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## Executive Summary

Romania's RDI sector was seriously affected by the budget cuts induced by the economic crisis, as illustrated by the evolution of key RDI indicators. GERD went down from 0.58% of the GDP in 2008 to 0.47% in 2009 and in 2010, respectively ([Eurostat](#)), reversing the previously estimated growth to about 1% of the GDP by 2013 that had been committed by the government in pursuance to the Barcelona target. GBAORD went down from 0.4% of the GDP in 2008 to 0.28% in 2010, in a similar declining trend to that observed for the R&D financed by HEIs and the R&D financed by PROs. BERD also dropped from approx. 0.22% of the GDP during 2000-2007 to 0.17% in 2008 and remained relatively constant at 0.19% in 2009 and 0.18% in 2010 ([Eurostat](#)), maintaining the existing gap to the EU-27 at approx. 14% of the EU-27 average.

Research input in terms of HRST as a share of the economically active population in the age group 25-64 went up from 23.8% in 2008 to 24.4% in 2010, but still lags behind at around 60% of the EU-27 average of 40.5% ([Eurostat](#)). The regional distribution of HRST is uneven, with the highest concentration in the capital region Bucharest-Ilfov, and the lowest in the North-East region ([Eurostat](#)).

Research output in terms of international scientific publications is very low relative to the EU-27 average, but on the rise, at a significantly higher growth rate over 2000-2008 than the EU-27 average (13.9% Romania vs. 5.1% EU-27) (European Commission 2011). However, the rise is less due to a **genuine increase in the number of Romanian publications in international journals**, as it is due to a higher coverage of Romanian journals in the Web of Science (WoS) up from 8 in 2005 to 60 in 2010, i.e. by a factor of 7.5. In other words, Romanian researchers still publish mainly in national journals, but more Romanian journals have been covered in the WoS since 2005 have got thus, greater international visibility in the WoS (Testa, 2011 cited in Technopolis 2012). Among Intellectual assets indicators, PCT patent applications have declined from 2008 to 2009 (-5.4%) (Innovation Union Scoreboard, 2010) in line with a longer-term negative dynamics of patent applications filed at the National Office for Inventions and Trade Marks. Romanian PCT applicants are largely predominant, while foreign applicants are only a minority (1,054 Romanian vs. 37 foreign in 2009), which is suggestive of a low degree of internationalisation of the Romanian technology markets (where such foreign applicants might seek protection through patents) and low absorption of foreign technologies. Similarly, the granted and published patents declined during 2002-2009 and went mostly to Romanian holders (National Institute of Statistics, 2011). In contrast, community trademarks and community designs scored a notable growth rate over 2008-2009 (45.2% and 30.1% respectively), above the EU-27 average (Innovation Union Scoreboard 2010).

The structure of the RDI system has remained relatively stable, with only two notable changes introduced early 2011 by GD no.133/2011: creation of the [National Council for Scientific Research](#) and of the [National Council for Development and Innovation](#) as consultative bodies of the Ministry of Education, Research, Youth and Sports (MERYS) and scientific coordinators of five programmes of the 2007-2013 National RDI Plan ('Human Resources', 'Ideas' and 'Capacities' for the former, 'Partnerships in priority domains' and 'Innovation' for the latter).

The 2009-2010 cuts budget in the public RDI had vast negative consequences that annihilated the improvements of the few previous years with higher RDI funding. In response to the budget cuts, the 2009 '[Plan to increase the efficiency and effectiveness of RDI expenditure](#)' introduced a funding re-prioritisation and several reform measures to maximize the social and economic impact of RDI investment and allow the release of the EU's RDI financial assistance to Romania. This was followed in 2010 by the launch of the [2011-2013 National Reform Programme](#) (NRP), which comprises among other RDI measures, the ambitious target of 2% of the GDP for public and private RDI investment by 2020 (1% for public RDI investment and 1% for private RDI investment) to narrow the gap to the EU RDI investment level.

The main structural challenges of the Romanian RDI system include:

**1. Poor synergy between the RDI system and the rest of the national socio-economic system, arising from flaws in the RDI system's governance, institutional set-up, policy mix and coordination**

This challenge refers to the overall RDI system, i.e. both the R&D and the innovation components, which are at different development stages (more advanced for R&D, earlier for innovation). The integration of the Romanian RDI system into the broader national economy is very limited, and the relevance of domestic R&D and innovation to economic development is very low. This challenge is most visible from the analysis of policy measures supporting science-industry partnerships (e.g. Operation 2.1.1 of Priority Axis 2 of SOP IEC 'R&D projects in partnership between universities/research institutes and enterprises', the 'Innovation' and 'Partnerships' Programmes of the 2007-2013 National RDI Plan, etc). This is a complex challenge rooted in several structural flaws of the RDI system, such as governance, institutional set-up, policy mix and coordination, which have been highlighted in the two recent evaluations of the Romanian RDI system, i.e. the mid-term evaluation of the Romanian National RDI Strategy and 2007-2013 National RDI Plan (Technopolis 2012) and the World Bank's Functional Review of the Romanian RDI system (World Bank, May 2011). Both documents provide several relevant recommendations for improvement.

**2. Sharp cuts of R&D funding induced by the economic crisis, further reducing Romania's already low R&D Intensity**

This challenge focuses on the R&D component of the RDI system. After a 7.9% average annual real growth of GERD during 2000-2008 ([European Commission, 2011](#)), on a steady pace from 0.37% of the GDP in 2000 to 0.58% in 2008, a sharp decline to 0.47% occurred in 2009 and 2010 respectively, in the context of the economic crisis ([Eurostat](#)). GERD dropped by 20.9% in 2009 compared to 2008, leading to a drop of 0.10% in the R&D intensity in the same period. This negatively affected Romania's R&D intensity, which was already at less than a quarter of the EU-27 average of 2.01 during 2000-2009 (0.48) ([European Commission, 2011](#)). Moreover, Romania's R&D Intensity followed a contrasting dynamics to that of the majority of EU Member States, rapidly increasing over 2000–2006 and slowing down during 2007-2009, further declining in 2010, in the context of the austerity measures imposed by the government. The [2011-2013 National Reform Programme](#) (NRP) aims to correct this declining trend of the R&D intensity by setting the target of 2% of the GDP for public and private RDI investment by 2020, but the implementation of this target remains problematic.

**3. Low levels of innovation, especially in the private sector, and business investment in R&D**

This challenge focuses on the innovation component of the RDI system, especially on the innovation in the private sector, which is one of the weakest links of the system. Innovation has a very limited effect on economic growth and competitiveness, as domestic firms, both SMEs and large firms have a weak innovation capacity. The translation of R&D into innovation in the private sector is a slow process, due to a low demand from industry, the early development stage of technology transfer infrastructure in universities and of the national network of institutions specialised in technology transfer and Innovation (ReNITT). Other contributing factors are the fuzziness of the intellectual property (IP) regulatory framework and its application, the early stage of technical and financial assistance to start-up firms applying innovations from Romanian R&D, as well as the low level of private R&D investment (BERD). Large foreign R&D investors are present in Romania especially in the ICT industry, but the R&D content of their activities in Romania is rather low and is focused on support activities. This challenge is addressed by several national RDI programmes and European Structural Funds, but their success is relatively low, as the low BERD and innovation capacity of the

private sector are rooted in several economic structural and managerial deficiencies that have not been fully addressed.

#### 4. The supply and demand of human resources for S&T (HRST)

HRST as a share of the economically active labour force has grown continuously over 2000-2010, from 18.4% in 2000 to 24.4% in 2010 ([Eurostat](#)), but still remains at approx. 60% of the EU average. However, the absolute total number of researchers in the R&D sector increased only in the first half of the period and declined significantly in the second (National Institute of Statistics, 2011), as a result of very different dynamics by performing sector: the enterprise sector lost over 50% of researchers in the 2000-2009 period, while in the public sector, the trend was ascending in the first half of the period and descending in the second, and the higher education sector nearly tripled its number of researchers during 2000-2009, from 2,542 in 2000 to 7,310 in 2009 (*ibid.*). Nevertheless, Romania is also one of the countries with the largest net-losses of researchers and doctoral candidates caused by unattractive conditions of the labour market for researchers (European Commission, 2011).

The national research and innovation priorities are synthesised in the 2007-2013 National RDI Strategy and the objectives of the Sectoral Operational Programmes disbursing Structural Funds for RDI. They are implemented through the current policy mix that includes a set of (i) **core RDI policies** (the 2007-2013 National RDI Plan, Sectoral R&D Plans, Core R&D Programmes, SOP 'Increasing Economic Competitiveness' Priority Axes 1 'An innovative and eco-efficient productive system and 2 'RTDI for competitiveness', SOP Regional Development Priority Axis 4 'Strengthening regional and local business environment', SOP Human Resources Development, Priority Axes 1 'Education and training in support for growth and development of a knowledge-based society' and 2 'Linking lifelong learning and labour market', tax incentives for RDI), as well as (ii) **human resources policies**, (iii) **policies for improving the business environment** and (iv) **policies for stimulating innovation in industry**.

National priorities address the structural challenges relatively closely, but the effectiveness of potential solutions to the structural challenges identified above is in general limited. Also, some of the corrective measures are relatively recent and too early to assess. For example, a formal evaluation of the 2007-2013 National RDI Strategy and Plan has just been released in January 2012, the 2011-2013 National Reform Programme has only been launched in 2010, the new legislation tackling many of these issues has been adopted early 2011 and some measures enter into force in 2012.

The most important changes in the policy mix over the last three years emerged from a legislative package introduced early 2011 (e.g. [GO no. 6/26 January 2011](#), [GD no. 133/ 2011](#), [GD no. 134 /2011](#), [Minister's Order 4088/2011](#), [Education Law no. 1/2011](#), etc.), which focused on the research evaluation and certification of RDI units, the provision of institutional funding, the structure and activity of the National Council for Science and Technology Policy, the evaluation and management of projects and programmes funded through the National RDI Plan, the definition of types of R&D expenses that can be financed from the state budget, the functioning of the Romanian education system. These changes reflect two important tendencies in the organisation and functioning of the RDI system: (i) separation of the RDI policy and strategy-making, funding and system performance evaluation functions (retained by NASR), from the implementation functions (delegated to UEFISCDI and some consultative bodies), in order to cut red tape and foster efficiency; and (ii) creation or restructuring of several consultative bodies in order to ensure a broader stakeholder representation (including the private sector) and sharper policy advice to complement institutional capacities within MERYS (World Bank, 2011). Although the reorganisation of the RDI system introduced in 2011 is an important improvement in terms of separation of the different functions of the RDI system and better overall functioning of the system, there remain several deficiencies in the policy coordination mechanisms (World Bank, 2011).

An increased interest in the Structural Funds (SF), especially SOP IEC Priority Axis 2, has emerged since end 2008, as potential ways to compensate for the reduction of public RDI

funding, which went in parallel with a reduction of private funding for R&D. The interest was manifested especially by business firms, which started to feel the damaging effects of the economic crisis and adopted a survival strategy, rather than an expansionary one based on R&D investments. For example, about 36.8% of the multi-annual budget of SOP IEC Priority Axis 2 for RTD was contracted for private firms in 2009 (NASR 2009, p. 44), further increasing to about 38% in 2010 (NASR, 2010, pp. 54-55). The increasing SF absorption degree also reflects a learning curve in the private firms' experience in project writing and managing, which improved with time. However, a seriously limiting factor was their difficulty to provide the co-financing share required by most operations caused by very limited access to bank loans and lack of other capital sources, technical implementation difficulties, etc. In some cases, many contracts have been cancelled at the beneficiary's request shortly after the project start, because of the impossibility to ensure the co-financing share and a steady funding flow for the project duration. (GEA Strategy & Consulting, Fitzpatrick Associates and KPMG Romania, 2010; NASR 2010, p. 57)

The national policy mix is closely aligned with the ERA pillars and objectives, but a lot of effort is still required in order to reduce the gap to the EU-27. Possible directions for the evolution of the current national policy mix in the short and medium term (one to three years) come from the recommendations that will be made in the evaluation of the 2007-2013 National RDI Strategy and National RDI Plan (expected to be released in 2012), the recommendations of the May 2011 World Bank's Functional Review of the Romanian RDI system, the provisions of the 2011-2013 National Reform Programme and the policy directions provided in the major EU innovation policy documents (Europe 2020, Horizon 2020, etc.). Three new policy directions have already been confirmed by NASR for 2012: implementation of innovation vouchers (to be launched soon), elaboration of a national strategy and programme regarding smart specialisation, based on the set of measures adopted by JASPERS (Joint Assistance to Support Projects in European Regions) in the programming period 2013-2020, and clarification of legislation on competitiveness poles and clusters (source: interviews with NASR officials, 2012).

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## Introduction

Romania is the 7<sup>th</sup> largest country in the EU (after Germany, France, UK, Italy, Spain and Poland) with a population of 21.47 m inhabitants on 1 July 2009 (National Institute of Statistics, 2010), which accounts for approx. 4.3% of the EU population (495.1 m). According to the [World Bank Atlas method](#), the country belongs to the upper middle income group with a GDP/inhabitant of €5,800 in 2010 ([Eurostat](#)). The national economy has been hard hit by the global financial crisis that became more visible in the country at the end of 2008, as reflected by the dramatic decline of the GDP growth rate, from 7.3% in 2008 to -6.6% in 2009. The GDP growth rate remained negative in 2010 (-1.6%), but is estimated to a positive 1.7% in 2011 ([Eurostat](#)). The RDI sector was seriously affected by the budget cuts induced by the economic crisis: GERD went down from 0.58% of the GDP in 2008 to 0.47% in 2009 and in 2010, respectively ([Eurostat](#)), reversing the estimated growth to about 1% of the GDP by 2013 that was approved by the government in pursuance to the Barcelona target. By source of funds, Government is the largest contributor to GERD (54.4% in 2010), much higher than the EU-27 average of 34.9% (2009 data, latest available). Business Enterprise and Higher Education sectors accounted for 32.3% and 2.2% of total GERD in 2010, respectively ([Eurostat](#)).

Research input in terms of Human Resources in Science and Technology (HRST) as a share of the economically active population in the age group 25-64 has grown continuously over the last decade, reaching 24.4% in 2010, but remains around 60% of the EU-27 average of 40.5% ([Eurostat](#)). One key factor that fostered this development, particularly during the period 2005-2008, was the increased public funding for RDI, which allowed, among other things, the attraction of young researchers and researchers with studies abroad, acquisitions of new research equipment, better international mobility of researchers, etc. However, much of this positive effect was lost in 2009, due to the drastic cuts of public RDI funding, as a consequence of the economic crisis. The regional distribution of HRST is uneven, with a highest concentration in the capital region Bucharest-Ilfov and the lowest in the North-East region ([Eurostat](#)).

Research output in terms of international scientific publications has been on the rise over the last decade (Table 1) and has recorded a significantly higher growth rate over 2000-2008 than the EU-27 average (13.9% Romania vs. 5.1% EU-27) (European Commission 2011, p. 139). However, the rise in the total number of international scientific publications is less due to a significant increase in the number of publications of Romanian authors in international journals, as it is due to a greater coverage of Web of Science (WoS)-indexed journals from Romania (next to other countries<sup>1</sup>), which increased from 8 in 2005 to 60 in 2010, i.e. by a factor of 7.5. In other words, Romanian researchers continued to publish mainly in Romanian journals, but these journals have got greater coverage in the WoS (see Testa, 2011 cited in Technopolis 2012). The increased WoS journal coverage effect is particularly visible in 2007-2008 (Table 1), when nearly a doubling of articles authored by authors from Romania has been recorded in the WoS. The order of magnitude of this effect is too great to be attributed only to an increased number of publications of authors from Romania in international journals.

