2014

experience in this respect is duly acknowledged by the Commission and EIB[9]. Perhaps for 2014-2020 what is forthcoming relates to the necessity to review and even revise the assumptions concerning infrastructural projects in 2007-2013 programming period. High participation rates (and the accompanying large number of smaller scale projects) as regards funding for infrastructure may conceal shortcomings in policy-making as well as potential beneficiaries' lack of autonomy and management capacity. That is why the objective under OP SEIG 2014-2020 is rather the opposite: to give priority to projects (especially under specific objective 1, targeting centres of excellence and competence centres) stimulating consolidation and reaching 'critical mass' to justify the high level of infrastructural costs needed.

5.2 Policy instruments implemented in the policy cycle 2007-2013

For the programming period 2007-2013 FP7 participation has not received funding from a targeted financial support instrument in Bulgaria (national budget or SF). Overall, the administrative culture and prevailing disposition in the country tends to view combined funding (or simply numerous projects from different funding sources implemented by one beneficiary) as a 'bad' practice[10]. The tendency is to overestimate the risks of duplication and potential state aid issues and to suspect cases of 'undeserving' constant winner. Nonetheless, this perception of unfair competition (between experienced and inexperienced) has links to reality, whereby countries or regions may enter either a virtuous or a vicious circle with respect to excellent research opportunities (e.g. framework programmes participation and success). A virtuous circle of participation is created once the initial difficulties in entry and adaptation are overcome. The more projects happen, the more research results, visibility and partnerships materialize, themselves leading to even more potential projects and funding. In exactly the opposite way, a vicious circle of isolation can be perpetuated with underfunding and lack of experience creating inaccessibility.

Therefore, FP general (EU-wide) calls in the past have been complemented only in justified cases by specific (regional or targeted to a number of countries) calls. The former guarantee excellence in research, while the latter aim to exploit potential. Usually new member states of the EU are given this specific opportunity to allow them to integrate in the existing highly competitive research and innovation system. In other word, countries or regions that may be far from the core of European research and industrial development are supported in their efforts to establish the conditions for their own research entities to compete at EU level. ,

A number of EU level policy instruments effectively assisted Bulgaria and allowed for exactly this kind of access point of the national system into the EU one. For instance, FP7 REGPOT reassured that realising the full research potential of the whole of the European Union depended on unlocking and developing existing or emerging excellence in the convergence and outermost regions. A key component of FP7 REGPOT was the building of links and collaboration between the selected entities and the well-regarded research entities elsewhere in the European Union. It also helped to strengthen and develop the capacities of researchers from convergence and outermost regions, allowing them to participate successfully in other activities related to research at the Community level. Building on both levels also complemented the European Research Area (ERA).

In addition, specific Calls for Proposals were implemented under FP6 targeting the increase of capacities of the best research institutes in (then) Associated Candidate Countries for alignment of these countries with the Framework Programmes and the European Research Area as a contribution to full integration. In 2006, this concerned three countries, Bulgaria, Romania (becoming Member States) and Turkey. Under FP5, Specific International Scientific Cooperation Activities (INCO), collaboration was encouraged with states in the (then) pre-accession phase: promotion of their centres of excellence, accompanying measures to facilitate participation in the other programmes of the framework programme, including through cooperation networks.

According to CORDIS database, 34 independent centres of excellence benefited from EC financial support under FP5 in order to bring together theoretical and applied research, particularly using a multi-disciplinary approach. Their links with other European research centres are improved through workshops, conferences, co-ordination of a research network with other countries, visiting fellows (teachers and/or researchers), etc. The

[9] e.g. FLPG instrument under JEREMIE (http://www.fi-compass.eu/sites/all/themes/ficompass/files/fi-compass_case_study_First-Loss-Portfolio-Guarantee_BULGARIA_2015_final.pdf)

[10] The pending first grant scheme under OPIC 2014-2020 as proposed for example introduces 'penalty points' for previous EU project funding.

