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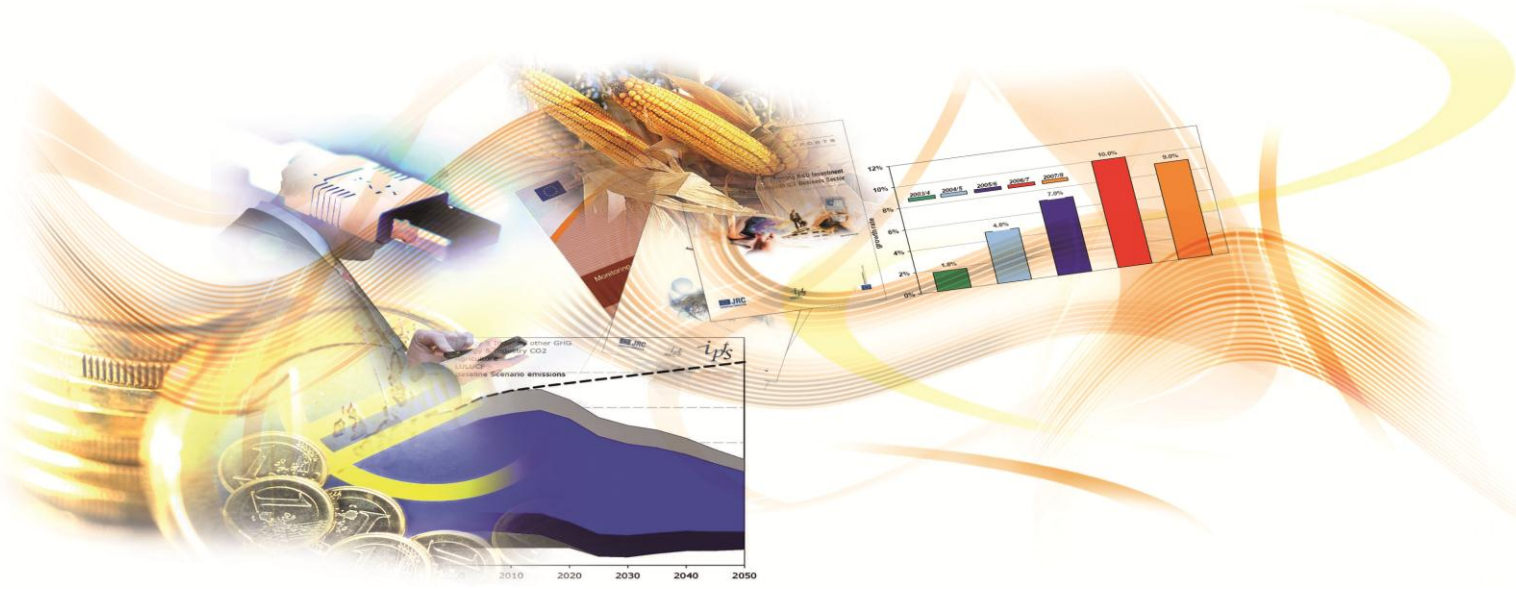

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Abstract

The Analytical Country Reports analyse and assess in a structured manner the evolution of the national policy research and innovation in the perspective of the wider EU strategy and goals, with a particular focus on the performance of the national research and innovation (R&I) system, their broader policy mix and governance. The 2013 edition of the Country Reports highlight national policy and system developments occurring since late 2012 and assess, through dedicated sections:

- national progress in addressing Research and Innovation system challenges;
- national progress in addressing the 5 ERA priorities;
- the progress at Member State level towards achieving the Innovation Union;
- the status and relevant features of Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3);
- as far relevant, country Specific Research and Innovation (R&I) Recommendations.

Detailed annexes in tabular form provide access to country information in a concise and synthetic manner.
The reports were originally produced in December 2013, focusing on policy developments occurring over the preceding twelve months.

ACKNOWLEDGMENTS AND FURTHER INFORMATION

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). ERAWATCH is a joint initiative of the European Commission's Directorate General for Research and Innovation and Joint Research Centre.

The Country Report 2013 builds on and updates the 2012 edition as well as the country reports produced by Dr. Attila Havas since 2007. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2013 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments and suggestions of Ms. Fatime Barbara Hegyi and Ms. Mariana Chioncel and from JRC-IPTS. The contributions and comments from DG-RTD are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the ERAWATCH website. Comments on this report are welcome and should be addressed to jrc-ipts-erawatch-helpdesk@ec.europa.eu.

EXECUTIVE SUMMARY

Hungary is a medium-sized EU member state with a territory of 93,036 km^2 and a population of 9,908,798 inhabitants (about 2% of the EU-28 total). In the past few years, the catch up of the Hungarian GDP to the EU-28 average slowed down due to the crises. The Hungarian GDP (in terms of purchase power standard) stayed at 67% of the EU-28 average in 2012. The GERD reached its highest ratio in 2012 (1.3%) after a fluctuation between 0.9-1.17% in the past decade. Principally, the growth of the GERD in the past two years is in line with the target set by the government in the National Research-development and Innovation Strategy (2013-2020), entitled "Investment into the Future". According to the commitments, Hungary will increase its research and development expenditures to 1.8% of the GDP by 2020 and 3% by 2030". A complementary target of the strategy is that BERD will reach 1.3% by 2020. With these efforts, Hungary still devotes significantly fewer resources to R&D than the EU-28 average: the GERD/GDP ratio was 63.1% of the EU-28 average in 2012.

Hungary has all the major elements of a potentially successful national innovation system (NIS). Nevertheless, the science and innovation policy governance system could not be stabilised in the past few years as major STI policy-making bodies and the RTDI funding structure were reorganised almost every year. At the highest political level, the National Development Cabinet (NFK), established in 2012, has the mandate to decide on various issues, discusses all the decision preparatory documents relevant to development policy and has the mandate to co-ordinate governmental STI policy decisions. At operational level, the National Innovation Office (NIH) is a governmental body responsible for research, development and technological innovation, including STI strategy-making and programme planning as well as for international RDI collaboration. The NIH schemes and various operational programmes financed from European Union resources used to administered by an intermediary body, called the Hungarian Economy Development Centre (MAG Zrt). Based on the government decree 1085/2014 (II.28.), this intermediary body has been integrated into the Ministry for National Economy by 15th April 2014. As of 1st January 2014, all managing authorities that used to be controlled by the National Development Agency (NFÜ) work under five ministries that are responsible for the implementation of various Operational Programmes co-financed by the European Union in 2014-2020. In addition, all the other intermediary bodies responsible for managing Structural Funds have been integrated into dedicated ministries by 15th April 2014.

The business expenditures on research and development constitute the biggest share of the total R&D funding and stayed almost the same level between 2009 and 2012 (46.4% and 46.9% respectively). Public funding decreased significantly from 41.9% in 2009 to 36.9% in 2012. This decrease is even more remarkable if we consider a longer period as the government sector funded the half (49.6%) of the total R&D expenditures in 2005. Research and development funding from abroad has a quite high and increasing share of the GERD (10.9% in 2009 and 15.4% in 2012).

The patterns of R&D performance by sectors became similar to the EU-28 average in the period between 2009 and 2012. The business enterprise sector increased their share from 57.2% to 65.6% (63.0% in EU-28). The higher education organisations underperforming the EU-28 average (23.8%), because their share decreased slightly in the past four years from 21.7% to 18.4%. The research performance of the government sector was shrinking from 20.1% to 14.4% which is close to the EU-28 average (12.4%).

The new RDI strategy 2013-2020 foresees significant support to be provided for the creation of an environment in which public institutions, companies and innovative enterprises could develop and grow. The strategy focuses on three main fields: knowledge creation, knowledge transfer and knowledge utilisation. The strategy foresees a purposeful system building according to three

priority axes: i) internationally competitive knowledge bases, ii) support of efficient knowledge and technology transfer collaborations and iii) companies that exploit intensively the results of modern S&T. The expected results of the above specific targets are the stimulation of RTDI demand, establishment of an efficient support and funding system as well as the completion of the start-up ecosystem.

The challenges of the Hungarian research and innovation system are fairly similar to those of the previous year as the situation and framework conditions for RTDI have not changed much. Based on the ERAWATCH country reports produced in the previous years and the situation analysis of the National Research-development and Innovation Strategy 2013-2020, the IUS and other data presented in this report, the following five major structural challenges of the Hungarian NIS are highlighted:

1. *Low level of innovation activities, especially that of the SMEs*. Only about one-fifth of enterprises introduce product or process innovations in Hungary. The negative trend seems to be halted, as no change (0.0%) could be observed according to the IUS2013 data compared to the previous period.
2. *Low occurrence of co-operation in innovation activities among key actors*. Particularly small innovative firms co-operate less frequently with their clients or customers than large innovative companies. This issue can be taken as a specific feature of a broader challenge, that is, the dual economy syndrome: the Hungarian economy is composed of highly productive and technologically advanced foreign-owned large firms, on the one hand, and fragile, financially and technologically weak indigenous SMEs, on the other.
3. *Insufficient quantity and supplement of human resources for R&D and innovation*. The share of S&E graduates and the rate of participation in life-long learning are rather low in international comparison. A significant gap might be opening between the supply and demand for qualified science and engineering (S&E) personnel in the near future.
4. *Unfavourable framework conditions for innovation*. The macroeconomic situation, the structure of the economy, the overall entrepreneurship culture together with the intensity and type of competition seem to influence firms' behaviour with such a power that STI policy schemes cannot offer strong enough incentives to overrule these unfavourable effects.
5. *Deficiencies in the STI governance system and the institutional framework*. There was another wave of reorganisation of major STI policy-making bodies and the RTDI funding structure introduced by the new government since 2010. Related to this challenge, there is another important issue that government bodies responsible for policy design and policy implementation have no critical mass in experienced professionals.

At least the first three challenges have been identified in various policy documents and the most recent RDI strategy 2013-2020, while the unfavourable framework conditions for innovation and the deficiencies in the STI governance system and the institutional framework were not yet identified as main challenges to trigger government intervention. As regards to the first three challenges, several measures have been introduced to promote RTDI activities of firms, strengthen industry-academia co-operation, and increase the supply of S&E graduates. In conclusion, somewhat modest improvement has been achieved in these three fields, and hence STI policy measures have not been highly effective.

Based on the assessment of both the progress of Hungary towards the Innovation Union commitments and the delivery of European Research Area, the following main findings could be summarised:

- The relevance of research and innovation in improving the national competitiveness is well recognised at policy and implementation level. In terms of performance, some progress was made towards the commitments and the gap closed slightly between the national and EU-28 figures as reflected in key RDI indicators. In addition, new strategic documents (i.e. RDI strategy, Science Policy Strategy, S3 White Book, IP strategy, etc.) were published in 2013 that foresee measures to reinforce the performance of the Hungarian NIS.
- The STI policy mix contains a high number of measures that doesn't seem to be effective. As long as no comprehensive evaluation and monitoring system is in place, it is not easy to decide how to change the mix in order to make a faster completion of national targets and commitments.
- The administrative burden, the red tape is generally high and the RDI calls and procedures are rather complicated that prevents many actors to participate in these measures. This issue effects largely the participation of SMEs and joint business-academia RTDI activities, therefore simplification of regulation with close monitoring would have high impact on collaborations and RDI performance.
- The application of modern, participatory policy preparation tools (e.g. foresight) for designing RTDI concepts, sectoral strategies, as well as systematic evaluation of programmes and measures is not a common practice. In addition, a wide involvement of stakeholders and devoting significant time to public consultations during the policy design phase would increase the efficiency and effectives of policy measures.
- Supporting excellence and using this principle in funding decisions is an increasingly used practice, particularly the Hungarian Academy of Sciences introduced a number of measures that support excellence. Besides, funding of higher education organisations will depend more on excellence if the draft higher education strategy will be approved.
- Exploration of innovative services and new services in public organisations as proposed by the RDI strategy 2013-2020, could improve the low risk taking culture of civil servants. Also, addressing societal challenges and setting clear performance measures for research personnel at public universities and PROs could also increase the overall quality of scientific outcomes.
- Exploitation of public research results, including knowledge transfer and spin-off creation is not yet a well explored area, even if TTOs are established at all major HEIs. Besides, attraction of young and mid-carrier professionals from companies to PROs and universities to introduce professional research management techniques, develop collaborations with companies and foreign R&D institutes could significantly enhance institutional performance and excellence.
- There are a relatively large number of intermediary organisations (e.g. regional innovation agencies, technology transfer offices) in the Hungarian NIS, nevertheless they have no critical mass neither in their size nor in their responsibilities. More targeted funding could increase their specialisation and gaining critical mass in order to become significant players of the NIS.

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1 BASIC CHARACTERISATION OF THE RESEARCH AND INNOVATION SYSTEM

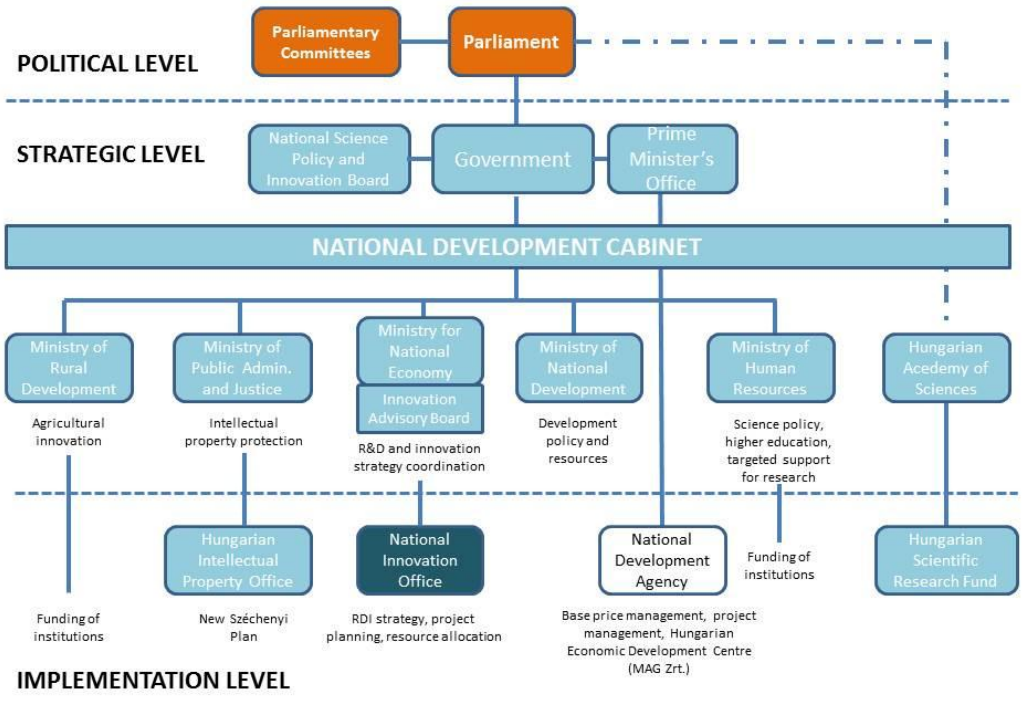
Position in the European RDI landscape. Hungary is a medium-sized EU member state, since 2004, with a territory of 93,036 km^2. On 1st January 2013, the country had a population of 9,908,798 inhabitants (about 2% of the EU-28 total) that slightly decreased (-1.3%) in the past 5 years. Hungary is the fifth largest national economy in Central and Eastern Europe. The Hungarian GDP per capita at market prices has been €16,000 in 2008 and €16,700 in 2012. The catch up of the Hungarian GDP to the EU-28 average slowed down due to the crises. Compared to the EU-28 average, the GDP in terms of PPS (purchase power standard) has been 64 per cent in 2008 and 67% in 2012.

The Hungarian GERD was fluctuating between 0.9-1.17% of the GDP between 2000 and 2010 than started to grow (1.22% in 2011) and reached its highest ratio in 2012 (1.3%). This growth of the GERD is in line with the target set by the government in its RDI strategy accepted in June 2013. According to the National Research-development and Innovation Strategy (2013-2020), entitled "Investment into the Future", Hungary will increase its research and development expenditures to 1.8% of the GDP by 2020 and 3% by 2030". A complementary target of the strategy is that BERD will reach 1.3% by 2020. With these efforts, Hungary still devotes significantly fewer resources to R&D than the EU-28 average: the GERD/GDP ratio was 63.1% of the EU-28 average in 2012. According to the latest Innovation Union Scoreboard 2014, non-R&D innovation expenditures as percentage of total turnover of Hungarian companies is significantly lower (0.4%) than the EU-27 average of 0.56%. Unfortunately, the trend is not advantageous either, as the value of the indicator decreased by 10.6% compared to the previous year, even if the R&D expenditures in the business sectors grew by 11.0%. Overall, the country's innovation performance, despite some fluctuations, improved between 2006 and 2013. The performance relative to the EU increased to 63% in 2013 from around 60% in 2006 (IUS, 2014).*Main features of the research and innovation system*. Hungary has all the major elements of a potentially successful national innovation system (NIS). The Parliament is the highest-level political decision-making body, while the National Development Cabinet - that has been set up in June 2012 - has the mandate to decide on various national development policy issues and to co-ordinate governmental STI policy decisions. The Cabinet discusses all the decision preparatory documents relevant to development policy and the Cabinet is responsible to establish the rules, procedures and organisational set up to be used when making and implementing decisions concerning the National Strategic Reference Framework for 2014-2020.