**Table 1 : Number of Romanian documents in ISI and Scopus during 2002-2011**

Year	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002
ISI-indexed	4,840	7,930	7,854	7,027	3,630	3,494	3,166	2,653	2,828	2,304

<sup>1</sup> WoS increased its general coverage of journals from 8,228 in 2000 to 11,739, in consideration of both the increasingly global nature of scholarly research and the needs of the global community of its users, in order to include the best regional journals complementing its coverage of top tier international journals (see Testa 2011 for details).

Scopus-indexed	n.a.	11.106	9,469	7,357	5,675	4,074	3,928	3,278	2,963	2,535
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Source: [AD Astra \(2011\)](#) for the ISI-indexed documents and SCImago (2007) for the Scopus-indexed ones<sup>2</sup>

The [scientific production by institution type](#), measured by the ratio of ISI articles per 100 staff, is concentrated in state universities (58.74% in 2011), followed at large distance behind by the Romanian Academy, national R&D institutes, and medical institutions (with 18.01%, 17.61% and 2.31% respectively), while private universities account for only 0.57% ([Ad Astra 2011](#)).

Among Intellectual assets indicators, PCT patent applications have declined from 2008 to 2009 (-5.4%) (Innovation Union Scoreboard 2010), which is consistent with a longer-term negative dynamics of patent applications filed at the National Office for Inventions and Trade Marks (OSIM), showing a drop in recent years from 1,682 in 2002 to 1,091 in 2009 (National Institute of Statistics, 2011). Romanian PCT applicants are largely predominant, while foreign applicants are only a minority (1,054 Romanian vs. 37 foreign in 2009), which is suggestive of a low degree of internationalisation of the Romanian technology markets (where such foreign applicants might seek protection through patents) and low absorption of foreign technologies. Similar patterns are also visible in the granted and published patents, which declined from 817 in 2002 to 646 in 2009 (ibid.) In contrast, community trademarks and community designs have scored a notable growth rate over 2008-2009 (45.2% and 30.1% respectively), above the EU-27 average (Innovation Union Scoreboard 2010).

The country's S&T specialisation, as reflected by the Revealed Scientific Advantage (RSA)<sup>3</sup> is concentrated in Materials Sciences, Mathematics, Physics and Astronomy, Chemical Engineering and Chemistry, and is less strong in ICT, Health, Earth Sciences, or humanistic and social research, although these latter fields receive larger financial support from the 2007-2013 National RDI Plan. This is a consequence of the fact that in Romania the science system has grown independently of the production system and most of the public funding is not targeted towards the fields where Romania could consolidate its current and potential comparative advantage (World Bank, 2011).

Although RDI is recognized as a priority of the 2009-2013 government programme, RDI policies have little visibility and importance among government priorities. Romania's RDI system has a complex structure, organized on several levels - see ERAWATCH Analytical Country Report 2010 for a full overview of the structure of the Romanian RDI system (Ranga, 2011). The [Ministry of Education, Research, Youth and Sport \(MERYS\)](#) is the key actor in education and RDI. Within its structure, the [National Authority for Scientific Research \(NASR\)](#) is the government agency that formulates and implements the RDI objectives and policies of the 2009-2012 Government Programme. MERYS collaborates with other ministries, which have only a very limited role in RDI activities, and with a few government-subordinated agencies with specific RDI functions, such as the [National Institute for Statistics](#), [National Commission for Forecasting](#) and the [Agency for the Implementation of Projects and Programmes for SMEs](#). **At MERYS level**, there are several consultative bodies, such as: [Consultative Board for Research, Development and Innovation \(CCCDI\)](#), [National Council for Ethics](#), [National Council for Scientific Research \(CNCS\)](#), [Romanian Committee for Research Infrastructures \(CRIC\)](#), the

<sup>2</sup> The difference between the two series of numbers comes from a difference in the methodology applied in each case. The ISI numbers provided by Ad Astra comprise all the scientific documents produced by authors from Romania, included by [Thomson ISI](#) in Science Citation Index Expanded, Social Sciences Citation Index and Arts & Humanities Citation Index, for the period 2002-2011, until June 2011. A small share of articles (approx. 0.05%) has been eliminated, due to wrong classification by ISI as having authors from Romania. Of the remaining documents, have been retained for analysis only those of an article, review and proceeding paper type (not conference papers, book reviews, editorials, biographies, reprints, etc.). The Scopus documents comprise a larger spectrum of documents, including peer-reviewed journals, trade publications, book series, conference proceedings, records and "articles-in-Press".

<sup>3</sup> Defined as the share of a country in documents in a given subject area, divided by the country's share of all documents published (World Bank, 2011).

[Innovation Council](#) and the [National Council for Development and Innovation](#) (CNDI). MERYS also has one key funding/coordination agency: the [Executive Unit for Funding Higher Education Scientific Research, Development and Innovation \(UEFISCDI\)](#). In addition, the [Institute of Atomic Physics](#) (IFA) serves as coordinator of the funding for FP7 EURATOM and Extreme Light Infrastructure (ELI) projects. An external support structure to MERYS/NASR is the Romanian Office for Science and Technology in Brussels.

**Romania has no regional RDI policy** and the eight development regions (North-East, South-East, South Muntenia, South-West Oltenia, West, North-West, Centre, and the Capital region Bucharest–Ilfov) do not have a role in RDI policy-making. RDI policies are designed and coordinated at national level by NASR, without any specific regional focus. NASR has a very limited role in spurring regional research and innovation potential and exerts little territorial coordination of RDI. An incipient regional focus in the implementation of national RDI policy has been adopted by NASR since 2008, consisting of: monitoring regional distributions of projects funded by the 2007-2013 National RDI Plan, nine regional Research Exhibitions, the [Innovation Roadshow](#)<sup>4</sup>, production of [Innobarometer](#) as an annual analysis of regional innovation

A regional innovation instrument emerged in the early 2000s in the form of the **Regional Innovation Strategies (RIS)** developed by six Romanian regions<sup>5</sup> with FP6 support on the basis of their affiliation to the [Innovating Regions in Europe \(IRE\) Network](#). However, because of the lack of a formal framework for regional innovation, the RIS have only an orientation purpose and are not seen as part of a regional innovation policy or as having a mandatory character. The RIS are managed by the Regional Development Agencies (RDAs), which have a very limited capacity of managing innovation projects and mobilising regional actors, arising from their status of NGOs with delegated authority from the central government (Ministry of Regional Development and Tourism) to coordinate regional development and the implementation of Structural Funds at the regional level. The RDAs, although not recognized as a regional innovation authority *de jure*, perform *de facto* some of the attributions of such an authority, such as the coordination of some regional development projects that have a strong innovation dimension. The RDAs find themselves in an institutional and policy vacuum at the intersection of *regional development* and *innovation*, two sectors coordinated by two central government agencies (Ministry of Regional Development and Tourism and NASR, respectively) that have little coordination and synergies among them. The Ministry of Regional Development and Tourism coordinates regional structures (the RDAs), but has no innovation responsibilities, while NASR, who is responsible for innovation policies, has no regional structures and policies, and a very limited territorial outreach. The RDAs, which can act as a bridge between the two areas, are very limited in doing so and lack the authority and instruments for more substantive action.

Because of the lack of a formal framework for regional innovation policies and programmes, and poor articulation of the national innovation policies and programmes with the regional priorities, there is no evidence of linkages between the six RIS, or between the RIS and the National RDI Strategy or evidence of inter-regional collaborations supported by the RIS. Also, the poor communication and coordination between the governing bodies of regional development and innovation policies (Ministry of Regional Development and Tourism for RIS, NASR for national RDI policies) has contributed to this gap. Possible solutions to this situation may arise from a significant advancement in the regionalisation process of the country, whereby the regions are given the authority to design and implement own policies, including

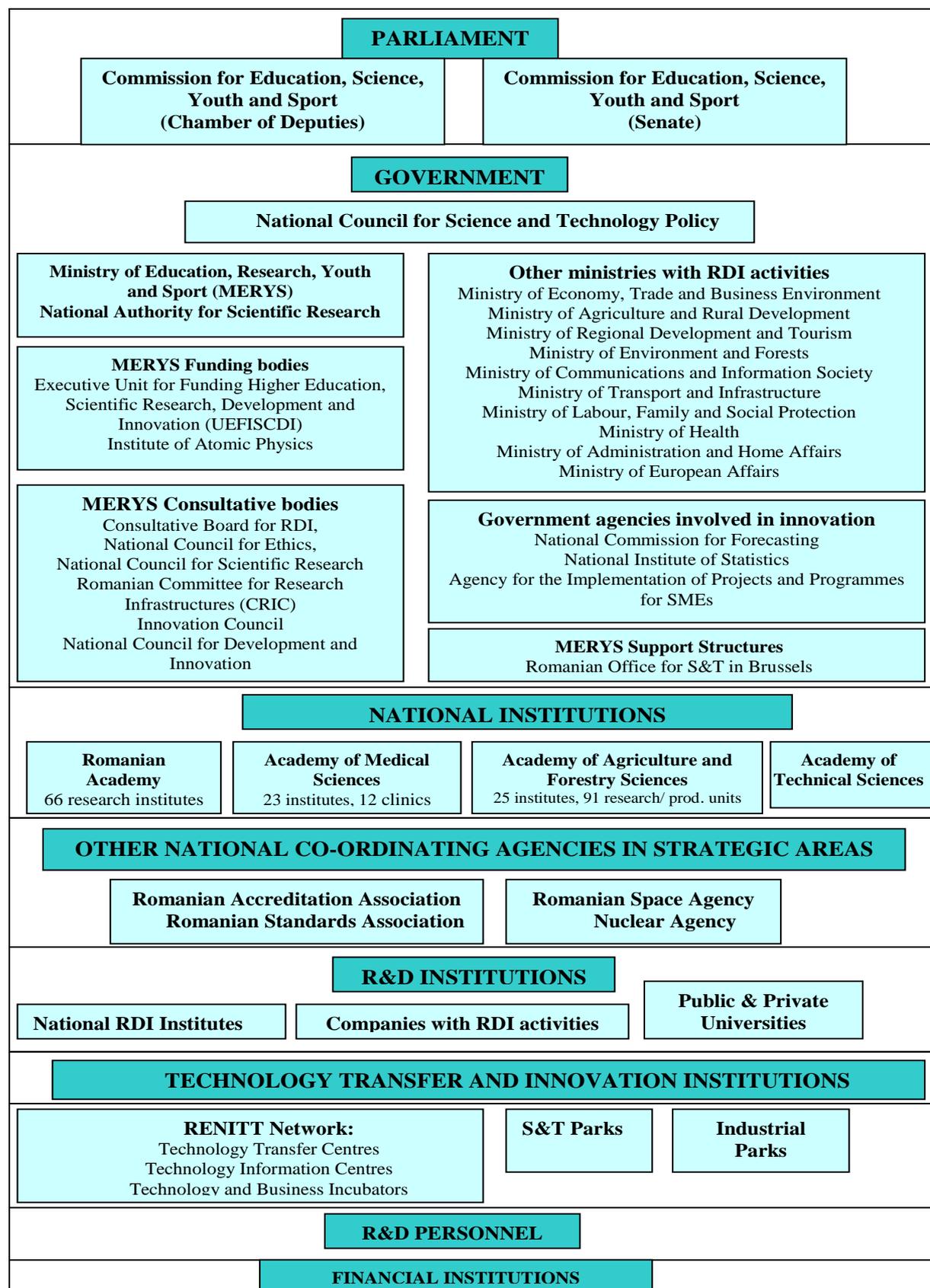
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<sup>4</sup> Organized in 2008 by local public administrations, RDAs and Chambers of Commerce in all development regions, to enhance the absorption of national R&D results by domestic companies

<sup>5</sup> The West Region was the first that developed its [2004-2008 RIS](#), which was later followed by the [2009-2013 RIS](#). The other five RIS: [RIS - Bucharest Ilfov](#), [RIS - North East](#), [RIS - North West](#), [RIS - South East](#), [RIS - South Muntenia](#) were developed during 2005-2008. A follow up of the 2005-2008 RIS was subsequently developed for 2009-2013 only by the South Muntenia region.

regional innovation policies. Once the legal framework for the creation of a regional innovation system is in place, other steps towards its consolidation should follow, such as the creation of an appropriate institutional set-up, definition of priorities, objectives, targets, policies, programmes, budgets, implementation procedures, formation of human resources and collaboration with other regions within the country and internationally. Some bottom-up steps in this direction have already been taken by the RDAs, and can serve as a good starting point in the creation and consolidation of a regional innovation system.

**Figure 1: Overview of Romania's RDI system governance structure**



## Structural challenges faced by the national system

In spite of steady improvements over the recent years, the performance of the Romanian RDI system is well below that of the EU-27, the country being part of the *'Modest Innovators'* group in the 2010 Innovation Union Scoreboard classification (IUS 2010). The IUS Summary

Innovation Index rose from 0.195 in 2006 to 0.237 in 2010 at an average annual growth rate of 5.23%. This places Romania among the growth leaders in the Modest Innovators group (next to Bulgaria), but also among the overall growth leaders (next to Bulgaria, Estonia, Malta, Portugal and Slovenia). IUS 2010 identifies Romania's relative strengths in Finance and support and Outputs, while relative weaknesses are in Open, excellent and attractive research systems, Linkages & entrepreneurship, Intellectual assets and Innovators. Some indicators have recorded a high growth, e.g. Public R&D expenditure (9.7%), Community trademarks (45.2%) and Community designs (30.1%), International scientific co-publications (11.6%), Venture Capital (17.2%), Medium and High-tech manufacturing exports (11.0%), Public-private scientific co-publications (14.0%), while others showed a strong decline, e.g. Non-EU doctorate students (-10.9%). Growth rates in Finance and support and Intellectual assets are above average, while in the other dimensions they are below average (IUS 2010).

A similar picture of the country's low innovation performance is given by the Innovation Union Competitiveness Report (European Commission 2011), which places Romania in *Group 9: Low knowledge capacity systems with a specialisation in low knowledge-intensive sector*, next to Bulgaria, Poland, Turkey and Croatia. In 2009, Knowledge-Intensive Activities (KIAs) were below 20% of the total employment in Romania, while total employment in high-tech and medium high-tech industries & in knowledge-intensive services amounted to 24.4%, significantly below other EU-27 Member States, where it ranges between 30% and 55% of total employment ([European Commission, 2011](#)). Romania also has a higher share of employment in the manufacturing sector compared to other European countries. The lowest European percentage of broadband connections in companies (40%) might be emblematic for this (*ibid.*).

Against this general background of the Romanian RDI system, the following challenges can be identified:

- 1. Poor synergy between the RDI system and the rest of the national socio-economic system, arising from flaws in its governance, institutional set-up, policy mix and coordination**

This challenge refers to the overall RDI system, i.e. both the R&D and the innovation components, which are at different development stages (more advanced for R&D, earlier for innovation). The integration of the Romanian RDI system into the broader national economy is very limited, and the relevance of domestic R&D and innovation to economic development is therefore very low. This challenge is most visible from the analysis of policy measures supporting science-industry partnerships (e. g. Operation 2.1.1 of Priority Axis 2 of SOP IEC 'R&D projects in partnership between universities/research institutes and enterprises', the 'Innovation' and 'Partnerships' Programmes of the 2007-2013 National RDI Plan, etc), For example, Operation 2.1.1 has been acknowledged by NASR as "*the most difficult one among all the Priority Axis 2 operations...Difficulties are primarily due to enterprises' lack of liquidities, but also to the lack of consistent research results obtained by universities and research institutes from public funding provided through the National RDI Plan. On the one hand, the research offer materialised through the publicly-funded package of knowledge and results cannot be transferred to enterprises, and on the other hand, the research services requested by enterprises do not find a mature and serious correspondent among the research institutions*" (NASR 2010, p. 57.) In the 'Innovation' Programme, which already functions at reduced capacity<sup>6</sup>, although some commercially exploitable results have been obtained and are available to the project manager SMEs in 78% of cases, they are not exploited because most of the results are frozen at the stage of experimental development (NASR 2010, p. 25).