34 Centres of Excellence are located in Poland (9), Hungary (6), Romania (4), Bulgaria (3), Czech Republic (3), Cyprus (2), Estonia (2), Slovakia (2), Lithuania (2), and Slovenia (1).

Following the combined approach for EU level support that existed under FP5, FP6 and FP7, not only the less advanced national (or regional) systems are more likely to integrate into the common EU research space. The process itself contributes to the restructuring of the science and technology sector of the countries (or regions) concerned, which can hardly be completed using internal means only. Perhaps under H2020 the logic can be re-applied considering the advancement of national (or regional) research systems, but also taking into account the specifics of H2020 participation by EU13, compared to EU15.

6 EVALUATION AND MONITORING MECHANISMS

6.1 Evaluation of project proposals

The difficulties that may arise in conducting an efficient and transparent project proposal evaluation procedure with high level of participation are particularly striking in the sphere of innovation. The slow process bothers innovators, since the break-through potential and the benefits of the innovators decrease with time, especially in dynamic and competitive environments. Trust in the confidential treatment of information even if no direct IP rights are concerned matters extremely to the extent of affecting the choice of applicants to use the funding instrument in question. According to the OP Competitiveness mid-term evaluation report (concerning Priority Axis 1 and 2), the evaluation, especially its length, is clearly a 'bottleneck' in the system. The long period from submission of project proposal to contract is one of the reasons also mentioned by bank institutions in defining the EU projects as high-risk concerning the decision to approve credit requests. This additionally exacerbates the challenges of beneficiaries with pre-financing and co-financing.

The expertise of the evaluators predetermines the quality of the projects to be funded and thus the relevance of the investment decision and the overall programme results. During 2007-2013 programming period the evaluation committees in the area of R&D&I continued to be comprised predominantly of administrators (internal to an evaluation agency or from other relevant institutions), although with time the share of external evaluators increased. The key issue refers to the procedures through which evaluators were chosen, their level of expertise and impartiality and the related reward system. For example, the Executive Agency for the Promotion of SMEs (EA PSME) at the Ministry of Economy managed the evaluation of project proposals under OP Competitiveness, as well as the National Innovation Fund until 2012. At that moment the decision was taken to eliminate the Intermediate Body within the management structure of the OP and the Managing Authority to perform the respective functions itself in order to improve specifically the efficiency and reliability of project evaluation.

The list of external evaluators existed for tender procedures (under the responsibility of the Agency for Public Procurement), but the inclusion was based largely on self-selection, without CV or other document review. Concerning grant schemes, the decision for inclusion within a specific evaluation committee was not guided by specific legal procedure or written guidelines. Given the size of the internal market and the restricted number of experts in R&I areas, cases of compromised impartiality became possible. These could mean nepotism (interest in overestimating the quality of the proposal) or the opposite cases of connectedness to competitor of the project applicant (i.e. interest in underestimating the proposal). Measures to avoid leakages of information hardly corresponded to the seriousness of this phenomenon. On-going changes of evaluators during a call were not regulated, neither the option to change eligibility criteria or increase the budget of an on-going call until a particular project (group of projects) was guaranteed funding. The evaluators themselves received negligible compensations for the high-expertise and high-responsibility kind of work assignment with overarching consequences. As a result of the conducted in 2014 legal, process and organizational

analyses[11], there could be made a justified inference for presence of numerous causes and circumstances, potentially facilitating inadmissible practices, among which the following general factors:

• lack of definitions and/or vague concepts which leave room for manifestation of subjective appraisal and evaluation;

• insufficient or absent possibilities for an objective and comprehensive control and verification of declarations;

• opportunities for acts of nepotism and lobbyism;

• opportunities for concentration and abuse of power;

• opportunities for influence peddling;

• opportunities to taking and enforcing sole or collective subjective decisions.

The corresponding proposals for preventive measures in order to avoid such phenomenon in the 2014-2020 programming period are directed towards:

• correcting or reducing the causes and circumstances for corruption arising from deficiencies of legislative nature (including related to evaluation, i.e. by random assignment of project proposals within the MA; by reduction of the score gap, necessary for third opinion; by obligation to provide justificatory information to applicants; by improvement of appeal procedures);

• personnel, information-analytical and technical providing of the Managing Authority (including development of obligatory tests of loyalty and integrity for MA staff).

