COUNTRY REPORTS 2011: Russian Federation







ERAWATCH COUNTRY REPORTS 2011: Russian Federation

ERAWATCH Network – Centre for Social Innovation, ZSI

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The opinions expressed are those of the authors only and should not be considered as representative of the European Commission's official position.



Executive Summary

Russia is the largest country in the world in terms of area, and spans over nine time zones. It has a population of 142.9m (Federal State Statistics Service, 2012), which is concentrated in the European part of the country making it the largest European country. In 2011 its GDP amounted to \pounds 1,364b (RUB 54,586b). It is an upper middle-income country with a GDP of \pounds 9,615 per capita (up from \pounds 7,957 in 2010, World Bank, 2012).¹ Its economy depends largely on primary goods production (oil, gas, mining and metallurgy). It is counted within the group of economically fast developing BRIC countries.

Over the period 2006-2010, Russia invested slightly above 1% of GDP in R&D (GERD). In 2010 GERD amounted to 1.11% of GDP (down from 1.24% in 2009), which was equivalent to €13b (up by nearly €2b in absolute figures as compared to 2009). GERD is financed largely by the government (70.3% in 2010), whereas the business enterprise sector financed only 25.5% of GERD in 2010, showing a declining trend (EUROSTAT, 2012). Most of GERD is performed in the business enterprise sector (BERD), a sector which is marked by big R&D intensive companies in state ownership. BERD has been slightly decreasing from 64.3% of GERD in 2006 to 60.5% in 2010, while R&D performance in the higher education sector (HERD) has been slightly increasing from 6.3% to 8.4% over the same period. The economic crisis resulted in a short, but significant dip in R&D funding in the years 2009-2010. With economic growth back at a rate of 4.3% in 2010-2011 (OECD, 2012), also funding for R&D entered again a growth path.

The EU and associated countries to the EU's Framework Programme for RTD (FP) are Russia's main international cooperation partners in R&D. The multilateral cooperation with the EU is legally based on the EU-Russia S&T agreement. Russia has the highest participation rate in the EU Framework Programmes in terms of the funding it receives, of all so-called "Third Countries" (non-EU and non-associated countries to the FP). In addition around fifteen bilateral S&T agreements and related bilateral R&D and innovation funding programmes underpin the cooperation with the EU.

Russia has an important scientific tradition with major successes in fields such as physics, space, aeronautics, and nuclear energy. It can rely on a well-educated labour force and a significant amount of R&D personnel.

Stimulating private investment into R&D and innovation is a major challenge for Russian policy makers. The structure of the economy with a focus on big companies and a large share of state ownership, as well as the framework conditions (e.g. legal system) are not very conducive to private investment. Several stimulation measures have been introduced in recent years: co-funding by businesses is a requirement in the main competitive R&D funding instruments - the Federal Targeted Programmes. Tax incentives and special economic zones for technology development have been established. Venture funds and technoparks have been added to the portfolio of measures. In 2010-2011 Technology Platforms were selected and a new funding tool for collaborative projects between business and higher education institutions (the HEI-business programme) was established.

¹ An exchange rate of $\mathfrak{E}1 = RUB40$ has been applied throughout this report for conversions, where no official figures were available.



The interactions and exchanges within the knowledge triangle education, research and innovation are not working well in Russia. Majority of research activities are traditionally performed in research institutes, and are more weakly established in universities and business enterprises. The measures mentioned above are targeting not only private R&D investment, but also an improved interaction in the knowledge triangle. In addition, specific support tools for enhancing research within universities were introduced since 2009. These include programmes for selecting and supporting National Research Universities and for attracting leading scientists to Russian universities. Innovation infrastructure at universities was enhanced and spin offs from higher education institutions (HEIs) and private research organisation (PROs) facilitated through a law introduced in 2009. The following table provides a brief overview of Strengths (S) and Weaknesses (W) within the knowledge triangle:

	Recent policy	Assessment of strengths and
	changes	weaknesses
Research policy	Strengthening research at universities	S: opening up to international cooperation, new funding tools introduced e.g. attracting foreign scientists and Russian scientific diaspora, focus on cooperation with the EU. W: HERD rather low in international comparison, domination of government sector
Innovation policy	Flagship project Skolkovo	S: commitment of policy makers to modernisation and innovation stimulation W: selective activities, without targeting the broader framework (e.g. legal framework); lack of evaluation of measures; weak R&D and innovation funding by business enterprise sector
Education policy	Selecting an elite group of universities and enhancing it with specific funding tools	S: upgrading of equipment and curricula, Bologna process joined and transformation to two cycle system W: streamlining of the university sector necessary
Other policies	Law on spin-offs issued in 2009	S: support tools for small innovative companies provided by FASIE, venture funds through RVK and funding through Rusnano available, framework conditions for spin-offs improved W: industry structure marked by a lack of SMEs

Knowledge Triangle.