One explanation to this situation is the disproportionate concentration of public funding disbursed through the National RDI Plan and SOP IEC Priority Axis 2 to the programmes

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<sup>6</sup> Only Module 1 is operational, while Modules 2, 3 and 4, which support the creation and development of innovation infrastructure and support services, quality management and services have not been activated yet because of a change in the funding priorities of the multi-annual programme (NASR 2010, p. 25).

supporting the early stage of the innovation value chain (basic research), while the later stages (product development and market launch) are severely under-funded and largely ignored by the government (World Bank, 2011). Another is the mismatch between the allocation of RDI funds and the areas of national comparative advantage, the fragmentation and large number of public R&D institutes (about 264) in a wide range of scientific fields and sub-optimal allocation of resources (*ibid.*). Other explanations reside in flaws of the RDI system's institutional set-up such as unbalanced separation between the policy-making and policy-implementation functions, a dominance of thematic priorities rather than a focus on structural approaches for strengthening institutions and governance aspects, a dominance of supply-side approaches, both in research performers and in instruments, missing link between sectoral research policies and sectoral policies in general, lack of a systematic attempt to address institutional learning, build-up of strategic intelligence and the balance of roles between different policy actors (Technopolis 2012).

On these grounds, the World Bank's 2011 Functional Review concludes that *"Romania's RDI sector is in a silent crisis, with seriously negative implications for the country's longer term competitiveness and growth prospects...Romania's government and private sector are investing too little in RDI, and, perhaps as importantly, often investing it poorly"* (p. 7).

Both the mid-term evaluation of the Romanian National RDI Strategy and Plan and the World Bank's Functional Review provide several recommendations for improvement. For example, the former document suggests the development of a systematic link between RDI policy and selected sectoral policies, as well as between the 2014-2020 Structural Funds and national RDI policy, a stronger focus on institutions and their empowerment, reducing complexity, improving the functions and the division of labour between the funding and advisory agencies of NASR, improving the implementation of the National RDI Plan, increasing the international exposure of Romania's research, the absorption of European funds and the business involvement in RDI. The latter document proposes to strengthen the governance of the RDI system through better understanding of the systemic nature of the national RDI set-up, increase the visibility of the RDI sector in the government for enhanced integration and functioning, strengthen the performance of public R&D activities, accelerate the translation of R&D into innovation in the private sector, and increase the level of private sector R&D (see further details in the next challenges that focus on R&D and innovation respectively).

## **2. Sharp cuts of R&D funding induced by the economic crisis, further reducing Romania's already low R&D Intensity**

This challenge focuses on the R&D component of the RDI system. After a 7.9% average annual real growth of GERD during 2000-2008 ([European Commission, 2011](#)), on a steady pace from 0.37% of the GDP in 2000 to 0.58% in 2008, a sharp decline to 0.47% occurred in 2009 and 2010 respectively, in the context of the economic crisis ([Eurostat](#)). Indeed, Romania was one of the countries with the most severe cuts in the R&D budget in 2009, and also one of the few countries where the drop in R&D budget was larger than the drop in GDP, leading to a decrease in the ratio of R&D budget to GDP that year. GERD dropped by 20.9% in 2009 compared to 2008, leading to a drop of 0.10% in the R&D intensity in the same period, further reducing the value of this indicator which was already at less than a quarter of the EU-27 average of 2.01 during 2000-2009 (0.48) ([European Commission, 2011](#)). An even sharper decline (-32.4%) was recorded in the public expenditure on R&D (GOVERD plus HERD) that determined a -0.12% change in the Public sector R&D Intensity between 2008 and 2009 ([European Commission, 2011](#)).

Romania's R&D Intensity followed a noteworthy dynamics: in contrast to the majority of EU Member States, where R&D intensity grew at a slower pace (on an annual average) in the period 2000–2006 than in the period 2006–2009, Romania experienced a rapid increase in R&D intensity over 2000–2006 (3.68% average annual growth) and slowed down during 2006-2009 (1.83%) (*ibid*) This dynamics is explained by the gradual GERD increases committed by the Romanian Government in pursuance of the Barcelona target of 1% of the GDP by 2010.

The most important measures adopted in order to address this decline included the 2009 [‘Plan to increase the efficiency and effectiveness of RDI expenditure’](#) which introduced a funding re-prioritisation and several reform measures to maximize the socio-economic impact of RDI investment and allow the release of the EU’s RDI financial assistance to Romania, and the [2011-2013 National Reform Programme](#) (NRP), which introduced the ambitious target of 2% of the GDP for public and private RDI investment by 2020 (1% of the GDP for public RDI investment and 1% for private RDI investment) (see section 3.3 for details on both), but their success is modest (section 3.4). Also, the recent World Bank’s Functional Review of the Romanian RDI system (World Bank 2011) provides several recommendations for strengthening the public R&D funding and R&D intensity, e.g. by allocation of R&D resources to a smaller number, but better performing R&D institutes, increasing the R&D efficiency, better aligning incentives, funding, performance monitoring and research priorities to the agreed national priorities, etc.

### **3. Low levels of innovation, especially in the private sector, and business investment in R&D**

This challenge focuses on the innovation component of the RDI system, especially the innovation process in the private sector, which is one of the weakest links of the system. Innovation has a very limited effect on economic growth and competitiveness, as domestic firms, both SMEs and large firms have a weak innovation capacity. For example, Romania’s 13.9% share of SMEs with new or significantly improved products new to the market as % of all SMEs with innovation activities (2006-2008) is the lowest among EU-27 countries, at about half of the EU-27 average of 27% (European Commission, 2011, p. 321). This is all the more relevant, as domestically, SMEs account for the largest part of innovative companies (nearly 90%) and have a higher share of innovation and R&D expenditure than large firms (about 30% in SMEs, 15% in large firms). Moreover, SMEs place a higher focus than large firms on the development of own R&D capacity rather than on acquisition of external knowledge, while large firms spend more on acquisition of external knowledge. Nevertheless, both SMEs and large firms face similar barriers to innovation, especially in terms of lack of external funding and qualified personnel (National Institute of Statistics, 2008). It is noteworthy here that the number of innovative enterprises in industry and services has increased in recent years, from 17% in 2000-02 to 21.1% in 2004-06 (latest available years) (National Institute of Statistics, 2011). Romania has a relatively high rate of entrepreneurial activity (about 18%), higher than the EU-27 average<sup>7</sup> (about 13%) (European Commission 2011, p. 368)

The translation of R&D into innovation in the private sector is also a slow process, due to low demand from industry and the early development stage of technology transfer infrastructure in universities and in the national network of institutions specialised in technology transfer and Innovation (ReNITT) (see a detailed discussion in section 5 of Annex). Other contributing factors are the fuzziness of the intellectual property (IP) regulatory framework and its application, and the lack of technical and financial assistance to start-up firms applying innovations from Romanian R&D.

Last, but not least, the low innovation performance in the private sector is closely related to the low level of private R&D investment (BERD). After a period of relative stability during 2000-2007 at approx. 0.22% of the GDP, Romanian BERD dropped to 0.17% in 2008 as a consequence of the economic crisis and recovered slightly to 0.19% in 2009 and 0.18% in 2010 ([Eurostat](#)). This decline was also observed in the evolution of the Romanian BERD relative to the EU-27 average: from about 0.18% of the EU-27 average in 2005-2007, to 14% in

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<sup>7</sup> The birth rate of business enterprises over the period 2003-2007 is high (between 15-20%, second highest in Europe after Lithuania), while the death rate of business enterprises over the same period is about 20%, similar to the European average. (European Commission 2011, p. 322-323),

2008, only slightly up to 15.3% in 2009 and back down to 14.6% in 2010, maintaining the existing gap to the EU-27 (own calculations based on [Eurostat](#) data).

Large foreign R&D investors are present in Romania especially in the ICT industry, where most of the global technology corporations are represented (Intel, Motorola, Sun Microsystems, Boeing, Nokia, Oracle, Microsoft, IBM, Alcatel – Lucent, Hewlett-Packard, Google, Siemens, etc.). Most of them intensified their software development activities and opened R&D and innovation centres (e.g. Microsoft Innovation Centre in Bucharest). However, the R&D content of these large multinationals' activities in Romania is rather low and is focused on support activities and call-centres (very low R&D content), adaptation of solutions for the Romanian market (no R&D content) and some ICT R&D carried out in non-ICT sectors (e.g. Renault R&D investment in Titu, Arges county). R&D teams account for about 10-20% of the total employees and are integrated in the headquarters R&D teams, having only a limited local innovation effect (Baltac, 2009).

The innovation challenge is addressed by several national programmes (e.g. the 'Innovation' and 'Partnerships in Priority Domains' programmes of the 200-2013 National RDI Plan) and Sectoral Operational Programmes allocating European Structural Funds (e.g. SOP IEC Priority Axis2: O.211 Partnerships, O231 Spin-offs/Start-ups, O232 Private R&D infrastructures, O233 Promotion of innovation in enterprises). In addition, this challenge is addressed by several measures in the [2011-2013 National Reform Programme](#) (NRP) that aim to improve the business environment and innovation in the private sector, and in SOP IEC Priority Axis 1 (Operation 'Competitiveness Poles' and the JEREMIE scheme) (see section 3.3). However, the success of these programmes is relatively low, as the low R&D expenditure of the private sector is rooted in several structural and managerial deficiencies that have not been fully addressed (see section 3.4).

#### **4. The supply and demand of human resources for S&T (HRST)**

The pool of human resources for S&T (HRST) as a share of the economically active labour force has grown continuously over 2000-2010, from 18.4% in 2000 to 24.4% in 2010 ([Eurostat](#)), but still remains at approx. 60% of the EU average. However, if we look at the absolute total number of researchers in the R&D sector (National Institute of Statistics, 2011), the ascending trend spans only over the first half of the period (from 19,726 in 2001 to 22,958 in 2005) and is followed by a significant decline in the second half (down to 19,021 in 2006 and 19,271 in 2009). This was the outcome of very different dynamics by performing sector. For example, the enterprise sector, which used to employ the largest numbers of researchers, saw the most dramatic decline throughout the 2000-2009 period, losing over 50% of researchers (from 12,690 in 2000 to 6,127 in 2009). This situation is in stark contrast to the EU, where the number of researchers employed in the private sector increased by 3.5% between 2000 and 2008, United States (1.2 %) and Japan (2%) ([European Commission, 2011](#)) and is all the more worrying as Romania has one of the lowest shares of researchers in the labour force (36.4 per 10,000 civil employed persons in 2009) (National Institute of Statistics, 2011). In the public sector, the trend was ascending in the first half of the period (from 5,244 in 2000 to 7,082 in 2005), but descending in the second (down to 5,585 in 2006 and 5,744 in 2009). In the higher education sector, the number of researchers went up continuously throughout the 2000-2009 period, in an almost 300% increase, from 2,542 in 2000 to 7,310 in 2009 (*ibid*). However, one should also note here that Romania is also one of the countries with the largest net-losses in absolute terms in intra-EU exchanges of doctoral candidates (1,700) after Italy (3,600) and Portugal (2,500), and is part of the top 30 countries with doctorates awarded in the United States (European Commission, 2011).

The high losses of researchers are caused by several factors, including: low market demand for researchers, low salaries in the RDI system, low political importance attached to the role of science, research and innovation for economic growth, in spite of government rhetoric, insufficient research infrastructure and funding meant to increase the attractiveness of S&T/R&D careers, and more recently, important cuts brought about by the economic crisis, etc.

On the other hand, it is also important to note that the HRST supply is very uneven at the regional level, with the highest concentration in the capital region Bucharest-Ilfov, and the lowest in the North-East region ([Eurostat](#)). This pattern follows closely the higher concentration of R&D funding, R&D institutions and innovative activity in the capital region Bucharest-Ilfov, and the concentration of the largest and most prestigious universities of the country in only a few regions.

This challenge is addressed by the 2001-2011 NRP, as well as the [2009-2015 Strategy 'Education and Research for a Knowledge Society'](#), which proposes several measures to improve the quality of the teaching and research staff, which, with some few exceptions, is very poor. Also, the 'Human Resources' Programme of the 2007-2013 National RDI Plan, as well as two SOPs - Human Resource Development, Priority Axis 1 and 3<sup>8</sup> and SOP IEC Priority Axis 2<sup>9</sup> focus on this topic. However, the implementation success of these schemes was modest and most of them have been reduced or discontinued in 2009-2010 as a result of the budget cuts applied since 2009 (see NASR 2010 for an overview of results of the 'Human Resources' Programme of the 2007-2013 National RDI Plan (p. 19) and of SOP IEC Priority Axis 2 O2.1.2, of (p. 57), and ERAWATCH Country Report 2010, p. 32) for an analysis of SOP HRD).

## Assessment of the national innovation strategy

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### *National research and innovation priorities*

The most important RDI policy document in Romania is the [2007-2013 National RDI Strategy](#), which defines nine national priority research areas (ICT, energy, environment, health, agriculture and food, biotechnologies, innovative materials, processes and goods, space and security, and socio-economic and humanistic research). The Strategy identifies six specific themes, similar to the EU FP7: People, Capacities, Ideas, Partnerships in Priority domains, Innovation and Sustaining Institutional Performance. The Strategy also sets out the key RDI policy goals<sup>10</sup> that are part of NASR's objective to consolidate the "**Romanian Research Area**" and facilitate integration into the European Research Area. The National Strategy, as well as its implementing instrument, the [2007-2013 National Plan for R&D and Innovation](#) were elaborated through a broad process of consultation with the main RDI stakeholders of the country, within the first national foresight exercise in S&T organized in 2005-2006 by NASR within its Sectoral R&D Plan. Other important policy documents including RDI objectives are the [2011-2013 National Reform Programme](#) (NRP), which continues the reforms started in the 2007-2010 National Reform Plan and proposes new reforms in response to the EC's *Europe 2020 Strategy*, first Annual Growth Survey and Euro Plus Pact; the [National Strategic Reference Framework \(NSRF\)](#), derived from the [National Reform Programme 2007 – 2010 \(NRP\)](#); the [National Roadmap for Research Infrastructures](#), produced in 2007 by the [Romanian Committee for Research Infrastructure](#); and the [National Pact for Education and Research](#), established in March 2008.

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<sup>8</sup> Relevant for HRST objectives are Priority Axis 1: Education and training in support for growth and development of knowledge-based society, which promotes doctoral and post-doctoral programmes in support of research, and Priority Axis 3: Increasing adaptability of workers and enterprises, which supports the development of entrepreneurial skills and training in new technologies. Under Priority Axis 1 three relevant projects have been funded in 2009-2011: 1. ['Quality and leadership for the Romanian Higher Education'](#); 2. ['Doctoral Studies in Romania - Organizing Doctoral Schools'](#), and 3. ['Doctorate in Excellence Schools - Evaluation of academic research quality and increase of international visibility through scientific publications'](#)

<sup>9</sup> Operation 2.1.2 'Attraction of foreign experts'

<sup>10</sup> These goals include: (i) development of the national RDI system capacity to create, transfer and use knowledge; (ii) fostering RDI activities and services in all socio-economic sectors and increasing their demand for RDI; (iii) supporting the provision of specialised human resources for RDI activities and services; (iv) improving the innovation framework and the innovative capacity of business firms, especially SMEs; (v) stimulating local and regional technological development and innovation potential, and (vi) the international collaboration.