The science and innovation policy governance system could not stabilised in the past few years as major STI policy-making bodies and the RTDI funding structure were reorganised almost every year. The National Research, Innovation and Science Policy Council (NKITT) had been set up in December 2010 to co-ordinate governmental STI policy decisions. After one and a half year operation, the NKITT was dissolved on 2 July 2012 when a new body, called National Development Cabinet (NFK) was set up. In September 2013, a new advisory body, the National Science Policy and Innovation Board (NTIT) was established by the government decree 116/2013 (IX.25.). The president of the NTIT is the prime minister, co-chaired by the president of the Hungarian Academy of Sciences (MTA). The mandate of the board is to provide advice, evaluate and make recommendations on strategic issues of scientific, research and development and innovation programmes, the sustainable finance of these programmes and the evaluation methodology to be carried out at scientific institutions.

At operational level, the National Innovation Office (NIH) is a governmental body responsible for research, development and technological innovation, including strategy-making and programme planning as well as for international RDI collaboration. One of the tasks of the NIH is to coordinate the activities of the regional innovation agencies (established in each seven regions in Hungary). These agencies established a network, called RIÜNET in 20005 in order to generate regional innovation processes, to harmonise and coordinate those actions, organise technological innovation networks and to provide innovation services to SMEs and start-ups. Nevertheless, the regional innovation agencies receive minimal government support and their operation is mainly based on funding from international programmes (i.e. EU FP7 and Interreg).The two most important financial sources providing competitive funding for R&D activities are the Research and Technological Innovation Fund (RTIF), and the various Operational Programmes of the New Széchenyi Development Plan co-financed by the EU Structural Funds (2007-2014). These funds were managed by the National Development Agency (NFÜ) until the end of 2013. Based on the government decree 475/2013 (XII. 17.), the Prime Minister's Office took over the role and responsibilities of the NFÜ from 1st January 2014, while dedicated ministries became the successors of the managing authorities that were working under NFÜ. In the new programming period 2014-2020, five ministries will be responsible for the implementation of the Operational Programmes of the EU Structural Funds. The RTIF schemes and various operational programmes financed from European Union resources used to be administered by the intermediary body, the Hungarian Economy Development Centre (MAG Zrt). Based on the government decree 1085/2014 (II. 28.), the intermediary bodies responsible for the administration of various OPs will be integrated into five ministries by 15th April 2014 and the reorganised MAG Zrt. will work under the Ministry for National Economy.

Figure 1 **Policy governance sub-system of the Hungarian National Innovation System**



Source: author's own compilation based on National Innovation Office

Hungary is a unitary state with a centralised decision-making system with regard to major policy domains, including science, technology and innovation policies. Hungarian regions have neither democratically elected leaderships, nor any power to raise revenues, e.g. regional tax. In effect

from 1st January 2013, new territorial administrative units, districts (NUTS3 level) were created within the 19 counties with no significant role regarding to STI policy-making.

Research and Innovation Policy. The new RDI strategy 2013-2020 foresees significant support to be provided for the creation of an environment in which public institutions, companies and innovative enterprises could develop and grow. The strategy focuses on three main fields: knowledge creation, knowledge transfer and knowledge utilisation. The purposeful system building will support the development of the following priority axes: i) internationally competitive knowledge bases, ii) support of efficient knowledge and technology transfer collaborations and iii) companies that exploit intensively the results of modern S&T. The expected results of these specific targets are the stimulation of RTDI demand, establishment of an efficient support and funding system as well as the completion of the start-up ecosystem.
The bulk of competitive public funding to be provided for research and innovation is financed from the Operational Programmes of the EU Structural Funds 2014-2020. Measures focusing on RTDI are highly prioritised in the multiannual plans, especially in the Economic Development and Innovation OP (GINOP) and the Competitive Central-Hungary OP (VEKOP). According to the planning documents, Hungary will allocate 60% for economic development purposes and about €2 billion for the development of the knowledge economy (i.e. support of company R&D and research programmes) out of the total Structural Funds available in the period 2014-2020.

2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

2.1 National economic and political context

The contraction in economic activity persisted until the 4th quarter of 2012, when investment and exports both shrank. The latter reflected falling demand abroad as well as temporary production stoppages, both of which were reversed in the 1st quarter of 2013. According to the most recent data published by the Hungarian Central Statistical Office[1], the Hungarian GDP grew by 1.8% according to raw data and by 1.6% according to seasonally and calendar adjusted data in the 3rd quarter of 2013 compared to the corresponding period of the previous year. The growth continued further in the 4th quarter of 2013 and the forecasts say that the annual growth of the GDP could be 1%.

As reported by the OECD (2013)[2], the Hungarian monetary policy eased further in 2013. With rapidly decelerating headline inflation, partly on account of a 10% cut in administered energy prices in January 2013 and further 11.1% cut in November 2013, the central bank has brought its policy rate to record low levels (3.0% as of 18th December). Also, the Hungarian National Bank (MNB) announced a Funding for Growth Scheme, whereby they will lend to commercial banks at 0%, first, to finance SME forint loans and, second, to convert outstanding SME foreign currency loans into Hungarian forints (each part being worth up to 0.9% of GDP).

The most important objective of the Hungarian economic policy is supporting the economic growth and increasing of the employment. The strong commitment of the Hungarian Government and additional spending cuts in mid-May 2013 contributed to the fact that the country exited from the excessive deficit procedure (in force from 2004) in June 2013. The most recent Convergence Programme has set deficit targets of 2.7% of GDP for both 2013 and 2014 and no one-offs being envisaged even if general elections will be held in spring 2014.

2.2 Funding trends

2.2.1. Funding flows

The national R&D investment target is stated in the National Reform Programme 2013 and in the National Research-development and Innovation Strategy (2013-2020) that was approved in June 2013. The Hungarian government aims to raise the amount of R&D expenditures to 1.8% of GDP by 2020 and 3.0% of GDP by 2030. The strategy also declares that the BERD/GDP ratio should reach 1.2% by 2020.

The Hungarian GERD was fluctuating between 0.9-1.17% of the GDP between 2000 and 2010. The economic crisis had severe impact on the Hungarian economy. According to the forecasts of

[1] KSH (2013): First release. Most recent data of the Hungarian Central Statistical Office. 4th December 2013, Hungarian Central Statistical Office, Budapest.

[2] OECD (2013): OECD Economic Outlook, Preliminary version, May 2013.

the Eurostat, the Hungarian GDP in nominal terms will reach its 2008 value only in 2014. Even in this situation the government maintained its R&D target and didn't cut salaries neither laid off civil servants in public research institutions. The government would increase the number of researchers by 50% up to 56,000 (from 37,000 in 2012) in order to achieve the GERD/GDP target by 2020 set by the RDI strategy. The challenge is, on the one hand, to secure the supply of qualified researchers and attract young researchers into PROs and HEIs as the age pyramid of many research units is heavy on the top. On the other hand, the government should provide incentives – in addition to the tax incentive for employment of PhD Researchers at companies that was introduced in January 2013 – and create an environment in which business sector would create more jobs for researchers.

The austerity measures had major impact on the institutional funding of the higher education institutions that decreased by one-third between 2009 and 2013. The total sector got an institutional funding of €424 m (HUF123 billion) in 2013 which corresponds to the budget of bigger Western-European university. This decrease was quite uneven among the HEIs, as shrinking of their budget was depending on the evolution of the number of students and specialisation of the respective HEIs. The priority was given natural science and engineering specialisations, while social science faculties suffered the most. At the same time, the HEIs got access to substantial funding from different Operational Programmes of the Structural Funds 2007-2014. This funding was distributed through competitive measures (i.e. TIOP and TÁMOP) through which HEIs were able to establish new research centres, renew their research infrastructure and launch new research programmes, including the implementation of some basic research projects too. No analysis or assessment is available on this topic, however the size of the project-based funding could be estimated similar to the institutional funding of HEIs according to OECD figures on education[3].

Table 1 **Basic indicators for R&D investments**

	2009	2010	2011	2012	EU-28 (2012)
GDP growth rate	-6.8	1.1	1.6	-1.7	-0.4
GERD (% of GDP)	1.17	1.17	1.22	1.3	2.06
GERD (euro per capita)	106.4	112.4	120.6	126.6	525.8
GBAORD - Total R&D appropriations (€ million)	426.6	349.3	296.2	402.5	86,309.497
R&D funded by Business Enterprise Sector (% of GDP)	0.54	0.55	0.58	0.61	1.12*
R&D performed by HEIs (% of GERD)	21.7	19.9	20.2	18.4	23.8
R&D performed by Government Sector (% of GERD)	20.1	18.5	15.7	14.4	12.4
R&D performed by Business Enterprise Sector (% of GERD)	57.2	59.8	62.4	65.6	63.0
Share of institutional public funding for R&D	40.0	31.0	24.6	32.0	33.9
Venture Capital as % of GDP (*Eurostat table code tin00141)*	0.001	0.019	0.031	0.067	n.a.
Employment in high- and medium-high-technology manufacturing sectors as share of total employment	7.9	8.1	8.5	n.a.	5.6

[3] OECD (2012) Education at Glance 2012. OECD, Paris.

Employment in knowledge-intensive service sectors as share of total employment [htec_emp_nat2]	34.2	35.0	34.5	n.a.	38.9
Turnover from Innovation as % of total turnover	7.0****	10.5***	16.4**	n.a.	13.3**

* Data from 2011

** Data from 2008

*** Data from 2006, **** Data from 2004

Source: Eurostat

The Hungarian GERD reached 1.3% of the GDP in 2012, the highest ratio in the past decade. The increase in national currency (HUF) was 8.1% compared to 2011. It is remarkable that the total of the increase came from the business sector. Also, the R&D personnel grow by 2.0% while the calculated number (FTE) by 5.2%. The share of research and development investments out of the total national investments also increased from 0.75% to 1.33% in the period 2009-2012. The growth was especially high in 2012. In this year the research and development investments grow by 50% compared to 2011 thanks to massive investment in public R&D infrastructure. The majority of the research and development expenditures were devoted to experimental development (44.2%), 35.8% to applied research, while 20.0% of GERD was spent on basic research (KSH, 2013).

The GERD per capita increased by 18.9% in the period 2009-2012, still it has reached only one-quarter that of the EU-28 average (24.0%). Nevertheless, it is a positive a development that companies located in Hungary invest steadily increasing amounts on research and development. The R&D funded by the business enterprise sector grew from 0.54% of the GDP in 2009 to 0.61% in 2012 which is 54% of the EU-28 average.

The business expenditures on research and development constitute the biggest share of the total R&D funding and stayed almost the same level between 2009 and 2012 (46.4% and 46.9% respectively). Public funding decreased significantly from 41.9% in 2009 to 36.9% in 2012. This decrease is even more remarkable if we consider a longer period as the government sector funded the half (49.6%) of the total R&D expenditures in 2005. Research and development funding from abroad has a quite high and increasing share of the GERD (10.9% in 2009 and 15.4% in 2012).

With regards to innovation funding, Hungarian companies paid €176m (HUF53 billion) innovation levy in 2013 to the Research and Technological Innovation Fund (KTIA),. Out of this sum €19.6m (HUF37.6 billion) was spent supporting domestic innovation activities of firms based on competitive calls. According to the state budget 2013 (Act CCIV), further €20m was spent on innovation implemented in international collaboration. It should be noted however, that the KTIA had to contribute to the central state budget with €34.5m (HUF10 billion). In addition to KTIA, various EU-funded operational programmes (notably GOP) supported business innovation. Unfortunately, there is no publicly available statistics about allocation of OPs to innovation activities.

Concerning the new programming period 2014-2020, the Hungarian government will allocate three times more funding for RDI purposes that in the past 2007-2013 period, which will account for 11% of the total funding. From the largest new operation programme (GINOP), about €2.7 billion (about HUF800 billion) will be allocated on RDI. According to the proposals, 35% of this amount will be allocated through revolving funds. The patterns of R&D performance by sectors became similar to the EU-28 average in the period 2009 and 2012. The business enterprise sector increased their share from 57.2% to 65.6% in this period (63.0% in EU-28). The higher education organisations underperforming the EU-28 average (23.8%), because their share decreased slightly in the past four years from 21.7% to 18.4%. The research performance of the government sector was shrinking from 20.1% to 14.4% which is close to the EU-28 average (12.4%).

The employment in high- and medium-high-technology manufacturing increased slightly between 2009 and 2012. The Hungarian figure of 8.5% is one of the highest in the EU-28 and over performing the community average by more than 50% thanks to the several multinational companies employing highly qualified personnel in their manufacturing plants in Hungary. Also the employment in knowledge-intensive service sectors grew between 2009 and 2012, and the last figure (34.5%) is close to the EU-28 average (38.9%).

Although, the latest figures beyond 2008 are not available in the EUROSTAT database, the same development could be identified concerning the turnover from innovation. For the last available year, in 2008, Hungarian organisations received 16.5% of the total turnover from innovation which was slightly higher than the EU27 value for that year.

2.2.2. Funding mechanisms

2.2.2.1 Competitive vs. institutional public funding

The institutional public funding for research and development decreased significantly in the past few years. The Hungarian government's central budget spends every year less on R&D. As a result of this process, the share of institutional funding[4] (32.0% in 2012) fell very close to the EU-28 average (33.9%) from 40.0% in 2009. Nevertheless, institutional – or core – funding is vital for the operation of research units at higher education organisations and PROs. There are two principal channels for providing such funding: normative support for R&D activities conducted at HEIs, and support to the largest PRO, the Hungarian Academy of Sciences. According to Eurostat GBAORD figures, R&D financed from General University Funds (GUF) – as a proxy for institutional funding – accounted for 27.6% and 23.2% of GBAORD in 2009, and 2012, respectively. The figures for R&D financed from other sources than GUF were 21.6% in 2009 and 43.7% in 2012. This significant increase means that more than half of the GBAORD was allocated via core funding in the past two years.

Competitive funding is also a major mechanism for public support to RTDI activities. The largest funds are the Research and Technological Innovation Fund (KTIA),[5] and the various Operational Programmes of the New Hungary Development Plan,[6] while for bottom-up funding is provided by a smaller one, called Hungarian Scientific Research Fund (OTKA).[7] The largest STI policy support schemes are co-financed by the EU Structural Funds, and given the cuts in domestic public funding, the balance has shifted significantly towards EU funds. Actual funding figures are not publicly available, and using that metrics might lead to a somewhat different picture, but probably still with a larger share of EU funds.

[4] The ratio GERD / GBAORD (total R&D appropriations) is used as a proxy for the share of institutional public funding for R&D.

[5] The annual budget of the KTIA was in the order of €130-150 m between 2009 and 2013. Between 2010 and 2011 no new tender was launched because of the obligations from previous years. In 2013, funding available from the KTIA was reduced by ~€35 m (HUF 10 billion) because of measures required for improvement of the balance of the central government's budget.

[6] The most important element is Priority 1, "R&D and innovation for competitiveness" of the Economic Development Operational Programme (EDOP). Its budget is €990 m for 2007-2013, including 15% national contribution.

[7] The annual budget of OTKA used to be around €20m that reached €26.5 m in 2013.

2.2.2.2 Government direct vs indirect R&D funding[8]

The dominant form of R&D support is the provision of grants; yet, other tools are also part of the Hungarian STI policy mix. This situation has not changed significantly in the last three years as no new instruments were introduced. Apart from the above mentioned major funding mechanisms, the R&D tax credits play a role in the indirect government funding. The R&D tax credits are one of the 51 (!) support incentives in the Hungarian tax regime. According to the estimates of the Ministry for National Economy, R&D tax credits could amount about 0.08-0.1% of the GDP in 2013. This significant share is about half of the total amount of the innovation levy collected from companies based on their net income which is the main source of the Research and Technological Innovation Fund.

A new indirect measure was introduced in January 2013 that made the employment of researchers with a PhD title (up to salaries of ~ €1,800 (HUF 300,000)/month) cheaper as they are exempt to pay social security contributions and other contributions (altogether 27% less). This incentive cost the government about €3.5 m according to estimates of the Ministry for National Economy and could be applied for 1,300 researchers employed in companies.

