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Executive Summary

Romania is the 7th largest country in the EU (after Germany, France, UK, Italy, Spain and Poland) with a population of 21.47 million inhabitants on 1 July 2009 (National Institute of Statistics, 2010), which accounts for approx. 4.3% of the EU population (495.1 million). The GDP growth rate fell dramatically from 7.3% in 2008 to -7.1% in 2009 ([Eurostat](#)), as a consequence of the economic crisis that hit Romania at the end of 2008, following the sharp decline of the three key factors that generated economic growth in the previous years: exports, internal demand, broadly financed by external debt, and FDI.

The RDI sector was seriously affected by the budget cuts induced by the economic crisis: after a notable increase from 0.45% in 2006 to 0.52% in 2008, GERD expenditure relative to the GDP went down to 0.47% in 2009 ([Eurostat](#)), reversing the estimated growth to 1% of the GDP by 2010 that was approved by the government in pursuance to the Lisbon Agenda target. Consequently, the public funding for national RDI programmes managed by the National Authority for Scientific Research (NASR) dropped by 27.6% in 2009 ([NASR, 2009](#)) and had vast negative consequences (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.) that annihilate the improvements of the few previous years with increased RDI funding. Also, approx. 30% of the research infrastructure investment planned for 2007-2009 was cancelled because of the budgetary limitations at the end of 2008 ([NASR, 2009](#)). In 2010, the effects of the economic crisis continued to be felt, so that the public R&D expenditure increased only by 8.6% relative to 2009, getting closer to the values of 2008, but remaining still considerably lower than the funding planned in the 2007-2013 National RDI Plan ([NASR 2010](#)).

Innovation activities, which had a very low profile in the country's economy already before the crisis, have declined further since 2009, because of the reduction of public funding channelled through the Innovation Programme of the 2007-2013 National RDI Plan, and the reduction of the already low private RDI investment. The declining RDI funding stimulated the interest of private firms for EU Structural Funds, especially Priority Axis 2 of the Sectoral Operational Programme 'Increasing Economic Competitiveness', which supports RDI activities. Although this effect could, in principle, be considered as a positive development that would, in principle, boost the low absorption rate of Structural Funds for RDI, in practice, it did not make a significant difference in terms of providing additional funding, because of other limiting factors, both at the beneficiary level and at the programme implementation level. For example, the firms' relatively poor capacity to prepare, submit and manage proposals, the difficulty to provide the co-financing share required by most operations, because of very limited access to bank loans and lack of other capital sources, technical implementation difficulties, systemic corruption and political allocation of contracts were among the major constraints. Moreover, as the first intermediary evaluation of most Sectoral Operational Programmes performed in 2009 showed, many contracts have been cancelled shortly after the project start at the beneficiary's request, because of the impossibility to ensure the co-financing share and a steady funding flow for the project duration.

Under these circumstances, an important policy change adopted in 2009 was NASR's funding re-prioritization to four main directions: (i) payment of international organizations membership fees (FP7, EURATOM, CERN, Dubna, etc); (ii) maintaining the research capacity of National R&D institutes by providing a 30% increase of their Core R&D programme budgets (the Core R&D programmes are developed by the National R&D institutes on annual or multiannual periods, according to the priorities of the National RDI Strategy in their respective fields, to support their specific medium- and long-terms strategies. They are a form of institutional funding that is allocated competitively among the institutes, but not by open competition) in order to help them retain the R&D personnel, especially the young researchers specialised abroad; (iii) freezing of new competitions under the National RDI programmes and adoption of a '*Plan to increase the efficiency and effectiveness of RDI expenditure*' that became operational in 2010; and (iv) increasing the absorption of Structural Funds. A positive development was the approval by the Ministry of Finance of NASR's initiative to modify the Fiscal Code in order to increase the proportion of firms' deductible expenditure for R&D of firms from 100% to 120% ([NASR, 2009](#)). These measures were meant to limit the important losses in the RDI system, but their effect has been modest.

Romania's RDI system has a complex structure, organized on several levels, from Parliament to RDI performers. The governance structure put in place for the design and implementation of RDI policies is relatively stable, but its large size and multi-level structure often create important gaps in the horizontal and vertical coordination and communication between the actors, as well as policy and implementation incoherencies. RDI policies are recognised as a priority of the 2009-2013 Government programme, but in reality they have little visibility and importance in the overall government policy, the RDI sector being one with the lowest public budgets and subject to one of the sharpest funding cuts in 2009, as a result of the economic crisis.

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 National Strategy is structured around six specific themes, similarly to the EU FP7: People, Capacities, Ideas, Partnerships in priority domains, Innovation and institutional performance, which have specific objectives that aim to consolidate the "Romanian Research Area" and facilitate integration into the ERA. The National Strategy and its implementing instrument, the *2007-2013 National RDI Plan*, were elaborated through a broad consultation with the main RDI stakeholders, within the first national foresight exercise in S&T organized in 2005-2006 by NASR within its Sectoral R&D Plan.

RDI funding instruments in Romania are both direct and indirect, with a strong reliance on the former and a poor development of the latter. *Direct instruments* include: the 2007-2013 National Plan for R&D and Innovation (with its six programmes: Human Resources, Capacities, Ideas, Partnerships in Priority domains, Innovation, and Sustaining institutional performance), the complementary Core R&D Programmes and Sectoral R&D Plans, as well as several Sectoral Operational Programmes that address RDI objectives: Increasing Economic Competitiveness (Priority Axes 1 and 2), Regional Development (Priority Axis 4) and Human Resources Development (Priority Axes 1 and 3). These programmes are open competition-based and address public and private RDI performers (national R&D

institutes, public R&D organisations, academic research centres, business firms with R&D activities, etc.). *Indirect instruments* are poorly represented at present by only a few tax incentives and some deductible costs under the Fiscal Code. Although the necessity to develop them has been raised in several recent policy documents, the strong strains on the public budget caused by the economic crisis stifled any attempt to realize this objective.

Romanian BERD relative to the GDP over the last 5 years was relatively stable in the period 2005-2007, at approx. 0.22% of the GDP, but dropped to 0.17% in 2008 and further to 0.15% in 2009, as a consequence of the economic crisis ([Eurostat](#)). The same trend was observed in the evolution of the Romanian BERD relative to the EU27 average: from approximately 0.18% of the EU27 average in 2005-2007, to 14% in 2008 and further to 11.7% in 2009, increasing even more the existing gap to the EU27 (own calculations based on [Eurostat](#) data). These low levels reflect the poor RDI capacity of domestic firms, which is determined by several reasons: poor motivation to invest in domestic R&D and preference for external technology acquisition, incomplete restructuring of the business sector, traditional structure of the economy, with low emphasis on knowledge-intensive sectors, limited own financial resources and difficulty to access bank loans, virtual inexistence of private venture capital, burdensome tax regime, etc. The success of the current policy mix in increasing private R&D investment is very modest taking into account the declining BERD levels since 2007, and was further reduced by the financial limitations induced by the economic crisis. Several key initiatives to stimulate private RDI investment are expected to start in 2011 (e.g. the elaboration of a National Innovation Strategy and four foresight studies in nanotechnologies, services, green energy and cell therapy to assess Romania's potential to participate in EU and other international programmes in these fields). Some of the key barriers to increasing private R&D investment include: high bureaucracy and paperwork required for accessing public RDI funding, especially Structural Funds, lack of innovation-oriented public procurement policies and dysfunctional implementation of the existing general public procurement regulations, ineffective and politically-subordinated regulatory authorities, failure to tackle non-competitive market behaviour, poor fiscal incentives and other private financial instruments, rudimentary and ineffective fiscal system, weak R&D and innovation capacity in the business sector, poor entrepreneurship incentives, limited business infrastructure, weak public administration, systemic corruption and subordination to political interest.

Knowledge triangle

The effectiveness and complementarities of mechanisms in place to coordinate research, education and innovation policies - the Knowledge Triangle - are highly variable across policy levels and policy areas, with the most significant achievements in the research area, while the education and innovation sectors have been catching up more slowly. This is the reflection of the traditionally stronger R&D dimension of the Romanian RDI system, in contrast to the innovation dimension that has only started to be developed over the last two decades or so. The education sector has been subject to several stages of the reform initiated in the 1990s and is continued up to present (e.g. a new Education Law was passed in March 2011), but suffered the consequences of a lack of vision, incoherent approaches and incomplete restructuring. The main policy changes, strengths and weaknesses of research, innovation and education policy are summarised in the table below.

Effectiveness of knowledge triangle policies

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	<ul style="list-style-type: none"> • Adaptation of funding priorities to the reduced R&D budget in 2009: main focus on support to R&D capacities in R&D institutions of national interest, payment of membership fees in international programmes and organizations, freezing of new competitions under the national RDI programmes, increasing the absorption of Structural Funds; • Functional competitions for the SOPs with RDI objectives. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Comprehensive, coherent multi-annual National RDI Strategy and RDI Plan, established by large consultation of the S&T and business communities and SWOT analysis; • The target of 1% of GERD/GDP set for 2010 generated significant increase of R&D public expenditures in 2007 and 2008, but dropped in 2009 as a consequence of the economic crisis; • Broad range of funding schemes in the National RDI Plan and complementary programmes for development of R&D capacity in public and private R&D institutions, universities and private firms, human resources for S&T/R&D, science-industry linkages and international cooperation (Note: policy impact not assessed yet, as formal programme evaluations are expected in 2011); • Broad range of R&D objectives financed through the SOPs with R&D focus (SOP IEC, ROP, HRD); • Specific measures for support of research infrastructures; • Competition as predominant funding mechanism and instrument to enhance scientific excellence; • Periodic evaluation at institutional, programme and project levels based on international criteria, introduction of new evaluation procedures, agencies, methodologies, improvement of existing ones; • Long tradition in some R&D fields. <p>Weaknesses:</p> <ul style="list-style-type: none"> • R&D commitments too sensitive to political and economic context. Drastic 2009 R&D budget cuts with long-term consequences; • Little visibility and importance of R&D policies in the political decisions, especially those related to funding; • Lack of regional R&D policies, poor regional outreach of NASR; • Strong regional disparities in the distribution of R&D resources between the capital and all the other regions; • Low absorption of R&D funds available through the SOPs; • Low BERD, strong dependence of BERD on public funding, weak science-industry links and inter-sectoral mobility, low interest of business community to collaborate with the scientific community, weak industry R&D capacity; • Low attractiveness of R&D careers, high losses of qualified researchers and postgraduates through brain drain and internal migration to better paid domestic sectors; • Incoherent approach between R&D policies/strategies and other national policies/strategies (education, employment, IT, energy, environment, regional development).

	Recent policy changes	Assessment of strengths and weaknesses
Innovation policy	<ul style="list-style-type: none"> • Preparation of a National Innovation strategy. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Establishment of a basic support structure for innovation - the national network for technology transfer and innovation ReNITT and sustained measures to develop it (evaluation, accreditation, monitoring). <p>Weaknesses:</p> <ul style="list-style-type: none"> • Little visibility and importance of innovation policies in the political decisions; • Lack of an innovation-based economic development strategy at national and regional level; • Ineffectiveness and incoherence of regional innovation strategies (RIS), poor implementation capacity of the RIS by the RDAs and poor vertical coordination between central and local authorities managing the RIS, lack of synergies between the RIS and the national RDI strategy, lack of synergies between the six RIS, poor inter-regional linkages in RIS implementation; • Poor innovative capacity of industry, low innovation culture, technological renewal mostly based on acquisition of foreign technologies, products, services rather than on the domestic offer or development of in-house R&D capacity; • Industry structure dominated by traditional manufacturing and processing industries, low share of new, knowledge-intensive technologies, slow pace of industry restructuring affecting the knowledge demand of the business sector; • Limited access to capital (bank loans), absence of venture capital schemes for R&D and innovation, difficulty to participate in innovation support schemes that require co-financing by the beneficiary; • Poor availability of training programmes for technology transfer personnel; • Lack of incentives for innovative enterprises.

	Recent policy changes	Assessment of strengths and weaknesses
Education policy	<ul style="list-style-type: none"> • New Education Law project under Parliament debate, highly controversial due to some provisions thought to affect university autonomy and politicize the higher education sector. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Broad range of support measures for R&D in HE in several programmes of the National RDI Plan and the SOPs with RDI objectives (SOP IEC, HRD); • Support for HE reform and restructuring programmes through SOP HRD Priority Axis 1 (quality and leadership in HE, doctoral schools, excellence schools); • Introduction of external and internal quality assessment procedures in many universities; • Efforts to increase research capacity and technology transfer in universities, elaboration of university research strategies; • Important institutional renewal in education-related fields (evaluation, accreditation, equivalence of diplomas). <p>Weaknesses:</p> <ul style="list-style-type: none"> • Incomplete and often incoherent reform of education sector; • Low attractiveness of HE careers, low salaries; • Poor links between education policies, especially HE policies, and RDI and employment policies, accelerating the high losses of HRST; • Poor lifelong learning activities and adult participation in education and training; • Poor entrepreneurial education, especially in universities; • Strong regional disparities in the distribution of universities, students, teaching staff between the leading university centres (e.g. Bucharest, Iasi, Cluj) and the rest of the country.
Other policies	<ul style="list-style-type: none"> • Austerity measures adopted in view of rebalancing the budget (25% cuts in public sector salaries, significant reductions and cuts of public subsidies, VAT increase to 24%, freezing of hiring in the public sector). 	<p>Weaknesses</p> <ul style="list-style-type: none"> • General business environment conditions affected by poor public administration, high bureaucracy, systemic corruption and subordination to political interests, limited use of e-services in public administration; • Gaps in the public-private partnerships legislation, unclear existing provisions; • Low enforcement of and corruption in the implementation of public procurement legislation and procedures.

European Research Area

ERA and ERA-related policies are extremely important in national research policies and strategies as a way to accelerate trans-national learning and the integration of the Romanian RDI community in the ERA and international RDI networks. Also the Structural Funds for RDI allocated through the Sectoral Operational Programmes mentioned above are an important source of funding that might compensate for the declining national resources, but the overall degree of absorption of these funds remains low. The poor capacity of the government to manage the Structural Funds and its poor performance in general, have become a matter of concern for the European Commission, which has considered the appointment of a EU representative as a minister without portfolio in the government, in charge with supervising the management of the Structural Funds. The main challenges for the

national RDI system in relation to ERA are underinvestment, in terms of both public and private RDI funding, and degradation of the national RDI system, high losses of qualified S&T resources (not only professional researchers, but also students and graduates), weak science-industry linkages, low R&D and innovation capacity of industry, poor incentives for innovation and innovative enterprises. The main characteristic of the national measures/policies supporting the strategic ERA objectives are summarised in the table below.