The 2009-2010 budget cuts in the public RDI had vast negative consequences<sup>11</sup> that annihilated the improvements of the few previous years with higher RDI funding. In response to the budget cuts, the 2009 '[Plan to increase the efficiency and effectiveness of RDI expenditure](#)' introduced a funding re-prioritisation to four main directions<sup>12</sup> and several reform measures<sup>13</sup> to maximize the social and economic impact of RDI investment and allow the release of the EU's RDI financial assistance to Romania. This was followed in 2010 by the launch of the [2011-2013 National Reform Programme](#) (NRP), which comprises among other RDI measures, the ambitious target of **2% of the GDP for public and private RDI investment by 2020 (1% of the GDP for public RDI investment and 1% for private RDI investment** to narrow the gap to the EU RDI investment level (Table 2).

**Table 2 : Planned evolution of RDI investment to reach 2% of the GDP by 2020**

INDICATOR (%GDP)	2009	2011	2013	2015	2020
Public RDI investment	0.31	0.33	0.60	0.80	1.00
Private RDI investment	0.17	0.15	0.25	0.50	1.00
Public and private RDI investment	<b>0.48</b>	<b>0.48</b>	<b>0.85</b>	<b>1.30</b>	<b>2.00</b>

Source: 2011-2013 National Reform Programme, p. 74

An important set of changes<sup>14</sup> in national innovation policies was adopted in 2011 by MERY/NASR:

- **Changes in the research evaluation and certification of RDI units, as well as in the direct institutional funding** introduced by [GO no. 6/26 January 2011](#). This GO stipulates that RDI units and institutions included in the national system are evaluated by the [Consultative Board for Research, Development and Innovation](#), according to a procedure that is established by NASR in consultation with the Consultative Board for RDI, [Romanian Academy](#), the [National Council for Scientific Research](#) and other national consultative councils, and is approved by government decision. The new evaluation procedure replaces the former accreditation system and ranks the R&D units by their research performance and the economic effect of their research into five performance classes: A+, A, A-, B and C. The new evaluation system allows highlighting the best performance of the 'champions' of the R&D system. The evaluators should include at least 50% foreign experts selected from EU or OECD member states to guarantee neutrality and international quality. The evaluation is finalized by certification, and only certified RDI units can benefit of a new system of basic institutional financing that entered into force on 1st January 2012 and is aimed to support the RDI infrastructure. To be certified the R&D unit must reach level A- or higher (with those with lower grades subjected to reorganisation, consolidation, or closure). Certification or re-

<sup>11</sup> For example, significant losses of qualified researchers in R&D institutions, especially in the National R&D institutes, weaker capacity to attract young researchers and to stop the migration of researchers abroad or towards better paid sectors, weakening of public-private partnerships, etc.

<sup>12</sup> These were: (i) payment of international organisations membership fees (FP7, EURATOM, CERN, etc); (ii) maintaining the research capacity of National R&D institutes by providing a 30% increase of their institutional funding allocated through the Core R&D programmes; (iii) increasing the absorption of Structural Funds; and (iv) freezing new calls under the National RDI programmes.

<sup>13</sup> (i) Increasing the RDI investments; (ii) increasing RDI importance at government level and the coherence of RDI policies and programmes; (iii) stimulating business RDI through implementation of some fiscal incentives and financial policies with impact on private RDI; (iv) adoption of specific financial measures; (v) adoption of a unitary RDI monitoring and evaluation procedure based on an updated classification of RDI expenditures; (vi) implementation of recommendations resulting from the independent intermediary evaluation of the 2007-2013 National Strategy and RDI Plan.

<sup>14</sup> See <http://www.ancs.ro/ro/categorie/971/despre-ancs-legislatie-acte-normative> for an overview.

certification is granted for a period of maximum five years. All R&D units (e.g. universities, national RDI institutes, research institutes of the Romanian Academy or under other ministries) that want to apply for public RDI funding need to go through the certification process. However, competitive funding does not require certification and is available to all research entities. In terms of institutional funding, the GO distinguishes between *basic and complementary institutional funding*. Basic institutional funding is calculated on a cost standard and is awarded through the NASR R&D budget on the basis of an institutional financing framework contract that remains active for the duration of the certification. The cost standard takes into account the number of certified researchers, the quality and complexity of research infrastructure, the unit's R&D performance, including international competitions results. It also respects the principle of proportionality of funding with performance.

- **Changes in the structure and activity of the National Council for Science and Technology Policy**, introduced by the same GO no. 6/2011. The Council's membership is established at maximum nine experts, four of whom must be members of the Consultative Council for RDI. The National Council will function on a 5-year mandate approved by the Government and will annually report to the Government on achievements and recommendations in the area of scientific research, technology transfer, innovation, societal development and knowledge-based economy in Romania.
- **Changes in the evaluation and management of projects and programmes funded through the National RDI Plan** introduced by [GD no. 133/2011](#). The document establishes the creation of Scientific Councils<sup>15</sup> coordinating the programmes of the 2007-2013 National RDI Plan, as follows: a) the [National Council for Scientific Research](#) for the programmes 'Human Resources', 'Ideas' and 'Capacities'; b) the [National Council for Development and Innovation](#) for the programmes 'Partnerships in priority domains' and 'Innovation'; and c) the [Consultative Board for RDI](#) for the programme 'Sustaining institutional performance'. This GD also introduces the National Council for Development and Innovation as a national consultative body of NASR, which is formally created later in April 2011, by [Minister's Order 4088/2011](#). This GD also stipulates that the complementary institutional funding mentioned in GO 6/2011 above can be accessed from the programme "Support for institutional performance" of the 2007-2013 National RDI Plan, on a competition basis, only after the scientific performance assessment. Other provisions introduced by this GD refer to the replacement of result indicators used in the evaluation of programmes under the National RDI plan with new process- and result indicators.
- **Changes in the definition of types of R&D expenses that can be financed from the state budget** introduced by [GD no. 134 / 2011 for the approval of Methodological Norms for the selection criteria of the types of R&D expenses financed from the state budget](#). This GD abrogates GD 1579/2002 and introduces several types of R&D expenses eligible for funding from the state budget (personnel, logistics, travel, and indirect costs).
- **Changes in the functioning of the Romanian education system** introduced by [Education Law no. 1/ 5 January 2011](#). The law changes the old system of public university funding based on the number of students to a system based on an internal assessment and performance classification of all departments every five years. The assessment is finalized with an annual report that is the fundamental condition to access public funding. One of the most important provisions of the law with regard to university

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<sup>15</sup> The Scientific Council has several responsibilities: elaboration of information packages, selection of evaluation experts and elaboration of evaluation procedures, project evaluation and monitoring, negotiation of financing contracts, etc. Each project is evaluated by minimum 3 experts, who must have international recognition. Evaluation experts must include foreign specialists from the EU or OECD member states to at least 50%, except for small projects in specifically domestic areas and projects funded at least 50% by private persons.

research is the classification of universities into three categories, on the basis of their study programmes: (1) education universities; (2) education and scientific research universities, or education and arts universities; and (3) advanced research and education universities. The Law stipulates that the government finances excellence research programmes in all the three types of universities, in order to encourage competition. Another important provision is the guarantee of researchers' inter-institutional mobility and portability of grants, applying the principle "the grant follows the researcher". The Law also refers to the organisation of doctoral research programmes (e.g. the Law introduces the right of the Romanian Academy to organize doctoral programmes, etc.) and their evaluation, as the basis for receiving public funding.

The changes discussed above are also the 'hottest' national innovation policy issues. Concepts like 'open innovation', 'social innovation', 'key enabling technologies' or 'specific societal challenges' are not distinctly addressed in the RDI policy debate. As an element of novelty, the 2011-2013 National Reform Programme refers to specific business sectors and strategic industries (e.g. ICT, energy, transport - the electrical vehicle, large R&D investments) where innovative clusters and public-private partnerships will be supported.

These changes reflect two important tendencies in the organisation and functioning of the RDI system: (i) **separation** of the RDI policy and strategy-making functions (retained by NASR), the system performance valuation (delegated to the Consultative Council for Research, Development and Innovation (CCCDI), National Council of Scientific Research (CNCS) and the National Development and Innovation Council (CNDI), and the funding and implementation functions (delegated to UEFISCDI), in order to cut red tape and foster efficiency; and (ii) **creation or restructuring of several consultative bodies** (CCCDI, CNCS, CNDI). This reorganisation of the RDI system introduced in 2011 was intended to improve the separation of the different functions of the RDI system, a broader stakeholder representation, including the private sector, and sharper policy advice to complement institutional capacities within MERYS (World Bank, 2011). However, the recent mid-term evaluation of the 2007-2013 National RDI Strategy and Plan (Technopolis 2012) considers the process to be inadequately designed, with considerable overlaps between CCCDI, CNCS and CNDI, UEFISCDI and NASR. For example, the CCCDI, CNCS, CNDI councils are overstretched with a multitude of evaluation tasks and related work that require profound professionals in evaluation, funding procedures or strategic studies, which the councils don't have, as these tasks should rather be performed by UEFISCDI. The assignment of the councils' tasks and roles was found to be inherently conflicting (e.g. performing operational tasks, like drafting information packages, developing evaluation methodologies, selecting evaluators), which places the councils in a non-legitimate situation to supervise the fulfilment and quality of the respective work performed by others, in particular UEFISCDI. Also, the division of labour between the councils on the one hand, UEFISCDI and NASR on the other hand is confusing, in the sense of giving the councils tasks that are genuine agency or government functions. Therefore, a re-thinking of the current roles of the councils, UEFISCDI and NASR has been recommended, reducing the roles attributed to the councils and leaving them with a focus on supervision and advice, while all kind of operational tasks should be transferred to UEFISCDI (Technopolis 2012).

### ***Trends in R&D funding***

The economic crisis had significant consequences on the R&D expenditure, as reflected by the declining values of several R&D funding indicators since end 2008, when the crisis effects became more visible in the Romania (Table 3). For example, GERD declined from 0.58% of the GDP in 2008 to 0.47% in 2009 and 2010 respectively ([Eurostat](#)), while GBAORD went down from 0.4% of the GDP in 2008 to 0.28% in 2010. A similar downwards trend was followed by the R&D financed by HEIs (from 2.6% of GERD in 2008 to 2.2% in 2010) and the R&D financed by PROs, where the decline was even more important (from 70.1% of GERD in 2008 to 54.4% in 2010). BERD also dropped from approx 0.22% of the GDP during 2000-2007 to 0.17% in 2008 as a consequence of the economic crisis and recovered slightly to 0.19% in

2009 and 0.18% in 2010 ([Eurostat](#)), maintaining the existing gap to the EU-27 at approx. 14% of the EU-27 average (own calculations based on [Eurostat](#) data). In order to compensate for this decline, the [2011-2013 National Reform Programme](#) (NRP) introduced the target of 2% of the GDP for public and private RDI investment by 2020, i.e. 1% of the GDP for public and 1% for private RDI investment (see section 3.1 for details).

**Table 3: Basic indicators for R&D investments in Romania**

	2008	2009	2010	EU average 2010
<b>GDP growth rate</b>	7.3	-6.6	-1.6	2,0
<b>GERD as % of GDP</b>	0.58	0.47	0.47	2.0
<b>GERD per capita</b>	37.6	25.9	:	490.2
<b>GBAORD (€ million) (civil)</b>	556,563	360,433	346,897	92,729.05
<b>GBAORD as % of GDP</b>	0.4	0.31	0.28	0.76
<b>BERD (€ million)</b>	242,492	223,365	:	151,125.56
<b>BERD as % of GDP</b>	0.17	0.19	0.18	1.23
<b>GERD financed by abroad as % of total GERD</b>	4	8.3	11.1	N/A <sup>16</sup>
<b>R&amp;D financed by HEIs (% of GERD)</b>	2.6	1.9	2.2	24.2
<b>R&amp;D financed by PROs (% of GERD)</b>	70.1	54.9	54.4	13.2
<b>R&amp;D financed by Business Enterprise sector (as % of GERD)</b>	23.3	34.8	32.3	61.5

Source: Eurostat. Note: (:) not available.

The most important funding form is the competitive grants from both national and EU funding, while other forms (e.g. tax incentives, subsidies, guarantees) have only a minor importance. The balance between these various forms has remained unchanged in the last three years, with the economic crisis only reducing/cancelling some national grants but not helping to increase the weight of other funding forms.

The national funding disbursed through the 2007-2013 National RDI Plan in 2010 declined compared to 2009 (€143.3m in 2009 vs. €120.6m in 2010), but increased slightly in the complementary Core R&D Programmes (€52.9m in 2009 vs. €53.9m in 2010). This was the result of NASR's funding re-prioritisation discussed in section 3.1, whereby one of the four main directions of the re-prioritisation was maintaining the research capacity of National R&D institutes by providing a 30% increase of their Core R&D programme budgets.

In contrast, the R&D funding from abroad increased in 2010 compared to 2009 mainly due to an increased absorption of SF, especially through SOP IEC Priority Axis 2, and less due to funds attracted through FP7, where the Romanian participation rate as a share of overall participation declined continuously since 2007 (from 1.2% in 2007 to 1.1% in 2008, 0.9% in 2009 and 2010) and the application success rate is the lowest amongst the EU-27 (14.5% for Romania vs. 21.6% EU-27)(Technopolis 2012). The SOP IEC Priority Axis 2 funding data available (NASR 2009, 2010) do not allow a clear comparison of 2009 and 2010 expenditure, but the likely trend is of an increasing allocation in 2010 compared to 2009, due to sustained efforts to increase the absorption of Structural Funds. SOP IEC Priority Axis 2 accounts for nearly a quarter of the SOP IEC resources and specifically targets €650 m for 2007-2013, of

<sup>16</sup> 8.4 (2009), 9.04 (2005)

which €110m comes from national funds and €540m from European Structural Funds for RDI as a means of promoting economic growth. Commitments by NASR of structural funds are generally on track (there was no budget reduction), although funding and disbursements for private sector R&D are lagging (World Bank 2011). Public-private partnerships have a minor importance in leveraging additional funding for RDI because they remain at a relatively low level, their development being hindered by unclear legislation and low interest of private investors to invest in RDI projects. The funding from international collaboration (FP7) amounted to €62.53m in 2010 (NASR, 2010).

## ***Evolution and analysis of the policy mixes***

The current RDI policy mix in Romania includes:

### **A. Core RDI Policies**

**a. The 2007-2013 National RDI Plan**, which is the most important public funding instrument, both policy- and budget-wise, having the largest budget of all current national programmes (multi-annual budget of about €4,700 million, at 1 €= 3.21 RON in 2007). The Plan comprises 6 programmes, of which only the first five are currently operational, while the sixth is expected to be launched in 2012:

1. **Human Resources**: supports the increase of the number and professional performance of researchers, as well as the attractiveness of scientific careers;
2. **Capacities**: is organised in four modules<sup>17</sup>, with different objectives;
3. **Ideas**: supports basic research and application of quality S&T results, leading to scientific excellence and increased international visibility;
4. **Partnerships in priority domains**: supports public-private partnerships for solving complex problems and enhancing technology transfer;
5. **Innovation**: supports pre-competitive research performed by economic agents (firms), in line with the state aid provisions.
6. **Sustaining the institutional performance**: supports the activity of national R&D institutes.

Participation in all these programmes is competition-based. Programmes 1-5 are managed by the [Executive Unit for Funding Higher Education, Research, Development and Innovation \(UEFISCDI\)](#), under the scientific coordination of the [National Council for Scientific Research \(CNCS\)](#) (for programmes 1, 2, 3) and of the [National Council for Development and Innovation \(CNDI\)](#) (for programmes 4 and 5). Programme 6 is managed by the [Consultative Board for RDI \(CCCDI\)](#). The evaluation and management of projects and programmes funded through the National RDI Plan was changed in 2011, according to [GD no. 133/2011](#) (see section 3.1 for details).