Hungary has one of the most recipients of financial engineering instrument (loans, guarantees and venture capital) in the economic development operational programme (EDOP). According to the data of the National Development Agency, the total number of recipients of these instruments was more than 16.000 in December 2013. As regards the annual volume of venture capital and private equity investments in terms of percentage of annual GDP, during the past 20 years Hungary has been in a reputable position not only within the Central and Eastern European region but also among the EU member states. During this period, venture capital and private equity funds invested close to $4 billion into more than 400 Hungarian enterprises (HVCA, 2012).

Within the frame of the New Széchenyi Venture Capital Programmes, 28 Jeremie funds were established between 2010 and 2013. These Jeremie funds invested in more than 100 companies during by the end 2013. According to Eurostat, Hungary has the highest growth rate in the EU in terms of VC invested that amount to 0.067% of the GDP in 2012.

As regards to the government R&D funding, it can be concluded that there are a high number of funding instruments in the Hungarian STI policy mix, although they provide mainly direct support for the whole value creation chain. Currently, there is no single programme that support from fundamental research through to market innovation.

2.2.3 Thematic versus generic funding

Among socio-economic objectives, the general advancement of knowledge had the highest weight in the Hungarian GBAORD throughout the period 2009-2012 and reached its peak (45.7%) in 2011. The high share of this objective is most likely due to the fact that the majority of the Hungarian STI policy schemes are meant to advance broad objectives (e.g. enhancing competitiveness), as opposed to narrowly defined themes.

Other relevant areas of the total GBAORD are transport, telecommunications and other infrastructures (slightly above 10%), health (9.5% in 2009 and 8.0% in 2012) as well as industrial

[8] Government direct R&D funding includes grants, loans and procurement. Government indirect R&D funding includes tax incentives such as R&D tax credits, R&D allowances, reductions in R&D workers' wage taxes and social security contributions, and accelerated depreciation of R&D capital.

production and technology (13.7% in 2009 and 5.3% in 2012). Agriculture lost some weight over the last four years (8.6% in 2009 and 3.8% in 2012). (see Table 2)

Table 2 Total GBAORD by socio-economic objectives, 2009-2012
(€ m and percentage of annual total)

	2009		2010		2011		2012	
	€ m	%	€ m	%	€ m	%	€ m	%
Exploration and exploitation of the earth	1.2	0.3	3.1	0.9	2.5	0.9	2.1	0.5
Environment	15.9	3.7	8.5	2.5	5.9	2.0	9.3	2.3
Exploration and exploitation of space	0.0	0.0	2.5	0.7	0.2	0.1	0.2	0.0
Transport, telecommunication and other infrastructures	**47.4**	**11.1**	20.4	5.8	14.1	4.8	**42.9**	**10.7**
Energy	5.9	1.4	4.6	1.3	2.4	0.8	5.9	1.5
Industrial production and technology	**58.5**	**13.7**	**36.9**	**10.6**	8.9	3.0	21.2	5.3
Health	**40.6**	**9.5**	24.5	7.0	12.9	4.4	**32.2**	**8.0**
Agriculture	**36.8**	**8.6**	18.7	5.4	9.1	3.1	15.3	3.8
Education	2.0	0.5	0.8	0.2	0.5	0.2	3.1	0.8
Culture, recreation, religion and mass media	0.2	0.0	1.6	0.5	0.0	0.0	0.0	0.0
Political and social systems, structures and processes	6.9	1.6	13.7	3.9	0.8	0.3	0.4	0.1
General advancement of knowledge: R&D financed from General University Funds (GUF)	118.1	27.7	100.9	28.9	103.1	34.8	93.3	23.2
General advancement of knowledge: R&D financed from other sources than GUF	92.3	21.6	110.6	31.7	**135.3**	**45.7**	176.0	43.7
Defence	0.4	0.1	2.2	0.6	0.2	0.1	0.5	0.1
Total civil R&D appropriations	426.2	99.9	347.1	99.4	295.9	99.9	402.1	99.9
Total R&D appropriations	**426.6**	**100.0**	**349.3**	**100.0**	**296.2**	**100.0**	**402.5**	**100.0**

Source: Eurostat

Concerning policies, it could be stated that there are hardly any thematically or sectorally focused support schemes in the current Hungarian STI policy mix. In accordance with to the EU for the next financing period of the Structural Funds, the Hungarian National Reform Programme 2013 foresees special measures to support the change for the low carbon emission economy as well as to support the development of telecommunication technologies and the IT economy.

2.2.4. Innovation Funding

Hungarian authorities publish budgetary figures and allocation plans of the EU operational programmes in such a way that budget allocations for innovation are not separated from research, and development expenditures. In this situation estimates could be used to assess the balance between research and innovation funding. It could be stated that the largest competitive funding mechanism of innovation is KTIA – that is based on innovation levies paid by companies, a total of €176m in 2013. The majority of funding (82%) from KTIA was devoted to innovation support activities. However, the fund should contribute the state budget with an amount of €34.5m (HUF

10 billion) both in 2013 and 2014. The significance of the KTIA innovation funding corresponds to the annual state support provided for the largest PRO, the network of the Hungarian Academy of Sciences. Furthermore, compared KTIA to the GERD figure (a total of €1,257m in 2012), it accounts 14.5% of it.

As indicated earlier in Section 2.2.1, in the new programming period 2014-2020 the Hungarian government will increase the funding for RDI purposes compared to the past 2007-2013 period. The funding allocation for RDI in the largest operation programme, i.e. the Economic Development and Innovation Operational Programme (GINOP) will be about €2.7 billion (about HUF800 billion) in 2014-2020. This amount corresponds about two years of GERD.

According to the published draft of GINOP, its Priority 1 (i.e. Improvement of competitiveness of firms and supporting job creation) and Priority 2 (i.e. Development of the knowledge economy) explicitly focus on supporting business innovation. In addition to these priorities, Priority 3 through supporting of ICT developments, Priority 4 through energy rationalisation and Priority 6 through supporting of RDI investments could be mentioned in this context. Out of 42 foreseen measures of GINOP, the following are dedicated directly to innovation support:

- supporting of entrepreneurship
- supporting growth opportunities of SMEs
- supporting of RDI activities and research and innovation investment of firms;
- supporting collaborative RDI projects of companies, universities and PROs and
- supporting investment in modern RDI capacities.

In a way, the Jeremie funds could also be perceived as innovation support or investment. Currently, there are 28 Jeremie funds (I-IV) operating in Hungary with a total of about €433m (HUF130 billion) to be invested in the years to come both in early stage and growth innovative projects and companies. This amount is more than double of the amount companies contribute annually to the KTIA.

In sum, the Hungarian government increases to funding available for RDI and especially for support schemes that can accelerate business research and innovation activities. In line with this intention, the government pays particular attention to the development of the start-up ecosystem and innovative start-up companies. About half a billion euros (HUF140 billion) will be allocated for these purposes in the period 2014-2020.

2.3 Research and Innovation system changes

The science and innovation policy governance sub-system could not stabilised in the past few years as major STI policy-making bodies and the RTDI funding structure were reorganised almost every year since 2010. The National Research, Innovation and Science Policy Council (NKITT) had been set up in December 2010 to co-ordinate governmental STI policy decisions. After one and a half year operation, the NKITT was dissolved on 2 July 2012 when a new body, called National Development Cabinet (NFK) was set up.

A new advisory body, the National Science Policy and Innovation Board (NTIT) was established by the government decree 116/2013 (IX.25.) in September 2013. The president of the NTIT is the prime minister, co-chaired by the president of the Hungarian Academy of Sciences (MTA). The mandate of the board is to provide advice, evaluate and make recommendations on strategic issues of scientific, research and development and innovation programmes, the sustainable finance of

these programmes and the evaluation methodology to be carried out at scientific institutions. Apart from these activities, the board reviews the government proposals related to STI fields and monitors the implementation of the government's science policy strategy. Also, prepares the science policy decisions of the government and takes part in the governmental consultations related to STI. Besides the prime minister, members of NTIT are the president of MTA, the state secretary of the Prime Minister's Office, the government members responsible for RDI, education, science policy coordination as well as the cabinet member responsible for development policies other than the application of EU resources.

2.4 Recent Policy developments

After public consultation started in November 2012, the **National Research-development and Innovation Strategy (2013-2020)**, entitled "Investment into the Future" was approved by the government decree 1414/2013. (VII.4.). The strategy aims to raise the RDI investments, and as a result, to mobilise the Hungarian economy and to strengthen its competitiveness. The strategy set the target to raise the amount of R&D expenditures to 1.8% of GDP and the BERD/GDP ratio to 1.2% as well as increase the number of researchers from 37,000 in 2012 to 50,000 by 2020.

The RDI strategy would support the creation of an environment in which public institutions, companies and innovative enterprises could develop and grow. The strategy focuses on three main areas of intervention: the knowledge creation, knowledge transfer and knowledge utilisation. The RDI strategy employs direct and indirect measures, such as tax reliefs, adjustments of capital market conditions, public procurement systems (also PCP) and innovation services to promote specialisation built naturally on the characteristics of local actors as well as market-driven and society-driven innovation processes. The strategy foresees a purposeful system building according to three priority axes: i) internationally competitive knowledge bases, ii) support of efficient knowledge and technology transfer collaborations and iii) companies that exploit intensively the results of modern S&T. The expected results of the above specific targets are: the stimulation of RTDI demand, establishment of an efficient support and funding system as well as the completion of the start-up ecosystem.

According to the government decree 1414/2013, the RDI strategy will be the guiding document for planning of the budget allocations for research, development and innovation for the next programming period 2014-2020. The vision, objectives and instruments of the RDI strategy will also be taken into account in elaboration of sectoral strategies and smart specialisation strategies (RIS3/S3) as indicated in the National Reform Programme 2013.

The government decree 1600/2012 (XII.17) made important decisions concerning the planning of utilisation of **Structural Funds** for the next planning period 2014-2020, including the reorganisation of the whole funding system. The most important general rules and guidelines of the decree are the following:

- resources of the Structural Fund should be used for the reinforcement of the growth potential of the Hungarian economy, hence the share of funding for economic development purposes should be increased, 60% of the development resources should be directly spent on economic development purposes, while the remaining 40% should be devoted to human resource and infrastructure development, environmental protection and energy rationalisation.
- during the planning, reinforcement of high added value production and employment should be considered as a strategic objective, bearing in mind the development priorities of

the National Development Concept, the National Territorial Development Concept as well as the objectives and measures set by the National Reform Programme;

- resources of the Structural Funds should be possibly utilised in a concentrated way along with the requirements set forth in the RIS3 strategy, by focusing upon few priorities to avoid the fragmentation of the resources;
- the establishment of the new institution system responsible for managing the Structural Funds 2014-2020 should be done in a way to secure the smooth closing of programmes and potentially full absorption of funds in the current planning period;

As a step towards the reorganisation of the funding system, the government changed the statute of the **National Development Agency** by law 273/2013 (VII.15.) In effect from 1st August 2013, the National Development Agency worked under the prime ministers central office and supervised by a government commissioner by the end of December 2013 when the NFÜ was dissolved. From 1st January 2014, the roles and responsibilities of the National Development Agency are integrated into the Prime Minister's Office based on the government decree 475/2013 (XII. 17.). In the new programming period 2014-2020, five ministries incorporate both the managing authorities and intermediary bodies that responsible for the implementation and technical administration of the Operational Programmes of the EU Structural Funds. This institutional set-up is basically a return to the system that was in place until 2006 before the programming period 2007-2013.

The government decree 1143/2013 (III.21.) set the **priorities of the operational programmes** for the next financial planning period 2014-2020. Out of the nine operational programmes (OP), the following three have priorities that specifically address STI: i) Economic Development and Innovation OP (including the development of the creativity and the knowledge economy, support of innovation, R&D and ICT), ii) Human Resources Development OP (development of the education and culture infrastructure, educational and cultural developments, improving the conditions of public administration infrastructure) and iii) Competitive Central-Hungary OP (programmes supporting the development of the knowledge economy, social integration and employment).

In July 2013, the Hungarian Government presented to and consulted with the European Commission the draft Partnership Agreement that specifies the priorities and preliminary budget allocations of the OPs. After building in the comments received from the EC, public consultation started with stakeholders about the content of the OPs in October 2013 organised by the National Economic Planning Office (under the Ministry for National Economy). In March 2014 the amended Partnership Agreement was sent to the European Commission for approval.

A **new higher education strategy** is under preparation and consultation that foresees changing several articles of the law on higher education approved in 2011. Since 2010 several strategies has been made for the sector, although none of them was implemented. The main stakeholder, the Hungarian Rectors' Conference supports the new strategy and expects that the austerity measures will be stopped and the disinvestment of resources will be ended in 2014. The shrinkage was very significant (~33%), as the government allocated HUF 187.2 billion (€645 million) from the state budget in 2011, the whole higher education sector received only HUF 123.5 billion (€425 million) in 2013.

The strategy outlines the new financing principles of the higher education sector and foresees more stable financing that will be based in 70% on the number of students and in 30% on the scientific excellence of the higher education organisations. In addition, the strategy aims to increase the government support of the sector and intends to reach the OECD average financing on mid-term. The strategy proposes four types of HEIs: national science universities, universities, colleges and community colleges. According to the proposal, the government will not limit the access to higher education but the number of state funded students will be fixed. In terms of

management of the higher education organisations, "chancellors" will be appointed and will be responsible for professional management of the organisations, leaving to the rectors only the scientific and education leadership role. Although the strategy was accepted by the Higher Education Round Table in September 2013, the government not discussed the higher education strategy by the end of 2013.

A new, two-stage scheme, called "**Start-up_13**", was launched in June 2013 in order to support the development of the Hungarian start-up ecosystem and more specifically the development of technology start-up companies. The programme is supported by HUF 2.1 billion (~€7.2 million) from the Research and Technological Innovation Fund. The main objective of the scheme is to support the development of young, technology companies that are exploiting the results of some kind of research and development activities and are potentially able to grow into a dynamic firm active on international markets.

Based on international peer-review organised by the National Innovation Office (NIH), four companies were announced in October 2013 to receive the title of "accredited technology incubator" that enable them to participate in the Start-up_13 programme and received €200.000 "de minimis support". Recognised the high demand, the NIH foresees further accreditation rounds that will enable them to incubate start-ups with support of funding available from the "Start-up_13" scheme.

2.5 National Reform Programme 2013 and R&I

With reference to research and innovation-related goals as presented in the National Reform Programme 2013 (NRP 2013), the following five major achievements could be reported:

1. Hungary made some progress towards to the quantitative objective set by the NRP 2013 that aims to increase the level of research and development expenditures to 1.8 per cent of the gross domestic product (GDP) by 2020. Similarly to 2011, the R&D expenditures increased further in 2012 and reached 1.3 per cent of the GDP . This means an 8% increase in 2012 compared to 2011. It should be noted, however, that the real GDP growth rate was -1.7 per cent in that year.
2. The National Research and Development and Innovation Strategy 2020 (RDI strategy) entitled "Investment into the future" was produced in 2012 in order to ensure the meeting of the research and development targets. After public consultation in November-December 2012, the RDI strategy was approved by the government decree 1414/2013. (VII.4.) on 4th July 2013. The RDI strategy employs direct and indirect tools, tax relief, adjustments of capital market conditions, tendering systems and innovation services to promote specialisation built naturally on the characteristics of local actors and market-driven and society-driven innovation processes.
3. Indicated in the NRP 2013, the draft Science Policy Strategy (2014-2020) has been published for public administration consultation in September 2013. The objective of the strategy is to provide a basis for the basic infrastructure for research and financing of the academic sector, as well as to systematically renew the acknowledgement and publication of scientific results. More specifically, the strategy aims at the increase of the attractiveness of the research environment, increase of the scientific excellence in all fields, as well as the talent management programmes to reverse brain drain. In addition, it is expected that as a result of the implementation of the strategy the higher education organisations and institutes of the Hungarian Academy of Sciences (MTA), as well as research facilities supported by the state budget and non-profit institutions will be able to get involved in the

programmes of Horizon2020 programmes, and to receive the appropriate ESIF grants for that. The Science Policy Strategy is in line with the RDI strategy 2013-2020 that was approved by the government in June 2013. The horizontal objective of the Science Policy Strategy is the involvement of the academic sphere into the implementation of the smart specialisation strategy (S3).