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

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
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	<ul style="list-style-type: none"> Funding opportunities provided by the National RDI Plan programmes (Human Resources, Ideas, People) and SOP HRD for young researchers, mobility of researchers, PhD students, Romanian researchers working abroad, restructuring of doctoral programmes and formation of excellence schools Evaluation and accreditation of public and private universities, both at institutional level and at study programme level Evaluation and accreditation of public R&D institutes Changes in the maternity leave law to be enforced from 1 January 2011 	<ul style="list-style-type: none"> Poor synergies between education, RDI and employment policies High losses of qualified HRST through brain drain and internal migration towards better paid domestic sectors National RDI programmes highly focused on Romanian researchers. Open to foreign researchers but unattractive, given the low salaries and unappealing working conditions Absence of gender policies to stimulate participation and retention of female scientists and researchers Low salaries in research and higher education
2	Increase public support for research	<ul style="list-style-type: none"> Cuts in the public budget for RDI in 2009, freezing of some competitions under the National RDI Plan Important funding opportunities through the Structural Funds, but low absorption rate 	<ul style="list-style-type: none"> Short-term and long-term effects of the 2009 public funding cuts, annihilating the improvements of the recent years that benefited from increased public RDI funding
3	Increase European coordination and integration of research funding	<ul style="list-style-type: none"> Participation in several European RTDI initiatives National participation in intergovernmental organisations and schemes 	<ul style="list-style-type: none"> Broad range of policy instruments to support participation in European RTDI programmes Strong reliance of public funding instruments
4	Enhance research capacity across Europe	<ul style="list-style-type: none"> Development of Regional Innovation Strategies in six development regions since the early 2000s Elaboration of the National Research Infrastructure Roadmap (2007) 	<ul style="list-style-type: none"> Broad range of policy instruments to support participation in European RTDI programmes

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	<ul style="list-style-type: none"> • Elaboration of the National Research Infrastructures Roadmap, creation of the Romanian Committee for Research Infrastructures (2007); • National participation in the ESFRI roadmap 	<ul style="list-style-type: none"> • Multi-annual funding for the National Research Infrastructure Roadmap through the National RDI Plan (Capacities Programme) and SOP IEC Priority Axis 2 • Cancellation of approx. 30% of the research infrastructure investment planned for 2007-2009 because of the budgetary limitations occurred at the end of 2008
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> • Competitive and institutional support trough the National RDI Plan, Core R&D Programmes and Sectoral R&D Plans; • Competitive funding through SOP IEC Priority Axis 2 • Implementation of university research strategies and strengthening of research capacities • Evaluation and accreditation of R&D institutions and universities 	<ul style="list-style-type: none"> • Concentration of R&D potential in National R&D institutes and other public R&D institutions. HEIs traditionally focused on the education mission, but increasingly consolidating the research mission and, in some cases, the 'third mission' of research commercialization. Poor research capacity in business firms
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> • Cuts in the public funding for RDI and adoption of survival strategies rather than development and expansion ones 	<ul style="list-style-type: none"> • Low private RDI investment and many obstacles to increasing it
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> • Important funding opportunities provided by the National RDI Plan programmes and SOP IEC Priority Axis 2 	<ul style="list-style-type: none"> • Weak public-private partnerships (PPP), low culture of collaboration • Unclear PPP legislation, with many gaps • Technology and knowledge transfer mechanisms still in early development stage
9	Enhance knowledge circulation across Europe and beyond	<ul style="list-style-type: none"> • Important funding opportunities provided by the National RDI Plan programmes, SOP HRD, bilateral and international cooperation agreements, participation in EU RTDI initiatives • Adoption of the Scientific Visa 	<ul style="list-style-type: none"> • Expansion of international mobility of Romanian researchers

	ERA objectives	Main national policy changes	Assessment of strengths and weaknesses
10	Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world	<ul style="list-style-type: none"> • Elaboration of the National Strategy for International Cooperation within a project under NASR's Sectoral Plan, in 2009 • Important funding opportunities for international cooperation through National RDI Plan (Capacities Programme) • Creation of the Romanian Office for S&T in Brussels, as support body to MERYS by the European Commission 	<ul style="list-style-type: none"> • Relatively low visibility of Romanian research in international cooperation • Low level of funding attracted from international cooperation projects
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> • Revival of the Interministerial Council for S&T Policy (foreseen for Q4 2010-2011) 	<ul style="list-style-type: none"> • Poor horizontal and vertical coordination across policy levels and areas, poor communication between NASR and other agencies involved in RDI
12	Develop and sustain excellence and overall quality of European research	<ul style="list-style-type: none"> • Important funding opportunities through SOP HRD for the restructuring of doctoral schools and establishment of excellence schools 	<ul style="list-style-type: none"> • Evaluation of university research quality
13	Promote structural change and specialisation towards a more knowledge-intensive economy	<ul style="list-style-type: none"> • Important funding opportunities through National RDI Plan programmes and SOP IEC Priority Axis 2 	<ul style="list-style-type: none"> • Low presence of knowledge-intensive industries in the economy structure • Shortage of qualified personnel in knowledge-intensive industries caused by brain drain
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> • Funding opportunities through the National RDI Plan 	<ul style="list-style-type: none"> • Low contribution of RDI to major societal challenges and sustainable development
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> • No specific schemes 	<ul style="list-style-type: none"> • Low visibility and importance of RDI in society

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1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the '**interlinkage**' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the '**interlinkages**' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

Romania is the 7th largest country in the EU (after Germany, France, UK, Italy, Spain and Poland) with a population of 21.47 million inhabitants on 1 July 2009 (National Institute of Statistics, 2010), which accounts for approx. 4.3% of the EU population (495.1 million). The GDP growth rate fell dramatically from 7.3% in 2008 to -7.1% in 2009 (Table 1 in Annex 1), following the sharp decline of the three key factors for economic growth: exports, internal demand, broadly financed by external debt, and

FDI The RDI sector was seriously affected by the budget cuts induced by the economic crisis: GERD expenditure relative to the GDP went down from 0.58% in 2008 to 0.47% in 2009 ([EUROSTAT](#)), reversing the estimated growth to about 1% of the GDP by 2013 that was approved by the government in pursuance to the Lisbon Agenda target. The distribution of GERD by sector of performance shows a leading position of the Government (54.9% of total GERD), followed by the Business Enterprise and Higher Education sectors with 34.8% and 1.9% of total GERD, respectively (2009 data) ([EUROSTAT](#)).

Romania's RDI system has a complex structure and performs several functions, as described below. It is organized on several levels, which are relatively stable, but its large size and multi-level distribution often create significant incoherencies in policy-making and implementation, and gaps in the horizontal and vertical coordination and communication between the actors. Although RDI is recognized as a priority of the 2009-2013 government programme, RDI policies have little visibility and importance in the overall priorities of the government. The structure of the Romanian RDI system has been described in detail in the 2009 ERAWATCH Country Report (see Chioncel, 2009 section 2.1) - below is a brief overview of the key institutions by organizational level and changes occurred in 2009-2010:

1. At Parliament level: the [Commission for Education, Science, Youth and Sport of the Senate](#) and [the homonymous commission of the Chamber of Deputies](#) debate and approve draft laws and other legal documents on science, education, sport and youth.

2. At government level:

- [The National Council for Science and Technology Policy](#) is the government's high-level policy coordination body that sets the National RDI Strategy priorities and legislative framework, in line with the government programme and sectoral strategies, and in consultation with key stakeholders (local and central public administration bodies, higher education organisations, R&D institutes, economic agents, employers' federations and labour unions, etc). It was established in 2003 by [Prime Minister's Decision 2/6.01.2003](#) that also defines its structure.
- The [Ministry of Education, Research, Youth and Sport \(MERYs\)](#) is the key actor in education and RDI. The RDI objectives and policies of the 2009-2012 Government Programme are formulated and implemented by the [National Authority for Scientific Research \(NASR\)](#). MERYs collaborates with other ministries¹, which have only a very limited role in RDI activities, arising from the coordination exerted on some national R&D institutes², participation in the National Council for S&T

¹ Ministry of Economy, Trade and Business Environment; Ministry of Public Finances; Ministry of Regional Development and Tourism; Ministry of Agriculture and Rural Development; Ministry of Environment and Forests; Ministry of Communications and Information Society; Ministry of Transport and Infrastructure; Ministry of Labour, Family and Social Protection; Ministry of Health; Ministry of Administration and Home Affairs.

² The Ministry of Economy, Trade and Business Environment coordinates ten National R&D institutes, the Ministry of Regional Development and Tourism – three, the Ministry of Communication and Information Society – two, the Ministry of Labour, Family and Equal Opportunities – two, the Ministry of Health – two, the Ministry of Environment and Forests – three, the Ministry of Agriculture and Rural Development – six. The coordination is based primarily on financing the Sectoral R&D Programmes proposed by some national R&D institutes for the technological development of the respective sectors, or the validation of the Core R&D Programmes developed by some national R&D institutes in order to support their specific medium- and long-terms strategies.

Policy, management of some Sectoral Operational Programmes³, consultations on the role of R&D in the respective sectoral strategies (e.g. IT, energy, environment). In addition, MERYS also collaborates with a few government-subordinated agencies that have specific functions related to R&D and innovation, such as the [National Institute for Statistics](#), [National Commission for Prognosis](#) (subordinated to the Ministry of Finances) and the [Agency for the Implementation of Projects and Programmes for SMEs](#), which was created in 2009 by GD 65/2009 on the basis of the former National Agency for SMEs, subordinated to the Ministry of Economy, Trade and Business Environment.

3. **At MERYS level:**

a) **Consultative bodies to MERYS:** [Consultative Board for Research, Development and Innovation](#), [National Council for Ethics](#), [National Council for Research in Higher Education Institutions](#), [Romanian Committee for Research Infrastructures \(CRIC\)](#) and the [Innovation Council](#).

b) **Funding/Coordination agencies within MERYS:** In 2010, the [Executive Unit for Funding Higher Education, Scientific Research, Development and Innovation \(UEFISCDI\)](#) was created by [Government Emergency Ordinance 74/2010](#), merging the activities of the former National Centre for Programme Management (CNMP), Executive Unit for Funding Academic Research (UEFISCU) and Managerial Agency for Scientific Research, Innovation and Technology Transfer (AMCSIT - Polytechnic University). UEFISCDI coordinates several 2007-2013 National RDI Plan programmes (Human Resources, Ideas, Partnerships in Priority Domains, and Innovation), designs and implements nationally or internationally funded institutional development projects in higher education and RDI, provides consultancy and technical assistance for internal and international research and innovation programmes, and ensures the executive activity of several national councils for higher education and research. Another funding/coordination agency is the [Institute of Atomic Physics](#), which coordinates the funding for FP7 EURATOM and Extreme Light Infrastructure (ELI) projects.

c) **Other support structures to MERYS:** [Romanian Office for Science and Technology \(ROST\)](#).

4. **Other national institutions involved in R&D policy-making:** [Romanian Academy](#)⁴, the [Academy of Medical Sciences](#)⁵, the [Academy of Agriculture and Forestry Sciences](#)⁶, Academy of Technical Sciences (AST).

5. **National agencies coordinating strategic areas:** [Romanian Standards Association \(ASRO\)](#), [Romanian Association for Accreditation \(RENAR\)](#), [Nuclear Agency](#) and [Romanian Space Agency \(ROSA\)](#)

6. **RDI organizations:**

³ E.g. SOP Increasing Economic Competitiveness (where the Management Authority is the Ministry of Economy, Trade and Business Environment and NASR is an Intermediate Body) and SOP Regional Development (where the Management Authority is the Ministry of Regional Development and Tourism).

⁴ Romanian Academy operates through 13 scientific divisions specialised in technical sciences, basic sciences and socio-humanistic sciences. It has its own national network of 66 research institutes and centres, which participate in national RDI programmes and can initiate and coordinate research projects of national impact.

⁵ Coordinates 23 institutes and research centres, as well as 12 clinics affiliated to medical universities.

⁶ Coordinates a network of 25 institutes and research centres, and 91 research and production units.

- 264 public R&D institutions:
 - 168 R&D institutions of national interest: 46 national R&D institutes, 56 accredited public universities (with 742 faculties) and 66 institutes and research centres of the Romanian Academy (52 institutes, 14 research centres);
 - 32 accredited private universities;
 - 17 institutes and agricultural R&D centres and 51 R&D stations of the Academy of Agricultural and Forestry Sciences "Gheorghe Ionescu-Sisesti".
 - approx. 2000 organizations with R&D activities, of which approx. 850 in the private sector (NASR, 2009).
- 7. The network of specialised technology transfer and innovation institutions (RENITT)**, which included in 2010 47 specific entities (13 technology transfer centres, 19 technology information centres, 15 technology and business incubators) as well as 4 S&T Parks (NASR, 2010).
- 8. R&D personnel**: R&D personnel at the end of 2009 was 42,420, of which 30,645 (72.2%) researchers, and 14,916 PhDs, of which 43.6% were women. The largest share of the R&D personnel is specialised in technical and engineering sciences (14,381 researchers, 46.9%), followed a distance behind by natural and exact sciences (4,111 researchers, 14.1%). The majority of R&D employees are highly educated (85.4%) and work full-time (56%). The share of researchers in total occupied population in 2009 was 5.6‰, much lower than EU27's 7.3‰, and the share of R&D employees in total occupied population was 6.7‰, also much lower than EU27's 11.7‰ (NASR, 2010)

Regional RDI policy

Romania is divided into eight development regions (North-East, South-East, South Muntenia, South-West Oltenia, West, North-West, Centre, and the Capital region Bucharest–Ilfov). They do not have an administrative status and are only territorial units (corresponding to NUTS2 classification of regions) created by the voluntary association of 4-7 counties, for which regional development policies are formulated and implemented, in view of more efficient use of resources from national programmes and Structural Funds. The eight regions are co-ordinated at the national level by the National Council for Regional Development, and at the regional level by eight Regional Development Councils and eight Regional Development Agencies (RDAs).

In spite of major regional disparities in the concentration of RDI resources, capacities, personnel, etc., between the capital region, Bucharest–Ilfov and all the other regions, **Romania has no formal regional RDI policy and the regions 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. In fact, NASR has a very limited role in spurring regional research and innovation potential and exerts little territorial coordination of RDI, although its mandate includes the task "to stimulate regional and local development" (Innova Europe, 2010). **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](#)

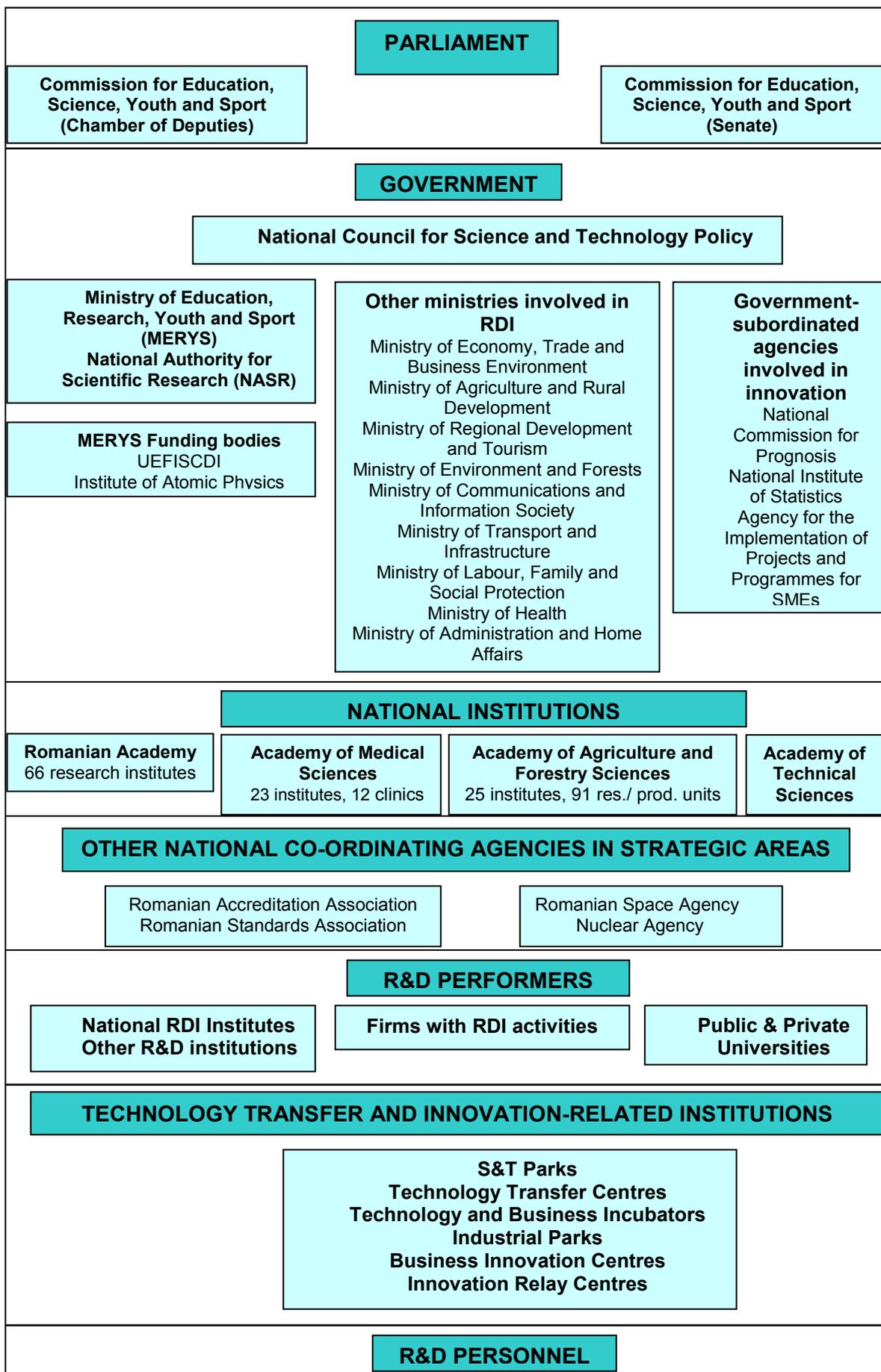
[Roadshow](#)⁷, production of [Innobarometer](#) in 2008 by NASR as an annual analysis of regional and national innovation through several regional innovation indicators.