**b. Two complementary funding instruments of the 2007-2013 RDI National Plan** that were launched in 2003 and have been continued to present:

1. **Sectoral R&D Plans**, proposed by some national R&D institutes for the technological development of the respective sectors and financed by the line ministries of the respective sectors, including MERY/NASR, Ministry of Economy, Trade and Business Environment, Ministry of Agriculture and Rural Development, Ministry of Environment and Forests, Ministry of Communications and Information Society<sup>18</sup>.

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<sup>17</sup> *Module I*: development of research infrastructure in R&D institutes and universities, and development of national R&D infrastructure; *Module II*: improvement of RDI quality and socio-economic role; *Module III*: participation in international RDI projects; *Module IV*: participation in international S&T bodies.

<sup>18</sup> The Sectoral Plan of MERY/NASR includes projects addressing various aspects of the R&D and education system. The 2007-2009 R&D Sectoral Plan of the Ministry of Economy, Trade and Business Environment focuses

2. [Core R&D Programmes](#) developed by some national R&D institutes to support their specific medium- and long-term strategies and financed by NASR. NASR supported 46 core R&D programmes in 2009, and 47 in 2010 (NASR 2009, 2010). They are a form of institutional funding that is allocated competitively among the institutes, in order to help them retain the R&D personnel, especially the young researchers specialised abroad.

**c. Sectoral Operational Programmes (SOP) relevant for RDI activities:**

1. [SOP 'Increasing Economic Competitiveness' \(SOP IEC\)](#) through [Priority Axes 1: An innovative and eco-efficient productive system](#) (managed by [Ministry of Economy, Trade and Business Environment](#) as Managing Authority) and [2: RTDI for competitiveness](#) (managed by [NASR](#) as Intermediary Body).
2. [SOP Regional Development \(ROP\)](#), [Priority Axis 4 'Strengthening regional and local business environment'](#) which supports regional and local business support structures (e.g. industrial, business parks, business incubators etc.), , in line with the *Regional Innovation Strategies*. ROP is managed by the [Ministry of Regional Development and Tourism \(MRDT\)](#).
3. [SOP Human Resources Development \(SOP-HRD\)](#) supports the development of human capital and the increase of competitiveness by linking education, lifelong learning and labour market and providing enhanced opportunities for future participation in the labour market. Relevant for RDI objectives are [Priority Axis 1: Education and training in support for growth and development of knowledge-based society](#), which promotes doctoral and post-doctoral programmes in support of research, and [Priority Axis 3: Increasing adaptability of workers and enterprises](#), which supports the development of entrepreneurial skills and training in new technologies.

**d. Tax incentives for RDI:**

Only few tax incentives for RDI have remained in force in the 2011 Fiscal Code and after the budgetary restrictions imposed by the economic crisis, as listed below. There is no available information regarding their effectiveness for RDI or the overall costs of these measures for the national budget.

- VAT exemption for RDI activities performed under the National RDI Plan, as well as RDI activities financed in international, regional and bilateral partnership. Increased deductibility of R&D expenditure from 100% to 120% for those units whose R&D activities account for at least 15% of their total yearly expenditure<sup>19</sup> A 3% tax for micro-enterprises (for turnover under €100,000) (not RDI specific).
- An income tax exemption for IT specialists (software engineers, system designers, system engineers or analysts).
- Tax incentives for the establishment and development of an industrial park (e.g. a more favourable regime of local taxes).
- Tax facilities to young entrepreneurs (up to 35-years old) setting up their first enterprise<sup>20</sup>,

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on specific issues to increase the competitiveness of industrial sectors. The 2008-2010 R&D Sectoral Plan of the Ministry of Communications and Information Society includes two programmes in specific areas that have been continued in the ministry's [2010-2013 Strategic Plan](#).

<sup>19</sup> Cf. Order No. 2086/4503/August 2010

<sup>20</sup> Cf. Government Emergency Ordinance 6/2011; The GEO stipulates that young entrepreneurs (up to 35 years old) setting up their first enterprise can receive a non-reimbursable state aid of max. €10,000 (up to max. 50% of the total budget of the enterprise) and can benefit of state guarantees of up to €80,000 in bank loans to cover the rest of the necessary investment. They are also exempted from the payment of social security dues for max. 4 employees and are obliged to hire min 2 employees and re-invest min. 50% of the profit made in the previous fiscal year.

- Deductible costs related to the management of information systems, quality management systems, marketing, trade fairs and exhibitions, environmental protection and conservation.
- Flexible options for the depreciation of some categories of RDI expenditure<sup>21</sup>.

## **B. Human resources policies**

Positions in R&D activities are predominantly permanent, as temporary work is generally less usual in the country, although on the rise, but recently temporary PhD, post-doc positions have been funded through various schemes. Salaries vary significantly by type of institution (highest salaries are usually in National R&D institutes, which receive a large share of their income from contracts financed by NASR. A number of [4 Romanian institutions](#) (Alexandru Ioan Cuza University of Iași, National R&D Institute for Textile and Leather (INCDTP), University of Agricultural Sciences and Veterinary Medicine - Bucharest and the University of Medicine and Pharmacy "Victor Babes", Timisoara) signed the **European Charter for Researchers** (March 2005).

A change in the maternal leave legislation entered into force on 1st January 2011, giving mothers the possibility to choose between two packages of measures regarding the duration of the maternity leave and the level of the child allowance associated to each<sup>22</sup> (see. The restoration to the same position after maternal leave is theoretically guaranteed by law, but in practice distortions from this provision may frequently occur, e.g. a return to a different position, or with a different salary, etc. However, only half of Romanian women go on maternal leave, for fear of losing their job, because the employer doesn't accept their absence for such a long period, and because the level of the child-rearing aid is very low (Jeles, 2010). Also, the maternity leave reduces women/men's chances for promotion based on the number of publications. The effects of maternity leave on women's research careers are not formally documented in Romania, just as there is no systematic research on women's careers, scientific excellence, productivity or payment in S&T/R&D. Gender policies are virtually inexistent and are not a real issue of concern in Romania, where the general belief is that women's personal choices and the 'free market' mechanisms are the main drivers regulating women's representation in different occupational fields, including S&T/R&D, or at different hierarchical levels.

## **C. Policies for improving the business environment**

The [2011-2013 National Reform Programme](#) (NRP), coordinated by the Ministry of Economy, Trade and Business Environment includes a set of new policies for improving the business environment:

1. **Improving the administration decision-making, management and horizontal coherence of public policies** through, among others, finalising the 2011-2013 Action Plan and Government Strategy for the improvement of the business environment, achievement of a qualitative and quantitative indicator system for enterprises, including number of new enterprises, number of incubated firms (incl. innovative firms), number of patents and trademarks, volume of national and foreign investments, number of potential competitiveness poles.
2. **Stimulating firms' capacity to create, add and retain value in the national production chain, based on processes, products and services**

In order to provide support for SMEs, the government approved in 2010 a supplement of €100m for the National Guarantee Fund for SMEs Credits. In 2011, several support measures

<sup>21</sup> Purchase of patents, copyrights, licenses, trademarks or trade; manufacturing and other similar development expenses (purchase of technological equipment, machinery, tools, computers and peripherals); non-taxable revenues of patent owners for 5 years from the first application.

<sup>22</sup> Cf. GD 52/2011.

and programmes have been continued, such as: granting de minimis state aid to SMEs and large enterprises; the [START Programme for the training of young entrepreneurs](#), which provides investment support for micro-enterprises younger than 2 years and for the development of entrepreneurial skills in young entrepreneurs starting their first firm<sup>23</sup>; the programme for creating micro-enterprises by young entrepreneurs (up to 35 years old)<sup>24</sup>; the programme for supporting business incubators<sup>25</sup>; the [multi-annual 2005-2012 programme for the development of entrepreneurial culture in women managers in SMEs](#)<sup>26</sup>, the UNCTAD Programme EMPRETEC for entrepreneurship support and SMEs development.

#### **D. Policies for stimulating innovation in industry**

The importance of innovation in industrial processes and technologies is recognised in the [2011-2013 National Reform Programme](#) (NRP), which focuses on few key areas such as: transition to the 'green economy'<sup>27</sup> and modernisation of some industrial sectors<sup>28</sup>, consolidation of regional/national/cross-border innovative clusters<sup>29</sup> and their collaboration with academia, national RDI institutes and public administration, completion by 2013 of the SOP IEC Priority Axis 1 Operation 'Competitiveness Poles', support to the JEREMIE scheme (by setting up several risk capital funds during 2011-2013 and providing guarantees for the investments of high-growth SMEs, as well as long- and medium-term credits for business development), local/regional entrepreneurship is also encouraged in view of reducing regional gaps in the business environment. To support these measures, the RDI Sectoral Plan of the Ministry of Economy, Trade and Business Environment will be funded with approx. €6.16m from the state budget during 2011-2013.

The focus on these measures is not new, as many of them have already been included in the former 2007-2010 NRP and have failed to lead to significant results. The success of these measures so far is too early to assess, but it is nevertheless questionable as long as the innovation absorptive capacity of enterprises remains very weak, the country lacks a clear industrial strategy correlated with the national RDI strategy and other key national strategic documents, the national economic growth is modest, with no significant perspectives of improvement and the financial markets turbulence is high.

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<sup>23</sup> The 2011 START Programme was launched in April 2011 and supports min.100 start-ups (younger than 2 years) with an allocation of approx. €24,000 and a bank credit of approx. €11,900.

<sup>24</sup> The 2011 budget amounts to approx. €5m and is coordinated by the [Agency for the Implementation of Projects and Programmes for SMEs](#) (formerly National Agency for the Promotion of SMEs) (AIPPIMM). The programme prioritizes businesses that invest in production or services, create jobs, invest in the rural environment, and start a creative or innovative business. The National Guarantee Fund provides guarantees for max. 80% of the credit that is necessary to implement such business plans (or max. €80,000). The new business is exempted from the payment of social security tax for max. 4 employees, but is obliged to hire min. 2 employees.

<sup>25</sup> The programme aims to reduce unemployment and develop entrepreneurship. It is implemented in Romania by the UNDP in collaboration with AIPPIMM and the local authorities in the target zones. Incubated firms receive office space for max. 3 years, financial, technical and managerial support. In 2011, non-reimbursable funding is provided for 120 firms, two new business incubators, creation of 50 new SMEs, 45 new jobs and incubation of 100 SMEs, of which 30% run by women.

<sup>26</sup> The programme aims to develop an information and training system that facilitates women's mobility on the labour market and the development of their entrepreneurial abilities in view of creating own businesses. The 2011 budget amounts to €120,000 for the training of 240 women in 8 locations, a study and an awareness campaign.

<sup>27</sup> E.g. support to the production of Renault's electrical vehicle, in view of reducing greenhouse effects and promoting ecological urban transport.

<sup>28</sup> The NRP encourages the consolidation of enterprises' technological capacity by stimulating investments in new technologies and introduction of quality management systems.

<sup>29</sup> The NRP refers to 19 innovative clusters in operation in Romania and expects six new ones to be created until the end of 2011 in aviation, renewable energies, naval constructions, textile industry, automotive industry, and wood and furniture industry. The 2011-2012 project "**Consolidation of innovative clusters' competitiveness and comparative evaluation of industrial sectors' competitiveness**" is expected to identify new industries with clustering potential and partnerships in strategic industries, as defined in the 2010-2014 National Export Strategy.

## E. Other innovation policies

Innovation policies encouraging social innovation, public sector innovation, design, creativity and services innovation are not specifically represented in the current RDI policy mix.

### ***Assessment of the policy mix***

The structural challenges of the innovation system discussed in section 2 are addressed by several measures in the current policy mix (Table 4).

**Table 4: Structural challenges and measures to address them**

Challenges	Policy measures/actions <sup>30</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
<b>1. Poor synergy between the RDI system and the rest of the national socio-economic system and flaws in its institutional set-up, governance, policy mix and coordination</b>	Recommendations included in the Mid-term evaluation of the Romanian National RDI Strategy and 2007-2013 National RDI Plan (Technopolis 2012) and the World Bank's Functional Review of the Romanian RDI system (World Bank, May 2011).	<ul style="list-style-type: none"> <li>- Too early to assess</li> </ul>
<b>2. Increasing R&amp;D Intensity and the public RDI funding</b>	<ul style="list-style-type: none"> <li>- 2009 'Plan to increase the efficiency and effectiveness of RDI expenditure';</li> <li>- 2011-2013 National Reform Programme</li> </ul>	<ul style="list-style-type: none"> <li>- Mixed effectiveness of the 2009 Plan</li> <li>- 2011-2013 NRP effectiveness too early to assess but low probability of success given the country's economic context, structure of the economy and the dysfunctions in the RDI system</li> </ul>
<b>3. Stimulation of innovation in the private sector and increase of private investment in R&amp;D (BERD)</b>	<ul style="list-style-type: none"> <li>- National RDI programmes (e.g. 'Innovation' and 'Partnerships in Priority Domains' programmes of the 200-2013 National RDI Plan, the Core R&amp;D Programmes)</li> <li>- SOP IEC Priority Axis 2: O.211 Partnerships, O231 Spin-offs/Start-ups, O232 Private RD infrastructures, O233 Promotion of innovation in enterprises).</li> <li>- SOP IEC Priority Axis 1 (Operations 'Competitiveness Poles' and JEREMIE)</li> <li>- 2011-2013 National Reform Programme</li> <li>- - tax incentives</li> </ul>	<ul style="list-style-type: none"> <li>- Formal evaluation of the national RDI Plan currently underway</li> <li>- major dysfunctionalities in the RDI funding system</li> <li>- Tax incentives are very few, effectiveness modest</li> <li>- 2011-2013 NRP too early to assess but low probability of success given the country's economic context, structure of the economy and the dysfunctions in the RDI system</li> </ul>

<sup>30</sup> Changes in the legislation and other initiatives not necessarily related with funding are also included.

Challenges	Policy measures/actions <sup>30</sup>	Assessment in terms of appropriateness, efficiency and effectiveness
<p><b>Increase the quality, supply and demand of human resources for S&amp;T (HRST)</b></p>	<ul style="list-style-type: none"> <li>- 2011-2013 National Reform Programme</li> <li>- Programme 'Human Resources' of the 2007-2013 National RDI Plan,</li> <li>- SOP Human Resource Development</li> <li>- SOP IEC Priority Axis 2</li> </ul>	<ul style="list-style-type: none"> <li>- 2011-2013 NRP too early to assess but low probability of success given the country's economic context, structure of the economy and the dysfunctions in the RDI system</li> <li>- Low absorption of SF, dysfunctions of the RDI system</li> <li>- Important losses of skilled people, including researchers and post-docs, little probability of recovery given the low budgets for education and research</li> </ul>

The effectiveness of the potential solutions to the structural challenges identified above is in general difficult to assess because most of these solutions come in a difficult economic context, where the country is significantly weakened after several years of economic crisis, sharp RDI budget cuts that annihilated the positive effects of a few years of increasing funding prior to the crisis onset in 2008, important job losses both in the public and the private sector, and a worsening of the already difficult living standards faced by the majority of the population.