4. As indicated in the NRP 2013, a comprehensive scheme for promoting RDI activities is under preparation. This new scheme will be implemented in the new Economic Development and Innovation Operational Programme (GINOP) 2014-2020 and will be co-funded by the Research and Technology Innovation Fund. In particular, the aim of this scheme is designing application solutions aimed at achieving the objectives laid down in the RDI Strategy 2013-2020, evaluating the R&D qualification system, drawing up tax proposals for promoting R&D and setting up the related regulatory environment, as well as drawing up the details of the direct support system.
5. In line with the process of development of the Smart Specialisation Strategy (S3), a research-development and innovation (RDI) sectoral strategic white book (KFI ÁSFK) was prepared in the National Innovation Office (NIH) on the request of the Ministry for National Economy in October 2013. The white book defines RDI related strategic objectives by selected sectors, identification of potential breakthroughs, potential interventions in order to provide information and input for longer planning, especially for programming of the next community financial framework 2014-2020. The National Innovation Office established the following working groups that cover the priority areas of the New Széchenyi Plan which is the main planning document in the current planning period after the change of Government in 2010:

    - healthcare industry;
    - mobility, vehicle industry and logistics;
    - ICT;
    - energy sector;
    - environmental protection and
    - agriculture and food processing.

    Based on series of interactive workshops ("charette") and further consultation with stakeholders, implementations plans are prepared in the Ministry for National Economy. According to the schedule as defined in the RDI strategy, the Smart Specialisation Strategy and the related implementation plans will be finalised in February 2014.

2.6 Recent evaluations, consultations, foresight exercises

STI policy evaluation culture is weak in Hungary. As for the nationally funded support schemes, one of the basic principles of the Law on Research and Technological Innovation (Act CXXXIV of 2004) was that publicly financed STI policy measures shall regularly be evaluated by independent experts. Based on the Law, the Government Decree no. 198/2005 specifies the precise range of measures to be evaluated ex-post. As a general rule, one-off schemes above HUF 1 billion (€3.4 million) are to be evaluated within 3 years following the closure of the scheme, whereas continuous programmes (with a cumulated funding over HUF 1 billion) within 2 years of the closure of the given programme cycle. For continuous programmes, irrespective of the

volume, ex-post evaluation is compulsory within 4 years of the launch of its first call. Several on-going evaluations are under way that address financial support mechanisms and indicators related to the cohesion policy. Particularly, a number of ex-post evaluations were carried in 2011 that focused on the economic development interventions, environmental protection, information and knowledge society measures. In 2012 ex-post evaluations addressed interventions related to the development of the higher education, sustainable development of settlements and logistic investments. Apart from these evaluations, no comprehensive evaluation of the STI policy has been carried out since 2010.

With regards to the new RDI strategy, accepted in June 2013, a public consultation was carried out that involved a series of workshops organised in major Hungarian cities in November-December 2012. In addition to the consultation of the RDI strategy, the government launched consultations on the following strategic documents during 2012-2013:

- National Development and Territorial Development Concept;
- Draft Science Policy Strategy;
- County level development concepts;
- New operational programmes for the planning period 2014-2020, more specifically the Economic Development and Innovation Operative Programme as well as the Human Resources Development Operational Programme.
- S3 roadshows and public consultation and charette-s.

Furthermore, it should be mentioned that a new methodology was developed on STI policy evaluation within the EU-funded EVALINNO project[9] that focuses on capacity building and institutional support. The results of this international project will support the National Innovation Office to fulfil its evaluation obligations stipulated by the government decree 303/2010 (XII.23.). This decree prescribes that NIH should evaluate all RDI related initiatives and programmes.

The key objective of the EVAL-INNO project is to strengthen regional as well as national RTDI evaluation capacities in order to improve framework conditions for innovation policies, programmes, institutions and projects. In particular, the project aims i) to promote the role of RTDI evaluation as crucial condition for a reflexive learning innovation system; ii) to develop needed capacities/competencies for comprehensive RTDI evaluations; and iii) provide procedural and methodological know-how and tool-kits both on the side of evaluators and on the side of awarding authorities.

2.7 Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)

Status and main features RIS3. All the seven Hungarian regions elaborated their Smart Specialisation Strategies (RIS3) according to the guidelines provided by the European Commission by end of May 2013. A peer review workshop took place in Budapest on 24-25 June 2013 that was organised jointly by the Smart Specialisation Platform of the European Commission and the National Innovation Office. The representatives of the national government and regional stakeholders have presented their current work on Research and Innovation Strategy for Smart Specialisation (S3) during the peer review workshop.

[9] Full name of the EVALINNO project is *"Fostering Evaluation Competencies in Research, Technology and Innovation in the SEE Region"*. Further information on the EVALINNO project available at: http://www.eval-inno.eu/

Over the summer 2013, the S3 strategy was further developed based on a process-based approach. In September 2013 the longer term development scenarios for Hungary were taken into account for the planning of the S3. An important milestone of the S3 planning was the elaboration of the draft White Book entitled "S3 White Book. Smart Specialisation Directions of Hungary" that was published for public consultation by the Ministry for National Economy in November 2013. This draft White Book was released after a series of workshop (roadshow) that were organised in all the seven Hungarian regions with stakeholders.

In parallel to the public consultation of the S3 White Book, implementations plans are prepared and the implementation structure of the S3 strategy is defined in the Ministry for National Economy. According to government decree 1187/2014 (III. 28.), a governing body of the S3 strategy was established. This governing body consists of experts coming from the business, scientific and government sector and has the role to provide strategic advice for the planning and completion of the S3 strategy before government approval. In addition, an inter-ministerial working group was established in order to ensure the harmonisation of S3 strategy with other planning documents and programmes, in particular with operational programmes co-funded by the Structural Funds. Furthermore, regional planning working groups – involving a wide range of stakeholders – will be established to ensure the interest of the sub-national level territorial units, i.e. counties and cities. The deadline set for the approval by the Government is 30th September 2014.

Priorities for future areas of specialisation. The preliminary specialisation directions to trigger the "entrepreneurial discovery process" (EDP) as indicated in the draft S3 White Book are the following:

- α specialisation: adaptation strategies and handling of global challenges (i.e. lifestyle and health industry, European start-up hub, water, energy and environment technologies)
- β-specialisation: industrial transformation (i.e. food processing and value chains of large companies)
- Ω-specialisation: to be originated in the "transition" (i.e. revitalisation of depression areas)

These specialisations could be modified based on the results and proposals from the interactive S3 workshop to be scheduled for early 2014. At the same time, it should also be mentioned that the α- β- Ω-specialisations correspond to the priorities set by the national Development and Planning Concepts and the county level development priorities for the period 2014-2020 in the following way and order:

- *National level priority sectors*: automotive industry, steel and metal processing, machinery, tourism, logistics, electronics, construction, rubber and chemical industry;
- *Sectors related to development directions*: agriculture, renewable energy, waste management and reuse, food processing, vehicle industry, logistics, energetics, machinery, health industry and electronics;
- *Outbreak sectors:* tourism, logistics, knowledge-based and high-technology sectors, cultural and creative industry, automotive industry, renewable energy, electronics, mechatronics, machinery and food processing.

The draft S3 White Book defines the horizontal pillars of smart specialisation as follow:

- Elaboration of a science and technology policy mix including the support of ICT's, science and technology capabilities and capacities, Key Enabling Technologies (KET);

- Development of "industrial commons" and development of the technology ecosystem, e.g. industrial research centres, measurement centres, supply networks, business incubators and science parks,
- Development of the knowledge ecosystem, including research infrastructure, secondary and higher education, health care and cultural institutions;
- Building the information ecosystem, including the development of special data analysis centres, the Hungarian Central Statistical Office and social science.

Design of the S3 strategy. The draft S3 strategy takes into consideration a comprehensive analysis of the Hungarian innovation landscape. Among other tools, the analysis involves a SWOT analysis. In the RIS3 peer review workshop on 24-25 June 2013 stakeholders proposed that the national RIS3 strategy should be even more better based on a sound assessment of the competitive assets of Hungary, including a more wider understanding of innovation in order to be able to tackle many fields at many levels not just hard-core technologies, not just high-tech industries, but also social, ecological, and service innovation.

It should also be noted that the recently adapted RDI strategy included a problem-tree analysis of the Hungarian national innovation system.

Governance structure. A partnership is established between the Regional Innovation Agencies and the Ministry for National Economy for the RIS3 process. Relevant actors and stakeholders of the RIS3 strategy at the regional level are identified and approached by the RIAs. They were actively engaged in the development of the strategy, however, their level of involvement is far from that of the more developed economies.

Links and co-ordination mechanisms between the national and regional level. National and regional governance bodies and mechanisms are still to be defined. Synergies between different policies, in particular the Operational Programmes 2014-2020 and funding sources are still being designed.

There is a clear link being established between the RIS3 and the Economic Development and Innovation Operational Programme (GINOP) that is of the most important programming documents for the 2014-2020 EU financial cycle. The Hungarian authorities and bodies responsible for planning are paying attention to the RIS3 links and also the Partnership Agreement under public consultation also takes account of the requirements of RIS3.

The definition of thematic RDI directions is the purpose of RDI Sectoral White Papers that are under development. As indicated in the Final Draft Partnership Agreement, these sectoral priorities will be incorporated into the Operational Programmes that are under public and intergovernmental consultation.

Policy measures included in the implementation plan of RIS3. Implementation plans of the S3 strategy will be elaborated by June 2014 after the second national survey and based on the results of the "charette". As indicated in the Partnership Agreement, Hungary would spend nearly 60% of EU funding (without the funding for rural development and fisheries) on direct economic development in the period 2014-2020. This ambition is decisively served by resources for RDI, SMEs and competitiveness, employment and low carbon economy thematic objectives. This means that substantial part of the EU funding between 2014 and 2020 will be allocated for measures that specifically target the stimulation of private RDI investments. Co-funding appears in the financial planning and the authorities responsible for planning consider the experiences of the current funding period.

Monitoring and evaluation mechanism. The monitoring and evaluation mechanisms are under planning. Nevertheless, the draft S3 White Book foresees the application of modern innovation policy decision making tools, such as evaluation, foresight, technology assessment and Delphi-surveys in

order to keep moving and channelling the Entrepreneurial Discovery Process (EDP) type of processes into the implementation of the Smart Specialisation Strategy.

2.8 Policy developments related to Council Country Specific Recommendations

The European Commission concluded in May 2012 that Hungary was experiencing serious imbalances, in particular as regards developments related to the net international investment position and implications of high government debt. Therefore, the Commission found useful to examine further the risks involved and progress in the unwinding of imbalances in an in-depth analysis. The in-depth review (IDR), published in April 2013, took a broad view of the Hungarian economy in line with the scope of the surveillance under the Macroeconomic Imbalance Procedure (MIP). The main observations and findings of the analysis addressed mainly macroeconomic, fiscal and labour market issues, STI policy related topics were not subject of the conclusions.

In its Country Specific Recommendation (CSR) No. 5 (10638/2/13, on 26 June 2013), the Council of the European Union recommended that Hungary should provide targeted incentives to innovative enterprises. Regarding to this recommendation, it should be mentioned that the new Economic Development and Innovation Operational Programme foresees specific measures that focus on increasing the competitiveness of the business sectors and it will particularly support the research and innovation activities of companies. According to the Partnership Agreement that was sent to the European Commission in March 2014, 11% of the total funding available in 2014-2020 will be spent on research and innovation activities which is three times increase compared to 2007-2013. In addition, more attention will be paid to SMEs as long as 15% of the total funding would target this sector. Furthermore, specific support schemes gains more and more policy and public attention that focus on start-up creation and their development. The government expressed it support for further development of the Hungarian start-up ecosystem in the document entitled "Budapest Runway 2.0.2.0. – A Start-up Credo" published in November 2013. The document sets an ambitious vision that the Hungarian capital will be the start-up centre of the Central Eastern European region within a decade. Furthermore, the document has several concrete proposals for strengthening a competitive start-up and innovation ecosystem that is based on the following four components and the interactions between them: i) education and training, ii) access to funds, iii) taxation and regulation, and iv) enabling environment. A more recent measure is the "Start-up_13" programme that was introduced in Section 2.4 above.

Country Specific Recommendation No. 6 proposed a higher-education reform that enables greater tertiary attainment, particularly by disadvantaged students. As mentioned in Section 2.4, a new higher education strategy is under preparation and consultation that foresees changing several articles of the law on higher education. In the past four years, the government reduced drastically the support of the state higher education sector in order to increase the quality of graduates and give up the "mass production" of diplomas. As a result, the number of state financed students decreased to 181,644 in academic year 2013/2014 that is 13.3% less in 2010/2011, while the total number of students decreased by 11.4% in the same period. With regards to budget allocation, the higher education sector will receive HUF196.6 billion (about €665m) in 2014 according to the Ministry of Human Resources that is a 12.6% increase compared to 2013.

3 PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM

3.1 National Research and Innovation policy

As regards to inputs to research and development, the Hungarian GERD was 1.17% of the GDP in 2009 then reached its highest volume in 2012 (1.3%). With these efforts, Hungary still devotes significantly fewer resources to R&D than the EU-28 average: the GERD/GDP ratio was 63.1% of the EU-28 average in 2012. Businesses have maintained their position as the largest employer of FTE researchers and reached 55.9% of the total in 2012, and had the biggest share in performing GERD (65.6%), too. Since 2009, the share of FTE researchers in total employment increased from 0.53% to 0.61% in 2012, while the share of all FTE R&D employees did so from 0.79% to 0.92% in the same period. Apart from increasing employment of researchers in the workforce, the share of R&D investments grown from 0.75% to 1.33% in total investments between 2009 and 2012.

As for scientific output, the number of publications by Hungarian researchers grew in 2012. The number of books and book chapters as well as the number of articles published in foreign language grew faster than the number of publications in Hungarian language. There are significant differences by sectors. The higher educational staff members are the most productive, they published on average 132 books and book chapters as well as 341 articles by 100 FTE researchers in 2012. (KSH, 2013) In international comparison the Hungarian scientific output, ranked 44th in terms of publications (9,082) recorded in Scopus SCImago Country and Journal Rank for 2012, and 38th in terms of citations (5,552) in the same year.

According to the annual report of the Hungarian Intellectual Property Office (SZTNH), the number of industrial property protection applications following the national route shows some increase in certain fields, elsewhere it is stagnant. In 2012, the number of patent applications increased by 6% to 743 applications. The number of national trademark applications also increased significantly by 10% (4599). The number of design and utility model applications decreased by 19% (196) and 3% (261). The Hungarian applicants increased their industrial property activity abroad in 2012. The number of international trade mark applications increased by 15% (292). The number of Community trade mark applications of Hungarian companies increased by 4% (370) after a decrease in the previous year. Patent applications filed abroad by Hungarian applicants also increased by 11% (157) in case of Patent Cooperation Treaty (PCT). The applications for European patents increased by 7% (180). The number of Community design application originated from Hungary was 31 that is only one third of the previous year. (HIPO, 2013)

Position of Hungary in the EU context. The Innovation Union Scoreboard 2013 report concludes that Hungary belongs to moderate innovators, a group of countries characterised by an overall innovation performance below that of the EU-28, together with the Czech Republic, Greece, Italy, Lithuania, Malta, Poland, Portugal, Slovakia and Spain. These countries are rather diverse, e.g. in terms of their size, structural composition of the economy, level of socio-economic development, and historical legacy.

Within the four country groups growth performance is different. Between 2008 and 2012, some countries grew relatively quickly and others more slowly. Lithuania is the growth leader of the moderate innovators with 5% growth and Hungary is positioned among moderate growers (1.4%).