The overall logic for unlocking of the evaluation predicament in the Bulgarian national case by no means differs from other EU countries. Necessary changes include:

- clarity as to the appropriateness of evaluators (based upon specific knowledge, experience and integrity);
- predominance of academia and business representatives to evaluate academic and business proposals;
- procedures for the inclusion/exclusion of evaluators in/from committees (incl. random assignment if necessary after preliminary assessment of appropriateness);
- obligation to produce sufficiently detailed project score justification;
- proper reward system for evaluation experts, accompanied by proportional sanctions for breaches of confidentiality and impartiality;
- avoidance of individual (incl. managerial) decisions and automatic results in the direction of common/consensual processes;
- ideally use of international expertise to improve both quality (excellence) and impartiality;
- linguistic requirements for innovation projects (e.g. English) to allow foreign expertise and to stimulate integration of the innovation system in the EU and global processes;
- alignment of priorities and application process of national funds, operational programmes and H2020 to reserve the option of resorting to common EU lists of experts.

6. 2 Monitoring and evaluation of R&D&I projects

Although monitoring and evaluation units have been created in all ESIF management structures, the effectiveness of the process can be further improved in the direction of periodic monitoring and evaluation exercises. Once approved, the majority of projects are monitored only when payment claims or suspicion of irregularity occur, i.e. not on a monthly or quarterly basis or other regular interval to be able to analyse progress and even forecast programme developments. Under the JEREMIE Instrument for example the monitoring is less burdensome, yet more regular and effective. In addition, the monitoring process should not be expected to compensate the deficiencies in programming and especially in project selection. The logic needs to lead from low success rate at the entry point of the EU funding system and high results at the exit, not vice versa.

[11] Centre for Prevention and Countering Corruption and Organized Crime (CPCCOC) Report "Analysis of the causes and circumstances creating preconditions for acts of corruption in the execution of the Operational Programme 'Innovation and Competitiveness' 2014-2020 and a proposal for implementation of measures for prevention of the identified corruption risks"

The OP produces Annual Implementation Reports (AIRs) covering all priority axes. The indicators used in the AIRs, as set in the tables to the reports, are programmed to measure the outputs, impacts and results of the OP per priority axis and overall, if the data are available coherently. Their adequacy however has not been tested in practice since not many individual R&D&I projects directly contribute to programme level indicators, whilst cumulative project data produces different indicators. The achievements of the macroeconomic indicators (or so-called context indicators) such as GDP per capita, often presented at the beginning of the AIRs, fit for describing the situation in the country. However, the change these indicators show is not a direct result solely of the implementation of the OP (e.g. R&D investment). Most of the indicators envisaged in the AIRs are quantitative, which might lead to a drive towards formalistic implementation, without regard to quality.

The on-going evaluations aim to present results and impacts, assess the contribution of the funding per OP priority for reaching its goals and the application of the partnership principle, present the reflection on the need for alterations in programming or re-programming, and propose specific recommendations for corrective measures at programme and project level on the quality of the processes, procedures, and documents. Although evaluation programmes or plans have been elaborated for the OPs in Bulgaria in 2007-2013 programming period, they were not implemented in a timely manner. In practice, evaluations happened ad hoc, the budget for the public tender being defined by the momentary availability of resources in the OP technical assistance budget. The scope, timing and implementation were also dictated by the public procurement schedule, instead of the programme content and necessities. The evaluations themselves focused on procedural matters and not sufficiently on indicator performance and policy support. Therefore, the ability of decision-makers to use M&E results and recommendations was constrained, especially within specific programme priority area such as innovation performance.