Moreover, the Romanian economy and business environment are characterized by multiple deficiencies that raise many obstacles to the successful implementation of the solutions discussed above. For example, there is a poor motivation to invest in domestic R&D and a preference for external technology acquisition. Firms are reluctant or unable to take on financial and commercial risks arising from R&D, largely because of the virtual absence of financial services and instruments to mitigate the risk (e.g. private venture capital, risk capital), etc. The venture capital market is at an early stage because of the unfavourable tax regime for private equity investments and underdeveloped domestic fund structure for private equity and venture capital<sup>31</sup>. The economy has a majority of low- to medium-tech sectors and a weak presence of knowledge-intensive, high-tech sectors. There are poor conditions for competition in the business environment and the non-competitive market behaviour and corruption are a frequent occurrence, given the weak public administration and inefficient judiciary system. The tax regime is one of the most burdensome in the world, with companies paying 113 taxes per year, accounting for nearly 45% of the firm profit and spending 222 hours per year on tax payments (World Bank, 2011). Firms, in general, and SMEs in particular, have limited financial resources and difficulty to access bank loans and public funding for RDI, especially from the EU Structural Funds, where paperwork and bureaucracy are high. There is a lack of specific innovation-oriented procurement policies and high dysfunctionalities/corruption in the implementation of the general national rules for public procurement, especially in the absorption of Structural Funds. The framework conditions for private investment in R&D, especially in terms of fiscal incentives and other financial instruments aiming to facilitate access to private finance are underdeveloped. FDI flows are distributed mainly to low- or non-R&D economic sectors and are in decline. For example, in 2008 (latest available data by sector) manufacturing industries received the bulk of FDI, followed by financial intermediation and insurance (20.5%), Construction and real estate (12.6%), Trade (12.4%), while IT and communication received only 6.7% (National Bank of Romania and National Institute of Statistics, 2008). IPR

<sup>31</sup> A recent study conducted by the European Private Equity and Venture Capital Association and KPMG ranked Romania 24<sup>th</sup> out of 27 countries surveyed in terms of tax regime for private equity investments (Vrinceanu, 2009).

regulations are unclear and have several contradictions on invention ownership, use and its transfer, creating negative views among domestic as well potential foreign investors. This calls for an update of the intellectual property legislation and protection in line with General European Standards Regarding Transparency and Invention Ownership (World Bank, 2011).

Synergies are expected between the programmes of the 2007-2013 National RDI Plan and the Structural Funds distributed through the SOP IEC, but they both present a disproportionate concentration of funding for the leaving the later innovation stages severely underfunded (World Bank 2011).

## National policy and the European perspective

Possible directions for the evolution of the current national policy mix in the short and medium term (one to three years) will likely emerge from the recommendations that will be made in the evaluation of the 2007-2013 National RDI Strategy and National RDI Plan (expected to be released in 2012), the recommendations made in the May 2011 World Bank's Functional Review of the Romanian RDI system, the provisions of the 2011-2013 National Reform Programme and the policy directions provided in the major EU innovation policy documents (Europe 2020, Horizon 2020, etc.). Three new policy directions have already been confirmed by NASR for 2012:

- Implementation of innovation vouchers (to be launched soon)
- Elaboration of a national strategy and programme regarding smart specialisation, based on the set of measures adopted by JASPERS2 in the programming period 2013-2020.
- Clarification of legislation on competitiveness poles and clusters.

The national policy mix is closely aligned with the ERA pillars and objectives, but much effort is still required in order to reduce the gap to the EU-27, as illustrated in Table 5 below.

**Table 4: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)**

	ERA dimension	Main challenges at national level	Recent policy changes
1	Labour Market for Researchers	Improve the supply and demand of researchers, increase salaries and the attractiveness of research careers, reduce brain drain, attract Romanian researchers from diaspora and foreign researchers from abroad	<ul style="list-style-type: none"> <li>- Specific provisions in 2011-2013 NRP and the 2009-2015 Strategy 'Education and Research for a Knowledge Society'</li> <li>- Significant budget cuts in 2007-2013 National RDI Plan and interruption of some funding schemes ('Ideas', 'Partnerships in priority domains' and 'Capacities'), SOP HRD Priority Axis 1</li> <li>- Involvement in two FP7 projects on EURAXESS activities: "Discover Europe" and "EURAXESS Transnational Operation of the Services Network".</li> </ul>

	<b>ERA dimension</b>	<b>Main challenges at national level</b>	<b>Recent policy changes</b>
<b>2</b>	<b>Cross-border cooperation</b>	Enhance Romanian participation in cross-border co-operation in areas with European value added	<ul style="list-style-type: none"> <li>- Involvement in programmes supporting research collaboration between national and foreign research organisations, in inter-governmental RIs, in programmes supporting individual mobility of researchers (SOP-HRD, two schemes of 'Ideas' Programme of the 2007-2013 National RDI Plan: 'Exploratory Research Projects' and 'Complex Exploratory Research Projects', bilateral cooperation programmes)</li> <li>- development of GRID and RO-GEANT networks through SOP-IEC Priority Axis 2</li> <li>- significant budget cuts and interruption of some schemes</li> </ul>
<b>3</b>	<b>World class research infrastructures</b>	Enhance Romanian participation in world-class RI	<ul style="list-style-type: none"> <li>- RI funding cuts in 2010 ('Capacities' Programme of 2007-2013 National RDI Plan)</li> <li>- Funding provided through SOP IEC PA2, O2.2.1 in five theme areas (health; agriculture and food security; energy; environment; innovative materials, products and processes) and O2.2.3 (GRID, RO-GEANT)</li> <li>- Involvement in 9 ESFRI projects and several inter-governmental RI (CERN, ESA)</li> </ul>
<b>4</b>	<b>Research institutions</b>	Prepare the methodological norms to ensure implementation of the Education Law, remove political control on academic autonomy, strengthen education and research performance of HEIs and the third mission, improve HEIs monitoring and evaluation	<ul style="list-style-type: none"> <li>- Specific provisions in Education Law no.1/2011</li> </ul>
<b>5</b>	<b>Public-private partnerships</b>	Broaden the scope and number of PPPs, improve the functioning of ReNITT, stimulate technology transfer in universities, increase demand for technology transfer from industry, strengthen university spin-off creation, improve IP regulatory framework and its application, update IP legislation, introduce a programme of early-stage technical and financial assistance to start-up firms applying innovations from Romanian R&D, encourage IP-based start-up firms.	<ul style="list-style-type: none"> <li>- Law 178/2010 on public-private partnerships</li> <li>- Funding cuts in 2010 (Programmes 'Innovation', 'Capacities', 'Partnerships in priority domains' of the 2007-2013 National RDI Plan)</li> <li>- Budget supplementing in 2011 of SOP IEC Priority Axis 2, Operation 2.3.1 – Support for innovative start-ups and spin-offs</li> <li>- Open Forum for Innovation and Technology Transfer (annual editions)</li> </ul>

	<b>ERA dimension</b>	<b>Main challenges at national level</b>	<b>Recent policy changes</b>
<b>6</b>	<b>Knowledge circulation across Europe</b>	Enhance participation of Romanian researchers in programmes supporting collaboration between national and foreign research organisations, inter-governmental RI and individual mobility of researchers, development of the GRID and RO-GEANT networks connecting Romanian R&D centres to the international networks	Significant budget cuts and/or interruption of schemes supporting these objectives (Module III of the 'Capacities' Programme of the 2007-2013 National RDI Plan, bilateral, regional and European (FP6 and FP7), EURATOM, several schemes of the Human Resources Programme, two schemes of the Ideas Programme of the 2007-2013 National RDI Plan: 'Exploratory Research Projects' and 'Complex Exploratory Research Projects', SOP IEC Priority Axis 2 (Operation O2.2.3 Development of networks of nationally-coordinated R&D centres connected to European and international networks))
<b>7</b>	<b>International Cooperation</b>	Enhance internationalisation of Romanian S&T	Bilateral collaborations with EU member states and third countries

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

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

### 1.1 Supply of human resources for research

In 2009, Romania had a total number of 19, 271 researchers (about 68% of total employees in the R&D sector), representing 36.4 researchers per 10,000 civil employed persons (National Institute of Statistics, 2011). By performance sector, the majority of researchers were concentrated in higher education (7,310 researchers, 37.93%), followed by the enterprise sector (6,127 researchers, 31.8%), government sector (5,744 researchers, 29.8%), and the private non-profit sector (90 researchers, 0.46%). By scientific field, the majority of researchers were active in engineering and technical sciences (37.65%, followed by natural and exact sciences (17.55%), social sciences (14.05%), medical sciences (13.99%), human sciences (10.09%) and agricultural sciences (6.7%) (*ibid*). The national labour market for researchers has grown continuously over the last decade, after the massive losses of the 1990s, but remains lagging behind the EU-27 level and with high dysfunctionalities between the supply and demand of researchers (see section 2, Challenge 4 for a detailed discussion on the national market for researchers).

### Transnational mobility measures

An important measure taken at national level in order to enhance transnational mobility is the implementation of the **Scientific Visa**, in application of the EC Directive 2005/71/CE regarding the admission in the EU Member States of third country citizens conducting scientific research for a duration exceeding three months (see ERAWATCH County Report 2010, p. 40 (Ranga, 2011) for details on the Scientific Visa). Romania is also involved in **two FP7 projects regarding EURAXESS activities** (“Discover Europe”<sup>33</sup> and “EURAXESS T.O.P” (Transnational operation of the EURAXESS Services Network)<sup>34</sup>) and in the **Romanian Mobility Centres Network (RoMob)**, as part of the European Mobility Centres Network<sup>35</sup>.

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

Positions in R&D activities are predominantly permanent, as temporary work is generally less usual in the country, although on the rise. Temporary PhD and post-doc positions have been funded recently through various schemes. The promotion of researchers is competition-based

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<sup>33</sup> The project, coordinated by Romania, stimulates the cooperation between mobility centres from France, Poland, Bulgaria and Romania by exchanging experience and good practices, in view of improving the services offered to foreign researchers. It also aims to enhance the overall performance of the ERA-MORE (EURAXESS) network and to stimulate cooperation between EURAXESS members on operational and strategic issues.

<sup>34</sup> The project includes Romania as Associated Partner. It aims to improve the functioning of EURAXESS centres by improving services to mobile researchers and building a dialogue with new actors, such as European mobility decision-making actors (ministries and other public authorities).

<sup>35</sup> RoMob is functional since 2005 and includes eight regional centres set up in the eight development regions of the country. The centres have dedicated staff in universities, research institutes and chambers of industry and commerce in the main cities of the country. However, the network has a relatively low visibility among researchers, domestic and foreign.

and relies on the evaluation of their professional performance in view of obtaining the title of *scientific researcher* (1<sup>st</sup> and 2<sup>nd</sup> degree)<sup>36</sup>,

A recent EC study (European Commission, 2007) estimated Romania's net yearly salary average in 2006 at €5,766 and total yearly salary average at €6,286. These levels are considerably lower than both the EU-25 average<sup>37</sup> and the Associated Countries average, of €37,948 and €34,730 respectively. Salaries vary significantly by type of institution (highest salaries are usually in National R&D institutes, which receive a large share of their income from contracts financed by NASR). Salary revenues can be supplemented with revenues from the research contracts funded from budgetary resources, within certain limits defined according to the type of activity performed within the contract (cf. [GD 327/2003](#)). The low level of salaries usually discourages the entrance into the research career<sup>38</sup>.

Four [4 Romanian institutions](#) (Alexandru Ioan Cuza University of Iași, National R&D Institute for Textile and Leather (INCDTP), University of Agricultural Sciences and Veterinary Medicine - Bucharest and the University of Medicine and Pharmacy "Victor Babes", Timisoara) signed the [European Charter for Researchers](#) (March 2005), which specifies the roles, responsibilities and entitlements of researchers as well as of employers and/or funders of researchers. Taking into account the low number of signatories, the implementation of the Charter is more the exception rather than the rule in the country.

Non-national researchers are eligible for permanent research and academic positions if they meet a set of conditions (see [http://www.dreptonline.ro/legislatie/ordonanta\\_cetateni\\_straini\\_munca\\_romania\\_56\\_2007.php](http://www.dreptonline.ro/legislatie/ordonanta_cetateni_straini_munca_romania_56_2007.php)).

The current regulation regarding the employment of foreign citizens is contained in the Emergency Ordinance no. 56/2007 on the employment and assignment of aliens in Romania, published in Official Gazette No. 424 of June 26, 2007 and the Education Law 1/2011, which does not differentiate between Romanian and foreign citizens applying for an education or research position (see Art 294/2).

Since the accession to the EU on January 1<sup>st</sup> 2007, Romania is open to the free movement of EU citizens on its territory, but third-country researchers pursuing scientific or academic activities in Romania must request an entry visa and a temporary residence permit for short-stays of max. 90 days within a period of 6 months, or a long-stay visa from the Romanian Immigration Office if their activities in Romania exceed this duration. In case of recruitment, foreign researchers need a 'work authorisation' (term replacing the previous 'work permit'), which entitles the holder to be employed on the basis of an individual labour contract, or seconded to Romania to a single employer. Third country citizens researchers coming to Romania for conducting scientific research for a duration exceeding three months must apply for a Scientific Visa (according to the EC Directive 2005/71/CE).

Foreign researchers having a legal work contract in Romania are entitled to health care insurance in the public system.

The taxation regime applicable to foreign citizens employed through a labour contract by a Romanian unit is that foreseen by the Romanian legislation and the tax provisions on wages or employment-related contributions (based on the gross salary)<sup>39</sup>.

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<sup>36</sup> Cf. Law 319/2003 on the Statute of the R&D personnel, Order of the education and research minister no. 5100/2005 (for the title of 'scientific researcher 1<sup>st</sup> degree') and Order of the education and research minister no. 5101/2005 (for the title of scientific researcher 2<sup>nd</sup> degree). The rules established through these orders apply the European Union standards. The titles are granted by NASR upon recommendation of the National Council for Certification of Academic Titles, Diplomas and Certificates.

<sup>37</sup> Romania was an Associate Country in 2006 when the study was undertaken (joined the EU on 1 Jan. 2007).

<sup>38</sup> See the [2007 EC report "Remuneration of Researchers in the Public and Private sectors" for examples of salaries in the R&D sector in Romania \(European Commission 2007\)](#).

<sup>39</sup> a) Employee contributions: pension fund 5%; unemployment fund 1%; health fund 7%; b) Employer contributions: social security fund (CAS) - 30% up to 45% depending on the sectors of activity; health fund 7%;

Research vacancies supported by public funds are internationally advertised on the Romanian website of the European Researcher's Mobility Portal [www.euraxess.ro](http://www.euraxess.ro), but the advertising is very reduced and the interest of foreign researchers for such positions is marginal, due to the unattractive work conditions. All issues related to the recognition of professional qualifications of Romanian citizens wishing to work abroad or foreign citizens wishing to work in Romania are addressed by the [Romanian Centre for the Recognition and Equivalence of Diplomas](#). The eligibility of EU researchers for the public funding provided through national funding instruments is conditional upon their employment in a Romanian institution.

The new [Education Law](#) no.1/2011 entered into force in March 2011 guarantees researchers' inter-institutional mobility and portability of grants, applying the principle 'the grant follows the researcher'. The law stipulates that portability is realized by distinct methodologies elaborated by the contracting authorities and the grant holder is publicly accountable for the grant management, according to the provisions of the contract with the contracting authority.

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

There are no specific policies and incentives in place to ensure a sufficient supply of science, technology, engineering and mathematics (post)graduates. The provision of skills through lifelong learning is very limited and is available mainly through the *SOP HRD Priority Axis 1: Education and training in support of growth and development of knowledge society* and *Priority Axis 2: Linking Lifelong Learning to labour* that are funded by the European Social Fund. Programme effectiveness is limited by a lack of synergies between lifelong learning, educational policies and the existing legal framework in the country, so that the population, especially the adult population, has difficulty in obtaining formal accreditation of skills acquired in the labour market and re-entering the formal education system. Other weaknesses are the lack of coordination between education, initial training and continuing vocational training policies, and the definition and transparency of vocational qualifications by the National Qualifications Framework.