Looking at a narrower time period, most Member States and the EU-28 have improved their innovation performance between 2010 and 2012. In particular all innovation leaders and innovation followers, except the UK, have improved their performance. In moderate innovator countries, the performance has slightly decreased in Czech Republic (-1.5%), Poland (-1.3%) and Hungary (-1.9%), while it has decreased more significantly for Greece (-6.0%), Portugal (-4.9%) and in particular Malta (-16.0%). (IUS, 2013)

The relative strengths of the Hungary are in human resources and economic effects (i.e. medium and high-tech product as well as knowledge-intensive services exports). High growth is observed for R&D expenditures in the business sector and community trademarks. Growth in venture capital investments has been the highest of all Member States. A strong decline is observed for non-R&D innovation expenditures. Growth performance in human resources, intellectual assets and economic effects is above average and in firm investments and innovators well below average. (IUS, 2013, p.43)

Table 3 Performance indicators of the national research and innovation system

	Current performance	EU-28 average	Growth performance
ENABLERS			
Human resources			
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	0.9	1.5	7.5%
Percentage population aged 25-64 having completed tertiary education	28.1%	34.6%	8.7%
Open, excellent and attractive research systems			
International scientific co-publications per million population	387	300	3.8%
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	4.91	10.9	-2.1%
Finance and support			
R&D expenditure in the public sector as % of GDP	0.43	0.75	-2.2%
Public Funding for Innovation			
FIRM ACTIVITIES			
R&D expenditure in the business sector as % of GDP	0.75	1.27	11.2%
Venture capital and seed capital as % of GDP	0.03	0.094	4.0%
Linkages & entrepreneurship			
Public-private co-publications per million population	31.2	52.8	4.4%
Intellectual assets			
PCT patents applications per billion GDP (in PPS€)	1.48	3.9	1.0%
PCT patents applications in societal challenges per billion GDP (in PPS€) (climate change mitigation; health)	0.34	0.96	-1.5%
OUTPUTS			
Economic effects			
Contribution of medium and high-tech products exports to the trade balance	5.84	1.28	0.3%
Knowledge-intensive services exports as % total service exports	28.55	45.14	3.0%
License and patent revenues from abroad as % of GDP	0.74	0.58	1.2%

Source: Innovation Union Scoreboard 2013

In comparison with the EU-28 average, the innovation performance of Hungary particularly lags behind in innovation collaborations, mainly between PROs and companies. This bottleneck was acknowledged in the situation analysis of the RDI strategy 2013-2020. According to this analysis, the collaboration is traditionally very weak between SMEs and large domestic as well as

multinational firms, in particular with the knowledge bases. On the contrary, Hungarian PROs and universities have relatively strong connections to foreign research units. This means that scientific aspects of collaborations prevail against practical utilisation and industrial exploitation. An untapped opportunity has been so far the start-up ecosystem (e.g. incubation and support available for knowledge and technology-intensive start-ups) that started to grow in the past few years. Nevertheless, spin-offs and start-ups often get stuck in their initial phases and the share of high-growth SMEs is rather small in the population of businesses. Domestic medium sized companies carry out generally low R&D intensive activities therefore they have low demand for RTDI services. The share of innovative small companies is rather low and they generally lack of capacities and capabilities for the implementation of innovative development strategies. Also, they often lack of company culture, global view, skills, experiences as well as material and human resources needed for bringing innovative products, technologies and services successfully to the market. (NRDIS, 2013)

Hungary has a more impressive position in innovations rankings if using other metrics. Introduced by the European Commission in 2013, a new composite indicator that measures innovation output the indicator complements the Innovation Union Scoreboard and its Summary Innovation Index. According to this indicator, Hungary became part of the group of "medium-level performers", including Austria, Hungary, Slovenia, Italy, and Cyprus. (EC 2013c)

In addition to the new EU composite indicator, the Ministry for National Economy announced and widely communicated that according to Bloomberg's latest innovation ranking[10], Hungary is placed as the 26th most innovative economy world-wide. Regarding manufacturing industry performance, Hungary is ranked as the 16th as a result of the high share of value added as percentage of GDP in this sector (high proportion in the economy) as well as the significant share of high-tech products within manufacturing exports. In addition, as far as R&D expenditures in the percentage of GDP concerned, among the regional peers Hungary is ahead of Poland and Slovakia.

In order to identify key issues regarding the performance of the RDI system and policy the *Innovation Union self-assessment tool* was used. The main strengths and weaknesses of the Hungarian RDI system could be summarised in the following (see details in Annex 1):

Main strengths (+):

- significant attention and effort is made to improve the performance of the RDI system;
- the new RDI strategy pursues innovation policy in a broad sense and foresees measures focusing for public sector and social innovation in addition to traditional areas of support;
- adequate and predictable public investment is secured through the RDI strategy and the Operational Programmes of the Structural Funds to stimulate private investment and reach the R&D target set by the strategy;
- the largest PRO, the Hungarian Academy of Sciences introduced several measures to increase the efficiency and effectiveness of scientific research as well as programmes to make researchers career more attractive for both foreign researchers and ex-pats working in research centres abroad;

10 The factors and their weightings of the Bloomberg's innovation ranking are the following: R&D intensity (20%), productivity (20%), high-tech density (20%), researcher concentration (20%), manufacturing capability (10%) and tertiary efficiency (5%). Further information on this ranking available at: http://www.bloomberg.com/slideshow/2013-02-01/50-most-innovative-countries.html

- use of tax incentives are explored, although their significance is rather low compared to the total R&D funding;
- excellence is becoming as a key criterion in funding of the public R&D and the financing of the higher education organisations as proposed by the new higher education strategy;
- increasing attention is paid to building of a start-up ecosystem (i.e. the capital Budapest to become the start-up hub of Central-East-Europe by 2020);

Main weaknesses (-):

- unstable, frequently changing STI governance structure even within government cycles and generally low interest of stakeholders to be actively involved in the design of STI policy and related measures;
- weak supply of researchers especially in the public sector where age structure of researchers in many scientific disciplines, in particular in natural science and engineering is unfavourable;
- weak RDI governance, although relevant institutions exist, their capacities and capabilities are rather low that could correspond to their insufficient funding and lack of empowerment, especially at regional level;
- despite of large number of measures in operation since many years, still weak business-academy partnerships and interoperability;
- innovative financing solutions such as private-public-partnerships are not really explored even if there was a pilot pre-commercial procurement (PcP) programme carried out by the National Innovation Office in 2012 and this tool is mentioned in the recently approved RDI strategy 2013-2020;
- public funding of research focusing mainly on tackling and improving the competitiveness of the economy and not really oriented towards addressing major societal challenges, such as ageing and climate change as reflected in GBAORD figures;
- weak evaluation culture of programmes apart from the necessary ex-ante/ex-post evaluation of the Structural Fund programmes and low use of modern STI policy making tools such as foresight, technology assessment;
- education and training curricula mainly focus on factual learning while critical thinking, team and project work is not frequently used neither in secondary nor in higher education. Entrepreneurship education and training is not available in the curricula apart from these specialisations at dedicated faculties;
- low share of women in senior researchers and management positions in research and higher education organisations;
- weak entrepreneurial culture and framework conditions (e.g. changing regulation) doesn't favour entrepreneurship, specific support is not widely available to young innovative companies to help them commercialise their ideas rapidly and promote internationalisation partly because university technology transfer offices set up in the past decade could not became stronger.

3.2 Structural challenges of the national R&I system

Based on the situation analysis and a SWOT analysis as presented in the National Research-development and Innovation Strategy (2013-2020), the main problem areas of the Hungarian NIS are the following (NRDIS, 2013, p. 22):

- *Weaknesses of the knowledge bases and knowledge production*: the evolution of knowledge-based production processes with high added value is slow, because of scarce supply of researchers, difficulties of scientific-technological education and low number of research centres competitive at international level.

- *Weaknesses of knowledge and technology transfer*: knowledge transfer organisations are weak, although university technology transfer centres are established at all main universities, but they have only 3-5 years experiences of operation. These intermediary organisations are not yet ready to mediate between academia and business efficiently and transfer the research results produced towards companies. This could have severe impacts on the production of higher added value goods and services as well as on the economic catching up of the country to EU-28 average.

- *Hindering factors of knowledge exploitation activities of companies*: it is one of the main consequences of the dual economic structure (i.e. on the one hand, highly developed multinational companies embedded in global supply chains that carry out significant R&D activities and domestic small and medium sized firms pursue for survival with no or very low level of R&D activities on the other hand) is that multinational companies operating in Hungary are able to purchase most modern technologies and acquire management knowledge, while domestic small companies could not leap frog their lagging innovation performance.

Based on the ERAWATCH country reports produced in the previous years (i.e. Havas, 2010, Havas, 2012 and Dőry-Havas, 2013), the situation analysis of the National Research-development and Innovation Strategy 2013-2020, the IUS and other data presented above, five major structural challenges of the Hungarian NIS are highlighted. These challenges are fairly similar to those of the previous year as the situation and framework conditions for RTDI have not changed much.

1) *Low level of innovation activities, especially that of the SMEs*

Only about one-fifth of enterprises introduce product or process innovations in Hungary, with no major change since 2002. This ratio is even lower for SMEs. According to IUS 2013, only 16.7% of them introduced product or process innovations, that is, 44% of the EU-28 average. The negative trend seems to be halted, as no change (0.0%) could be observed according to the IUS2013 data, compared to the previous period.

2) *Low occurrence of co-operation in innovation activities among key actors*

Innovation processes draw on different types of knowledge and skills, often possessed by various types of actors. Co-operation among them is, therefore, indispensable for successful exploitation of knowledge. At an aggregate level, the frequency of innovation co-operation reported by Hungarian firms is higher than in most EU countries (Hungary is ranked 6 with 41.3% in CIS 2008; the EU average is not available). Yet, only 6.5% of innovative firms reported any form of co-operation with Hungarian "government or public research institutes", and with that figure Hungary ranked 16 among the EU countries. Furthermore, small innovative firms co-operate less

frequently with their clients or customers than large innovative companies. This issue can be taken as a specific feature of a broader challenge, that is, the dual economy syndrome: the Hungarian economy is composed of highly productive and technologically advanced foreign-owned large firms, on the one hand, and fragile, financially and technologically weak indigenous SMEs, on the other. This challenge, therefore, would need attention both by STI and economic policy-makers.

Recognised this challenge, the RDI strategy 2013-2020 set as a main objective to increase the dynamism of collaborations and networking, in particular, foresees measures to strengthen traditional innovation collaborations, to support open, pre-competitive and social innovative collaborations as well as to support efficiency of networks.

3) Insufficient quantity and supplement of human resources for R&D and innovation

The future of R&D and innovation activities is predetermined by the quality and quantity of scientists and engineers, and the level of skills more generally. Yet, both the share of S&E graduates and the rate of participation in life-long learning are rather low in international comparison. A significant gap might be opening between the supply and demand for qualified science and engineering (S&E) personnel in the near future. According to the IUS 2013, the share of doctoral graduates in the 25-34-year age group slightly increased by 7.5% to 0.8 (per 1,000 people) in 2012, which is still only 53% the EU-28 average (1.5) and lower than the figure was in 2009 (0.9). As regards to longer time period, the share of doctoral graduates shows some up and downs, therefore stronger improvement would be required in order to maintain the quality of the Hungarian research system.

Apart from the share of doctoral graduates, it is a positive trend that the share of population aged 30-34 having completed tertiary education increased significantly (8.7%) to 28.1% according to the IUS 2013 figures and reached 81% of the EU average (34.6%). Furthermore, brain drain seems to be an element of this broad challenge: it is primarily the highly qualified, young workers, especially those with S&E degrees that are overrepresented within the group of Hungarians working abroad. Some reverse brain-drain could be observed thanks to the "Momentum" programme of the Hungarian Academy of Sciences (MTA), although the volume of the brain-gains is rather small scale but could be seen as role model for researchers working abroad.

4) Unfavourable framework conditions for innovation

The macroeconomic situation, the structure of the economy, the overall entrepreneurship culture, the low level of risk-taking together with the intensity and type of competition seem to influence firms' behaviour with such a power that STI policy schemes cannot offer strong enough incentives to overrule these unfavourable effects.[11]

5) Deficiencies in the STI governance system and the institutional framework

The shortcomings in the Hungarian STI policy were identified in the last OECD Review on Innovation Policy in 2008. In this report four aspects of policy failures are highlighted: (i) lack of political commitment, (ii) instability, (iii) shortfalls in implementation, (iv) slow, insufficiently informed policy learning processes. (OECD, 2008, pp. 15-16)

The situation neither have improved nor stabilised much so far because there was another wave of reorganisation of major STI policy-making bodies and the RTDI funding structure introduced by

[11] For more details, see Havas (2011); Havas and Nyiri (2007); and OECD (2008).

the new government since 2010. The National Research, Innovation and Science Policy Council (NKITT) had been set up in December 2010 to co-ordinate governmental STI policy decisions. After one and a half year operation, the NKITT was dissolved on 2 July 2012 when a new body, called National Development Cabinet (NFK) was set up.

The RDI strategy 2013-2020, accepted in June 2013, also reflects some uncertainties concerning the implementation structures of the strategy. Apart from lacking of clearly indicated responsibilities, the main issue is that government bodies responsible for policy design and policy implementation have no critical mass in experienced professionals. The same is true for intermediary organisations, including those at the regional level, and particularly the regional innovation agencies. Unfortunately, all these bodies are rather small, they have a scattered portfolio of activities, sometimes duplicate each other's efforts and often lack of long-term funding commitments. These circumstances do not help the STI governance system attracting and keeping well trained professional employees.

In conclusion, no 'quick fix' of the Hungarian STI governance system and institutional framework seems possible by taking into account of the above described shortcomings.

3.3 Meeting structural challenges

The overall paradoxical feature of the Hungarian research and innovation system is that innovation performance is 'moderate' (IUS, 2013) in spite of an impressive number and range of STI policy measures, which seem to be appropriate. Further, there are 'recurring' severe macroeconomic imbalances, too, at least for years, if not decades. In such an uncertain environment firms tend to focus on day-to-day survival, and thus RTDI activities are rarely in the focus of business strategies.

Table 4 Structural challenges, policy actions and impacts

Challenges	Policy measures/actions addressing the challenge[12]	Assessment in terms of appropriateness, efficiency and effectiveness
Challenge 1. Low level of innovation activities, especially that of the SMEs	- direct support measures of the KTIA and OPs - tax incentives - RDI strategy 2013-2020 - S3 White Book	Even if several measures are available for companies, they seem to be appropriate, e.g. in terms of their overall objective, the identified target groups, and the tools applied (grants and tax incentives). The effectiveness of these measures is another issue, as innovation performance of the business sectors has not improved significantly in the past decade. Risk-averse attitude and culture is deep-rooted in the Hungarian society. As long as research and innovation could be highly risky and consumes lots of money, business try to find other ways of operation and survival. It is unfavourable too, that grants support mainly low risk projects and for example require that applicant companies should be in business for 2 years. In addition, public schemes require high administration companies are not prepared for and rather withdraw from tenders and sending proposals.

[12] Changes in the legislation and other initiatives not necessarily related with funding are also included.

Challenge 2. Low occurrence of co-operation in innovation activities among key actors	- a number of measures aiming at supporting the collaboration between business and academia, e.g. establishment and operation of university knowledge centres and technology transfer offices - cluster initiatives - RDI strategy 2013-2020 - S3 White Book	In general, the schemes in place are appropriate; there is a strong rationale to use public funding for this purpose. Nevertheless, public funds are not spent as efficiently as it could be: (i) several of these measures have overlapped; (ii) these measures might have induced 'rent-seeking' strategies, leading to superficial and temporary collaboration, instead of facilitating knowledge circulation and exploitation in a sustained way. Evidence on impacts is mixed. The effectiveness of measures could be significantly increased by reforming the public research sector, conduction more risky research potentially new to the world or addressing global/national challenges and in particular placing more emphasis on exploitability of knowledge when evaluating research proposals.
Challenge 3. Insufficient quantity and supplement of human resources for R&D and innovation	- The quota for publicly financed students enrolled at S&E faculties has been increased. - Grants of the MTA, the largest PRO (e.g. Bolyai) - Post-doc fellowships to be introduced in HEIs	Public research centres and HEIs could not compete with salaries offered by multinational companies, hence can't attract highly qualified, top-grade graduates. Financial incentives or mechanical increases in S&E enrolment themselves might not yield results without major changes in the research and education systems, and sustained, concerted public efforts and actions by businesses.
Challenge 4. Unfavourable framework conditions for innovation	- The austerity measures and economic policies pursued since June 2010 have increased fiscal tensions - No public contribution is paid to the KTIA, the largest fund for technological innovation, hence the funds is based on the "innovation levy" paid by companies	The economic structure is dominated by large multinational companies that outperform their domestic counterparts in RTDI, but don't create enough demand for innovative SMEs and public research centres. The overall entrepreneurship culture is underdeveloped, neither high technology entrepreneurship nor start-up is popular among (young) scientists. These issues together with the intensity and type of competition seem to influence firms' behaviour with such a power that STI policy schemes cannot offer strong enough incentives to overrule these unfavourable effects.
Challenge 5. Deficiencies in the STI governance system and the institutional framework	- The STI policy governance system was reorganised in 2010, then once again in 2012. - Regional level organisations and intermediaries have uncertain future, they struggle for survival.	No measures have been taken to rectify the shortcomings identified by the OECD Review published in 2008. The reorganisation of the policy governance sub-system has further aggravated the problems stemming from instability: (i) lack of organisational capacities possibility for organisational learning and thus weakened policy formation and implementation capabilities; (ii) unnecessary burdens on RTDI performers.

Source: based on Havas (2012)

As to the individual challenges highlighted (see Table 4 above), at least the first three of them have been identified in various policy documents and the most recent RDI strategy 2013-2020, while the unfavourable framework conditions for innovation (Challenge #4) and the deficiencies in the STI governance system and the institutional framework (Challenge #5) were not identified as main challenges to trigger government intervention. As regards to the first three challenges several measures have been introduced to promote RTDI activities of firms, strengthen industry-academia co-operation, and increase the supply of S&E graduates. In conclusion, somewhat modest improvement has been achieved in these three fields, and hence STI policy measures have not been highly effective.