The external analysis of the implementation of OP Competitiveness[12] suggests multiple recommendations with respect to innovations. The following list contains the main ones:

- to introduce thematic orientation and focus on projects, generating higher value added;
- to offer stimuli to enterprises in order to increase demand for innovations;
- to improve monitoring and evaluation in the area of innovations, incl. indicator system;
- to further link science and business in support for commercialization;
- to redesign and subsequently consult with all partners project selection criteria;
- to simplify procedures and introduce capacity building opportunities;
- to attract evaluators with the necessary expertise;
- to create patent and other IP rights registry;
- to expand the current instruments for supporting innovation projects;
- to explore and build upon synergies between different OPs and other funding options.

The forthcoming ex-post evaluation could possibly produce similar proposals, although years 2014 and 2015 will witness the actual completion of the majority of the innovation projects.

7 Enhancing or limiting the synergies?

In order for synergies to appear, the feasibility and the implementation logic need to coincide. Within the current system, they remain unlikely to occur due to the unpredictability of the national system and the restriction on the beneficiary level (project management capacity, own financial resources and state aid issues). However, if they are actively encouraged as the conditions presuppose (the EU Guide, the OP texts), they may become effective and efficient tool to achieve the innovation 'leap', mentioned in the RIS3.

[12] conducted under Contract No. 29/15.01.2014, covering the period 01.01.2007 until 31.12.2013

Factors enhancing synergies	Factors limiting synergies
• Institutions with research and experience already (few, but recognized as excellent partners)	• Timing (esp. project delays) and coordination (difficult to plan ESIF calls)
• OPIC and OPSEIG arrangements for synergies exist (but need to be put in practice at each phase of implementation, from the design of calls to monitoring and evaluation)	• Few on-going or repeated calls in Bulgaria (typical is one call with one strict deadline)
• Increased recognition at EU level of the particular difficulties post-2004 countries face in R&D&I	• State Aid issues (esp. need for more effective enforcement, greater predictability and transparency)
• Developed consultancy sector in the country (although difficult for beneficiaries to differentiate high value added)	• Disparities in payments, salaries and fees (esp. their effect on brain-drain)
• RIS3 approach	• Separating different assignments and reporting staff hours per activity
	• Project management capacity and workload issue
	• Budget restrictions (pre-financing, final payment issues, conservative bank credit system)

Table 2. **Factors affecting the synergies between SF/ESIF and FP7/H2020**

At this stage only conceptual attempts are made to introduce initiatives that support synergies between ESIF and H2020 (to finance reserve list, to open pool for pre-financing, to finance capacity building, to give bonus points to FP/H2020 winners, to organize grants for proposals). The most effective path to synergies and high levels of H2020 participation pass though eradicating the deficiencies of the national R&D&I set-up. Once the national system is functioning smoothly, the working instruments based on the experience of other EU countries can be in the form of:

- creating and strengthening NCP network (incl. at regional level, perhaps also by sector) able to provide support for H2020 proposal drafting;
- stimulating participation by direct financial support for proposal drafting (incl. vouchers) with focus on high-value added services, competence and independence;
- beneficiary capacity-building, especially training in research management and project cycle management;
- using good practices and established procedures from H2020 in the framework of national funding instruments and operational programmes with the priorities and procedures of H2020;
- focusing on economic impact to benefit to the highest possible extent from the RIS3 approach.

The complication encountered of course can be viewed as a 'moving target'. National research entities and individual researchers cannot compete for excellence on equal grounds, while waiting for the national system to start functioning smoothly. The other systems cannot stay on hold either. Hence, the role of EU assistance for system reform and transformation (e.g. FP7 REGPOT) is decisive, simultaneously with the neutral approach and competition on equal grounds.

8 TAKE-UP OF PUBLIC SECTOR RESEARCH RESULTS

8.1 Cluster support scheme under OP Competitiveness

Practically clusters represent adequate innovation environment, including infrastructure where necessary, consisting of companies, R&D institutions and universities that are specialised in a specific industry or knowledge area. The existence of such environment provides governments with an excellent opportunity to promote economic growth through the support of innovation and R&D activities and specifically take-up of public sector research results. Given that the clusters are operational, companies participating are: far more likely to become innovative than other companies; and far more likely to enter into R&D collaborations than other companies. The potential advantages of cluster support need to be spread widely, since they lead to an overall better ability of enterprises to absorb and translate new knowledge and technology (mostly public sector produced), cost minimisation in research and innovation projects and reducing financial risks associated with long-term research investments.