Creativity, critical thinking, problem solving, teamwork and communication skills are not formally recognized objectives of the academic curricula. Entrepreneurship education in universities is poorly represented, and no significant change has been noted since the November 2007 study of the European Commission assessing the compliance with the entrepreneurship education objective (European Commission, 2007a). This review shows that in Romania, entrepreneurship is not an already recognised objective of the education systems and is not embedded explicitly in national framework curricula. Entrepreneurship education in universities is poorly represented, with fewer and less systematic entrepreneurship initiatives and actions taken than in other EU Member States. The [Agency for the Implementation of Projects and Programmes for SMEs](#) (formerly National Agency for the Promotion of SMEs) promotes specific entrepreneurship training schemes, such as training of potential new entrepreneurs, especially young people and women (e.g. the [START Programme for the training of young entrepreneurs](#), the [multi-annual 2005-2012 programme for the development of entrepreneurial culture in women managers in SMEs](#)) and the multi-annual [2006-2012 programme supporting SMEs' access to training and consultancy](#).

### **1.4 Promote equal treatment for women and men in research**

National regulations regarding the employment of researchers do not formally hinder the progression of female researchers in comparison with their male counterparts after career breaks. The maternity leave legislation has been changed in December 2010, giving mothers the possibility to choose between two packages of measures regarding the duration of the

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social solidarity fund (for disabled people) 3%; education fund 2%, unemployment fund 5% (selected from [www.euraxess.ro](http://www.euraxess.ro)).

maternity leave and the level of the child allowance associated to each<sup>40</sup> This change entered into force on 1 January 2011 and was associated with the commitment of the government to improve the nursery facilities in the country within one year, which are largely insufficient and underdeveloped. The restoration to the same position after maternal leave is theoretically guaranteed by law, but in practice distortions from this provision may frequently occur, e.g. a return to a different position, or with a different salary, etc. However, only half of Romanian women go on maternal leave, for fear of losing their job, because the employer doesn't accept their absence for such a long period, and because the level of the child-rearing aid is very low (Jeles, 2010).

An indirect effect of the maternity leave is the reduction of women researchers' chances for promotion based on the number of publications. The effects of maternity leave on women's research careers are not formally documented in Romania, just as there is no systematic research on women's careers, scientific excellence, productivity or payment in S&T/R&D. Gender policies in general, and in research in particular, are virtually inexistent and are not a real issue of concern in Romania, where the general belief is that women's personal choices and the 'free market' mechanisms are the main drivers regulating women's representation in different occupational fields, including S&T/R&D, or at different hierarchical levels.

## ***2. Facilitate cross-border cooperation, enhance merit-based competition and increase European coordination and integration of research funding<sup>41</sup>***

In the ERAC context, Romania participated in the activities of the Joint Programming Group devoted to preparing and consolidating the future joint programmes in the following areas: Agriculture, Food security and climate change, Water, microbial challenges, Healthy diet for a healthy life, and Healthy and Productive Seas and Oceans (NASR 2010, p. 31). National programmes are not open for funding foreign legal entities (foreign PROS, HEIs etc.). National programmes allow funding for foreign researchers provided they are employed in a Romanian R&D institution (see section 1.2 above).

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

In order to improve RIs in Romania, NASR established in April 2007 the [Romanian Committee for Research Infrastructures \(CRIC\)](#) as a strategic forum providing recommendations and advice for the long-term planning and the efficient allocation of resources necessary for RI development (see ERAWATCH Country Report 2010 for details on the CRIC mission and its **National Research Infrastructures Roadmap**).

Large investment projects for public RIs are funded on a competition basis through:

- **The 2007-2013 National RDI Plan: the Capacities Programme** is the most important instrument for RI funding, as it includes the provision that R&D investments should represent at least 80% of each project's budget. Taking into account that the 2010 budget of the Capacities Programme was about three times smaller than the necessary budget to cover the projects contracted in 2008 and 2009, the RI funding followed a different course than originally planned.

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<sup>40</sup> Cf. GD 52/2011.

<sup>41</sup> Promote more critical mass and more strategic, focussed, efficient and effective European research via improved cooperation and coordination between public research funding authorities across Europe, including joint programming, jointly funded activities and common foresight.

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

For example, in March 2010, under Module 1, which covers the funding of large RI projects, have been funded 8 large investment projects contracted in Q4 2008, with an amount of approx. EUR 59,000 (RON 247,800), while the payment for projects contracted in 2009 was temporarily ceased, following the recommendations of NASR's Commission for Large R&D Infrastructures (NASR, 2010).

- **SOP IEC Priority Axis 2:** *Operation 2.2.1 - Development of the existing R&D infrastructure and creation of new infrastructures laboratories, research centres*) covers large investments in public R&D infrastructure and focuses on five of the ten theme areas of the 2007-2013 National RDI Strategy (health; agriculture and food security; energy; environment; innovative materials, products and processes). The other five theme areas are covered exclusively by the National RDI Plan. *Operation 2.2.3 - Development of networks of R&D centres, coordinated at national level and connected to European and international R&D networks* has a small budget that covers specific investments for GRID structures and the RO-GEANT IT network (NASR, 2010).

Romania is currently involved in 9 of the 36 **ESFRI projects** (funded through Module IV of the [Capacities Programme](#)): Social Human Science (CESSDA, CLARIN), Environment (LIFEWATCH, EUROPOLAR and ERICON), Life and biomedical sciences (Biobanking and BioMolecular Resources Research Infrastructures) and Astronomy, astrophysics and particles physics (SPIRAL2, KM 3NeT (Cubic Kilometre Neutrino Telescope, FAIR, ELI). Romania's participation as founding member of the FAIR project (Facility for Ion and Antiproton Research) in Darmstadt, Germany is an important achievement. Romania is involved in the *Extreme Light Infrastructure* (ELI) project that also involves Czech Republic and Hungary<sup>42</sup> (see [www.eli-np.ro](http://www.eli-np.ro)). In April 2010, Romanian and international physicists finalised the White Chart of the most important ELI pillar that will be built in Romania will bring to Romania the most powerful laser in the world (NASR, 2010).

Romania also participates in several **inter-governmental Research Infrastructures (RI)**, such as:

- **CERN** -Romania's candidate status for accession to CERN was ratified in 2010.
- **European Space Agency** - Romania provides an annual financial contribution to ESA of €2 m (EUR 10m for the period 2007-2011), according to the Law of the Cooperation with ESA, and contributes to several ESA projects<sup>43</sup>.
- **Other inter-governmental RIs with Romanian participation** have as partners the Joint Institute for Nuclear Research Dubna, International Centre for Genetics Engineering and Biotechnology Trieste, the Treaty of Antarctica (UNESCO).

#### **4. Strengthen research institutions, including notably universities**

##### **HEIs autonomy**

The autonomy of Romanian universities is guaranteed by the Constitution and the Education Law no. 84/1995 republished in 1999. Also, the new [Education Law](#) no.1/2011 recognizes academic autonomy as one of the key principles of the national higher education system, but also adds that MERYYS "*controls the way universities exert their academic autonomy, achieve their gender and own mission and exert their public responsibility*" (Art. 118). Many universities

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<sup>42</sup> The three countries presented the 'Joint Declaration on the integrated proposal for the implementation of the Extreme Light Infrastructure project' (December 2009) concerning the joint construction of the project infrastructure on a distributed model in the three countries.

<sup>43</sup> The launch of the GOLIAT satellite, the scientific programmes related to the space telescope COROT, MARS EXPRESS and VENUS EXPRESS programmes, CLUSTER, the space probe SOHOs and GAIA, RO-KEO (Romanian Centred Knowledge Earth Observation), SPACEGRID construction of the ESEO (European Student Space Orbiter) satellite and lunar probe ESMO (European Student Moon Orbiter). Source: [http://old.cotidianul.ro/contributia\\_romaniei\\_la\\_programul\\_spatial\\_european\\_pe\\_2009-70596.html](http://old.cotidianul.ro/contributia_romaniei_la_programul_spatial_european_pe_2009-70596.html). See <http://www.rosa.ro/index.php/en/esa.html> for further info on Romanian contribution to ESA.

also subscribed to the Lima Declaration on Academic Freedom and Autonomy of Institution of Higher Education (1988), the Magna Charta of European Universities (Bologna, 1988), and joined the European University Association, the International Association of Universities and the Bologna Declaration.

The fundamental aspects of academic autonomy, such as university mission, principles, objectives, structure, organisation, activities<sup>44</sup>, operational mechanisms, etc. are defined in the *University Charter* that is approved by the University Senate. It ensures, in principle, all the three types of university autonomy: (i) **academic autonomy** b) **political autonomy** and c) **financial and managerial autonomy**). However, both the political and the financial/managerial autonomy of universities are currently considered to be negatively affected by the changes introduced by the new Education Law no.1/2011. On these grounds, the members of the 'Universitaria' Consortium - University of Bucharest, University A. I. Cuza of Iași, West University of Timișoara, University Babeș-Bolyai of Cluj-Napoca and the Academy of Economic Studies of Bucharest formally asked the Parliament in May 2010 to intervene to prevent the destruction of university autonomy in Romania<sup>45</sup>, but no changes have been made in the law. Below are just a few examples:

- **Political autonomy:** a much contested issue in the Education Law no.1/2011 is the procedure for the election of the Rector in public and private universities, which can be done in two ways (Art. 209): (1) by public competition, on the basis of a methodology approved by the University Senate; or (2) by direct and secret universal vote of all didactic and research staff and student representatives. In either case, Rector is confirmed by the Minister of Education, Research, Innovation and Sports, who also has the right to revoke the rector. This procedure has been considered to introduce a high degree of politicisation of university top leadership structures that is detrimental to university autonomy. It contrasts with the procedure practised under the previous Law, whereby the Rector was elected from and voted by the members of the Senate, and the nominations for the Rector position were made by the faculty councils or independently, by the Senate members. The Rector elected by the Senate was also confirmed by Order of the Minister of Education, but the ministry did not intervene in revoking the Rector.
- **Financial/managerial autonomy:** Art. 132 (3) of the Law mentions that in a public HEI, the government can establish and finance study programmes or faculties organizing them, provided that the respective study programmes meet a stringent need for training and professional formation in domains of national interest. The use of the 'national interest' criterion in the allocation of these funds is believed to be easily prone to misuse or abuse, first because MERYS is considered to have a weak capacity to assess labour market demand for one or another study programme that would thus qualify it as being 'of national interest', and secondly, universities could easily be hindered in creating or cancelling study programmes or faculties according to the labour market demands and requirements, and thus be limited in their freedom to use own resources.

## HEIs missions

Romanian universities have been traditionally focused on the **teaching** mission, but the increasing investments in academic research infrastructure since 1997, as well as the obligation of research activity for university accreditation since 2006 (Government Decision 1418/2006) speeded up the development of the **research** mission. At present, many universities participate in various programmes to upgrade the research infrastructure facilities,

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<sup>44</sup> Activities include: research, teaching, artistic and knowledge transfer activities, granting didactic, scientific, research and honorary titles, implement and improve own structures, establish teaching and research programmes, manage student accommodation and grant student scholarships, publish scientific works and manage own publishing houses, elect own officers according to the legal procedures, organize internal and international scientific events, cooperate with other institutions and manage own financial resources.

<sup>45</sup> <http://www.uaic.ro/uaic/bin/view/University/declaratie-universitaria>

most notably the largest university centres of the country: [University of Bucharest](#), [University „Babeş Bolyai” of Cluj Napoca](#), [University „Al.I.Cuza” of Iasi](#), [University „Politehnica” Bucharest](#), [Technical University Cluj](#), [Polytechnic University Timișoara](#). Also, many universities have established their own Research Strategies<sup>46</sup>. However, the international research performance of Romanian universities is modest, as none of them appears in the [Shanghai Academic Ranking of Top 500 World Universities](#), or in the [Times Higher Education Top 200 World University Ranking](#), or in the [Taiwan Performance Ranking of Scientific Papers for World Universities](#). The [QS World University Rankings](#) includes only four Romanian universities: the University of Bucharest Babes-Bolyai University of Cluj, [the "Gheorghe Asachi" Technical University of Iasi](#), and [‘Alexandru Ioan Cuza’ University](#) of Iasi.

On the national arena, state universities account for the country's largest share of scientific production by institution type, measured by the ratio of ISI articles per 100 staff (57.04%), according to the 2009 rankings of the "White Book of Research" produced by the [Ad Astra Association of Researchers](#).

The **third mission of universities - contribution to the local or regional wealth and economic development** - is in a very incipient stage, with only a few universities consolidating their technology transfer and commercialisation infrastructure and personnel (mostly the leading academic centres in Bucharest, Timisoara, Iasi, Brasov, etc. mentioned above). Romanian universities see themselves as teaching and research institutions, although they have a very different balance between research and teaching outcomes, e.g. one third of the universities have no doctoral programmes. No HEIs identify themselves as giving a purely professional education or as serving solely a region or a community, asserting instead their national and European vocation (ENQA, 2009). However, this perspective is likely to change in the foreseeable future, in light of the HEIs taxonomy introduced by the new Education Law no. 1/January 2011, which divides universities into three categories, on the basis of their study programmes: (1) *education-focused universities*; (2) *education and scientific research universities, or education and arts universities*; and (3) *advanced research and education universities*. The Law stipulates that the government finances excellence research programmes in all the three types of universities, which is positive for encouraging competition. However, there is a current strong reliance of public funding for education and research, which could be reduced if other funding sources, especially private and EU/international would become more important. In particular, funding arising from research commercialisation and technology transfer needs to be encouraged in a variety of ways, from strengthening entrepreneurship education in universities to promoting various forms of academic entrepreneurship, science parks, spin-off firms, venture capital and science-industry mobility schemes, etc. The successful implementation in Romania depends essentially on the clarity and coherence of the Law's methodological norms of implementation, the research funding available, and the connection between each university type and the key features of the HEIs' city/region (economic structure, human and financial resources, links with the business community, etc.) and its international visibility.

### **HEIs monitoring and evaluation**

The research performance of HEIs is monitored within a national system of **academic/research quality assurance mechanisms**. The quality assurance (QA) of national HE and research is considered by the new Education Law no.1/2011 as an obligation of the HEIs and a fundamental responsibility of MERYS. Several institutions are involved in the realisation of this objective, in collaboration with MERYS: [Romanian Agency for Quality Assurance in Higher Education \(ARACIS\)](#), , [National Council for Scientific Research](#), and

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<sup>46</sup> For example, the University of Bucharest has a Research Strategy elaborated by the University Scientific Council, and approved by the Senate, which integrates all annual institutional research programmes of the research centres. [University Babes-Bolyai of Cluj](#) has a Research Strategy entitled "Vision and principles - Strategic Plan 2008-2012" which defines five strategic research objectives aimed to increase the research performance, the socio-economic role of the university and its international visibility.

[National Council for the Certification of Academic Titles, Diplomas and Certificates](#). Also, in addition to the QA mechanisms implemented at the national level by the above institutions, many universities apply their own internal Quality Management System (QMS).

The legal framework for the national academic QA is provided by Government Emergency Ordinance 75/2005 on education quality insurance, later approved by Law 87/2006 and recently updated by the new Education Law no.1/2011. All the details regarding the evaluation and accreditation procedures are available in the ARACIS' [Methodology for external evaluation, standards and performance indicators](#), which applies QA principles to three complementary domains: institutional capacity, educational efficacy, and quality management, each with its own standards and performance indicators. The methodology has been introduced in the academic year 2006-07 and has been designed on the basis of the following key principles:

- Alignment to the European Higher Education Area (EHEA) system, institutions and quality standards;
- Institutional responsibility of each accredited university, according to the academic autonomy, institutional diversity and identity;
- Cooperation with all the education system components;
- Focus on results;
- Internal (self) evaluation and external quality evaluation;
- Continuous improvement of quality and institutional management.