A regional innovation instrument emerged in the early 2000s in the form of the **Regional Innovation Strategies (RIS)** developed by six Romanian regions⁸ on the basis of their affiliation to the [Innovating Regions in Europe \(IRE\) Network](#). All RIS are very similar in aims, methodology, structure and objectives, as these stem from IRE's approach to the promotion of innovation, but they also have specific elements, determined by the economic and RDI characteristics of the regions. Overall, the RIS comprise ambitious objectives that are most relevant to the respective regions, but their implementation has been weakened by the lack of specific budgets and high reliance on public RDI funding programmes, primarily the ROP, to some extent SOP IEC Priority Axes 1 and 2, and the 2007-2013 National RDI Plan, each with its own implementation difficulties. The SOPs have provided funding more actively only since 2009, facing a lot of obstacles at several levels, while the funding provided through the 2007-2013 National RDI Plan has been drastically cut since 2009. Another factor is the RDAs' limited capacity of managing innovation projects and mobilising regional actors, arising from their operation model (as NGOs that function on the basis of service contracts concluded with the Ministry of Regional Development and Tourism). They do not have innovation-specific legal competences and expertise, and do not necessarily place a high priority on innovation objectives, since these are not their principal remit. In addition, as many other local authorities, they have important shortage of human resources, especially those with experience in project management. 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, which is largely the consequence of the fact that such interaction hasn't been an explicit policy objective. This is also due to poor communication and coordination between the governing bodies of these policies - the Ministry of Regional Development and Tourism and the RDAs for RIS, NASR for national RDI policies.

Figure 1: Overview of Romania's research system governance structure

⁷ 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

⁸ West Region's was the first that developed its [2004-2008 RIS](#), which was followed by the [2009-2013 RIS](#). The other five RIS [RIS - Bucharest Ilfov Region](#), [RIS - North East Region](#), [RIS - North West Region](#), [RIS - South East Region](#), [RIS - South Muntenia Region](#) were developed during 2005-2008.



Source: ERAWATCH Research Inventory

2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section assesses the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment includes also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

Public RDI investment in Romania (GERD as % of GDP) has been planned to reach 1% of the GDP by 2010, in line with the 2007-2013 National RDI Strategy and government commitment to meet the Lisbon Strategy target. Romanian GERD relative to the EU27 average increased thus continuously until 2008 but remained within a modest range being one of the lowest among EU Member States (30.52% of EU27 in 2008) (see Table 2 in Annex 1). In 2009, this gradual progression dropped significantly as a result of sharp cuts in the public RDI funding caused by the economic crisis. As a result, NASR funding for national programmes dropped by 27.6% in 2009 relative to 2008, which in turn, led to significant losses of qualified researchers in the national R&D institutes, weaker capacity to attract young researchers and migration of researchers abroad or towards better paid sectors (NASR, 2009). Also, approx. 30% of the research infrastructure investment planned for 2007-2009 was cancelled because of the budgetary limitations occurred at the end of 2008 (*ibid.*). Innovation activities have also declined because of reduced public funding channelled through the Innovation Programme of the 2007-2013 National RDI Plan, and declining private RDI funding in business firms, which have been hard hit by the economic crisis and adopted a survival, rather than an expansion strategy. The private sector recorded a significant drop of own investments in RDI, but showed an increased interest to access EU Structural Funds, especially Priority Axis 2 of the Sectoral Operational Programme 'Increasing Economic Competitiveness', which supports RDI activities (*ibid.*).

Under these circumstances, an important policy change adopted in 2009 was NASR's funding reprioritization to the following objectives: (i) payment of international organizations membership fees (FP7, EURATOM, CERN, Dubna, etc.); (ii) maintaining the research capacity of National R&D institutes by a 30% increase of their Core R&D programme budgets to help them retain the R&D personnel, especially the young researchers specialised abroad; (iii) freezing new competitions under the National RDI programmes and adoption of a '*Plan to increase the efficiency and effectiveness of RDI expenditure*' in 2010; and (iv) increasing the absorption of Structural Funds (NASR 2009). A positive development was the approval by the Ministry of Finance of NASR's initiative to modify the Fiscal Code in

order to increase the proportion of firms' deductible expenditure for R&D from 100% to 120% (*ibid.*). These measures were meant to limit the losses in the RDI system, but their effect has been modest. In 2010, the effects of the economic crisis continued to be felt, so that the public R&D expenditure increased only by 8.6% relative to 2009, getting closer to the values of 2008, but remaining still considerably lower than the funding planned in the 2007-2013 National RDI Plan (NASR 2010). In the medium- to long-term, the consequences of these cuts are complex and annihilate the improvements in the Romanian RDI fostered by the few years of improved funding in 2005-2008 (e.g. attraction of human resources for RDI, enhancing science-industry links, etc.).

Key National RDI policy documents

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 goals⁹ 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 [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 (see details in ERAWATCH Country Report 2009, Chioncel, 2009).

Main public funding instruments

The main RDI public funding instruments consist of a set of programmes that address a broad target of R&D performers both in the public and the private sector (national R&D institutes, public R&D organisations, academic research centres, business firms with R&D activities, etc. The main public funding instruments have been described in detail in ERAWATCH Country Report 2009 (Chioncel, 2009) - below is a brief overview of main features and changes occurring in 2009-2010:

1. [2007-2013 National Plan for R&D and Innovation](#). Launched in 2007, this is the most important funding instrument of NASR, both policy- and budget-wise, and has the largest budget of all current national programmes (multi-annual budget of about €4,700m, at 1 EUR = 3.21 RON in 2007). It is organised in six programmes, similarly to the EU FP7: (1) [Human Resources](#), (2) [Capacities](#), (3) [Ideas](#), (4) [Partnerships in priority domains](#), (5) [Innovation](#) and (6) [Sustaining the institutional](#)

⁹ 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.

performance (not active yet, to be launched in 2011). The most important change occurred in the management of programmes (1), (3), (4) and (5) was the management takeover by the [Executive Unit for Funding Higher Education, Research, Development and Innovation \(UEFISCDI\)](#) from the previous management bodies (National University Research Council for (1), NASR for (3), National Council for Programme Management for (4) and Managerial Agency for Scientific Research and Innovation for (5). Programme 2 remained under NASR. Participation in all these programmes is competition-based.

2. Two complementary funding instruments to the RDI National Plan were launched in 2003 and have been continued to present:

- The [Core R&D Programmes](#) are initiated and developed by the national RDI institutes on an annual or multi-annual basis in accordance to the National RDI Strategy priorities. They provide institutional funding to support institutes' own medium-to long-term R&D strategies (in addition to the funding gained through competition-based programmes). The Core R&D Programmes are validated by the line ministries of the respective institutes, and are approved and financed by NASR. In 2009 NASR supported 46 core R&D programmes, with a total budget of approx. €83m (1 EUR=4.2 RON), which was about 30% higher than in 2008, in view of helping them maintain the R&D personnel, especially the young researchers trained abroad. In 2010, NASR funded 47 Core R&D Programmes (NASR, 2010).
- The [Sectoral R&D Plans](#) are proposed by some national R&D institutes for the technological development of the respective sectors and are financed by the line ministries of the respective sectors, including MERYS/NASR, Ministry of Economy, Trade and Business Environment, Ministry of Agriculture and Rural Development, Ministry of Environment and Forests, Ministry of Communications and Information Society¹⁰.

3. [Structural Funds \(SF\) for RDI activities](#)

- [Sectoral Operational Programme 'Increasing Economic Competitiveness' \(SOP IEC\)](#) aims to increase the competitiveness of Romanian enterprises and reduce the productivity gaps between Romania and the EU, with the specific target that Romania should reach 55% of the European average productivity by 2015. SOP IEC is also the only SOP which mainly targets the private sector, and as such is much more demand-driven and dependent on its attractiveness to potential beneficiaries than other SOPs that are mainly or completely focused on the public sector. Relevant for RDI objectives are *Priority Axes 1: An innovative and eco-efficient productive system and 2: Research, Technological*

¹⁰ For example, the [Sectoral Plan of MERYS/NASR](#) addresses various aspects of the R&D and education system, such as "Educational needs and priorities in Romania as the basis of pre-higher education" (2006-2007), "Integrated information system for identifying, evaluating, planning and managing the national fund of medicinal and aromatic plants (raw material for food, pharmaceutical and cosmetic industries)" (2006-2008), "Evaluation of the Romanian physics research potential and elaboration of the national international cooperation strategy" (2009-2011). The 2007-2009 R&D Sectoral Plan of the Ministry of Economy, Trade and Business Environment focuses on increasing 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: *R&D in Communications* (development of communications networks and services, including the digital system) and *R&D in information technology* (information architectures and solutions for e-Government). The two programmes have been continued in the ministry's [2010-2013 Strategic Plan](#).

Development and Innovation for competitiveness. SOP IEC's Management Authority is the Ministry of Economy, Trade and Business Environment, while the Priority Axis 2 is managed by NASR as Intermediate Body.

- **SOP Regional Development (ROP)** is the main instrument for regional development policies. It is managed by the Ministry of Regional Development and Tourism (MRDT) and covers all development regions, without any particular regional focus. Relevant for innovation objectives is *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.), especially in the less developed and declining areas, regional and local entrepreneurial initiatives in order to attract investors, job creation and sustainable economic growth, technology transfer to microenterprises, in line with the *Regional Innovation Strategies*. This Priority Axis aims to narrow the large disparities between regions in terms of entrepreneurial and industrial development that have widened in recent years.
- **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* supports the development of entrepreneurial skills and training in new technologies). SOP-HRD is managed by the Ministry of Labour, Family and Social Protection.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

Evolution of BERD

Romanian BERD relative to the GDP over the last 5 years was relatively stable in the period 2005-2007, at approx. 0.22% of the GDP, but dropped to 0.17% in 2008 and further to 0.15% in 2009, as a consequence of the economic crisis ([EUROSTAT](#)). The same trend was observed in the evolution of the Romanian BERD relative to the EU27 average: from approximately 0.18% of the EU27 average in 2005-2007, to 14% in 2008 and further to 11.7% in 2009, increasing even more the existing gap to the EU27 ([EUROSTAT](#)). These low levels of the Romanian BERD reflect the poor RDI capacity of domestic firms, which, in turn, is determined by several reasons: incomplete restructuring of the business sector, limited own financial resources and difficulty to access external funding sources (bank loans), virtual inexistence of private venture capital for RDI, poor motivation to invest in R&D, and preference for external acquisition of technology instead of developing their own.

The reduction of public RDI funding from the 4th quarter 2008 went in parallel with a reduction of private funding for R&D, as business firms 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. An increased interest has been manifested by private firms for the Structural Funds, as a potential way to compensate for the reduction of the public RDI funding. However, in practice, few

firms actually managed to access Structural Funds to make up for the declining national public funding, because of several reasons pertaining to the implementation mechanisms of the Structural Funds and to the firms' lack of experience in writing and managing such projects. For example, the relatively poor capacity to prepare, submit and manage proposals, the difficulty to provide the co-financing share required by most operations, because of very limited access to bank loans and lack of other capital sources, technical implementation difficulties, systemic corruption and political allocation of contracts have been among the major constraints. Moreover, as the first intermediary evaluation of most Sectoral Operational Programmes performed in 2009 showed, 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.

The policy mix towards increased private R&D investment

The policy mix aiming to stimulate private R&D investment comprises:

a. Programmes of the 2007-2013 National RDI Plan: *Capacities, Partnerships in priority RDI domains, Innovation:*

- *Partnerships in priority domains* (1,354 projects funded in 2009 and 1,347 projects in 2010). Most coordinating units were R&D institutions of national interest, especially universities, followed by national R&D institutes, and to a smaller extent firms, NGOs and SMEs (NASR 2009, 2010).
- *Innovation* (285 projects in 2009, 263 in 2010, all coordinated by firms who contributed with approx 43.6% of the budget in 2009, especially SMEs in 2010). The programme is characterised by a very high share of high-tech projects (97%) (NASR 2009). Commercialisation of results was under the expected level, because of results freezing in the experimental development stage generated by the contraction of public funding by 26.1% to the value agreed upon at the contracting stage (NASR 2009, 2010).

b. National technological platforms (39 in 2009, 32 in 2010) in several areas: alternative energy sources, genomics and plant biotechnologies, water management and quality control, manufacturing technologies, nano-electronics, nano-medicine, innovative medicine, sustainable chemistry, maritime transport, aeronautics (NASR 2009, 2010). Romania is also involved in several [European Technology Platforms](#).

c. Joint Technology Initiatives (JTI): see section 3.5.3.

d. Tax incentives for R&D

Tax incentives in general are poorly represented at present, as only a few remained active after the revision of the Fiscal Code in 2007 and the cancellation of many measures in 2009, as part of the austerity measures adopted by the government to limit the effects of the crisis. In this context, the adoption of new tax incentives, although promoted in most of the recent policy documents, has faced a lot of obstacles in 2009 and 2010. Specific measures for RDI in the Fiscal Code include: VAT exemption for RDI activities performed under the National RDI Plan or financed in international, regional and bilateral partnership. The tax regime for micro-enterprises that was in force in 2009 stipulated a reduced tax of 3% of the turnover, but the provision was modified in 2010 with the option to pay a 16% flat tax or a tax on profits, depending on

the company turnover¹¹. In 2011, the 3% tax for micro-enterprises was reintroduced, as it was considered to be more favourable to firms and less problematic for the tax collection system than the previous dual provision.

An income tax exemption for IT specialist programmers (software engineers, system designers, system engineers or analysts) has been in force in 2009-2010 (introduced in 2001 and also continued in 2011, due to its positive economic effects on economic growth and considerable improvement of the IT sector contribution to GDP)¹². There are also tax incentives for the establishment and development of an industrial park, in terms of a more favourable regime of local taxes. In June 2010, a project law granting tax facilities to young entrepreneurs (up to 35-years old) setting up their first enterprise was approved by the Parliament¹³. Other deductible costs under the Fiscal Code are related to the management of information systems and quality management systems; marketing, market study, promotion of existing or new markets; participation in trade fairs and exhibitions; environmental protection and conservation. The Fiscal Code also introduced flexible options for the depreciation of some categories of expenditure¹⁴. In 2009, the Ministry of Finance approved NASR' s initiative to support the private sector by increasing the deductibility of R&D expenditure from 100% to 120% for units whose R&D activities account for at least 15% of their total yearly expenditure.

e. SOP “Increasing economic competitiveness” (Priority Axes 1 and 2), ROP (Priority Axis 4) and SOP-HRD) (Priority Axis 1 and Priority Axis 3).

The dynamics of operations implemented under these SOPs shows several key features of the public and private RDI institutions:

- (i) high interest of the scientific community in public research infrastructure and a lower interest in administrative and project management projects;
- (ii) high interest of the scientific community for complex RDI projects involving foreign specialists, and relatively low interest of enterprises in RDI projects in partnerships with universities and research institutes. This low interest can be attributed to some extent to the effects of the economic downturn, which obliged many enterprises to adopt a survival rather than a collaboration strategy, but a more likely explanation is their limited internal R&D capacity, especially in large enterprises. The difficulty of providing co-financing (up to 75%, apart from non-eligible expenses) and some restrictions on eligible expenses also contributed to the low response rate from enterprises.
- (iii) strong investment need of SMEs in order to carry on existing operations and survive on the market, reflected in the high level of *investment financing* they

¹¹ If the turnover is below €100,000 the company can pay a tax of 3% of the turnover in the next fiscal year. If the turnover exceeds €100,000 then the company must pay the tax on profit.