4 NATIONAL PROGRESS IN INNOVATION UNION KEY POLICY ACTIONS

4.1 Strengthening the knowledge base and reducing fragmentation

Promoting excellence in education and skills development

There were 3,090 research units operated in Hungary in 2012 according to R&D statistics of the Hungarian Central Statistical Office (KSH, 2013). The total number of research personnel was 56,486 persons, out of which 35,732 persons worked as full time (FTE) researchers. The number of FTE researchers increased 5.2% compared to 2011. The share of research and development personnel reached 0.92% of the total workforce in 2012 which is 16.4% higher than it was in 2009 (0.79%), although still lagging behind the EU-28 average (1.17% in 2011). Even if the number of FTE researchers slightly increased, the share of researchers in the population is relatively low in international comparison, 360 FTE researchers per 100,000 population in a country of 9.9 million inhabitants. Apart from this figure, it should be mentioned that human resources in science and technology (HRST) as a share of the economically active population in the age group 25-64 is lower (35.4%) than the EU-28 average of 42.9% (Eurostat, 2012 figures). The crisis had not much impact of the catch up of the Hungarian HRST figure that increased from 33.2% in 2008 to 35.4% in 2012 that means a 6.6% increase in the past 5 years.

Businesses have maintained their position as the largest employer of (FTE) researchers since 2006, reaching 55.9% in 2012, and had the biggest share in performing GERD (65.6%), too. The government sector's share was 21.2% in 2012 in the total number of (FTE) researchers. This figure reflects a high weight of PROs in the Hungarian innovation system compared to the EU-28 average (13.6% in 2012). The most important player is the Hungarian Academy of Sciences (MTA) with still a substantial – albeit declining – weight in the Hungarian research system: its share was 11.4% in the total R&D personnel (FTE) and 10.7% of the GERD in 2012.

According to the data of the Hungarian Central Statistical Office, the number of foreign students decreased slightly compared to 2011, there were 589 foreign researchers (many ethnic Hungarian from neighbouring countries) working in Hungarian institutions in 2012, out of which 406 came from other EU Member States. This means 1.6% of the total FTE researchers. In addition, 254 foreign citizens hold a research grant, out of which 137 from other EU Member States. The number of Hungarian researchers who spend more than 6 months abroad were oscillating between 398 and 454 in the period from 2009 to 2012. This figure indicate that out-going mobility is smaller than the incoming mobility of researchers, although it can happen that the official statistics does not register all those Hungarian researchers who work abroad.

The intention of the government in the education policy domain is to reduce higher education expenditures funded by the state and support especially science and engineering education. The changing funding focus of the government addresses the recognised shortage of scientists and engineers and resulted in substantial decrease of state funding of law and business education. It is foreseen that type of education should be gradually financed from the market.

The **Campus Hungary program** launched in 2012 aims to enhance international student mobility in higher education, both in terms of having more incoming foreign students to Hungary and also having more Hungarian students studying abroad. The program supports Hungarian students, academics and university staff with different kinds of scholarships for partial studies to study abroad and gain experience. The main goal of the program is to support and facilitate the internationalisation of Hungarian higher education by initiating and deepening cooperation with foreign higher education institutions and achieving knowledge exchange by means of student mobility. Launched in 2012, the Campus Hungary program is executed with the financial support of the European Union in the framework of the Social Renewal Operational Program (TÁMOP) of Hungary. It is implemented by the consortium of the Balassi Institute and the Tempus Public Foundation.

Based on the Government Decree No. 24/2013. (II. 5.) on **national higher education excellence**, for the rating period between 2013 and 2016, three institutions were awarded the title of priority higher education institution, six were awarded the status of research university, 4 university faculties received the title research faculty and 2 colleges were awarded the status of college of applied sciences. The 2013 budget set aside HUF10 billion (€34.5 m) for supporting institutional excellence; the above-mentioned institutions received this sum as additional funding. The fine-tuning of the law on higher education (Act CCIV. of 2011) is under way based on a strategy consultation process launched by the Ministry of Human Resources in May 2013. This process resulted in a draft higher education strategy that was published in September 2013. This strategy specifically aims at promoting excellence in the higher education sector. It means that the institutional funding provided by the government will be based in 30% on the institutional scientific excellence of HEs and the remaining 70% will be allocated based on the number of students.

According to the information available at the **Euraxess** website, 13 Hungarian universities and research organisations declared the implementing the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.

As regards to the support of researcher's career development, the largest PRO in Hungary, the Hungarian Academy of Sciences (MTA) published the **Momentum programme for excellence** for the fifth time in 2013. This initiative is a unique competition model that gives "momentum" to boost researcher career, form research workshops, choose and connect internationally competitive research topics, and to improve the host research institution's environment as well. Attracting and keeping the best Hungarian researchers home, and renewing the institutional culture of Hungarian science, the competition model has revived Hungarian scientific life, and contributed to a number of world standard achievements by supporting the most outstanding young scholars and the most promising research topics. Since its launch in 2009, the Momentum programme has become an internationally acclaimed and followed model for halting brain-drain, realising research yielding steady results, and competitive and sustainable research funding. Together with the scholars awarded previously, 79 research teams can conduct research promising internationally significant achievements from the summer of 2013 with a total funding of nearly HUF3 billion (about €10.3 m).

In 2014 a **new post-doctorate fellowship** will be launched in order to support fresh PhDs to setting up their research teams and develop their career plans. The programme will provide 150 fellowships that will be financed from the budget of the Hungarian Academy of Sciences (MTA).

Research Infrastructures

In 2008, the Hungarian Government launched the National Research Infrastructure Survey and Roadmap (NEKIFUT) project as a part of its 2007–2013 mid-term science, technology and innovation (STI) strategy. The NEKIFUT project has two objectives: i) the assessment of the Hungarian research infrastructure: the preparation, publication and operation of the National Research Infrastructure Register of national research infrastructures, in order to optimise their use; ii) and the formulation of a national report and programme for the development of research infrastructures.

The **National Research Infrastructure Register** is a searchable database providing information on major research infrastructures (RIs) in Hungary in all fields of science. RIs include research facilities, resources, related services and their networks like instruments, gene banks, data bases, etc. that are used by the scientific community to conduct top-level research in their respective fields. The National Research Infrastructure Register is not exhaustive. Currently, it contains only RIs of strategic importance in Hungary, i.e. those having the highest scientific and socioeconomic impact (strategic research infrastructure, SRI)[13]. The 63 SRI has 361 research infrastructures.

The RDI strategy 2013-2020 foresees the utilisation of the Register to measure the implementation of some quantitative targets of the strategy, namely the growth of the number research centres joining the global elite (i.e. 30 new centres by 2020).

So far Hungary has chosen to participate in two research infrastructures (RI) listed on the **ESFRI roadmap**. The **European XFEL** is a research facility currently under construction in the Hamburg area, Germany. From 2015 on, XFEL will generate extremely intense X-ray flashes to be used by researchers from all over the world. Hungary contributes about 1% of XFEL total budget, around €1.0-1.5 m.

Hungary will host the **ELI-ALPS** (Extreme Light Infrastructure Attosecond Light Purse Source) that will be established in Szeged, South-East-Hungary. In April 2013, the Government qualified the implementation of ELI as a high priority project and the management organisation submitted the project documentation to Brussels for approval. According to the plans, the first phase of ELI will be completed by end 2015 that will cost about € 127.5 million (HUF 36.99 billion). Further 83.7 million (HUF 24.3 billion) was allocated for the second phase of ELI in the next programming period 2014-2020.

Besides, several Hungarian research units have expressed their interest to participate in over a dozen ESFRI projects, in which cases RIs are (or would be) located in other EU countries. Hungary has joined several inter-governmental agreements, organisations and large RIs, nevertheless there is not much funding allocated for those collaborations. Various calls were launched (in total of €19.6 m) in 2012 to support EIT KIC, EUREKA, bilateral STI collaborations.

Central Europe's top **research-oriented data centre** was inaugurated at MTA's Wigner Research Centre for Physics in June 2013. The new centre hosts half of the European Laboratory for Particle Physics's (CERN) "brain centre". A total value of about €29.3 million (HUF8.5 billion) has gone into the establishment of a data centre that can give a push to Hungarian scientific research and also become invaluable in promoting Hungary's participation in international research and research-development projects over the next two decades.

[13] The SRI register is available at: https://regiszter.nekifut.hu/en/ki_kereses/results

With regards to new scientific infrastructure, it should be mentioned the opening of the **new natural science research centre** of the Hungarian Academy of Sciences (MTA) in November 2013, which is the largest investment in the research infrastructure of MTA in the past forty years. The new research centres integrates in its 30,000 m^2 surface 214 laboratories and provides modern working environment for more than half a thousand researchers. The volume of the investment was €32.7 m (HUF9.5 billion).

4.2 Getting good ideas to market

Improving access to finance

There are a high number of measures that specifically target improving access to finance innovation. Hungary has one of the most recipients of financial engineering instrument (loans, guarantees and venture capital) in the Economic Development Operational Programme (GOP) of the New Széchenyi Development Plan. According to the evaluation of the Economic Development Programme produced by the KPMG and published in April 2013, the number of recipients of the financial engineering instruments was close to 11,000 with a total funding of HUF248 billion (about €855 million) by the end of 2012. (KPMG, 2013) According to data provided by the National Development Agency, this figure was above 16,000 in December 2013.

The **New Hungary Enterprise Promotion Loan Programme** scheme provides preferential loans to micro-, small- and medium-sized enterprises with the aim of enhancing their roles in employment, strengthening their innovation and supplier activities and to contribute to their environmental and health-related investments. Development loans are specifically provided for development and upgrading of the RTDI infrastructure, enhancing innovation capabilities, and financing innovation centres.

The forms of guarantee provided within the **New Széchenyi Guarantee Programme** aims to improve the chances of small- and medium-sized enterprises of being granted credit. The resources to be invested for this purpose amount to a total of HUF 28 billion (about €100 M) in the period between 2007-2013. However, less than half of this amount was invested by the Jeremie funds by the end of 2013. The main objective of the portfolio guarantee program is to develop micro-, small- and medium-sized enterprises located in Hungary by improving their credit options. Based on international experiences, one of the most effective means of encouraging SME-credits is the credit guarantee. Still, the proportion of credits covered by credit guarantee in Hungary fails to reach 10%. Within the program, a collateral scheme has been developed based entirely on the risk management of the collaborating banks, thus it allows for a faster and less expensive operation than the guarantee products currently available, requiring minimal administration. Within the portfolio guarantee program, Venture Finance Hungary Plc. and Garantiqa ans MV Zrt provides direct guarantee for the financial claims (backing SME credits) of the financial intermediaries (mostly commercial banks and saving banks) based on pre-determined risk sharing, thus improving the SMEs' bank finance options. For a given credit, the amount of collateral to be secured by Venture Finance Hungary Plc is a maximum of 80% of the bank claim – the rest constitutes the bank's own risk which is 85% counter-guaranteed through EU funds.

Within the frame of the **New Széchenyi Venture Capital Programmes**, eight venture capital funds (Jeremie I) were set up in the first half of 2010. According to publicly available information, the Jeremie I funds invested in 73 companies with a total amount of €76.8 m (HUF 22.27 billion) by end of July 2013. The Jeremie II programme, launched in 2012, foresees €140.3 m (40.7 billion HUF) venture capital to be invested by the end of 2015 in three different investment categories:

seed funding, growth I and growth II. It is expected that the ten Jeremie II funds will invest in several high-growth companies and changing the situation of low share of available early-stage venture capital reported in the Innovation Union Scoreboard. Furthermore, eight new Jeremie III funds were launched with €117.9 m (HUF34.2 billion) in June 2013. In addition, two more Jeremie IV funds will be launched by the end of 2013 with €15.8 million (HUF4.6 billion). Thanks to the Jeremie funds, VC investments catapulted in the past two years and Hungary has the highest growth rate in the EU in terms of VC invested according to 2012 Eurostat data. The amount of VC investments reached 0.067 per cent of the GDP in 2012.

It could be concluded that the design of financing instruments and funding allocated through different measures tries to take into account the needs of companies, particularly the needs of SMEs, in particular only SMEs can be final beneficiaries of these revolving funds. As long as the above mentioned measures are funded by the EU Structural and Cohesions Funds, the Hungarian authorities would keep the bureaucracy at the level necessary to fulfil the administrative requirements of those funds.

Protect and enhance the value of intellectual property and boosting creativity

According to the annual report of the Hungarian Intellectual Property Office (SZTNH), the number of industrial property protection applications following the national route shows some increase in certain fields, elsewhere it is stagnant. In 2012, the number of patent applications increased by 6% to 743 applications. The number of national trademark applications also increased significantly by 10% (4599). The number of design and utility model applications decreased by 19% (196) and 3% (261).

In July 2013, the Government approved and published the **National Strategy for Protection of Intellectual Property 2013-2016**, called Jedlik Plan. The plan has the following four pillars: i) industrial property rights, ii) copy rights, iii) IPR should focus on national economic breakthrough fields and iv) institutional system responsible for IPR in Hungary. As annex of the plan, the Government also published its Action plan against falsification 2011-2015.

The Hungarian Intellectual Property Office (SZTNH) runs a programme, called **VIVACE**, to raise awareness of the intellectual property system within small and medium-sized enterprises (SMEs) and nurture their industrial property culture. SZTNH has an extended mandate from January 2012. Since 2012, companies that carry out R&D activities could optionally (ex-ante) ask the SZTNH to review the documentation of the research projects (optional for companies) and qualify it according to international standards as certain type research and development activity. Other national authorities should accept the qualification of SZTNH.

Based on the above measures and initiatives, it could be concluded that there is an effective regulatory framework on place to protect intellectual property and encourage creativity.

Public procurement

The National Innovation Office launched a pilot programme to elaborate a pre-commercial procurement (PcP) strategy in 2012, although there is no public information available on that PcP strategy so far.

The RDI strategy 2013-2020, approved in June 2013, foresees measures that are dedicated explicitly to innovative SMEs and positively discriminate innovative SMEs in certain restricted

areas of pre-commercial procurement (PcP). More specifically, the RDI strategy would increase the public demand for innovation through PcP actions. New tools for intensifying the dynamics of innovation in the public sector through PcP are foreseen in the fields of health care, environment protection, energy, education and transport sector.

4.3 Working in partnership to address societal challenges

The European Innovation Partnerships (EIP) are one of the latest initiatives under the Innovation Union that aim to bring together actors at EU, national and regional levels in a new way, combining supply and demand-side tools for innovation. According to the information available on different EIP websites, Hungarian participants are involved in the following EIP actions:

- Active and Healthy Ageing (AHA) – 32 Action Group Membership
- Agricultural Productivity and Sustainability – n.a.
- Smart Cities and Communities – n.a.
- Water – first results on action groups will be presented at the EIP Water Conference on 21 November 2013
- Raw materials – 4 Operational group membership

In addition to the above data on the Hungarian participation in different EIPs, it should be mentioned that the role of innovation in addressing societal challenges, and social innovation are generally perceived as not important issues in Hungary. Nevertheless, a horizontal priority of the recently approved RDI strategy 2013-2020 foresees a measure that specifically aims at supporting of research related to global grand societal challenges. The priority fields are related to research of water resources, agri-food production, energy research, brain research, integration of roma population and network research (mathematics).

4.4 Maximising social and territorial cohesion

The planning of different operational programmes for the new EU funding period 2014-2020 as well as the National Smart Specialisation Strategy is underway. The preparatory planning activities started already in 2011-2012, although the relevant national, sectoral and territorial development concepts and strategies were under public consultation by the end of 2013. Different stages of public and administrative consultation included stakeholder involvement at different territorial levels and across different sectors. Conferences and workshops were organised in all the seven regions of Hungary in order to get comments on the draft strategies and to receive new proposals.

The year 2013 is especially busy period in terms of strategy preparations. New strategies are developed at all territorial levels, including municipality, county, and sector level programming apart from the already mentioned EU funded operational programmes. As long as the elaboration of these planning documents should be completed and consulted with stakeholders within limited time, it requires special attention and strong coordination on behalf of responsible planning organisations and professionals to include all relevant comments and recommendations. Certainly, the time pressure and limited consultation possibilities does not allow the integration of all stakeholders reflections into these strategies and other planning documents under development.

Concerning the institutional preparations and capacity building, a new high level body, called National Development Cabinet (NFK) was set up in July 2012 in order to coordinate effectively

and speed up relevant development policy decisions. The Ministry for National Economy supported by the National Planning Office and the Ministry of National Development are responsible for the preparation of the main development concepts and programmes. With regards to RIS3, the National Innovation Office and the regional innovation agencies are involved in planning process under coordination of the Ministry for National Economy.

The RIS3 planning methodology was perceived as a novel tool for definition of longer term objectives and priority setting. It introduced a new type of stakeholder dialog that essentially builds on participatory techniques which is not yet frequent in Hungary. Usually, intermediary organisations and NGOs are actively taking part, nevertheless company representatives and managers do not devote sufficient time taking part in such strategy consultations, even if responsible organisations for the consultations make a hard job to involve them in the process.