ARACIS' evaluators are registered in the National Registry of Evaluators (NRE), which comprises over 1000 professors, senior lecturers, researchers from Romania and abroad, of national and international prestige, as well as students, who receive special training for this activity. The NRE evaluators are chosen from an ARACIS online database where these evaluators are registered and selected, based on the results of their scientific activity.

Within the framework of the institutional evaluation process conducted by ARACIS, [77 universities](#) have been evaluated so far. With regards to university programmes, [663 programmes](#) have been evaluated in 2011 and many others during 2006-2010 (see details at <http://www.aracis.ro/rezultate-evaluari/arhiva/>).

Based on the above brief presentation of the HE QA system, it can be concluded that the institutional framework, methodologies, personnel, etc. dedicated to these activities are relatively well developed. However, the effectiveness of these activities in terms of actual improvement of Romanian HEIs' quality and raising of their national and international profile is difficult to assess, since there has been no formal "evaluation of the evaluators" so far, there is a relatively short tradition of evaluation mechanisms, which are still in an incipient stage and have several implementation gaps, and Romanian universities still have a long way to go to be included in the top international academic rankings (although their performance of many of them has improved significantly in recent years). On the other hand, the improvement of Romanian HEIs' quality also pertains to some structural factors that take longer time to be changed. For example, a general assessment of the Romanian HE sector in 2010 (see [ARACIS, 2010](#)) presents a paradoxical image: high quality content of education and research, but low connections to the society, self-centrism and little capacity to respond to the needs of the labour market. This tension is thought to emerge from a low social implication of the HEIs, which continue to be seen as an environment for educating and training elites, rather than broader student populations, a poor degree of labour market structuring and lack of a long-term HE national strategy to guide HEIs in defining their strategies, all further worsened by the current economic crisis which deepened labour market uncertainties.

### **HEI's block funding vs. competitive mechanisms**

Block funding for HEIs is provided only for education activities, while research activities of the HEIs are funded on a competition basis. Block funds are calculated by the National Council for

Higher Education Funding (CNFIS) according to a specific set of criteria for basic and complementary funding from the state budget (see details at [http://www.cnfis.ro/index\\_f.html](http://www.cnfis.ro/index_f.html)). Private universities are self-funded, only after accreditation being entitled to receive funds from the state budget (Chioncel, 2009). HERD expenditure as percentage of GERD has increased from 0.08% in 2006 to 0.12% in 2009 and had the following distribution by financing source: 56.63% from public funds, 28.97% from university public general funds, 5.56% from economic units, 5.45 % from external funds and 0.06% from non-lucrative purposes (National Institute of Statistics, 2011). Public funds for R&D are obtained on a competition basis from public funding, especially the programmes of the **2007-2013 National RDI Plan** and **SOP IEC Priority Axis 2**, but these funding flows have been drastically reduced since 2009 as a result of the austerity budgets. External funds for R&D are obtained through the European and international cooperation programmes that Romania is involved in, as well as national or European research and educational programmes that promote collaboration between universities.

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

### **Mechanisms to facilitate partnerships and productive interactions between research institutions and the private sector**

The support systems to facilitate partnerships and productive interactions between research institutions and the private sector are weak and still in an early stage. Public-private partnerships for innovation purposes are generally very limited, due to the lack of communication, common purposes and converging interests of both public authorities and private partners. Part of this lack of collaboration was determined by unclear regulations on public-private partnerships, but the new [Law 178/2010 on public-private partnerships](#) clarifies some of these aspects. The Programme 'Partnerships in priority domains' of the 2007-2013 National RDI Plan supports public-private partnerships for solving complex problems and enhancing technology transfer.

The main structure for knowledge and technology transfer in Romania is **ReNiTT - the network of institutions specialised in technology transfer and innovation** that provide various services of technology information, counselling, training and technical assistance<sup>47</sup> to public RDI units and private firms, especially innovative SMEs. The provisional authorisation or accreditation of these institutions, as well as the audit of the institutions already accredited, continued in 2010, according to the specific methodology provided by GD 406/2003. In 2011 ReNiTT included 54 accredited entities, as follows: 14 technology transfer centres, 20 information technology centres, 16 technology and business incubators and 4 S&T Parks (Tanase, 2011). Technology transfer in universities is a relatively recent activity and only a few universities (the major universities of the country) have developed their own technology transfer offices<sup>48</sup>. The training of the necessary personnel for university technology transfer offices is usually provided by a few universities, e.g. Babes-Bolyai or the Technical University of Cluj. Technology transfer activities from universities to business firms are very limited, due to a low demand from industry and also a relatively weak offer from universities, but many universities are currently strengthening their technology transfer capacity.

University spin-off creation based on recent research results, patents or licenses is a slow process, which has been further hindered by the lack of capital and difficult access to bank financing determined by the economic crisis. **SOP IEC Priority Axis 2**, Operation 2.3.1 –

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<sup>47</sup> Technical assistance services include: technology audit and forecast, consultancy for experimental models, prototypes and intellectual protection rights, etc.

<sup>48</sup> For example, University of Bucharest has a [Department for Research and Technology Transfer](#) which ensures the management of all research contracts, while University Babes-Bolyai has a Department of Research and Programme Management, which manages the projects run within national and international programmes, and coordinates, technology transfer, patenting and IPR activities, as well as evaluation and statistics operations.

Support for innovative start-ups and spin-offs<sup>49</sup> was launched in 2008 as an open call competition and is still open, gaining momentum and having a budget supplementing in 2011. In 2010 the distribution of the operation budget among the two objectives (spin-offs and start-ups) was of 69% for start-ups and 31% for spin-offs (NASR 2010, p. 57)NASR also supports technology transfer activities through the **2007-2013 National RDI Plan ('Innovation' and 'Capacities' Programmes)**, and also by organizing annual editions of the **Open Forum for Innovation and Technology Transfer** (NASR, 2009).

### **Recent initiatives to promote and facilitate knowledge transfer**

Knowledge transfer and translation of R&D into innovation in the private sector are very slow and at an incipient stage in Romania (see World Bank (2011) for an overview of measures aimed to strengthening the technology transfer the IPR framework,. A recent initiative to support the development of the process is the project „Development of NASR’s public policy-making capacity in the field of innovation and technology transfer to ensure a sustainable socio-economic development’, approved by NASR in July 2011. This two-year project (2011-2013) is co-funded from the European Social Fund through SOP ‘Development of the Administrative Capacity’, Priority Axis 1.It aims to create a national network of innovation managers in the national and local administration and to elaborate a national technology transfer standard and database (see further details at <http://www.ancs.ro/ro/articol/2613/ancs-demareaza-un-proiect-de-elaborare-a-politicilor-publice-in-domeniul-inovarii-durabile>).

### **Ownership and exploitation of government-financed research results**

The use of R&D results obtained from projects funded by public money is regulated by [Government Ordinance 57/2002](#) (Cap. 7, Art. 75), which specifies that R&D results obtained from projects funded by public money belong equally to the legal persons who executed the projects (i.e. a university, research institute, business firm, etc.) and to the funding authority (i.e. NASR through UEFISCDI), unless otherwise specified in the project contract. R&D results obtained from projects funded by public money are managed by the legal persons who executed the project, upon agreement of the funding authority, with the exception of documentation of national interest, which will remain under the custody of the executing legal person, but are under the control of the national R&D authority (NASR)<sup>50</sup>. This implies that the financial revenues obtained from the commercialisation of publicly-funded research are managed by the legal persons who executed the research project. In case the research performer is an university, the distribution of revenues is agreed between the university administration (the technology transfer office), the department and the researcher, usually in shares of 33% each, unless otherwise agreed upon. If the research performer is an institute, a similar distribution of revenues can be established between the institute administration and the researcher.

In view of stimulating technology transfer to the economy, GD 57/2002 stipulates that business firms can receive R&D results obtained from projects funded by public money at no cost, on a

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<sup>49</sup> This operation provides funding for the creation of spinoffs implementing recent results resulted from research projects, doctoral theses of researchers employed in public R&D institutes or academics from public universities, and also supports innovative start-ups (implementing research results or a patent or other IP right) which are micro-enterprises or small firms with maximum 20 employees and no older than 3 years.

<sup>50</sup> In case of closing down, reorganisation, merging, etc. of the executing legal person, the R&D results can be taken over at no cost by the legal person taking over the activity of the executing agency, upon agreement of the funding authority. The documentation of national interest will be taken under the custody of a legal person designated by the national R&D authority and will remain under the control of the national R&D authority. R&D results obtained from projects funded by public money in the defence, public order and national security areas, can be taken over from the executing agency by central public administration bodies, on the basis of specific contractual clauses, upon agreement of the national R&D authority. The communication, in any way, of R&D results obtained from projects funded by public money, to third parties is made by the funding authority, except for scientific communications and other public dissemination activities.

contract basis. They can also receive, on a co-financing basis, an amount of maximum 20% of the total expenses incurred by the application of these results. The contract regulating this transfer will include specific clauses regarding the intellectual property regime and custody of the R&D results received. Free technology transfer to economic agents is also possible, if approved by Government Decision upon proposal of the line ministry. The contract between the beneficiary economic agent and the executing agency will specify confidentiality and IP protection clauses.

### **Researchers' inter-sectoral mobility**

Inter-sectoral mobility between public and private institutes is very limited due to a poor culture of collaboration between the public and the private sectors, as well as obstacles on the administrative regulations with regard to transferability of funds, coverage of expenses, etc., usually very narrowly focused on own workplace. Two public funding instruments include provisions for supporting partnerships between research institutions and SMEs: the **'Innovation' and 'Partnerships in Priority domains' programmes of the 2007-2013 National RDI Plan, and SOP Increasing Economic Competitiveness, Priority Axis 2** (O.2.1.1 "R&D projects in partnership between universities/R&D institutes and enterprises", O.2.3.3 "Promotion of innovation in enterprises", and O.2.3.1 "Support for innovative start-ups and spin-offs").

### **Business sector involvement in the governance of Universities and PROs**

Business people are not eligible for the higher governance positions of HEIs and PROs (rector, general manager). The Rector is elected from among the members of the university Senate, and the General Manager of a PRO must have an R&D background. There is no information available about the involvement of business people in the administration boards of HEIs and PROs.

## ***6. Enhance knowledge circulation across Europe and beyond***

Cross-border co-operation in areas with European value added is supported through several public funding instruments:

- **Programmes supporting research collaboration between national and foreign research organisations.** These are programmes funded through Module III of the 'Capacities' Programme of the 2007-2013 National RDI Plan: bilateral, regional and European Framework Programmes (FP6 and FP7) and EURATOM.
- **Programmes supporting participation of national teams in projects involving inter-governmental Research Infrastructures (RI):** see section 3 above.
- **Programmes supporting individual mobility of researchers:** several schemes of the [Human Resources Programme](#)<sup>51</sup> and two schemes of the [Ideas Programme](#) of the [2007-2013 National RDI Plan](#): ['Exploratory Research Projects'](#) and ['Complex Exploratory Research Projects'](#), as well as bilateral cooperation programmes that support short stays of researchers related to a joint project.

The most important measures supporting the development of a sustainable, efficient and effective European scientific information system and enhance open circulation of knowledge across national borders is the development of the GRID and RO-GEANT networks connecting Romanian R&D centres to the international networks. This measure is funded through SOP

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<sup>51</sup> For example, [Projects supporting the mobility of researchers; Projects supporting the mobility of PhD candidates, Post-doctoral research projects, Research projects for stimulating the formation of young independent research teams, Research projects to stimulate the return to the country of researchers working abroad, Complex projects for the reintegration of researchers; Research scholarships 'Stefan Odobleja'](#).

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

The internationalisation of Romanian S&T is a major policy priority of the 2007-2013 National RDI Strategy, which encourages a greater international visibility of Romanian S&T, but no specific strategy for international cooperation exists at the moment. Bilateral cooperation is conducted on the basis of bilateral agreements.

In 2010, Romania conducted bilateral collaborations within two- and three- year programmes with nine EU member states (Bulgaria, Slovenia, Slovakia, Hungary, France, Germany, Austria, Cyprus, Belgium-Wallonia) and six third countries (Turkey, South Korea, Republic of Moldova, India, Japan, South Africa) and initiated negotiations in view of concluding collaboration agreements with Israel, Belarus, Indonesia, Ukraine, Vietnam and Armenia. The collaboration agreements with third countries is based on several criteria, such as long-term partnerships (China, Moldova), geographic proximity (Moldova, Armenia, Ukraine), importance of research fields (Japan, South Korea, India, Israel), partnerships with emerging countries (Turkey). During 2008-2010, a number of 162 bilateral cooperation projects have been performed. By research field, most projects were conducted in 'Innovative materials, processes and products', 'Basic sciences' and 'Environment', while by institutional type, the most frequent partners were universities and R&D institutes.

The projects have been supported by Module III of the Capacities Programme of the 2007-2013 National RDI Plan. In 2010, the funding allocated for bilateral projects amounted to about € 715,000 - a reduced amount due to the budget cuts of 2010, which was allocated only to mobility within projects concluded in 2009 and 2010. In addition to the mobility funds, some additional funding was allowed for bilateral projects within the new funding rules of Module III introduced in 2010, in the form of a salary for one researcher per project, purchase of small equipment and organisation of seminars (NASR, 2010).

The rules regulating the national collaborations with third countries are those specified in the national legislation and the provisions of the bilateral/international agreements that serve as basis for the collaboration. There are no specific research fields prioritised for the inter-sectoral and cross-border knowledge circulation apart from the nine research fields prioritised by the 2007-2013 National RDI Strategy (ICT, energy, environment, health, agriculture and food, biotechnologies, innovative materials, processes and goods, space and security, and socio-economic and humanistic research). The research projects performed within these priority areas address the Grand Challenges implicitly, without an explicit reference or policy intervention in that direction.

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## List of Abbreviations

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BERD	Business Expenditures for Research and Development
CCCDI	Consultative council for Research Development and Innovation
CERN	European Organisation for Nuclear Research
CNCS	National Council for Scientific Research
CNDI	National Development and Innovation Council
COST	European Cooperation in Science and Technology
CRIC	Romanian Committee for Research Infrastructure
ELI	Extreme Light Infrastructure
ERA	European Research Area
ERA-NET	European Research Area Network
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
ESMO	European Student Moon Orbiter
EU	European Union
EU-27	European Union including 27 Member States
EURATOM	European Atomic Energy Community
FDI	Foreign Direct Investments
FP	European Framework Programme for Research and Technology Development
FP	Framework Programme
FP7	7th Framework Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
HRST	Human Resources for Science and Technology
INCDTP	National R&D Institute for Textile and Leather
IP	Intellectual Property
IPR	Intellectual Property Rights
IRE	Innovation Regions in Europe
IT	Information Technology
IUS	Innovation Union Scoreboard
JASPERS	Joint Assistance to Support Projects in European Regions
KIA	Knowledge Intensive Activities
MERYS	Ministry of Education, Research, Youth and Sports
MRDI	Ministry of Regional Development and Tourism
NRP	National Reform Programme
NSRF	National Strategic Reference Framework
OECD	Organisation for Economic Co-operation and Development

OSIM	National Office for Inventions and Trade Marks
PCT	Patent Cooperation Treaty
PRO	Public Research Organisations
R&D	Research and development
R&D	Research and Development
RDI	Research Development and Innovation
RI	Research Infrastructures
RIS	Regional Innovation Strategies
RSA	Revealed Scientific Advantage
RTDI	Research Technological Development and Innovation
S&T	Science and technology
S&T	Science and Technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
UEFISCDI	Executive Unit for Financing Higher Education, Research Development and Innovation
VC	Venture Capital

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#### Abstract

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

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

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

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.



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