¹² Continuing this measure in 2011 was appreciated by some as the only effective anti-crisis initiative of the government, as “it brings a €450m annual contribution to the state budget, which represents the annual gross salary of 83,500 public sector employees or the annual pension of 235,000 pensioners” (<http://www.ziare.com/articole/eliminare+scutire+impozit+programatori>)

¹³ The law stipulates that young entrepreneurs (up to 35 years old) can set up their first enterprise with a capital of min. 10 RON (€2.5) and benefit of salary and profit tax exemption for 3 years.

¹⁴ 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.

requested, exceeding by far the budget allocated, while *consultancy financing* remained well under the budget allocated.

- (iv) poor innovative capacity of Romanian enterprises and difficulty to access Structural Funds for RDI without a means of facilitating access to capital to cover co-financing.
- (v) low level of public-private partnerships and lack of motivation of local public authorities participating in local and regional development projects in preparing and submitting project proposals. This, in turn, is determined by the state aid restrictions applicable to business support, the high co-financing share of the projects (up to 50% of eligible expenses), unclear ownership provisions in respect of land and building(s), and lack of clear regulations on public-private partnerships. The new [Law 178/2010 on public-private partnerships](#) clarifies these aspects.
- (vi) large number of cancellations of signed contracts (50 by end 2009). Some were caused by the failure to provide co-financing in the context of the economic crisis, while others were caused by irregularities.

In conclusion, taking into account the declining BERD levels since 2007, the success of the policy mix described above in stimulating private R&D investment can be considered as very modest, and was further weakened by the financial limitations induced by the economic crisis. Several key initiatives that could stimulate private investment in R&D are expected to start in 2011, such as the launch of the National Innovation Strategy and elaboration of four foresight studies in nanotechnologies, services, green energy and cell therapy to assess Romania's potential to participate in these fields, etc.

Quality, ease of access and clarity of public funding for RDI in businesses

The procedures for submission and evaluation of proposals for public funding through the programmes described in the policy mix above are clearly explained on the websites of the coordinating agencies (e.g. NASR, MRDT, etc.) and in a wide range of presentation materials (brochures, posters, etc). An important number of events (conferences, seminars, workshops, round tables, etc.) have been organized across the country to explain and advertise the possibility to access Structural Funds. Paperwork and bureaucracy involved, especially by the Structural Funds are high, so that a number of corrective measures have been adopted in 2009, such as the simplification of the proposal submission procedure by reducing the number of accompanying documents. Also, in order to stimulate applications, the pre-financing share granted to contracted projects was increased, for public institutions (national R&D institutes and universities) from 15% to 20%, respectively 30% maximum), and for private enterprise (from 0% to max. 35%) (NASR, 2009)

Innovation-oriented procurement policies

Romania has no specific innovation-oriented procurement policies. Public procurement operations for RDI follow the general national rules for public procurement (see http://www.anrmap.ro/indexro.php?page=legislatie_nationala_en for an overview) and are made following public bids announced through the national Electronic System for Public Procurement (ESPP). The principles imposed by the EU directives (non-discrimination, equal treatment, mutual recognition, transparency, efficiency of public funds use, accountability, etc.) are included in the national legislation and apply in principle to all public procurement operations, but in practice, the enforcement of these principles is poor. Public procurement procedures are

highly dysfunctional, especially in the absorption of Structural Funds, because of corruption and allocation of contracts on political criteria; complexity, instability and unclear regulations of the public procurement legislation; high bureaucracy, irregularities in the use of the ESPP and excessive number of institutions overseeing the management of Structural Funds¹⁵; large numbers of complaints taking long time to solve; delayed payment by the state of outstanding invoices raised by contractor firms. In spite of these obstacles, public procurement contracts are currently the most profitable business for a small number of private firms that are close to the political circles, as the state runs the most financially-significant projects in the country¹⁶.

Three scenarios for the restructuring of public institutions managing the Structural Funds are currently being considered by the government, including unification into one institution, outsourcing, and privatisation of public evaluation services. In spite of these obstacles, public procurement contracts are currently the most profitable business for a small number of private firms that are close to the political circles, as the state runs the most important and financially-significant projects in the country (an overall market of €13b - over 9% of the GDP, representing public acquisitions per se, plus another €10b representing the investments made by the state companies)¹⁷.

Since December 2008, Romania is involved, through the Regional Development Agency Bucharest-Ilfov, in the project "[EU Regional Cooperation for SMEs' access to Public Procurement – EuroPROC](#)", which is co-financed by the Interreg IV C Programme. The project is implemented over 3 years by a consortium comprising 11 organizations from 10 countries. It aims to improve SMEs' access to public funding available through public procurement through regional cooperation and reduce regional gaps within the EU, providing thus an important opportunity for policy learning at the level of a regional administration agency. Another example of policy and practice learning in the public procurement area is the training programme "*Promotion of ecological public procurement through creation of a favourable environment for the training of public procurers*" which has been implemented by the Ministry of Environment and Forests in partnership with the National Agency for Civil Servants during April 2009-September 2010. The programme was co-funded by the European Social Fund (85%) through SOP Development of Administrative Capacity and the Ministry of Environment and Forests (15%). The project aimed to increase the awareness on the positive impact on the environment of ecological public procurement, by training public procurers in the central public administration, and disseminate instruments, methods and good practice in the area.

Other policies that affect R&D investment

The general business environment is regulated by a variety of laws and legal provisions that are sometimes far from simple and transparent, and their enforcement is often poor. World Bank's *Doing Business Report 2011* (World Bank 2011) ranks Romania 56th among 183 countries in 2011, down from 54th in 2010, highlighting both some improvements and some difficulties in the country's business environment. For example, **the process of setting up a new business is relatively straightforward**

¹⁵ 75 institutions, including 7 Management Authorities and 33 Intermediate Bodies that certify payments and propose financial corrections, see Anghel (2010).

¹⁶ Public procurement accounts for an overall market of €13b, i.e. over 9% of the GDP, representing public acquisitions per se, plus another €10b representing the investments made by the state companies - see Vass (2010).

¹⁷ <http://www.juridice.ro/110584/achizitiile-publice-in-romania-cum-functioneaza-si-la-ce-va-astepati.html>

(Romania ranks 44th in this regard), taking about 10 days to complete and relatively modest cost and minimum capital (2.6% and 0.9% of income per capita, respectively). The application file is submitted to a one-stop company registration office within the National Trade Register Office, followed by the business registration in the Trade Register and allocation of a unique tax identification number by the Ministry of Public Finance, after which the applicant receives authorization to operate. Other notable improvements have also been made in dealing with construction permits, improving bankruptcy law and business closing conditions.

On the other hand, the **conditions for competition in the business environment and the tax regime are less favourable**. Competition is regulated by the Competition Law 21/1996 and is monitored by the [Competition Council](#), an autonomous administrative body in the field of competition and state aid. However, 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). **The venture capital market** is in an early stage, because of the unfavourable tax regime for private equity investments and underdeveloped domestic fund structure for private equity and venture capital. A recent study conducted by the European Private Equity and Venture Capital Association and KPMG ranked Romania 24th out of 27 countries surveyed in terms of tax regime for private equity investments (Vrinceanu, 2009), pointing out the great potential for private equity investments in Romania, especially in infrastructure development projects.

Framework conditions for private investment in R&D are also underdeveloped, especially in terms of fiscal incentives and other financial instruments aiming to facilitate access to private finance. Romania ranked 24th out of 27 countries in a survey conducted in 2008 by the European Association for Private Equity and Venture Capital and KPMG, assessing the private equity funds friendliness of national fiscal and legal systems (Business Magazine, 2009). The survey shows that in spite of some slight improvements, the Romanian risk capital market continues to be affected by unfavourable regulations for pension funds, a difficult fiscal environment and the lack of references to private and risk capital in the legislation. The survey also pointed out that Romania does not provide any incentive or tax reduction to encourage private and risk capital investments and the fiscal system is rudimentary and ineffective, being used only for tax collection. Because of these weaknesses, the fiscal system contributes only 32% to the GDP and encourages tax evasion in some sectors, like agriculture and construction. Financial instruments are also poorly developed, contributing about 30% to the GDP, in contrast to some 120% in other European countries. Although the creation of risk capital funds for innovation was foreseen in several policy documents (e.g. the 2007-10 National Strategy on RDI, the 2007-10 National Reform Plan, etc.), such funds have not been created so far and the JEREMIE Fund for Romania is not functional yet.

Intellectual Property protection is realised in Romania primarily through the [Office for Inventions and Marks \(OSIM\)](#), which is subordinated to the Ministry of Economy, Trade and Business Environment, and the [Romanian Office for Copyright and Related Rights \(ORDA\)](#), which is subordinated to the government. Romania's IP legislation covers all IP domains, is compatible with EU and international legislations and is in line with all the IP conventions and treaties. Patenting activities are generally modest and have declined in recent years - see section 2.4.1 for details.

Barriers and risks for attaining the 2% BERD

The effects of the financial crisis on the Romanian economy

Romania's economic performance declined significantly in 2009 compared to 2008 after having been hard hit by the global economic downturn that became more visible from the second half of 2008. Falling exports due to declining external demand, reduced access to credit as international financial markets froze, declining internal demand caused by rapid and massively dropping exchange rate, declining foreign capital inflows and high bank interests were among the most important crisis effects. Consequently, the GDP slowed down and the unemployment rate went up, especially in private firms in construction, road transport and chemical industries, extraction of crude oil and natural gas. Large firms have been hit, but even more dramatically so, the SMEs. SMEs bankruptcies doubled in the first half of 2009 compared to the same period of 2008, particularly in trade, construction and real estate, and start-ups followed a similar trend ([Mediafax, 2009](#)). The rising unemployment rate created labour market imbalances, aggravated by labour shortages and large migratory outflows, skill obsolescence, low adult participation in education and training, lack of basic skills amongst young people, resulting primarily from weaknesses in the education system and inefficient active labour market policies. Both anti-crisis plans proposed by the government (in January¹⁸ and May 2009¹⁹) have failed, the public deficit continued to grow and Romania applied for a €20b financial loan from IMF (including a share from the EU, the World Bank and the EBRD). The money is channelled over 2010-2011 and will be repaid by 2015, at a 3.5% annual interest rate ([Interpress Service, 2009](#)). The prospects for 2011 remain bleak, in spite of minor and slow recovery. The National Commission of Prognosis forecasts a slow recovery of exports, persistent high unemployment, while the former level of unemployment of just some 4.4% is not expected to be reached again before 2014 (National Commission for Prognosis, 2010).

Weak R&D capacity in the business sector, low private R&D expenditure, low innovation capacity

The R&D capacity of Romanian domestic firms is weak, since most of the R&D potential is concentrated in the national R&D institutes, while private firms are only marginally involved in R&D and innovation. The innovative capacity is low, both in SMEs and in large firms. The number of innovative enterprises in industry and services has slightly increased in recent years, from 17% in 2000-02 to 21.1% in 2004-06 (the latest available years) (National Institute of Statistics, 2010a). Only 21% of the innovative enterprises were successful innovators in 2004-06 and only 15% were both product and process innovators. SMEs accounted for the largest part of innovative companies (nearly 90%). A 2008 study of the National Institute of Statistics shows that both SMEs and large firms share similar barriers to innovation,

¹⁸ The first anti-crisis plan comprised a package of 74 measures (investments in roads, highways, rehabilitation of residential buildings, health and education infrastructure, agriculture, environment, tourism, etc.) but no explicit RDI measures, which reflects the low visibility and importance of these fields in the country. The plan was widely contested on various grounds, such as addressing the effects and not the causes of the crisis, providing state aid for unprofitable industry sectors, etc. and had significant implementation flaws, which considerably delayed the expected effects, while some measures have not been adopted at all.

¹⁹ The second anti-crisis plan included state aid schemes for firms in strategic sectors (agriculture, constructions, infrastructure, tourism, environment and health), guarantees for the credits contracted by youth for the first home purchase, support to agricultural production and simplification of tax and tariffs.

especially in terms of lack of external funding and qualified personnel (National Institute of Statistics, 2008). The same study also shows that SMEs have a higher share of innovation expenditure on machinery, equipment and software, and a higher R&D expenditure compared to 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.

The low levels of business R&D, lower in large firms than in SMEs, are rooted in several structural and managerial deficiencies, including: (1) poor competitive environment; (2) firms' reluctance or inability to take on financial and commercial risks arising from R&D; and (3) absence of financial services and instruments to mitigate the risk. This poor innovation performance is also reflected by the [European Innovation Scoreboard \(EIS\) 2009](#) indicators. Romania is one of the growth leaders among the Catching-up countries, with an innovation performance well below the EU27 average (SII in 2009 = 0.294, in slight progression from 0.278 in 2008), but a rate of improvement that is one of the highest of all countries. Relative strengths, compared to the country's average performance, are in Innovators and Economic effects, and relative weaknesses are in Finance and support and Throughputs. Over the past 5 years, Finance and support and Throughputs have been the main drivers of the improvement in innovation performance, in particular as a result from strong growth in Public R&D expenditures (18.0%), Private credit (25.8%), Broadband access by firms (46.7%), Community trademarks (34.5%) and Community designs (37.3%). Performance in Firm investments, Linkages & entrepreneurship, Innovators and Economic effects has increased at a slower pace.

Industry structure and FDI distribution

The capacity of industry revival based on innovation is low. The country does not have an innovation-based development strategy and innovation has a low-profile among government priorities, although it is formally recognised as a priority of the 2009-2012 Governing Programme. Nearly 90% of innovative enterprises were SMEs in 2004-06 (National Institute of Statistics, 2010a), but SMEs are also those who have been hardest hit by the economic crisis and their innovation activities have been sharply reduced. Also, the largest concentration of innovative firms mostly in traditional processing industry, rather than in emerging R&D intensive industries, points to a low capacity for innovation-based revival. Fuelled by the large privatisation programmes of the 1990s, FDI was encouraged by the low labour cost, proximity to the euro-zone, successful disinflation, high economic growth rate and increasing domestic market potential. The record FDI inflows that Romania benefited of over 2004-2008, thanks to macroeconomic stabilisation, strong GDP growth, large-scale privatisations and the prospect of EU membership, have dropped by more than 50% in 2009 (National Bank of Romania, 2009). In addition, successive wage negotiations have driven up unit labour cost, affecting Romania's international competitiveness, especially in light industry, in favour of low-cost Asian countries. Faced with slowing FDI inflows and with an erosion of the low-cost advantage in certain sectors due to skill shortages, partly due to large outward migration, Romania needs to step up efforts to attract investment in higher value-added sectors, which are less dependent on low wages, by further improving the business climate, upgrading infrastructure and developing labour skills (Pauwels and Ionita, 2008).

2.2.3 Providing qualified human resources

The national labour market for researchers has grown continuously over the last decade, after the massive losses of the 1990s that were generated by severe underinvestment and slow reform in the R&D system. The value of Human resources in science and technology (HRST) as a share of the economically active population in the age group 25-64 reflects this trend, going up from 18.4% in 2000 to 24.1 in 2009, but remains around 60% of the EU27 average ([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](#)).