4.5 International Scientific Cooperation

The Hungarian Academy of Sciences (MTA) has a recent initiative, the "**Visiting scholars**" program, in the framework of which prominent foreign scientists are invited to join the activities of the research institutes of MTA. According to the president of the MTA, the intention behind of this initiative is to attract the most outstanding experts, i.e. ones who can inspire the Hungarian research environment.

In 2013, the Hungarian Academy of Sciences joined the initiative of "**Teaming for Excellence"** elaborated by the Max Planck Society (MPG) and eight other leading Western-European scientific organisations, an initiative meant to enhance and even out the development of the European Research Area.

Four internationally acclaimed scientists take part in the Hungarian Academy of Science's workshops as part of the **"Invitation 13"** competition and they are going to spend 3 to 10 months in Hungary. This is the second time MTA's President has announced a competition to invite prominent international experts to Hungary. This year all participating guest researchers come from the United States of America. As a result of the "Invitation 13" competition the guest researchers selected from among the most acclaimed experts around the world are going to spend 3 to 10 months in Hungary. They will join research groups at MTA's various research centres. Significant scientific progress is expected from the accomplishment of their research plans, and their activity could affect the entire scientific community of Hungary. These guest researchers will share their professional and publishing expertise with their Hungarian counterparts, strengthen relationships with research centres abroad, and ultimately new joint programs, projects can be realised. Such close cooperations could give impetus to international cooperations for up to 10 years, and significantly increase Hungarian research groups' competitiveness. In 2012 when the competition was announced for the first time 6 guest researchers received an invitation to come to Hungary. In 2013, altogether 16 scientists had applied and four scientists won HUF57.5 million (about €200,000) to assist their stay and scientific work in Hungary.

The Hungarian Government announced a new grant scheme called "**Stipendium Hungaricum**" in July 2013 to attract foreign students to Hungarian higher education institutions. According to the information obtained from the State Secretariat for Higher Education of the Ministry of Human Resources, ASEAN (Association of Southeast Asian Nations) member states, China, Japan and several other Central Asian countries have been invited to participate in the scheme. Negotiations are also underway with partners in the Middle East and Latin America with regard to possible participation in the new Hungarian scholarship programme.

5 NATIONAL PROGRESS TOWARDS REALISATION OF ERA

5.1 More effective national research systems

Hungary undertakes to increase the level of research and development expenditures to 1.8 per cent of the gross domestic product by 2020 (from 1.3% in 2012) as set by the "National Research and Development and Innovation Strategy 2020" (RDI strategy) and stated in the National Reform Programmes (2011-2013) submitted to the European Commission. The RDI Strategy foresees a wide variety of policy instruments to achieve the above objectives such as direct and indirect tools, tax relief, adjustments of capital market conditions, tendering systems and innovation services to promote specialisation built naturally on the characteristics of local actors and market-driven and society-driven innovation processes.

Increasingly more R&D funding is allocated via project-based mode in the past few years because of the high significance of Structural Funds in total national investments that are typically distributed via competitive calls. The largest funds are the Research and Technological Innovation Fund (KTIA), and the various Operational Programmes of the New Hungary Development Plan, while for bottom-up funding is provided by a smaller one, called Hungarian Scientific Research Fund (OTKA). In absence of publicly available statistics or report on competitive versus institutional research funding in Hungary, according to senior government officers of Ministry for National Economy the ratio of competitive versus institutional funding could be estimated for about 40% and 60%, respectively. According to this estimates, the share of competitive funding will grow further in the years to come to reach the EU-28 average triggered by the EU policy push and the legislative requirements for allocation of Structural Funds.

Hungary has no long term tradition in evaluation of R&D performers that are entitled to receive public funding, although the largest PRO, the research centres and institutions of the Hungarian Academy of Science (MTA) should regularly report about their research performance and result. The MTA produces a comprehensive report for the Parliament about the state, progress of science in Hungary and the performance of the MTA network. International peer evaluation of proposals is not yet typical, although the MTA applies more and more frequently this type of evaluations in its funding programmes, e.g. Momentum Programme.

The new higher education strategy (under consultation by end of 2013) shows also into the direction of more effective public funding. According to the strategy, 30% of the institutional funding would be allocated based on criteria of scientific excellence. This would be significant improvement as currently the funding of HEIs is allocated on the basis of the number of inscribed students.

5.2 Optimal transnational co-operation and competition

The role of research and innovation in addressing societal challenges, and social innovation are generally perceived as not important issues in Hungary. Nevertheless, a horizontal priority of the "National Research, Development and Innovation Strategy 2013-2020" explicitly addresses the global social challenges and the importance of excellent research infrastructure. According to the quantitative objectives of the RDI strategy, thirty major research and technology centres are

expected to find their way to the global elite. The priority fields of the strategy are related to research of water resources, agri-food production, energy research, brain research, integration of roma population and network research (mathematics).

In terms of large scale research infrastructures, Hungary has chosen to participate in two research infrastructures listed on the ESFRI roadmap: XFEL and ELI. The latter, ELI will be located in South-Hungary (Szeged) and its construction started in late 2013. Besides, several Hungarian research units have expressed their interest to participate in over a dozen ESFRI projects, in which cases RIs are (or would be) located in other EU countries.

The largest PRO, the Hungarian Academy of Sciences introduced a number of programmes in the past few years to facilitate access to its research infrastructure and mobility of researchers, e.g. visiting scholars, Invitation 13, Teaming for excellence and the Momentum programme.

To conclude, some positive developments could be reported on the conditions of trans-national scientific co-operation, although the scale of the programmes is rather limited and should be further expanding to achieve a critical mass of initiatives.

5.3 An open labour market for researchers

Incoming and outgoing mobility of researchers is rather low and stable in the past few years. According to statistical data it is about 2.5-3% of the total FTE researchers. Research positions at public research institutes are open to non-nationals. In most cases, however, command of the Hungarian language is among the prerequisites. That basically prevents foreign nationals from applying for these positions (except the ethnic Hungarians coming from neighbouring countries). The situation is far more advantageous in the institutes of the Hungarian Academy of Sciences (MTA) where all researchers speak at least one foreign language therefore foreign national researchers can be easily integrated.

The equivalence/ validation of foreign academic degrees, i.e. the recognition of foreign certificates and degrees are carried out by the Hungarian Equivalence and Information Centre (Hungarian ENIC, a member of the European Network of Information Centres) within the Educational Authority, while the nostrification of scientific degrees is done by the Hungarian higher education organisations.

Just as in other new EU Member States, Hungarian research institutes advertise very few (a mere 10 in March 2013 and 7 in December 2013) vacancies (for researcher positions) on the Euraxess website. The Hungarian Rectors Conference called the attention of the rectors in January 2013 to join to the Code of Conduct for the Recruitment of Researchers that aims to improve recruitment, to make selection procedures fairer and more transparent and proposes different means of judging merit.

Grants awarded by the various Hungarian research funding schemes are generally not transferable to other (national and foreign) research institutes. Therefore, this regulation in place doesn't facilitate mobility of researchers.

5.4 Gender equality and gender mainstreaming in research

The proportion of women in academic positions in Hungary increased in the past decade, although the proportion of female heads of institutions in the higher education sectors stayed at a mere 9% in 2010, which is one of the lowest shares among the EU-28 Member States.

There are no specific provisions for female researchers in Hungary. Nevertheless, the restoration of the same position after maternity leave is no longer safeguarded by the general provisions of the Labour Code changed in July 2012. The employer can quit the employee in case the previous position terminated or the employer cannot offer similar position to the person coming back from maternity leave and the person rejects the offered new position. At the same time, the employer is not obliged to extend the employment period of a fixed-term contract.

Gender quotas have been discussed in various areas in order to reduce the gap between the representation of men and women in various professions and bodies, but have not been introduced. According to the Hungarian Central Statistical Office, the share of female researchers is 40.1%, although their share is much lower (25.7%) in R&D positions at companies in 2012.

Recognised the low share of women in academic positions, the MTA introduced a framework programme for equal opportunities that allow for female researchers with children under 10 years old to apply for grants over two years of age limit compared to male researchers. Also, the impact of EU policies and expectations towards balanced gender representation could be identified in the various operational programmes of the Structural Funds that contain specific provisions in the calls. This means that at least one third (30%) of the management positions and project participants should be given to under-represented sex.

5.5 Optimal circulation, access to and transfer of scientific knowledge including via digital ERA

Hungarian researchers intend to contribute to the development of a sustainable, efficient, and effective European scientific information system via ESFRI initiatives (developing e-infrastructures in all various fields of science). Support to these efforts at this stage – until a national RI development strategy (called NEKIFUT) is completed – can only be obtained via one-off decisions, i.e. not in the framework of a dedicated scheme.

The Hungarian Academy of Sciences (MTA), the largest PRO network introduced several actions with regards to open circulation and access to and transfer of scientific knowledge. The President of the Hungarian Academy of Sciences (MTA) issued an Open Access Mandate decree in 2012. According to this decree, the researchers and employees of the MTA - including researchers of the subsidised research units and Momentum research groups - should make their scientific publications Open Access. Open Access could be achieved by i) self-archiving in institutional or discipline-based repositories, ii) publishing them in Open Access journals or in hybrid journals offering paid Open Access.

Hungarian researchers of the MTA and HEIs are requested to use and update regularly their publications in the scientific bibliography database (i.e. List of Hungarian Scientific Works, MTMT in Hungarian) of the Hungarian Academy of Sciences' Library. This database has the main purpose "to keep an inventory on Hungarian academic achievements and to make these valuable contributions known to the world in a high quality format". The database became a central part of the Hungarian research-development information system.

The knowledge transfer organisations are weak, although university technology transfer offices / centres are established at major HEIs, but they have only 3-5 years experiences of operation. Initiated by the National Innovation Office in 2013, discussions started with key stakeholders in order to formulate a national policy to promote knowledge transfer. By the end of 2013, a recommendation was prepared in order to facilitate technology transfer at Hungarian universities.

ANNEX 1. PERFORMANCE THE NATIONAL AND REGIONAL RESEARCH AND INNOVATION SYSTEM

Feature	Assessment	Latest developments
1. Importance of the research and innovation policy	(+) The government considers the promotion of research and innovation as a key policy instrument to enhance national and regional competitiveness. (+) GERD/GDP could slightly grow even in the years of the crisis, as RDI has a high priority in the allocation of funding, especially in the utilisation of Structural Funds. (-) No specific programmes are designed to tackle grand challenges, although Hungary is a small economy that's has limited possibilities to achieve significant impact on them.	(+) Growth of GERD/GDP ratio (1.3% in 2012) (+) Coherent and achievable R&D target (1.8% of GDP) published in NRPs and in other policy documents (+) Approval of the RDI strategy 2013-2020 (+) Wide range of measures and incentives in place to increase business R&D investment (-) The new RDI strategy doesn't contain measures focusing on grand challenges
2. Design and implementation of research and innovation policies	(+) In the new programming period 2014-2020, 60% of the Structural Funds will be used for economic development purposes, out of which about €2 billion will be devoted to R&D in a predictable way (+) The most important domestic fund (KTIA Fund), provides funding for RTDI activities in a sustainable way from the innovation levy paid by companies, although the government doesn't top up the fund by the same amount as companies as used to do before 2010 (-) Weak STI policymaking capacities at government level, because of lack of highest level representation of the sector and critical mass of civil servants dealing STI policy issues who use modern STI policy decision making tools. Moreover, the STI governance system couldn't stabilise in the past few years because of frequent reshuffling of related tasks and responsibilities (-) Stakeholders and NGOs are consulted with regards to STI related strategies and programmes, although their scale and level of involvement could be increase allowing more time for reflections (-) Monitoring and review system is not yet effective,	(+) Approval of the RDI strategy 2013-2020 (+) Publication of S3 White Book to tackle national and regional level RDI priorities (+) Establishment of the Science and Technology Observatory (called Kaleidoscope information service) within the National Innovation Office (-) No improvements in terms of reinforcing the STI policy making capacities

	although some international benchmarking indicators were used in the situation analysis of the RDI strategy 2013-2020	
3. Innovation policy	(+) The concept of innovation is actively promoted as specific programmes and measures focus on awareness raising and dissemination of scientific results, as well as new science centres promote science and innovation as an important social issue (+) The new RDI strategy foresees measures to promote the broader concept of innovation, including service and social innovation as well as innovation in the public sector (-) Dominance of supply-side measures in the STI policy mix and little attention is paid to regulation, standardisation and PcP-type of measures, although the new RDI strategy enlist these measure but doesn't specify how and when they would be applied	(+) New RDI strategy 2013-2020 (+) New Operational Programmes of the SF 2014-2020 (-) Low share of domestic companies and in particular SMEs introducing new products and services to the market (-) Low share of demand side measures in the new RDI strategy 2013-2020
4. Intensity and predictability of the public investment in research and innovation	(+) Significant amount of resources from the OPs served the renewal of research and development infrastructure of the HEIs, and establishment of new research centres (+) In order to improve the international competitiveness of the knowledge infrastructure, the new RDI strategy set the target to support the establishment of 30 new research centres significant at global level (+) Hungary employs tax incentives since years and has a large number of financial engineering instruments. apart from this, the Jeremie funds established between 2010-2013, significantly improved the access to financing in the early stage of innovation (-) The absence or low investments into the knowledge infrastructure in the last decades couldn't be compensated within few years	(+) The new RDI strategy (+) Renewal of research infrastructure of HEIs from the OPs of the SF during 2007-2013 (+) Opening of new research centres and (some) update of laboratory equipment of the Hungarian Academy of Sciences (-) Low leverage effect on SME innovation and few exits of Jeremie fund investments so far
5. Excellence as a key criterion for research and education policy	(+) Increasingly more funding is allocated via project-based mode because of high significance of Structural Funds in total national investments that are typically distributed via competitive calls, still the balance between institutional and project-based funding could be estimated for 40% and 60%, respectively (+) HEIs and research institutes enjoy high level of autonomy to organise their RDI activities. HEIs will get 30% of their funding according to the proposal of the new Higher Education Strategy (-) Hungary has no long term tradition in evaluation of all R&D performers that are entitled to receive public funding, although the largest PRO, the research centres and institutions of the Hungarian Academy of Science (MTA) should regularly report about their research performance and result (-) RDI funding is not portable across borders neither institutes. (-) HEIs and PROs couldn't offer competitive salaries researchers therefore they often go to (multinational)	(+) Draft Science Policy Strategy 2014-2020 (+) Draft Higher Education Strategy (-) Low number of institutions signed the Code of Conduct for the Recruitment of Researchers and they are not yet reorganised their processes accordingly

	companies	
6. Education and training systems	(+) Government policies and incentives support the supply of graduates in sciences and engineering specialisations, although slow progress could be observed so far if looking at (post)graduate data (-) Education and training curricula doesn't focus on critical thinking, problem-solving and teamwork, although intercultural and communications skills improved likely due to exchange such as Erasmus (-) Entrepreneurship education and training is not availably widely, especially not for science and engineering student in mass that is recognised by the situation analysis of the draft Science Policy Strategy	(-) Draft Science Policy Strategy 2014-2020 (-) Draft Higher Education Strategy
7. Partnerships between higher education institutes, research centres and businesses, at regional, national and international level	(+) Technology transfer centres are established at all major HEIs, although they have no critical mass. It is positive development that both the new RDI strategy and Science Policy strategy 2014-2020 foresees further support for their reinforcement (+)The National Strategy for Protection of Intellectual Property 2013-2016 , set clear rules on the IPR (-) Research efforts are not sufficiently accompanied by measures supporting commercialisation of innovative ideas (-) Neither the draft Science Policy Strategy nor the new Higher Education Strategy set clear rules for creation and running of university spin-offs	(+) Several measures of the Economic Development OP (+) The RDI strategy 2013-2020 (+) The National Strategy for Protection of Intellectual Property 2013-2016 , called Jedlik Plan (-) Draft Science Policy Strategy and the new Higher Education Strategy
8. Framework conditions promote business investment in R&D, entrepreneurship and innovation	(+) Favourable conditions are in place through the New Széchenyi Venture Capital Programme that resulted in establishment of 28 Jeremie funds between 2010 and 2013. Some of the new Jeremie funds invest also in the seed phase (+) The RDI strategy was prepared applying system approach of innovation and foresees measure improving the conditions of innovation (+) Rules for starting up and running business are clear, although there would be opportunities to lower the red tape. (-) Underdeveloped early stage investment opportunities, slowly growing (pre)seed capital market and low number of business angels (-) Risk taking is generally low among population and Hungarians have a rather risk-averse culture. No public measure in place to promote willingness to take risk.	(+) The RDI strategy 2013-2020 (+) New Széchenyi Venture Capital Programme (-) The RDI strategy 2013-2020
9. Public support to research and innovation in businesses is simple, easy to access, and high quality	(+) Company needs are regularly monitored and acknowledged in the situation and SWOT analysis of STI policy related strategies (+) There are wide range of bilateral of S&T agreements as well support measures that facilitate participation in EU and other international research programmes (+) A new, two-stage scheme, "Start-up_13" was launched	(+) The RDI strategy 2013-2020 (+) Launch of a new two-stage scheme, called "Start-up_13"

	in June 2013 in order to support the development of the Hungarian start-up ecosystem and more specifically the development of technology start-up companies. (-) There are a large number, although often rather small-scale measures in the STI policy mix that support research and innovation (-) No long term traditions in evaluation of funding schemes and R&D measures. Evaluations are not used or rarely used as a policy design tool	
10. The public sector itself is a driver of innovation	(+) Some measures are foreseen in the RDI strategy in order to support public sector innovation (-) No significant use of public procurement as a tool to support the elaboration of innovative solutions in public services (-) Public tenders are evaluated mainly on the lowest price (-) Government-owned data is not widely accessible for innovation purposes	(+)The RDI strategy 2013-2020 (-) Law and related regulations on public procurement