The creation and functioning of clusters in Bulgaria was supported by OP Competitiveness[13], co-financed by ERDF, in 2010/2011 and later in 2013. The cluster support served different purposes: to increase the competitiveness of SMEs, to support collective research, to rationalise a whole industry, and to implement effective (incl. environment) management system. Taking into account the complex nature of clusters, support actions had an integrated character comprising of support to common cluster activities (related to cluster management and to common cluster investment needs), as well as aid to individual cluster members (including consultancy, investment and training).

The results of the investment support vary. On the one hand, project proposals submitted by new or existing clusters include over 1000 members, including companies, NGOs, almost all accredited universities in Bulgaria, and a large number of municipalities. Their business is carried out throughout the country (not only in Sofia as typically more developed) and cannot be divided on a regional basis. The predominant concept behind project proposals is to adapt and apply knowledge within the cluster, i.e. already known (public sector) research results or technology to be spread. On the other hand, the challenge in Bulgaria relates to the clusters being far above the number that can feasibly function effectively – 190, according to data in RIS3 analysis, covering extremely diverse themes. Classification of clusters based on the stage of cluster integration, sustainability and technology development is obviously necessary. In addition, although the internal knowledge sharing is a positive trend, clusters should lead to increased R&D investments by firms and new possibilities to use external knowledge, which is currently insufficient.

The perspective in the 2014-2020 programming period further stimulates take-up of public sector research results by specific objective 1.1. within OPSEIG, aiming to create and/or upgrade centres of excellence and competence centres. These are expected to serve as platforms for better cooperation between research and businesses, as well as to guarantee to quality and relevance of the research activities. To avoid duplication and to overcome the level of fragmentation, proper mapping of the available infrastructure and accompanying facilities is needed. Such diagnostics and prioritization have been undertaken, also as one of the milestones in the RIS3 Action Plan to complete the fulfilment of the *ex ante* conditionality, concerning Thematic Objective 1 of the ESIF in Bulgaria.

8.2 Sofia Tech Park and TTO network support under OP Competitiveness

Technology parks and Technology Transfer Offices (TTOs) also constitute innovation infrastructure that stimulates take-up of public sector research results. In 2011 both calls BG161PO003-1.2.01 "Support for creation of technology parks" and BG161PO003-1.2.02 "Support for new and strengthening the existing technology transfer offices" were launched. The former aims at increasing competitiveness of Bulgarian science and business sectors through building an eco-system for R&D and innovation support, developing a sustainable environment for experience and knowledge exchange and idea incubation. In practice, Sofia Tech Park is the first major strategic project of the country, focused on the development of innovation, new technologies and science. The aim of the project is to create a physical and virtual environment in which

13 BG161PO003-2.4.01 in 2010/2011 and BG161PO003-2.4.02 "Support for cluster development in Bulgaria"

ideas with broad applicability meet diverse support and opportunities for practical implementation. It focuses on information and communication technologies, life science and green energy, all integral parts of RIS3. It is designed as a science research and development centre with business incubator where research breakthroughs become products and technologies, through mentoring and business advising. Private company interest is already confirmed, although Sofia Tech Park as infrastructure is expected to reach a key phase in 2015.

The latter procedure encourages TTOs in Bulgaria to act as intermediaries to intensify the relations between scientific research organizations and enterprises. For example, in 2013 is founded the Bulgarian Network for Technology Transfer (BgNTT) with 28 collaborating organizations of the innovation infrastructure of Bulgaria, specializing in technology transfer and commercialization of research results and intellectual property[14]. The good practice of providing the 'missing link' between science and business however needs to be expanded, especially since it may also assist HEI reform and increase the rate of commercialization of intellectual property. Not only the government, but HEIs and regions should be formulating and implementing coherent and feasible technology transfer/commercialization strategies.