Human resources in the R&D sector (National Institute of Statistics, 2010a, 2011) are characterised by:

- A predominance of researchers in engineering and technical sciences (37.7% in 2008), followed by natural and exact sciences, (18.7%), social sciences (15.7%), human sciences (9.5%), medical sciences (11.7%), agricultural sciences (6.7%).
- A growing number of R&D employees since 2001, after massive drops in the 1990s and predominance of R&D employees with tertiary education (73.7% in 2007),
- Predominance of researchers in the total number of R&D employees (30,740 researchers out of 42,484 R&D employees in 2007, of which 14,228 PhDs),
- Predominance of R&D personnel in the Higher Education sector, followed by Enterprises, Government and Private non-profit, relatively young age of R&D employees (about 50% of the R&D employees are under 45 years old);

Articulation of education policies within the knowledge triangle

Although very low relative to EU27 average (rank 25th of 27 according to the European Innovation Scoreboard 2009), the availability of HRST as a share of the economically active labour force in Romania has grown continuously over the last decade, reaching 24.1% in 2009, but still remains under the EU27's share of 40.1% ([EUROSTAT](#)). The growth rate of the number of tertiary degrees with academic orientation granted between 1998 and 2005 was one of the highest in EU27 (12.4%), especially in Science and Engineering fields²⁰, where it exceeded 10% in 2005. On the other hand, Romania is also one of the countries with the highest losses of qualified HRST. It has one of the lowest inflows of doctoral candidates from other Member States and one of the countries with the highest share of doctoral students having finalised their doctoral degree in the United States (European Commission, 2011). Romania also registers one of the largest net-losses in absolute terms (1700) in intra-EU exchanges of doctoral candidates (ibid.). According to Mogu erou and Di Pietrogiacomo (2008), Romania has one of the highest ratios of scholars holding positions in the US per 100 working at home - 4.6, and one of the lowest demand for

²⁰ Grouping together the fields 'Science, mathematics and computing' and 'Engineering, manufacturing and construction'.

researchers in EU27 - 0.22% in 2005, which is further weakened by a high rate of brain drain.

At present, opportunities for lifelong learning are provided 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.

Education policies are generally poorly correlated with the private and the public research needs, which is a cause for the high losses of qualified HRST.

Main societal challenges

Although the supply of science, maths and engineering graduates in Romania has had one of the highest growth rates in EU27 in recent years, the employment of these people in the country is limited and the brain drain is significant. In this respect, the national system is highly dysfunctional, and has a deep mismatch between supply and demand. The most important reasons for this situation include: low market demand for researchers, low salaries in the S&T/RDI system, low political importance attached to the role of science, research and innovation for economic growth, insufficient/inadequate research infrastructure, insufficient funding of programmes meant to increase the attractiveness of S&T/R&D careers and important additional cuts brought about by the economic crisis, etc.

Entrepreneurship education in universities is poorly represented, as highlighted in 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. Similarly, creativity, critical thinking, problem solving, teamwork and communication skills are not formally recognized objectives of the academic curricula. In the attempt to compensate for the poor formal entrepreneurship training in the higher education system, 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](#).

2.3 Knowledge demand

Structure of knowledge demand drivers

In the structure of knowledge demand drivers reflected by the contribution of various economic sectors to the national GDP ([Monthly Statistical Bulletin](#), August 2010, National Institute of Statistics), 'Industry' has a leading position (25.45% of GDP), followed closely by 'Wholesale and retail, repair of motor vehicles and household goods, hotels and restaurants, transport and communications' (21.03%), and two services categories (with 15.04% and 13.48% respectively). 'Construction' and 'Agriculture' contributed the least to the GDP (with 9.18% and 6.41% respectively). However, the policy response to knowledge demands in these areas, proxied by the allocation of GBAORD to the respective areas ([EUROSTAT](#)) does not seem to follow this order. For example, although 'Industrial production and technology' led both as main contributor to the GDP and in the GBAORD allocation in 2010 and before (2005-2010), its GBAORD allocation declined continuously during 2005-2010, reaching the lowest level in 2010. To some extent, this decline could be attributed to the budgetary constraints generated by the economic crisis emerging in Romania since end-2008, but this logic doesn't apply to other sectors like Defence, where GBAORD allocation increase starkly in 2010 (around 300%), in a continuous trend since 2008, although this sector is not a leading knowledge demand driver. Other leading contributors to the GDP - Transport and infrastructure, Education, Health and social security - have received slightly increased GBAORD allocations in 2010, which came at the expense of a sharp decline (by more than 50%) since 2008 for General advancement of knowledge: R&D financed by other sources than GUF. Also, the Energy sector, which, in the developed countries is one of the sectors receiving highest attention for its potential to speed up economic recovery, in Romania remains a sector with relatively low allocations of funding, albeit in increase compared to previous years. Overall, this analysis reflects the low importance attached in Romania to knowledge-intensive industries with high growth potential, as the national industrial structure is mainly based on traditional manufacturing industries. This conclusion is also supported by the distribution of FDI flows by economic sector: for example, in 2008 (latest available data) 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).

Research efforts to address major societal challenges

The research efforts to increase the knowledge base of the economy and increase the economic competitiveness of the country are supported by the main public RDI funding instruments described in section 2.2.1.

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

2.4.1 Quality and excellence of knowledge production

The quality and excellence of knowledge production is reflected by the performance of the national research system, in terms of input (R&D funds, availability of quality Research Infrastructures (RI) and HRST) vs. outputs (publications, citations, patents).

National RDI system inputs:

See the discussion on public and private funds for R&D (GERD, BERD) in sections 2.2.1 and 2.2.2, on Human resources for science and technology (HRST) in section 2.2.3, and on Research infrastructures in sections 3.2.1 and 3.2.2.

National RDI system output (publications, citations, patents)**Publications**

The number of Romanian scientific publications is still relatively low, but is on an increasing trend, indicating progressive integration of the domestic science system into the world science. The 2009 rankings of the "White Book of Research" produced by the Ad Astra Association of Researchers provide a good picture of the leading institutions in terms of scientific production:

- the [scientific production by institution type](#), measured by the ratio of ISI articles per 100 staff, is concentrated in state universities (57.04%), followed at a distance behind by national R&D institutes, the Romanian Academy and medical institutions (with 19.67%, 13.75% and 6.71% respectively), while private universities account for only 0.43%;
- the [top 5 Romanian universities](#), based on the ratio of ISI articles per 100 teaching staff, include "Alexandru Ioan Cuza" University of Iasi, "Babes-Bolyai" University of Cluj-Napoca, University of Bucharest, University 'Politehnica' of Bucharest and West University of Timisoara. However, in spite of continuously improving results, none of the Romanian universities is included in the Shanghai top 500 of world universities;
- the [scientific production by geographic location](#) is concentrated in the leading universities of Bucharest, Cluj-Napoca, Iasi, Timisoara and Craiova;
- the [scientific production by scientific discipline](#) is concentrated in engineering and exact sciences, where the top 3 disciplines are Physics (1480 articles), Materials Engineering (1367 articles), and Chemistry (1178 articles) This concentration of the scientific expertise in engineering and exact sciences reflects the scientific and technical structure and specialization of the Romanian S&T/R&D system, which has built traditional strengths in applied research, in the context of the industrial and S&T policy of the last 50 years;
- [International collaboration in the production of scientific papers](#) is relatively low, at 32.53% (1,831 articles out of 5,629).

The main public funding instrument supporting the production of scientific publications is the [Ideas Programme](#) of the [2007-2013 National RDI Plan](#) which is credited with having contributed to the increase of the number of Romanian ISI-indexed articles from 2,065 in 2008 to 2,177 in 2009 (NASR, 2009). The majority of scientific articles are published in Romanian journals, which increased from 54 in 2008 to 57 in 2009 (*ibid.*) Also, within the [Human Resources Programme](#) of the [2007-2013 National RDI Plan](#) the scheme "Awards for scientific excellence" offered financial incentives to authors researchers or research teams who have ISI publications, provided they are affiliated to a Romanian institution.

Patents

Patenting activities are modest and have significantly declined in recent years: patent applications filed at OSIM have dropped by nearly 50% from 2002 to 2007 (from 1,682 in 2002 to 926 in 2007) (National Institute of Statistics, 2010a). OSIM statistics

show a relatively constant number of patent applications filed by Romanian applicants during 2003-2009 around 45-50 applications/million inhabitant (OSIM, 2010). By applicant type, the number of applications from enterprises, research and education institutions accounts for approx. 40% of total applications, while the remaining 60% comes from individual inventors. This proportion is in contrast to developed countries, where individual inventors' applications do not exceed 20%. Patent applications are encouraged by Government Ordinance 41/1998 regarding taxes for industrial property protection and their utilization, which grants a 20% tax reduction to applicants who have submitted prior patent applications or are public or non-profit institutions protecting an object resulted from publicly-funded research.

The most important public funding instruments for supporting patenting activities are: [The 'Innovation' Programme of the 2007-2013 National RDI Plan \(Modules 1 and 3\)²¹](#), [SOP Increasing Economic Competitiveness Priority Axis 2, Operation 2.3.2 - Development of RDI infrastructure in enterprises and job creation through R&D²²](#), the "Awards for scientific excellence" scheme of the [Human Resources Programme](#) of the [2007-2013 National RDI Plan²³](#).

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

A multi-level evaluation system is in place to ensure the quality of knowledge production, as described below. The impact of the evaluation processes at the respective levels is reflected by the actual number of institutions that receive accreditation or the number of scientific researchers evaluated in view of obtaining scientific titles and professional promotions.

- **Evaluation of the R&D personnel's professional performance** in view of obtaining the title of scientific researcher (1st and 2nd degree) and occupying professional positions. The evaluation is based on competition and is organized according to Law no. 319/2003 on the Statute of the R&D personnel, taking into account the scientific achievements of the applicants. The evaluation for obtaining the title of scientific researcher 1st degree is regulated by Order of the education and research minister no. 5100/2005, and for the title of scientific researcher 2nd degree, by the order of the education and research minister no. 5101/2005. The titles are granted by NASR upon recommendation of the National Council for Certification of Academic Titles, Diplomas and Certificates. The criteria and standards established through these orders ensure the evaluation of the applicant in accordance with European Union standards.

- **Evaluation of R&D institutions and units**, according to GD 551/2007 on the approval of standards, criteria and evaluation methodology of the capacity to perform R&D activities, against a set of indicators foreseen in Government Decision 475/2007 (see Table 3 in Annex 1). The evaluation is performed every 3 years for certification and every 5 years for accreditation, to promote competition and excellence in research. Both public and private institutions performing R&D activities are evaluated, to ensure a balanced and transparent process. The certification an

²¹ Provides funding for patent taxes (in conjunction with funding from other sources) and for patenting support consultancy.

²² Funds, among others, the acquisition of non-tangible assets for R&D, such as patents, licenses and know-how.

²³ Offers financial incentives to researchers or research teams who have patents filed/granted by national and international patent offices, provided they are affiliated to a Romanian institution.

accreditation is an essential process for the R&D institutions and units because only certified R&D units have the right to conduct R&D activities and to apply for public funding. Several bodies are in charge with the evaluation²⁴. An improvement of the system of evaluation/accreditation of R&D units is aimed to be achieved through the Programme 'Sustaining Institutional Performance' of the 2007-2013 National RDI Plan, which is expected to become operational in 2011.

- **Evaluation of the main public RDI funding instruments:** the intermediary evaluation of the 2007-2013 National RDI Plan (and 2007-2013 National RDI Strategy), Core R&D Programmes and Sectoral R&D Programmes was foreseen for the 4th quarter 2010 but was launched in spring 2011. The first intermediary evaluation of the SOP Increasing Economic Competitiveness and SOP Regional Development took place in 2009.
- **Evaluation of project proposals submitted for the RDI funding instruments** - this is achieved by peer review conducted by the respective programme management bodies.
- **Evaluation of research quality in universities** - this is performed by the National Council for Research in Higher Education, which ensures the university accreditation. A quality indicator (IC6) was introduced in 2006, with a complex structure and methodology²⁵, in order to correlate the research quality with the institutional university funding from the public budget (see the list of accredited and certified universities at <http://www.cnscis.ro/Public/cat/532/Rezultate-evaluare.html>). Also, the strategic project '*Doctorates in schools of excellence - Evaluation of research quality in universities and increasing the international visibility through scientific publications*' financed by SOP HRD and implemented in the period 2009-2013 aims to improve the evaluation of research quality in universities. The first intermediary evaluation was due in the 4th quarter 2010. Project results to date are available at <http://www.ecs-univ.ro/despre-proiect/rezultate-asteptate.aspx>.

2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

²⁴ The RDI Consultative Board, the National Council for Scientific Research in Higher Education, Romanian Academy, Academy of Agricultural and Forestry Sciences and the Academy of Medical Sciences. The evaluation outcome provided by these institutions is validated by NASR.

²⁵ The factors considered in the calculation of IC6 include: capacity to attract research funds (25%), capacity to train researchers (10%), relevance and visibility of results (50%), capacity to develop innovative products and technologies (10%), capacity to organize research (5%).

2.5.1 Knowledge circulation between the universities, PROs and business sectors

Knowledge circulation between the universities, PROs and business firms is supported primarily by the programmes '**Partnerships in priority domains**' and '**Innovation**' of the **2007-2013 National RDI Plan** and **SOP Increasing Economic Competitiveness, Priority Axis 2 'RTDI for competitiveness'**, in two Key Intervention Areas: *2.1 R&D partnerships between universities, R&D institutes and enterprises and 2.3 - Enterprises' access to RDI activities* (see section 2.2.2 for details). Knowledge circulation facilitated by these programmes consists mainly of joint projects between institutions, but the mobility of researchers between the public and private spheres is not significant, as the research potential is usually concentrated in the public sector. Also, the "**University in Society**" (**UNISO**) **Summer Conference** coordinated by the Agency for Qualifications in Higher Education and Partnerships with the Socio-Economic Environment (ACPART), promotes the partnerships between universities and the business sector and facilitates knowledge circulation through debates, exchanges of views, etc.

2.5.2 Cross-border knowledge circulation

Cross-border knowledge circulation 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 (see section 3.5.2).
- **Programmes supporting participation of national teams in projects involving inter-governmental Research Infrastructures (RI):** see section 2.4.1.
- **Programmes supporting individual mobility of researchers:** several schemes of the [Human Resources Programme](#)²⁶ 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.

2.5.3 Main societal challenges

There is no evidence of specific research fields being prioritised for inter-sectoral and cross-border knowledge circulation. The support provided for these objectives is granted on a competition basis that is open to all research fields.

2.6 Overall assessment

Table A: Summary of main policy-related opportunities and risks

Domain	Main policy opportunities	Main policy-related risks
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²⁶ 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'](#).

Domain	Main policy opportunities	Main policy-related risks
Resource mobilisation	<ol style="list-style-type: none"> 1. Stimulate inter-regional synergies and synergies between RIS and the National RDI Strategy, other national strategies, and the SOPs 2. Introduce specific innovation funding schemes (risk capital, venture capital) 3. Stimulate the absorption of SF and improve the policy prioritization of resource allocation to innovative sectors and actors 4. Improve policies that affect the RDI process: public procurement, the general business environment 	<ol style="list-style-type: none"> 1. Poor communication and horizontal coordination between government agencies with RDI responsibilities 2. Lack of coherence between RDI policies and strategies, and other policies and strategies of the country (e.g. education, employment, health, energy, IT) 3. Low importance and visibility of RDI policies in the overall set of government policies 4. Lack of a coherent plan for economic recovery from the economic crisis and of an innovation-based strategy of recovery 5. Economic structure of the country mostly based on traditional manufacturing industries, with little capacity for new technologies, with high knowledge-content and skills 6. Weak science-industry links, low innovative capacity of industry 7. FDI flows that do not contribute to RDI activities 8. Poor incentives to innovation and entrepreneurship, weak public administration
Knowledge demand	<ol style="list-style-type: none"> 1. Increase the policy focus on knowledge- and research-intensive fields driving economic growth 2. Reduce the high losses of scientists and researchers, increase the attractiveness of the scientific career 3. Reduce the gaps in the regional and local distribution of RDI resources 	<ol style="list-style-type: none"> 1. Economic structure of the country, mostly focused on traditional manufacturing industries, with little capacity for new technologies with high knowledge content 2. Weak science-industry links, low innovative capacity of industry
Knowledge production	<ol style="list-style-type: none"> 1. Increase GERD and BERD expenditure 2. Stimulate RI development 3. Improve scientific output (publications, citations, patents) 4. Improve the quality of the evaluation process at all levels 5. Reduce the high losses of scientists and researchers, increase the attractiveness of the scientific career 6. Reduce the gaps in the regional and local distribution of RDI resources 	<ol style="list-style-type: none"> 1. Economic structure of the country, mostly focused on traditional manufacturing industries, with little capacity for new technologies with high knowledge content

Domain	Main policy opportunities	Main policy-related risks
Knowledge circulation	<ol style="list-style-type: none"> 1. Increase the funding allocated to the programmes supporting knowledge circulation 2. Enhance the links with the Romanian diaspora 3. Further encourage the mobility of researchers and collaboration between science and industry institutional spheres 4. Improve the international visibility of Romanian research achievements 	<ol style="list-style-type: none"> 1. Extensive losses of highly qualified scientists and researchers 2. Poor perspectives of significant improvement of research infrastructures to attract young researchers and researchers from abroad (including from the Romanian diaspora). 3. Low inter-sectoral circulation

Table B: Main barriers to R&D investments and respective policy opportunities and risks

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
Low innovative capacity of industry, low innovation culture, predominance of technological renewal based on imported technologies, products and services rather than on domestic ones	Stimulate regional innovation capacity through regional innovation strategies correlated with the National RDI strategy and other strategies of the country (education, employment, IT and communication, health, energy, environment).
Weak science-industry linkages	Stimulate the third mission of universities through higher support for R&D in universities, strengthening of entrepreneurial education in universities, introducing measures to stimulate academic entrepreneurship and technology transfer from university to industry (e.g. creation of spin-off firms, mobility between university and industry)
Economic structure of industry mostly based on traditional manufacturing industries, with little capacity for new technologies with high knowledge and R&D content	Increase the funding for knowledge-intensive industries, improve business infrastructure, provision of entrepreneurship and innovation incentives
Virtual absence of venture capital for RDI, unfavourable tax regime, disfunctionalities in the market competition and public procurement system, high systemic corruption and weak public administration	Introduction of venture capital for RDI schemes, use of FDI for RDI activities.