ANNEX 2. NATIONAL PROGRESS ON INNOVATION UNION COMMITMENTS

	IU Commitment	Main changes	Brief assessment of progress / achievements
1	**Member State Strategies for Researchers' Training and Employment Conditions**	(+) New Higher Education Strategy (+) Campus Hungary programme support international mobility of students, academic and administrative staff exchange (-) National budget for higher education has decreased	(+) Clear employment conditions (+) New collaboration agreements and joint projects (-) The budget cuts translate in less attractive university careers (-) Only 13 Hungarian institutions joined the Charter & Code (-) Few vacancies are published on EURAXESS website
4	**ERA Framework**		
5	**Priority European Research Infrastructures**	(+) National Research Infrastructure Register provides information of major Hungarian RIs (+) Government budget commitment to ELI-ALPS (+) Academic leaders' collaboration in Visegrad countries (-) Limited national budget for new RI and update old RI	(+) Easier contacting and collaboration with Hungarian RIs (+) Hosting world-class researchers at ELI-ALPS (+) Closer cooperation between in CEE scientists in Horizon 2020 programme (-) No update of existing national RI result in less attractive researcher careers
7	**SME Involvement**	(+) The National RDI strategy foresees increased attention to high-growth SMEs ("gazelles") (+) Start-up_13 – technology incubator programme launched (+) Several measures of the Economic Development Operational Programme (GOP) provided significant funding opportunities for SMEs	(+) large number of SMEs got support from SF for their development activities (-) SMEs would require more funding support (-) low number of domestic high-growth SMEs that are competitive on global markets
11	**Venture Capital Funds**	(+) Altogether 28 JEREMIE (I-IV) Funds were launched in 2010-2013	(+) Abundant VC is available for innovative projects (-) Not enough well prepared projects to be invested in

			(-) Only one successful exit so far (-) Taxation regimes does not favour angel investments
13	**Review of the State Aid Framework**	(+) Government decision on allocation of 60% of EU funds in 2014-2020 for economic development (+) Draft S3 White Book foresees the support of key enabling technologies and addressing social challenges	(+) increased number of competitive call for proposals and diminishing number of special funding decisions (-) the ratio of competitive versus institutional funding could be estimated for about 40% to 60%, respectively
14	**EU Patent**	(+) Strategy for Intellectual Protection 2013-2016 (Jedlik-Plan)	(+) The Jedlik plan will support Hungarian individuals and institutions issuing an EU patent (-) Low impact is expected from the EU patent as the number of domestic applicants is very low
15	**Screening of Regulatory Framework**		
17	**Public Procurement**	(+) Pilot PcP programme of the National Innovation Office (+) The National RDI strategy foresee PcP measures as a new tool for intensifying the dynamics of innovation	(-) No PcP measure / programme launched so far
20	**Open Access**	(+) The President of the Hungarian Academy of Sciences (MTA) issued an Open Access Mandate	(+) research units and Momentum research groups of MTA should make their scientific publications open access (-) No specific Hungarian policy measure aimed at enhancing open circulation of knowledge across national borders
21	**Knowledge Transfer**	(+) The National RDI strategy foresee the strengthening of research universities, it KT function and technology transfer offices (+) Accredited cluster development	(+) TTOs established at all major universities in the past 5-10 years (+) Several measures of the SF target university-industry collaboration (+) 21 accredited innovation cluster in operation, that integrates more than 600 SMEs (-) University TTOs are weak and not capable effectively managing TT processes
22	**European Knowledge Market for Patents and Licensing**	(+) Strategy for Intellectual Protection 2013-2016 (Jedlik-Plan) (+) HIPAVILON established which is a not-for profit limited of the National IPO	(+) Support measures provided for protecting IPR (+) Hipavilon provides information and consultancy for patenting and licencing (-) No policies, measures in place that

			develop markets for patents and licencing
23	**Safeguarding Intellectual Property Rights**		
24	**Structural Funds and Smart Specialisation**	(+) Regional S3 strategies are prepared (+) Final Draft Partnership Agreement is signed (+) County and municipality level longer term strategies are prepared (+) Draft S3 White book is available	(+) Stakeholder involvement, and public consultation through roadshows (-) Limited stakeholder involvement because of generally low interest of companies in public consultations
25	**Post 2013 Structural Fund Programmes**	(+) New operative programmes are defined with indicative budget allocation and priorities (+) Final Draft Partnership Agreement signed	(+) Priorities of the new OPs favour RDI and the government would spend 60% of the funding on economic development (-) Harmonisation of and establishing link between OPs is challenging
26	**European Social Innovation pilot**	(+) The National RDI strategy explicitly foresees measures on social innovation (+) National Rural Development Strategy 2020 encourages CLLD	(+) Community led local development (CLLD) methodology is applied in several rural development strategies
27	**Public Sector Innovation**	(+) The National RDI strategy explicitly foresees measures on public sector innovation	(+) Target sectors of public sectors innovation are health care, environmental protection, energy sector , education and transport (+) The observatory service called "Kaleidoscope" of the National Innovation Office will follow the trends of public sector innovation (-) Mainly prospective planes are available and facts are still lagging behind
29	**European Innovation Partnerships**	n.a.	(+) Hungarian participants are involved in the AHA, Water and Raw materials EIP
30	**Integrated Policies to Attract the Best Researchers**	(+) Visiting scholar programme of MTA (+) "Invitation 13" for short term stay at MTA's research units	(+) The MTA, the largest PRO in Hungary has several initiatives to attract best researchers (-) The size of initiatives is relatively low (-) Low number of vacancies are

			published on EURAXESS website
31	**Scientific Cooperation with Third Countries**	(+) bilateral STI co-operation agreements with 34 countries, among them with 18 non-EU countries (+) Network of S&T attachés in 11 countries	(+) the primary objective of bilateral agreements is to promote mobility and international co-operation, and organising S&T seminars and workshops
32	**Global Research Infrastructures**	(+) MTA's Wigner Research Centre for Physics inaugurated in Budapest in June 2013 as a "brain centre" of CERN	(-) Hungary is a small country to establish global research infrastructures
33	**National Reform Programmes**	(+) The National RDI strategy was approved by the government (+) The draft Science Policy Strategy was published for public consultation (+) Sectoral strategic white books are under preparation	(+) some progress made towards the quantitative objective set by the NRP 2013 (-) progress is slow to reach the set objective by 2020 (-) no public information is available on sectoral strategic white books

ANNEX 3. NATIONAL PROGRESS TOWARDS REALISATION OF ERA

ERA Priority	ERA Action	Recent changes	Assessment of progress in delivering ERA
1. More effective national research systems	Action 1: Introduce or enhance competitive funding through calls for proposals and institutional assessments	(+) National RDI strategy 2013-2020 (+) Draft Science Policy Strategy (+) Support to RTDI umbrella projects (+) Draft Higher Education strategy (-) Increase of the GBAORD in 2012 compared to previous years	(+) Recent policy documents foresee further increase of competitive funding (+) Proposed by the draft Higher education Strategy, HEIs will receive 30% of their funding based their scientific excellence (+) The Hungarian Academy of Sciences distribute block funding to research centres based on their performance (-) Block funding of HEIs is not yet based on institutional assessment
	Action 2: Ensure that all public bodies responsible for allocating research funds apply the core principles of international peer review	No new measures were introduced	(+) The Hungarian Academy of Sciences applies international peer reviewers in its Momentum programme (-) No change in the evaluation culture (-) Evaluation of RDI projects and institutional assessment is carried out by panels consisting of domestic experts and doesn't follow international peer review criteria
2. Optimal transnational co-operation and competition	Action 1: Step up efforts to implement joint research agendas addressing grand challenges, sharing information about activities in agreed priority areas, ensuring that adequate national funding is committed and strategically aligned at European level in these areas	(-) National RDI strategy 2013-2020 (-) No joint research agendas addressing grand challenges, joint calls or joint programming with other countries	(+) The horizontal priority of the RDI strategy addresses the global social challenges and the importance of excellent research infrastructure (+) Experiences of other EU countries are taken into account in setting national funding priorities (+) Operation of a network of Science and Technology attachés (-) No measures are in place that explicitly support joint activities with other countries

	Action 2: Ensure mutual recognition of evaluations that conform to international peer-review standards as a basis for national funding decisions	(+) Involvement international peer-reviewers in the assessment of "Start-up_13" programme and the Momentum programme of the Hungarian Academy of Sciences	(-) No action or initiative could have been identified that support the introduction of foreign experts in peer-reviews.
	Action 3: Remove legal and other barriers to the cross-border interoperability of national programmes to permit joint financing of actions including cooperation with non-EU countries where relevant		(-) There are no joint research programmes in place.
	Action 4: Confirm financial commitments for the construction and operation of ESFRI, global, national and regional RIs of pan-European interest, particularly when developing national roadmaps and the next SF programmes	(+) Participation in two ESFRI roadmap research infrastructure (RI)	(+) The National Research Infrastructure Register provides searchable information on major Hungarian RIs. (+) The funding is secured to ELI-ALPS (RI) by government decree for phase I and II of the establishment of ELI that will be located in Szeged/South-East Hungary
	Action 5: Remove legal and other barriers to cross-border access to RIs	(+) Opening of Central Europe's top research-oriented data centre at MTA's Wigner Research Centre for Physics (+) "Visiting scholar" programme and the "Invitation_13 call of MTA aims to attract outstanding researchers to carry out research in the research centres of the MTA	(+) Wigner Centre hosts half of the European Laboratory for Particle Physics's (CERN) "brain centre". (+) The research centres of MTA are open to the international research community (+) IPR and data protection is clarified and can't be seen as a barrier for researchers (-) Only a small fraction of Hungarian RIs could be considered as large RI
ERA priority 3: An open labour market for researchers	Action 1: Remove legal and other barriers to the application of open, transparent and merit based recruitment of researchers	(-) Draft Higher Education Strategy	(-) The foreseen modification of the Act on Higher Education doesn't provide criteria for open, transparent and merit-based recruitment (-) Low salaries in international comparison doesn't attract many foreign researchers
	Action 2: Remove legal and other barriers which hamper cross-border access to and portability of national grants		(-) National grants are not open to nationalities other than Hungarians (-) National grants are not portable to other countries

	Action 3: Support implementation of the Declaration of Commitment to provide coordinated personalised information and services to researchers through the pan-European EURAXESS3 network		(+) There is a Euraxess network in Hungary mainly located at universities in almost all the seven regions (+) Contacts of local Euraxess network points are duely acknowledged on the portal of Euraxess Hungary
	Action 4: Support the setting up and running of structured innovative doctoral training programmes applying the Principles for Innovative Doctoral Training.		(+) The Hungarian Accreditation Committee reviews regularly the operation of the doctoral schools run by universities and publish their results on it website (-) Regulation of doctoral schools doesn't mention the principles of innovative doctoral training
	Action 5: Create an enabling framework for the implementation of the HR Strategy for Researchers incorporating the Charter & Code	(+) Draft Science Policy Strategy 2014-2020	(+) The Hungarian Rector's Conference draw the attention of the rectors to join the Charter&Code (+) Two Hungarian universities started the process achieving the logo (+) The draft Science Policy Strategy explicitly refers to the Charter & Code and foresees measures to facilitate the access to these frameworks (+/-) 15 Hungarian institutions joined the Charter & Code
ERA priority 4: Gender equality and gender mainstreaming in research	Action 1: Create a legal and policy environment and provide incentives	(+) National Strategy for the Promotion of Gender Quality 2010-2021	(+) The National Strategy for the Promotion of Gender Quality aims to increase the proportion of women in leading positions, although no quotas are set by the government
	Action 2: Engage in partnerships with funding agencies, research organisations and universities to foster cultural and institutional change on gender	(+) Female researchers are awarded at the MTA during the "Week of Hungarian Science" (+) L'Oréal-UNESCO Hungarian Grant for Women and Science	(-) Only few small scale actions are in place mainly at institutional level to foster cultural and institutional change on gender.
	Action 3: Ensure that at least 40% of the under-represented sex participate in committees involved in recruitment/career progression and in establishing and evaluating		No measures could have been identified on this action.
ERA priority 5: Optimal circulation,	Action 1: Define and coordinate their policies		(+) OTKA, one of the main Hungarian funding agencies requires that scientific

access to and transfer of scientific knowledge including via digital ERA	on access to and preservation of scientific information		publications resulting from grants provided by OTKA should be made freely available. (+) MTA and most Hungarian universities requires their researchers to register their publications in the scientific bibliography database run by MTA (-) Lack of national Open Access strategy
	Action 2: Ensure that public research contributes to Open Innovation and foster knowledge transfer between public and private sectors through national knowledge transfer strategies	No action or initiative could have been identified	(+) Several R&D funding measures contain provisions for knowledge transfer (+) TTOs are established all major universities throughout Hungary (-) Even if the National Innovation Office is backing the TTOs, no nation-wide recommendations or measures could have been approved so far to secure their longer-term operation (-) The Act on Higher education doesn't have provisions to support knowledge transfer and TTOs
	Action 3: Harmonise access and usage policies for research and education-related public e-infrastructures and for associated digital research services enabling consortia of different types of public and private partners		(+) The National Information Infrastructure Development (NIIF) programme provides the framework and wide range of information and communication and co-operation services and it is funded by the central budget.
	Action 4: Adopt and implement national strategies for electronic identity for researchers giving them transnational access to digital research services	No action or initiative could have been identified	

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LIST OF ABBREVIATIONS

BERD	Business Expenditures for Research and Development
BME	Budapest University of Technology and Economics
CERN	European Organisation for Nuclear Research
CIS	Community Innovation Survey
COST	European Cooperation in Science and Technology
CSR	Country Specific Recommendation
EDOP	Economic Development Operational Programme
EIS	European Innovation Scoreboard
ELTE	Eötvös Lóránd University of Sciences
ERA	European Research Area
ERA-NET	European Research Area Network
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-28	European Union including 28 Member States
FDI	Foreign Direct Investments
FP	European Framework Programme for Research and Technology Development
FP7	7th Framework Programme
FTE	Full-time equivalent
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
HERD	Higher Education Expenditure on R&D
HES	Higher Education Sector
HUF	Hungarian Forint
IP	Intellectual Property
IU SAT	Innovation Union self-assessment tool
JTI	Joint Technology Initiative
KSH	Hungarian Central Statistical Office
KTIA	Research and Technological Innovation Fund
MISZ	Hungarian Association of Innovation
MTA	Hungarian Academy of Sciences
NEFMI	Ministry of National Resources
NEKIFUT	National Research Infrastructure Survey and Roadmap
NFK	National Development Cabinet
NIH	National Innovation Office
NIS	National Innovation System
NKITT	National Research, Innovation and Science Policy Council
NKTH	National Office for Research and Technology
NRDIS	National Research and Development and Innovation Strategy
NRP	National Reform Programme
NTIT	National Science Policy and Innovation Board
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development
OP	Operational Programme
OTKA	National Scientific Research Fund

PcP	Pre-commercial Procurement
PCT	Patent Cooperation Treaty
PPS	Purchasing Power Standard
PRO	Public Research Organisation
R&D	Research and Development
R&D&I	Research and Development and Innovation
RI	Research Infrastructure
RIÜ	Regional Innovation Agency
RTDI	Research Technological Development and Innovation
S&E	Science and Engineering
S&T	Science and Technology
SF	Structural Funds
SIP	Science - Innovation Programme
SME	Small and Medium Sized Enterprise
SZTE	University of Szeged
SZTNH	Hungarian Intellectual Property Office
STI	Science, Technology and Innovation
TTPK	Science and Technology Policy Council
VC	Venture Capital

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