14 http://www.gis-tc.org/centers

9 Country tailored policy suggestions

The strategic level policy suggestions below intend to support a general framework, which would be more conducive to results compared to the current innovative eco-system. The structure chosen is of 'problem-solution' type:

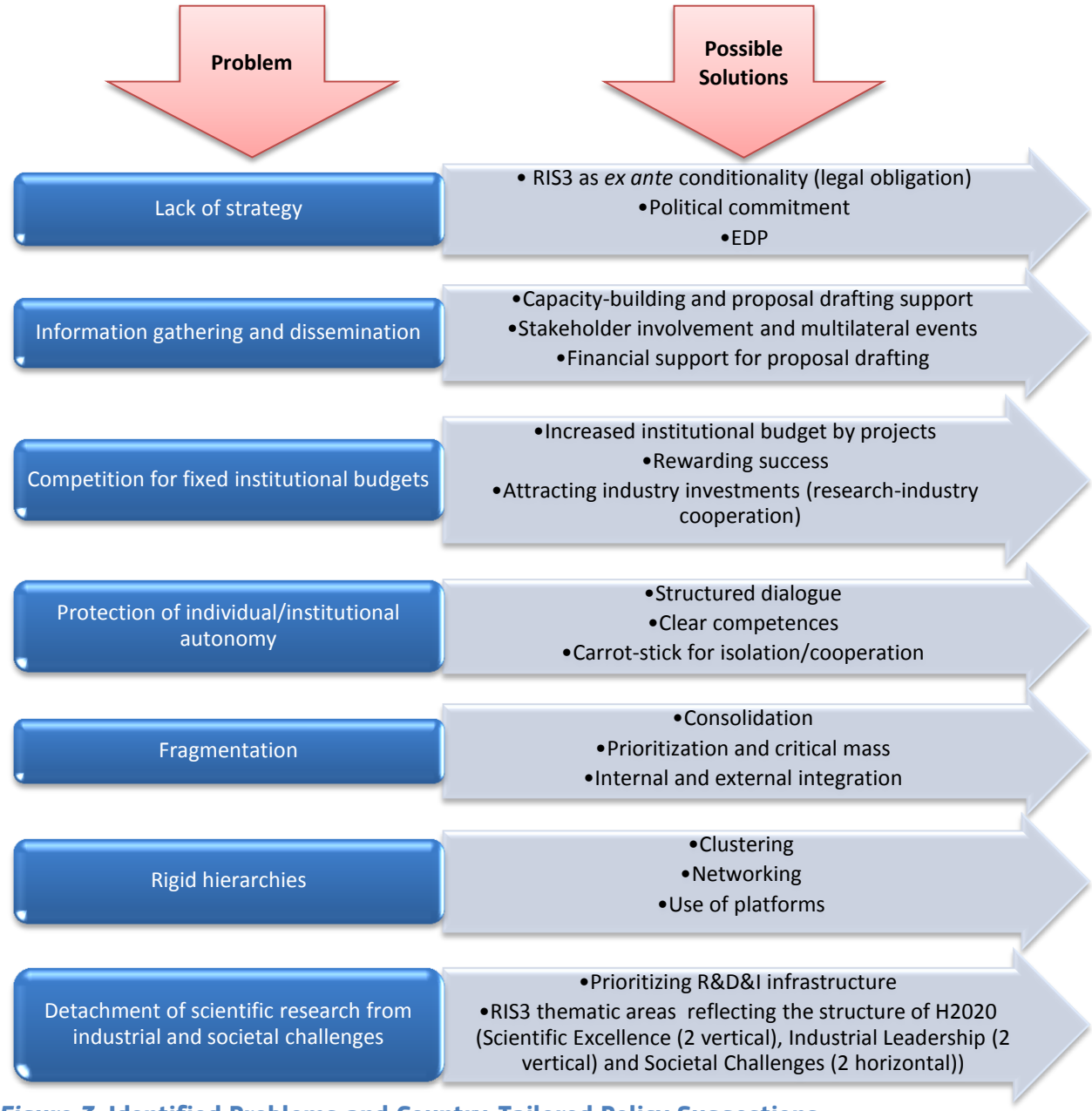

Figure 3. **Identified Problems and Country-Tailored Policy Suggestions**

The operational level policy suggestions and the other recommendations in the report aim to be concrete enough and applicable in the specific context and decision-making process in Bulgaria, and to offer practicable ways forward related to existing, often pressing issues. As already discussed, the **strengthening of the relationship between the participants in the R&D&I system** is of key importance for enhancing capacity and results. This could be achieved in at least three steps, consecutive or ideally simultaneous. Firstly, business and science could not exist as separate islands. Both demand-side measures (to stimulate business exploiting R&D results) could be introduced, as well as supply-side measures (to increase quality of research). To guarantee business interest funding could be reoriented towards market-driven priority themes and/or (industrial) problem-solving. In general, what can also intensify cooperation are more forums including both academia and entrepreneurs, more financial support stimulating cooperative efforts and more visibility

of public research results. Entrepreneurial discovery process (EDP) as integral part of RIS3 is fundamental in this respect. Secondly, the administrative efficiency and coordination need additional improvement. The policy-making directorates within both MES and MoE could benefit from strengthened capacity, external support as well as additional motivation. They need to be part of a structured dialogue and work in a coordinated and synchronized manner to allow integrated policy developments. Thirdly, strengthened role of research infrastructure (e.g. competence centres, centres of excellence) as catalysts for better performed science and training platforms for retaining/attracting high-level researchers. TTOs and other intermediary organisations e.g. clusters, that have proved a pre-requisite for a well-functioning national innovation system, may be necessary given that SMEs predominate in the Bulgarian economy and research and innovation can hardly be highly developed at the level of individual firms. They provide and institutionalise the missing (or informal) links between business and science that convert R&D expenditure into innovation and economic gain.