3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The [Communication Better careers and more mobility: A European Partnership for Researchers](#) proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;

- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of [EURAXESS – Researchers in Motion](#). Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

In reply to the EC Communication *‘Better careers and more mobility: A European Partnership for Researchers’* launched in May 2008, NASR created in 2009 a National Working Group aimed to ensure the national implementation of the objectives identified by the European Commission. The Working Group is coordinated by NASR and includes all the structures involved in the coordination of the four key areas mentioned in the EC Communication: NASR, the Executive Unit for Higher Education, Research, Development and Innovation Funding, the Romanian Immigration Office, and the National Agency for Pensions and Other Social Security Rights (NASR, 2009).

The national labour market for researchers has been discussed in detail in section 2.2.3 Providing qualified human resources. The balance between inward and outward flows of researchers is severely inclined towards the outward flows of researchers, as Romania is one of the EU countries with the highest losses of qualified R&D personnel (see section 2.2.3 Articulation of education policies within the knowledge triangle).

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 specific procedure for admission in the EU Member States of third country citizens with the purpose of conducting scientific research for a duration exceeding three months. NASR and the Romanian Immigration Office are involved in the process of implementing the scientific visa. In 2010 there were 17 RDI organizations authorized to employ researchers from several third countries. A number of 38 researchers have been received within the framework of the national or European projects: Algeria, Canada, Mexico, Morocco, India, Republic of Moldova, Georgia, Ivory Coast, Ethiopia, China, South Korea, Bangladesh (NASR, 2010).

Romania is also involved in **two FP7 projects regarding EURAXESS activities**: *“Discover Europe”*²⁷ and *“EURAXESS T.O.P”* (*Transnational operation of the*

²⁷ 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.

EURAXESS Services Network)²⁸. The **Romanian Mobility Centres Network (RoMob)**, as part of the European Mobility Centres Network 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, and the mobility of foreign researchers in Romania is reduced, due to unattractive research conditions. Other programmes for the cross-border mobility of researchers have been discussed in section 2.5.2.

3.1.2 Providing attractive employment and working conditions

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. There are no official figures about salaries in public and private R&D institutions, as these issues are considered to be confidential, but 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 EU25 average²⁹ 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).

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), which is a set of general principles and requirements which specifies the roles, responsibilities and entitlements of researchers as well as of employers and/or funders of researchers.

A change in the maternal leave legislation was adopted early December 2010, which gives mothers the possibility to choose between two options: (i) two years of leave and a child-rearing aid between approx. €140-280 and (ii) one year's leave, up to approx. €800 child-rearing aid and €120 per month if the mother chooses to return to work before the first year of leave is up, paid for the remainder of two years. Mothers who return to work after one year's maternity leave will not receive the €120 incentive. This change entered into force on 1 January 2011 and is 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). Also, the maternity leave reduces women/men's chances for promotion based on the number of publications. The

²⁸ 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).

²⁹ Romania was an Associate Country in 2006 when the study was undertaken (joined the EU on 1 Jan. 2007).

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.

The 2007-2013 National RDI Plan has several funding schemes to improve the attractiveness of employment and working conditions in S&T/R&D through the Human Resources Programme (see section 2.5.2 for a detailed description).

3.1.3 Open recruitment and portability of grants

Since the accession to the EU on January 1st 2007, Romania is open to the free movement of EU citizens on its territory. Foreign citizens 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 citizens need a 'work authorization' (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 coming to Romania with the purpose of conducting scientific research for a duration exceeding three months must apply for a Scientific Visa (according to the EC Directive 2005/71/CE). NASR and the Romanian Immigration Office are involved in granting the Scientific Visa.

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. Foreign citizens can be employed in Romania if they meet a set of conditions (see http://www.dreptonline.ro/legislatie/ordonanta_cetateni_straini_munca_romania_56_2007.php). Foreign citizens residing in Romania can benefit from the package of medical services for optionally insured persons if they are insured with the county- or Bucharest health insurance houses. Otherwise they have to pay to the medical services providers. 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: 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%; social solidarity fund (for disabled people) 3%; education fund 2%, unemployment fund 5% (selected from www.euraxess.ro).

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](#). International advertising of research vacancies supported by public funds is available on the Romanian website of the European Researcher's Mobility Portal www.euraxess.ro. The eligibility of foreign researchers for competitions for permanent research and academic positions is, in principle, subject to the general recruitment conditions described above. The eligibility of EU researchers for the public funding provided through national funding instruments is conditional upon their employment in a Romanian institution. The National RDI Plan allows the participation

of foreign evaluators in the peer-review process of applications, can support travel costs of foreign researchers invited to workshops in Romania, etc.

The new [Education Law](#) 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 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.

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

The tax regime, health and social security provisions applicable to EU researchers employed in Romania are discussed in section 3.1.3 - Open recruitment and portability of grants. There are no tax incentives for participation in supplementary pension schemes.

3.1.5 Enhancing the training, skills and experience of European researchers

Romanian higher education system was restructured according to the objectives of the Bologna Declaration. Law 288/2004 on the organization of university studies provides the legal framework for introducing the three educational cycles foreseen by the Bologna Declaration: Bachelor, Master's and Doctoral. Doctoral programmes have also been restructured and are regulated by [GD 567/2005](#)³⁰ and by the provisions of the new [Education Law](#) passed in March 2011. Other laws with impact on the doctoral and postdoctoral training include [Law 287/24 June 2004](#) regarding the creation of Consortia of universities and R&D institutions³¹ and [Order 3861/13 April 2005](#) of the Minister of Education and Research regarding the creation of postdoctoral research programmes starting with the academic year 2005-2006³². The structure and evaluation of doctoral research programmes have been discussed in detail in Chioncel (2009). Doctoral and postdoctoral programmes are supported through the Human Resources Programme of the 2007-2013 National RDI Plan, SOP HRD Priority Axis 1 "Education and training in support for growth and development of knowledge based society", Key Intervention Area 5 'Doctoral and postdoctoral programmes in support of research', as well as several bilateral collaboration agreements that give young researchers and doctoral students the opportunity to participate in training courses abroad (see section 3.5.2).

³⁰GD 567/2005 defines the main objectives of doctoral programmes as the development of knowledge through original scientific research. There are two types of doctoral programmes: scientific doctorate (based on creation and advanced scientific research) and professional doctorate (based on research-scientific analysis of professional performance (art and sport). Both types have two main components: (i) a programme based on advanced university studies; and (ii) a programme of scientific research. HEIs are encouraged by law to promote interdisciplinary doctoral university studies.

³¹ The Law promotes joint education (Master programmes) and research (PhD programmes) for consortium members, to identify excellence research domains and provide logistical and financial support to consortium research centres. The law facilitates the mobility of academic staff within the consortium, supports the development of joint national and European programmes and scientific associations.

³² This Order filled an important gap in the education and research system in Romania, as universities and research institutions had not developed postdoctoral programmes prior to this policy measure.

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures ([ESFRI](#)) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures roadmap

In order to address the issue of RI improvement in Romania, NASR set up 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. The basic mission of CRIC is to define, and periodically review, a unitary strategy and national priorities for RI development and to formulate recommendations for their construction and operation phases, in the form of a national roadmap. Later in 2007, CRIC delivered the **National Research Infrastructures Roadmap**, which envisaged the development of 19 new research centres in ten S&T fields considered national priorities: ICT (6 RIs with a total of €51.95m), Energy (1 RI with €3m), Environment (2 RIs, €54m), Physics (1 RI, €20m); Health (2 RIs with €69m), Agriculture, food safety and security (2 RIs with €0.7m), Biotechnologies, biology and genetics (1 RI, €20m), Innovative materials, processes and products (2 RIs, €5.5m), Space and security (1 RI, €12m), Socio-economic and humanistic research (1 RI, €20m).

The funding for the implementation of these projects is provided through large investments made on a competition basis through [2007-2013 National RDI Plan](#) (mainly the [Capacities Programme](#)), [NASR's Sectoral R&D Plan](#) and [SOP IEC Priority Axis 2](#): Operation 2.2.1 - Development of the existing R&D infrastructure and creation of new infrastructures laboratories, research centres) and Operation 2.2.3 - Development of networks of R&D centres, coordinated at national level and connected to European/international R&D networks (GRID, GEANT) (NASR, 2009).

3.2.2 National participation in the *ESFRI* roadmap. Updates 2009-2010

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 (see www.eli-np.ro). At the Competition Council meeting of 3 December 2009, the three countries presented the 'Joint Declaration on the integrated proposal for the implementation of the Extreme Light Infrastructure project' concerning the joint construction of the project infrastructure on a distributed model in the three countries. 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).

3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation 'clusters', mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System

Size and rough composition of the HE sector

Romania has 56 accredited public universities (with 742 faculties) and 32 accredited private universities. According to the new Education Law, in public HEIs, access is free for the enrolment numbers annually approved by the government, and tuition-based for a set number of places determined by the HEI's Senate. In private HEIs, access is tuition-based, and the tuition levels are established by each private HEI. HEIs have autonomy in establishing the tuition level and are obliged to publicly announce that, including by posting on the HEIs website.

A brief overview of higher education statistics for the academic year 2008-2009 (National Institute of Statistics 2011) shows that the population of students enrolled in higher education accounted for 24.2% of the school-aged population, while tertiary education graduates accounted for 29.7% of total graduates. Student enrolments by technical field were highest in economics (31.6%), university-pedagogy³³ (26.4%), technical sciences (21.2%) and law (14.3%), and lowest in medicine & pharmacy and artistic fields (5.4% and 1.1%, respectively). The number of graduates increased continuously over the period 2000-2007, including the number of women graduates, which almost doubled over this period.

The current market supply and demand of HE graduates is related to a large extent to the transformations in the Romanian economy and HE system in the 1990s and the 2000s. In the 1990s, universities became more and more depoliticized and followed to a large extent the turbulence of the market and the economy. New study programmes have been introduced, and many new private universities have been created to match the *increasing demand for higher education*. Most universities renewed their curricula and shifted the student enrolment patterns from a heavy

³³ This category includes philology, history, philosophy, geography, biology, chemistry, mathematics, physics, pedagogy, physical education, political and administrative sciences, environmental sciences, culture sciences.

dominance of engineering and technical sciences towards other areas, like law, economics and social sciences, where student numbers increased massively in both public and private higher education. Engineering and technical sciences became unpopular in the 1990s when many industries closed down, but regained popularity in the early 2000s, along with the economic revival, especially in communications, metal industry, chemical industry, constructions, etc. This factor helped many state universities maintain their programmes in technical fields. Also, law became popular in the 1990s, because of a lack of trained professionals in the field, but decreased in popularity after 2000 as the market became saturated. Social sciences such as political science, sociology and psychology are still popular, since they were rare during communist times, and such specialists are still in demand. Nevertheless, job opportunities for tertiary educated people are not always easy to find, and the unemployment rate among tertiary educated people is about 5% (National Institute of Statistics, 2011, based on National Agency for Employment data)³⁴. This share is higher among the young, about 13% for people under 25 years old, and around 11% for people in the 25-29 years old age group (own calculations based on National Institute of Statistics 2011 data).

Mission of HEIs

Romanian universities have been traditionally focused on the *teaching* mission, but the increasing investments in academic research infrastructure since 1997, as well as the obligativity 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 meant to upgrade the research infrastructure facilities, most notably the largest university centres of the country: University of Bucharest, University "Babeş Bolyai" of Cluj Napoca, University "Al.I.Cuza" of Iaşi, University "Politehnica" Bucharest, Technical University Cluj, Polytechnic University Timișoara. Also, many universities have established their own Research Strategies³⁵. The consolidation of the research mission of universities has been fostered by several initiatives, such as: identification, evaluation and accreditation of university research centres by the [National Council for Higher Education Research \(CNCSIS\)](#)³⁶, implementation of the project "[Doctoral Studies in Romania - Organizing Doctoral Schools](#)" for restructuring and consolidating the national system of doctoral studies³⁷ and the project "[Doctorate in Excellence Schools - Evaluation of academic research quality and increase of international visibility through scientific publications](#)"³⁸.

³⁴ http://www.insse.ro/cms/files/Anuar%20statistic/03/03%20Piata%20fortei%20de%20munca_ro.pdf

³⁵ 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. The 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.

³⁶ The project ran during 2001-2006 and resulted in the accreditation of 38 excellence centres in all scientific fields.

³⁷ The project started in 2008, under SOP HRD 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.

³⁸ The project, which started in 2009 under SOP HRD Priority Axis 1 'Education and training in support for growth and development of knowledge based society', aims to produce, test and validate a methodology for international evaluation of academic research, support to Excellence Schools and production of

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 commercialization infrastructure and personnel (mostly the leading academic centres in Bucharest, Timisoara, Iasi, Brasov, etc.).

Romanian universities see themselves as teaching and research institutions, although they have a very different balance between their 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, 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, but at the same time it may inherently reinforce the allocation of public funding to the universities with stronger research potential (advanced research and education universities), reducing the chances for the development of this potential in the other universities - the so-called 'Matthew effect' (Merton, 1968). This effect is enhanced by the current strong reliance of public funding for education and research, but could be reduced if other funding sources, especially private and EU/international, become more important. In particular, funding arising from research commercialization 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 will depend 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.

Research performance

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 two Romanian universities: the University of Bucharest appears in the category 501+, and the Babes-Bolyai University of Cluj in the category 601+. This suggests a poor research productivity, even in relation to other Central and Eastern Europe universities, many of which are included in the Shanghai top 500 (e.g. Poland has three universities, Hungary has two, and Czech Republic one³⁹) 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

scientific publications. It is expected to attract young researchers and stimulate business-academia partnerships.

³⁹ See http://www.ad-astra.ro/journal/8/florian_shanghai_romania.pdf.

Research" produced by the Ad Astra Association of Researchers - see section 2.4.1 for a detailed discussion of university scientific publications performance.

National academic quality assurance mechanisms

The assurance of national HE and research quality is regarded as an obligation of the HEI and a fundamental responsibility of MERYS, in the new Education Law. Several institutions are involved in the realisation of this objective, in collaboration with MERYS:

- [Romanian Agency for Quality Assurance in Higher Education \(ARACIS\)](#), the national institution in charge with the implementation of academic quality assurance. ARACIS was established in 2005 as an autonomous public institution of national interest with the mission of external evaluation of the Romanian higher education's quality, at the level of study programmes, as well as institutionally. As of September 2009, ARACIS is a full member of the European Association for Quality Assurance in Higher Education (ENQA) and is registered in the European Quality Assurance Register for Higher Education (EQAR). The agency has tasks both in accreditation and quality assurance and performed institutional evaluations of over 70 public and private universities⁴⁰ so far, and the evaluation of various university study programmes is an ongoing activity. As an element of continuous quality assurance and improvement, the activity of ARACIS itself was evaluated during 2007-2009 by the ENQA, and was audited in 2008 by the European Students' Union, by means of which students' representatives evaluated the way ARACIS fulfils the European Standards and Guidelines.
- [National Council for University Research](#), which coordinates, finances and monitors and evaluates scientific research in Romania.
- [National Council for the Certification of Academic Titles, Diplomas and Certificates](#).

In addition to the national quality assurance mechanisms, many universities adopted their own internal Quality Management System (QMS)⁴¹. The legal framework for the national academic quality assurance is provided by Law 87/2006 on the approval of the Government Emergency Ordinance No. 75/2005 regarding the education quality assurance, and has been recently updated with the provisions of the new Education Law.

The above description of various institutions involved in the HE and research quality assurance suggests that the institutional framework for achieving this objective is well

⁴⁰ See full list of institutional evaluations at <http://www.aracis.ro/en/evaluation-status/institutional-assessments/>

⁴¹ For example, the QMS of the **University of Bucharest** includes: a) The Commission for Quality Evaluation and Management of the University; b) 19 Commissions for Quality Evaluation and Management at the level of each faculty of the university; c) The Bureau for Quality Management of the university, which supports the commissions mentioned previously; and d) Internal QMS auditors at the level of each faculty and at the level of administration. **Cluj University Babes-Bolyai's** Centre for Quality Management (CQM) ensures the coordination and self-evaluation of QM programmes in faculties, elaborates QM documents, and coordinates the student course evaluation, peer evaluation of education activities and the internal audit at faculty level. In December 2008 an Internal Audit has been performed by the Internal Audit Bureau, and quality management programmes have been introduced in the administrative services. '**Politehnica' University of Bucharest** implemented its QMS system in 2002 and created specialized support structures like the Quality Council, at the university level (including internal and external quality experts and students), and the Quality Commissions, at faculty level.

in place, but the effectiveness of its activity is modest, since the research performance of Romanian universities is low, as none of them appears in the top academic rankings, as discussed in the previous section. This holds true particularly for the private universities, which have an extremely low contribution to the research output (only 0.43% of the scientific production, see http://www.ad-astra.ro/cartea-alba/institution_types.php and section 2.4.1 for details).

3.3.2 Academic autonomy

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](#) 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 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, organization, activities⁴², 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**" ("free speech" and the right of teachers to decide on what to teach or research), b) "**political autonomy**" (the power to appoint the heads of different units (rector, dean, head of department, etc.) and to deal with internal political conflicts), and c) "**financial and managerial autonomy**" (freedom to decide on salaries, tuition fees, allocation of governmental funds, looking for additional funds, as well as to recruit researchers). However, both the political and the financial/managerial autonomy of universities are currently highly controversial issues, in light of changes introduced by the new Education Law that is widely believed to threat university autonomy. Below are just a few examples:

- **Political autonomy**, a much contested issue in the new Education Law 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 politicization 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

⁴² 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.

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.

On these grounds, the member universities 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 Romania⁴³, but no changes have been made in the law.

Governance

The election of academic governing structures (rectors, deans, etc.) abides by the regulations of the HEI's Charter and the legal framework set by the new [Education Law](#).

3.3.3 Academic funding

Public HEIs function on the basis of (1) budgetary funds, (2) extra-budgetary funds, and (3) funds from other sources (physical and legal persons, Romanian or foreign, donations, etc.). Budgetary funds are provided on a contract basis by MERYS for *institutional (block funding)*, investment projects, institutional development projects, inclusion projects, scholarships and social protection of students. *Block funding* for HEIs is provided for education activities, while research activities of the HEIs are funded on a competition basis. Block funds are calculated according to the number of equivalent students and to other quality indices set by MERYS, mainly based on the proposals made by the National Financing Council for Higher Education. The quality quota in the financing formula increased to 30% and 13 quality indicators in 2008, the other part (70%) being determined by the number of equivalent students. Although some of the quality indicators are determined by the quality of the training and research delivered by HEIs, the number of equivalent students is dominant in funds allocation. The funds from the state budget account for 65-80% of the whole budget, and the rest of funds come from fees, research contracts, services and other types of activities. In addition to the budgetary funds, MERYS can provide both public and private HEIs, also from public funds, a *supplementary funding* aimed at stimulating institutional excellence or some study programmes. The supplementary funding accounts for min. 30% of the amount allocated at national level to state universities as block funding, on the basis of quality standards approved by MERYS (Art. 197 (a) of the new Education Law). Also, a distinct fund for institutional development funded

⁴³ <http://www.uaic.ro/uaic/bin/view/University/declaratie-universitaria>

from MERYS budget is created to support the best performing university in each of the three categories discussed in section 3.3.1 (Art. 197(b) of the new Education Law). Public HEIs' revenue is supplemented to a small extent by private revenue (i.e. tuition fees charged for certain groups of students, such as limited number of self-funded student positions as approved by MERYS, lifelong learning etc).

Private HEIs are self-funded and are entitled to receive funds from the state budget to only after accreditation being entitled (Chioncel, 2009).

The R&D expenditure of the HE sector has almost doubled in 2007 compared to 2006 (latest available data) 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, 2010a). *Public funds for R&D* are obtained on a competition basis from the public funding instruments described in section 2.2.1, especially the programmes of the 2007-2013 National RDI Plan and the SOP Increasing Economic Competitiveness Priority Axis 2 RTDI for Competitiveness. External funds from 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.

3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the [ERA Green Paper](#) in April 2007, the EC Communication "[Improving knowledge transfer between research institutions and industry across Europe](#)" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the trans-national dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

3.4.1 Intellectual Property Policies

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 assistance⁴⁴ 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 2009, according to the specific methodology provided by GD 406/2003. In 2009, 51 entities were provisionally authorised, of which 45 were accredited, as follows: 14 technology transfer centres,

⁴⁴ Technical assistance services include: technology audit and forecast, consultancy for experimental models, prototypes and intellectual protection rights, etc.

21 information technology centres and 16 technology and business incubators). ReNITT also includes 4 S&T Parks (NASR, 2009). In 2010, the ReNITT network included only 47 entities (13 technology transfer centres, 19 information technology centres, 15 technology and business incubators). 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 offices⁴⁵. 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 relatively limited, due to a low demand from industry and also a relatively weak offer from universities, but many universities are currently actively involved in strengthening their technology transfer capacity. NASR supported technology transfer activities through the 2007-2013 National RDI Plan (Innovation and Capacities programmes), SOP Increasing Economic Activities Priority Axis 2, and also by organizing the 8th edition of the Open Forum for Innovation and Technology Transfer in 2009 (NASR, 2009).

The use of R&D results obtained from projects funded by public money is regulated by [Government Ordinance 57/2002](#) (Cap. 7), which specifies that:

- R&D results obtained from projects funded by public money belong equally to the legal persons who executed the projects and to the funding authority, 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).
- In case of closing down, reorganization, 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 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.
- If the R&D results obtained from projects funded by public money make the object of rental, concessions, etc., their value is established by negotiation between parties, upon agreement of the national R&D authority. In case these results are in the areas of national defence, public order and national security, the coordinating central administration bodies will decide if the rental, concession, etc. satisfies the national interest.

⁴⁵ 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.

- 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.
- The above provisions are applicable also to situations where the public money funding was made via grants, starting with 1996.
- In view of stimulating technology transfer to the economy, economic agents (business firms) can receive R&D results obtained from projects funded by public money at no cost, on a contract basis. They can also receive, on a co-financing basis, an amount of max. 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.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Spin-offs

The support systems to facilitate knowledge transfer from universities to the economy are in an early stage. Consequently, 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 Increasing Economic Competitiveness, Priority Axis 2, Operation 2.3.1 – Support for innovative start-ups and spin-offs*, which was launched in 2008 with a total budget of €18.5m, 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. This operation 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 years⁴⁶.

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 administrative regulations (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

⁴⁶ Selected projects are financed with €200,000 allocated during 3 fiscal years, and the beneficiary must provide a 10% co-financing share. The activities funded in the case of projects undertaken by spin-offs and start-ups include: R&D activities and acquisition of R&D services, consultancy services for innovation (management, technology assistance, technology transfer, training, acquisition, protection and commercialisation of industrial property rights, use of standards), support services for innovation (trials and tests in specialised labs, quality tests, certification, market studies). In addition, for spin-offs, the firm formation taxes can be covered as well. This operation is complementary to SOP-HRD Priority Axis 3 'Increasing the adaptability of workers and enterprises', which has two Key Intervention Areas relevant to spin-off formation: 3.1 Promoting an entrepreneurial culture; and 3.2 Training and support for enterprises and employees for promoting adaptability.

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 spinoffs").

EU cohesion policy

The most important SOPs for RDI funded by the ERDF are SOP Increasing Economic Competitiveness, Priority Axis 2 RTDI for Competitiveness, and SOP Regional Development, which have been described in section 2.2.1.

3.5 Cooperation, coordination and opening up national research programmes within ERA

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level, and between EU and national policies can hinder the build of critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 National participation in intergovernmental organisations and schemes

Participation in COST, EUREKA, FP7

Romanian participation in COST, EUREKA and FP7 is supported by NASR through Modules III and IV of the Capacities Programme, 2007-2013 National RDI Plan:

- **COST:** In 2009 Romania was involved in 89 out of the 292 COST projects in all the 9 priority actions, and in 2010 in 134 out of the 259 projects in all the 9 priority domains. The best representation was in the field of 'New Materials and Nano-sciences' in 2009 and in 'Food and agriculture' in 2010 (NASR, 2009, 2010).
- **EUREKA:** Romanian involvement in 12 projects in 2009, while 5 new projects have been financed in 2010. Other 3 cluster-type projects have been initiated in 2010 (in the ITEA2 and CELTIC clusters) (NASR 2009, 2010).
- **FP7:** 14 FP6 and FP7 projects of Coordination and Support Action (CSA) type or Support Action (SA) type⁴⁷ in 2009 and 371 projects in 2010 (4,08% of total, 469 participants) (NASR 2009, 2010).

National participation in inter-governmental Research Infrastructures (RI)

⁴⁷ "Coordination action to improve trans-national co-operation of National Contact Points" (TRANS REG NCP), "Trans-national cooperation among Research Potential NCPs -ResPotNET", "Improving the services of the NMP National Contact Points - Network through Trans-national Activities", "Coordination actions for the consolidation of Health National Contact Points (Health NCP Net), "Trans - national co-operation among national Contact Points for socio - economic sciences and the humanities" (NET4SOCIETY), and two FP7-EURAXESS projects "Discover Europe" and "EURAXESS T.O.P" (Transnational operation of the EURAXESS)

Romania participates in several inter-governmental RIs, such as:

- **CERN** - in 2008 Romania was formally accepted as a Candidate for Accession to CERN membership, a transitory position for five years, during which the country's contributions will go up to normal CERN member states levels, and will allow participation in CERN projects. Eight projects supporting Romania's participation in CERN were funded in 2008-2009, accounting for 3% of the budget (Module III [Capacities Programme](#)).
- **European Space Agency** - the negotiation between Romania and ESA for finalising the country's accession to the ESA Convention continued in 2009-2010. In 2006 Romania signed the European Cooperating State Agreement, which makes her the third European country holding this status. The signed agreement defined the legal basis for developing a Plan for European Cooperating State (PECS) Charter, describing activities, projects and budget for Romania's cooperation with ESA⁴⁸. Romania provides an annual financial contribution to ESA of €2m (€10m for the period 2007-2011), according to the Law of the Cooperation with ESA, and contributes to 12 of the ESA projects⁴⁹.
- **Other inter-governmental RIs with Romanian participation:** the Joint Institute for Nuclear Research Dubna, International Centre for Genetics Engineering and Biotechnology Trieste, United Nations Commission for Science and Technology, the Treaty of Antarctica (UNESCO).

3.5.2 Bi- and multilateral agreements with other ERA countries

Romania has bilateral cooperation programmes with 17 countries, which are supported from Module III of the 'Capacities' Programme of the 2007-2013 National RDI Plan. In 2008-2009 bilateral cooperation accounted for the largest share of the budget (73%) and included 193 projects mainly aimed at building research teams for accessing FP7 funds. The distribution by scientific field shows the highest numbers of projects in: Innovative materials and processes (46), Basic sciences (31), Environment (29), Health (23) and Agriculture (19). Social Sciences and Humanities, and Health have the lowest numbers of projects (11 and 5 respectively). Third countries involved in bilateral cooperation agreements with Romania include: South Africa, China, India, Japan, South Korea, Turkey, Republic of Moldova and Ukraine⁵⁰.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Participation in ERA-NETs

Romania currently participates in 32 [active ERA-NETs](#), and has also been part of other 16 ERA-NET that are now finished ([inactive](#)). By domain, the participation was highest in: Environment (8 active, 3 inactive), Food, agriculture and fisheries (5 active, 1 inactive), ICT (5 active, 1 inactive), Nanoscience and nanotechnologies (5

⁴⁸ See http://www.esa.int/esaCP/SEMI2HMVGJE_Benefits_0.html for details.

⁴⁹ 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 Centered 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.

⁵⁰ See details of the work programmes established within these agreements at <http://www.mct.ro/index.php?action=viewart&artid=2223&idcat=270>

active), Energy (4 active), Transport (3 active, 2 inactive). The lowest participation was in: Health (2 active), Government and social relations (2 active), space (1 active), Services (1 active). ERA-NETS are currently under the coordination of the [Executive Unit for Funding Higher Education, Scientific Research, Development and Innovation \(UEFISCDI\)](#), which has taken over this coordination task from the [National Centre for Programme Management](#).

Participation in initiatives undertaken under Art. 185 of the Treaty of Lisbon (EUROSTARS): In the 2nd call of the EUROSTARS programme (launched in 2008, results announced in 2009) Romania had 13 eligible proposals, of which 1 was accepted for funding following the international evaluation. In the 3rd call (September 2009), Romania had 11 eligible proposals, of which 4 have been accepted for funding as coordinator (E!5112 RELIS, E!5119 EUGEN).

Participation in European public-private partnerships - Joint Technology Initiatives (JTI) and European Technology Platforms

In 2007-2008, Romania registered as member to four of the approved six Joint Technology Initiatives: **ARTEMIS** (integrated information systems), **ENIAC** (nanotechnologies), **IMI** (innovative medicines) and **CLEAN SKY** (aeronautics). Romania is a founding member of CLEAN SKY, in which it participates through a consortium of two research institutes and two plane manufacturers. Romania is also a founding member of IMI, through the Romanian Association of International Medicines Manufacturers. In November 2009 Romania became full member of ENIAC Joint Undertaking JU15.

3.5.4 Opening up of national R&D programmes

The opening up of national R&D programmes has not been addressed as an important policy option, as the primary aim of the national R&D programmes was to support the Romanian scientific community. Therefore, the nationality of the applicant is not mentioned as an eligibility criterion in most programmes of the 2007-2013 National RDI Plan, which require instead that the applicant have a full time labour contract in a Romanian R&D organisation registered and validated in the Register of Potential Contractors and framed in the research definition, pursuant to the Community Framework for State Aid. Only some specific schemes of the Human Resources and Ideas Programmes meant to encourage the return to the country of Romanian researchers working abroad clearly refer to the Romanian nationality of the applicant (see section 2.5.2).

SOP Increasing Economic Competitiveness *Operation 2.1.2 "R&D projects of high scientific level involving foreign specialists"* (launched in March 2009) is the only funding scheme that clearly refers to foreign researchers, as this operation supports the creation of highly competent research teams within an R&D institution, a university or a host enterprise, involving established international experts, of any nationality, as project managers. The international specialists will be employed as scientific researchers in the host institution, if they meet specific conditions⁵¹.

⁵¹ They are employed for a period at least equal with the duration of the project, have at least 5 years research experience and PhD degree, and at least 3 years work abroad in research during the last 5 years (also as PhD student or post-doc).