In addition, only very active approach could help in **overcoming the issue of low FP/H2020 participation and success rate.** One possible measure addressing this issue could mean reshaping the NCP and the overall network as may be appropriate. Awareness-raising requires what can be called a 'leap' in current efforts. Furthermore, good practices from other meber-states should be explored, such as:

- Signposting pre-information regarding future potential calls
- Advice and quick check/review of project ideas
- Support to international partner search
- Grants for exploring project feasibility and validation of project ideas
- Grants/vouchers to seek advice from specialised trainers/consultants
- Provision of training to potential EU project managers
- Support to COST/ERA-Net projects on strategic topics (such projects are excellent springboards for regional actors' participation in FP/H2020)
- Provision of mentoring and coaching to potential EU project partners
- Support to attend or get feedback from info days on calls.

Another type of measure could involve separate legislative act (Council of Minsters Decree) concerning national H2020 participation. The idea would not be to differentiate rules and procedures from mainstream ESIF system, but to engage additionally the structures, to describe formally the working conditions, the possibilities for bonuses based on performance, the required level of involvement and even technical details, such as the approaches to reducing administrative burden.

As mentioned earlier in the report, research orientation of HEIs remain one of the weakest aspects of the R&D&I system in Bulgaria. The measures in view of **reforming research activities in HEIs** could be in the direction of differentiating quality and also following EU best practices. Excellent performance, including project participation, should be identified and rewarded. Focus should be strengthened on a limited number of universities, producing results in RIS3 spheres and having established international partnerships. There is an urgent need for re-organisation towards more senior management commitment to research, more collaboration between HEIs and more joint utilisation of infrastructure and resources. More generally, there should be stimuli for "transformation of the 'traditional' model of a university, which focuses its efforts [distinctly] on teaching and research, towards an innovative and entrepreneurial higher education institution (HEI), which is designed to empower students and staff to demonstrate enterprise, innovation and creativity in teaching, research and third mission, directs its activities to enhance learning, knowledge production and exchange, in the dedication of creating public value via processes of open engagement" (HEInnovate, 2014). The latter joint OECD and EC report recommends for example the creation of HEInnovate Fund (co-financed by ESIF or other EU source) to become the main vehicle to promote and sustain organisational change in HEIs in Bulgaria.