3.6 International science and technology cooperation

In 2008, the European Commission proposed the [Strategic European Framework for International Science and Technology Cooperation](#) to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section analyses how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

See section 3.5.2.

3.6.2 Mobility schemes for researchers from third countries

There are no mobility schemes particularly targeting researchers from third countries apart from the projects included in the bilateral agreements mentioned above.

4 Conclusions

4.1 Effectiveness of the knowledge triangle

In the knowledge triangle in Romania, progress in research has been more rapid over the last two decades than in innovation and education, which are catching up more slowly. Important changes and reforms have taken place in all the three sectors, but their effectiveness has been often hampered by underinvestment, lack of vision or coherence in the measures adopted, or lack of political will for bolder reforms. Catching-up in innovation is seriously hindered by the lack of a National Innovation Strategy to establish national and regional innovation priorities and to act as a focal point for synergies with other sectors, like education, employment, IT and telecom, energy, environment, regional development. The elaboration of a National Innovation Strategy is expected to start in 2011. Also, Romania does not have an economic strategy based on innovation, as other EU MS, and innovation is not a driver of economic growth.

Research and innovation policies are coordinated through the 2007-2013 National RDI Strategy and its implementing instrument, the 2007-2013 National RDI Plan and complementary programmes Sectoral R&D Programmes and Core R&D Programmes. Some SOPs that address RDI objectives are also important, but their role is still limited since they started to actually fund projects since 2009 and the absorption rate is relatively low. All these instruments comprise a wide range of funding schemes that could in principle cover important needs of the scientific and business communities, but the national public funding has been drastically cut since 2009, while the absorption of Structural Funds remains low. This increases the orientation towards the Structural Funds as a key funding source for innovation, but the absorption remains low because of several other limiting factors, at the programme implementation level, the beneficiary level and the general economic, social and political conditions of the country. Overall, the effectiveness of knowledge triangle policies remains limited, and the RDI and education systems continue to

suffer from underinvestment, shortage of skilled people, lack of synergies with other economic sectors and slow reform progress, in spite of a good number of funding schemes and other provisions with high transformative potential.

Table C: Effectiveness of knowledge triangle policies

	Recent policy changes	Assessment of strengths and weaknesses
Research policy	<ul style="list-style-type: none"> • Adaptation of funding priorities to the reduced R&D budget in 2009: main focus on support to R&D capacities in R&D institutions of national interest, payment of membership fees in international programmes and organizations, freezing of new competitions under the national RDI programmes, increasing the absorption of Structural Funds; • Functional competitions for the SOPs with RDI objectives. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Comprehensive, coherent multi-annual National RDI Strategy and RDI Plan, established by large consultation of the S&T and business communities and SWOT analysis; • The target of 1% of GERD/GDP set for 2010 generated significant increase of R&D public expenditures in 2007 and 2008, but dropped in 2009 as a consequence of the economic crisis; • Broad range of funding schemes in the National RDI Plan and complementary programmes for development of R&D capacity in public and private R&D institutions, universities and private firms, human resources for S&T/R&D, science-industry linkages and international cooperation (Note: policy impact not assessed yet, as formal programme evaluations are expected in 2011); • Broad range of R&D objectives financed through the SOPs with R&D focus (SOP IEC, ROP, HRD); • Specific measures for support of research infrastructures; • Competition as predominant funding mechanism and instrument to enhance scientific excellence; • Periodic evaluation at institutional, programme and project levels based on international criteria, introduction of new evaluation procedures, agencies, methodologies, improvement of existing ones; • Long tradition in some R&D fields. <p>Weaknesses:</p> <ul style="list-style-type: none"> • R&D commitments too sensitive to political and economic context. Drastic 2009 R&D budget cuts with long-term consequences; • Little visibility and importance of R&D policies in the political decisions, especially those related to funding; • Lack of regional R&D policies, poor regional outreach of NASR; • Strong regional disparities in the distribution of R&D resources between the capital and all the other regions; • Low absorption of R&D funds available through the SOPs; • Low BERD, strong dependence of BERD on public funding, weak science-industry links and inter-sectoral mobility, low interest of business community to collaborate with the scientific community, weak industry R&D capacity; • Low attractiveness of R&D careers, high losses of qualified researchers and postgraduates through brain drain and internal migration to better paid domestic sectors; • Incoherent approach between R&D policies/strategies and other national policies/strategies (education, employment, IT, energy, environment, regional development).

	Recent policy changes	Assessment of strengths and weaknesses
Innovation policy	<ul style="list-style-type: none"> • Preparation of a National Innovation strategy. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Establishment of a basic support structure for innovation - the national network for technology transfer and innovation ReNITT and sustained measures to develop it (evaluation, accreditation, monitoring). <p>Weaknesses:</p> <ul style="list-style-type: none"> • Little visibility and importance of innovation policies in the political decisions; • Lack of an innovation-based economic development strategy at national and regional level; • Ineffectiveness and incoherence of regional innovation strategies (RIS), poor implementation capacity of the RIS by the RDAs and poor vertical coordination between central and local authorities managing the RIS, lack of synergies between the RIS and the national RDI strategy, lack of synergies between the six RIS, poor inter-regional linkages in RIS implementation; • Poor innovative capacity of industry, low innovation culture, technological renewal mostly based on acquisition of foreign technologies, products, services rather than on the domestic offer or development of in-house R&D capacity; • Industry structure dominated by traditional manufacturing and processing industries, low share of new, knowledge-intensive technologies, slow pace of industry restructuring affecting the knowledge demand of the business sector; • Limited access to capital (bank loans), absence of venture capital schemes for R&D and innovation, difficulty to participate in innovation support schemes that require co-financing by the beneficiary; • Poor availability of training programmes for technology transfer personnel; • Lack of incentives for innovative enterprises.

	Recent policy changes	Assessment of strengths and weaknesses
Education policy	<ul style="list-style-type: none"> • New Education Law project under Parliament debate, highly controversial due to some provisions thought to affect university autonomy and politicize the higher education sector. 	<p>Strengths:</p> <ul style="list-style-type: none"> • Broad range of support measures for R&D in HE in several programmes of the National RDI Plan and the SOPs with RDI objectives (SOP IEC, HRD); • Support for HE reform and restructuring programmes through SOP HRD Priority Axis 1 (quality and leadership in HE, doctoral schools, excellence schools); • Introduction of external and internal quality assessment procedures in many universities; • Efforts to increase research capacity and technology transfer in universities, elaboration of university research strategies; • Important institutional renewal in education-related fields (evaluation, accreditation, equivalence of diplomas). <p>Weaknesses:</p> <ul style="list-style-type: none"> • Incomplete and often incoherent reform of education sector; • Low attractiveness of HE careers, low salaries; • Poor links between education policies, especially HE policies, and RDI and employment policies, accelerating the high losses of HRST; • Poor lifelong learning activities and adult participation in education and training; • Poor entrepreneurial education, especially in universities; • Strong regional disparities in the distribution of universities, students, teaching staff between the leading university centres (e.g. Bucharest, Iasi, Cluj) and the rest of the country.
Other policies	<ul style="list-style-type: none"> • Austerity measures adopted in view of rebalancing the budget (25% cuts in public sector salaries, significant reductions and cuts of public subsidies, VAT increase to 24%, freezing of hiring in the public sector). 	<p>Weaknesses</p> <ul style="list-style-type: none"> • General business environment conditions affected by poor public administration, high bureaucracy, systemic corruption and subordination to political interests, limited use of e-services in public administration; • Gaps in the public-private partnerships legislation, unclear existing provisions; • Low enforcement of and corruption in the implementation of public procurement legislation and procedures.

4.2 ERA 2020 objectives - a summary

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

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard to the specific ERA objective
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	<ul style="list-style-type: none"> • Funding opportunities provided by the National RDI Plan programmes (Human Resources, Ideas, People) and SOP HRD for young researchers, mobility of researchers, PhD students, Romanian researchers working abroad, restructuring of doctoral programmes and formation of excellence schools • Evaluation and accreditation of public and private universities, both at institutional level and at study programme level • Evaluation and accreditation of public R&D institutes • Changes in the maternity leave law to be enforced from 1 January 2011 	<ul style="list-style-type: none"> • Poor synergies between education, RDI and employment policies • High losses of qualified HRST through brain drain and internal migration towards better paid domestic sectors • National RDI programmes highly focused on Romanian researchers. Open to foreign researchers but unattractive, given the low salaries and unappealing working conditions • Absence of gender policies to stimulate participation and retention of female scientists and researchers • Low salaries in research and higher education
2	Increase public support for research	<ul style="list-style-type: none"> • Cuts in the public budget for RDI in 2009, freezing of some competitions under the National RDI Plan • Important funding opportunities through the Structural Funds, but low absorption rate 	<ul style="list-style-type: none"> • Short-term and long-term effects of the 2009 public funding cuts, annihilating the improvements of the recent years that benefited from increased public RDI funding
3	Increase European coordination and integration of research funding	<ul style="list-style-type: none"> • Participation in several European RTDI initiatives • National participation in intergovernmental organisations and schemes 	<ul style="list-style-type: none"> • Broad range of policy instruments to support participation in European RTDI programmes • Strong reliance of public funding instruments
4	Enhance research capacity across Europe	<ul style="list-style-type: none"> • Development of Regional Innovation Strategies in six development regions since the early 2000s • Elaboration of the National Research Infrastructure Roadmap (2007) 	<ul style="list-style-type: none"> • Broad range of policy instruments to support participation in European RTDI programmes
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	<ul style="list-style-type: none"> • Elaboration of the National Research Infrastructures Roadmap, creation of the Romanian Committee for Research Infrastructures (2007); • National participation in the ESFRI roadmap 	<ul style="list-style-type: none"> • Multi-annual funding for the National Research Infrastructure Roadmap through the National RDI Plan (Capacities Programme) and SOP IEC Priority Axis 2 • Cancellation of approx. 30% of the research infrastructure investment planned for 2007-2009 because of the budgetary limitations occurred at the end of 2008

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard to the specific ERA objective
6	Strengthen research institutions, including notably universities	<ul style="list-style-type: none"> • Competitive and institutional support through the National RDI Plan, Core R&D Programmes and Sectoral R&D Plans; • Competitive funding through SOP IEC Priority Axis 2 • Implementation of university research strategies and strengthening of research capacities • Evaluation and accreditation of R&D institutions and universities 	<ul style="list-style-type: none"> • Concentration of R&D potential in National R&D institutes and other public R&D institutions. HEIs traditionally focused on the education mission, but increasingly consolidating the research mission and, in some cases, the 'third mission' of research commercialization. Poor research capacity in business firms
7	Improve framework conditions for private investment in R&D	<ul style="list-style-type: none"> • Cuts in the public funding for RDI and adoption of survival strategies rather than development and expansion ones 	<ul style="list-style-type: none"> • Low private RDI investment and many obstacles to increasing it
8	Promote public-private cooperation and knowledge transfer	<ul style="list-style-type: none"> • Important funding opportunities provided by the National RDI Plan programmes and SOP IEC Priority Axis 2 	<ul style="list-style-type: none"> • Weak public-private partnerships (PPP), low culture of collaboration • Unclear PPP legislation, with many gaps • Technology and knowledge transfer mechanisms still in early development stage
9	Enhance knowledge circulation across Europe and beyond	<ul style="list-style-type: none"> • Important funding opportunities provided by the National RDI Plan programmes, SOP HRD, bilateral and international cooperation agreements, participation in EU RTDI initiatives • Adoption of the Scientific Visa 	<ul style="list-style-type: none"> • Expansion of international mobility of Romanian researchers
10	Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world	<ul style="list-style-type: none"> • Elaboration of the National Strategy for International Cooperation within a project under NASR's Sectoral Plan, in 2009 • Important funding opportunities for international cooperation through National RDI Plan (Capacities Programme) • Creation of the Romanian Office for S&T in Brussels, as support body to MERYS by the European Commission 	<ul style="list-style-type: none"> • Relatively low visibility of Romanian research in international cooperation • Low level of funding attracted from international cooperation projects
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	<ul style="list-style-type: none"> • Revival of the Interministerial Council for S&T Policy (foreseen for Q4 2010-2011) 	<ul style="list-style-type: none"> • Poor horizontal and vertical coordination across policy levels and areas, poor communication between NASR and other agencies involved in RDI

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses with regard to the specific ERA objective
12	Develop and sustain excellence and overall quality of European research	<ul style="list-style-type: none"> • Important funding opportunities through SOP HRD for the restructuring of doctoral schools and establishment of excellence schools 	<ul style="list-style-type: none"> • Evaluation of university research quality
13	Promote structural change and specialisation towards a more knowledge-intensive economy	<ul style="list-style-type: none"> • Important funding opportunities through National RDI Plan programmes and SOP IEC Priority Axis 2 	<ul style="list-style-type: none"> • Low presence of knowledge-intensive industries in the economy structure • Shortage of qualified personnel in knowledge-intensive industries caused by brain drain
14	Mobilise research to address major societal challenges and contribute to sustainable development	<ul style="list-style-type: none"> • Funding opportunities through the National RDI Plan 	<ul style="list-style-type: none"> • Low contribution of RDI to major societal challenges and sustainable development
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	<ul style="list-style-type: none"> • No specific schemes 	<ul style="list-style-type: none"> • Low visibility and importance of RDI in society

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List of Abbreviations

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
COST	European Cooperation in Science and Technology
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
EU	European Union
EU27	European Union including 27 Member States
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
IP	Intellectual Property
OECD	Organisation for Economic Co-operation and Development
PRO	Public Research Organisations
R&D	Research and development
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
S&T	Science and technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
VC	Venture Capital

Annex 1

Table 1: Romania's GDP growth rate and GERD as a percentage of GDP relative to EU27

GDP growth rate (percentage change to previous year)

GDP/Year	2006	2007	2008	2009*	2010*	2011*
EU 27	3.3	3.0	0.5	-4.3	1.8	1.8
Romania	7.9	6.3	7.3	-7.1	-1.3	1.5

 Source: [Eurostat](#)

GERD as percentage of GDP

GERD	2006	2007	2008	2009	2010	2011
EU27	1.85	1.85	1.92	2.01	:	:
Romania	0.45	0.52	0.58	0.47	:	

 Source: [Eurostat](#); (:) not available.

Table 2: GERD as % of GDP, 2001-2009

	2009	2008	2007	2006	2005	2004	2003	2002	2001
EU27	2.01*	1.92*	1.85*	1.82*	1.82*	1.83*	1.86*	1.87*	1.86
Romania	0.47	0.58	0.52	0.45	0.41	0.39	0.39	0.38	0.39
Relative size RO/EU27 (%) **	22.33	30.52	28.11	24.32	22.53	21.43	20.97	20.32	20.97

 Source: [Eurostat](#); (*) Eurostat estimate; (**) own calculation.

Table 3: Result indicators for the national evaluation of the RDI system

No	Indicator	Unit	Reference year 2006	Target 2013	2008 /2009***
1	Scientific papers in ISI-WoS journals	No/year	1692	2000	9458***
2	Citations in ISI-WoS journals	No.	5922	15	1975***
3	Romanian ISI-WoS journals	No.	6	174	57***)
4	National patents filed/granted	No.	965/527	122 cumulated	995/394
5	International patents (EPO filed, USPTO granted, triadic)	No.	38/11 (30, 29, 30)		(36,483)
6	Foreign funds for R&D (% in GERD)	Thousands RON (%)	63,914 (4.08)	- (10)**	118,304 (3.45)
7	BERD expenditure (% in GERD, % in GDP)	Thousands RON (%) (%)	476,162 (30.4) (0.14)	- (0.75)	585,046 (29.3) (0.17)
8	Number of PhDs in the RDI system	No.	12,309	18,000	14,851
9	Investment in RDI infrastructure	Thousands RON (%)	246,555 (15.7)	- (25)	467,235 (15.7)

Source: NASR 2009, Based on the Statistical Yearbook of Romania 2008, National Institute of Statistics. *) Target established in GD 457/2007 - National RDI Plan; **) Revised target; ***) Provisional data for 2009.