The whole policy framework cannot function sustainably without introducing **talent acquisition and retention measures**. On the one hand, the number of newly enrolled students is decreasing, and reaching 'critical mass' has become a serious issue for HEIs. The number of students opting to study abroad is increasing. The unfilled surplus of 8,000 study places (11.3% of the total offer) in the academic year 2014 risks becoming a recurring phenomenon. The number of PhD programmes per university is also very high (on average between 8 to 15 programmes). There is a tendency for PhD programmes to serve as an additional source of income rather than a way of broadening research activities. On the other hand, the phenomenon of 'brain-drain' is symptomatic of the economy as a whole. The research career itself cannot be claimed to be attractive, given the conservative environment, the low salaries and the reduced fee rates with respect to

project participation. Multiple forms and approaches may apply in this respect. As proposed above, reforming HEIs towards consolidation can amend the situation. Also, ESIF or other EU funding source can be engaged to supplement human potential in R&D&I activities, at least in the thematic areas of RIS3:

- Informatics and ICT;
- Mechatronics and Clean Technologies;
- Industry for Healthy Lifestyle and Bio-Technology;
- New Technologies in Creative and Recreative Industries.

At EU level fee equalization policy could lead to improved conditions for researchers in their home countries, especially in the case of EU13, without affecting mobility and exchange opportunities. Additional suggestions relate to: a.) protecting IP rights effectively; b.) spreading more widely the good practice of improving the innovative start-up environment through financial instruments (such as Eleven and LAUNCHub in the ICT sector in Bulgaria, which could be used for other segments of the economy); as well as c.) paying high attention to cross-border and trans-national research and innovation activities as a 'lift' next to the stairway to EU excellence for true internationalization.

10 REGIONAL ANALYSIS

Bulgaria has 6 NUTS II level regions (North-Western, North-Central, North-Eastern, South-Western, South-Central and South-Eastern), but without a separate regional governance system. There are 28 districts (NUTS III) with district governors, appointed by central government. The districts are divided into 265 municipalities (община, *obshtina*) at LAU level 1. Although Regional Development Plans are elaborated for the 2014-2020 programming period, no regional operational programme or RIS3 exists at this stage. Excluding Sofia City, the country's capital where R&D&I activities are predominantly concentrated, regional (NUTS II level) heterogeneity hardly exists in view of R&D&I policy and instruments.

11 ABBREVIATIONS

AIR	Annual Implementation Report
BAS	Bulgarian Academy of Sciences
COST	European Cooperation in Science and Technology programme
EC	European Commission
ERA	European Research Area
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds 2014-2020
EU	European Union
EU13	MS with post-2004 EU entry
EU15	MS with pre-2004 EU entry
FP	Framework Programme
GDP	Gross Domestic Product
HEI	Higher Education Institution
H2020	Horizon 2020
ICT	Information and Communication Technologies
ICTEE	Information and Communication Technologies for Energy Efficiency
IP	Intellectual property
IPTS	Institute for Prospective Technological Studies
JRC	Joint Research Centre
MES	Ministry of Education and Science
MoE	Ministry of Economy
M&E	Monitoring and Evaluation
MS	Member State
NCP	National Contact Point
NUTS	Nomenclature des unités territoriales statistiques
OP	Operational Programme
OPC	Operational Programme "Development of the Competitiveness of the Bulgarian Economy" 2007-2013
OPIC	Operational Programme "Innovation and Competitiveness" 2014-2020
OPSEIG	Operational Programme "Science and Education for Intelligent Growth" 2014-2020
R&D	Research and Development
R&D&I	Research, Development and Innovation
R&I	Research and Innovation
RIS3	Regional Innovation Strategy for Smart Specialization
SF	Structural Funds 2007-2013
SMEs	Small and Medium-Sized Enterprises
S2E	Stairway to Excellence Project
TTO	Technology Transfer Office

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