The main challenges for Russia's R&D system are strengthening research and innovation activities in the business sector, and enhancing the linkages in the knowledge triangle education, research and business. In the past few years, several new support measures have been devised to address specifically these issues.



Measures such as special economic zones, technology platforms and innovative territorial clusters are targeted at linking research and business. Funding programmes for strengthening research in the university sector, for linking universities and business, and for attracting highly qualified researchers to the universities were launched.

	Objectives	Main national policy changes over the last vear	Assessment of strengths and weaknesses
1	Labour market for researchers	Funding programme launched in 2010 to attract leading scientists (especially from abroad) to Russian universities Simplified procedures for hiring foreign highly qualified specialists introduced	S: high levels of tertiary education attainment W: Overall limited attractiveness of working conditions for researchers: low basic salaries, good RIs only at leading institutions, however, significant improvements over the last years
2	Research infrastructures	participation in international infrastructures plans for "Megascience" projects for national infrastructures	S: participation in international R&D infrastructure projects (especially in Germany); financial means for investing in big infrastructures in Russia available after a long time W: big infrastructures in Russia outdated; variety of infrastructure investments under discussion, possibly not enough focus on most relevant infrastructures
3	Strengthening research institutions	stimulation measures for strengthening research at universities introduced streamlining of the HEI sector envisaged evaluation of the academy sector announced significant increase of GERD in absolute figures	S: several new funding tools for university research and related knowledge transfer introduced: attracting leading scientists, HEI- business programme, Federal Universities, National Research Universities W: HERD increasing, but still low in international comparison; academy sector slowly moving forward in a reform process

Assessment of the national policies/measures



4	Knowledge transfer	Technology Platforms (TPs) selected in spring 2011	S: stimulation tools implemented: FASIE, TPs, Rusnano, Russian Venture Company W: results of stimulation measures not verified; limited level of business co- funding in the major R&D funding programmes, the FTPs
5	International R&D cooperation with EU member states	inward mobility programmes introduced (attracting leading scientists) participation in ERA- NET projects, especially the regional ERA.Net RUS for Russia repeated proposals of Russia to lift visa procedures with the EU	S: Russia is traditionally a very strong third country performer in FPs; dense network of bilateral RTDI cooperation with EU Member States and countries associated to FP7 (through RFFI, RAN, etc.) available; great international interest in programme for attracting leading scientists (mainly from abroad) to Russian universities W: bureaucratic hurdles (customs, taxation, etc.) for international R&D cooperation, however hiring of foreign staff in Russia has been made easier
6	International R&D cooperation with non- EU countries	inward mobility programmes introduced (attracting leading scientists)	S: cooperation with major international R&D players (USA, CN, JP, etc.); cooperation network with other Former Soviet Union countries W: limited inward mobility to Russia, however hiring of foreign staff in Russia has been made easier; bureaucratic hurdles (customs, taxation, etc.) for international R&D cooperation



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1 INTRODUCTION

The main objective of the ERAWATCH International Analytical Country Reports 2011 is to characterise and assess the evolution of the national policy mixes of the 21 countries with which the EU has a Science and Technology Agreement. The reports focus on initiatives comparable to the ERA blocks (labour market for researchers; research infrastructures; strengthening research institutions; knowledge transfer; international cooperation). They include an analysis of national R&D investment targets, the efficiency and effectiveness of national policies and investments in R&D, the articulation between research, education and innovation as well as implementation and governance issues. Particular emphasis is given to international research cooperation in each country.



2 PERFORMANCE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM AND ASSESSMENT OF RECENT POLICY CHANGES

2.1 MAIN POLICY OBJECTIVES / PRIORITIES, SOCIAL AND GLOBAL CHALLENGES

Some research fields, where Russia has strong scientific potential, or where it wants to push its capacities, are more relevant for intersectoral and international S&T cooperation than other fields. These fields concern for example cooperation on research in physics, energy (including nuclear fission and fusion), aeronautics, space and nanotechnologies.

An important grand challenge, where Russia is cooperating internationally concerns energy: on the one hand it is a major energy resource provider for EU countries and on the other hand it cooperates on future energy technologies with the EU, e.g. on the international nuclear fusion project ITER.

Another important field for Russia is nanotechnology, where it has put high priority on research, technology development and innovation. Support and stimulation activities have been getting off the ground in the last few years. The Russian state corporation for the support of nanotechnologies - Rusnano – has, after a slow start, begun funding innovative projects and annually organises an important international nanotechnology forum in Moscow.

The selection of Russian Technology Platforms, which stimulate the intersectoral cooperation among business, research institutes, universities and governmental organisations, confirms the thematic priority setting. Of the 27 TPs selected for support in spring 2011, some 11 deal with energy related topics (nuclear energy, oil and gas, alternative energies, etc.), Five TPs deal with nanotechnologies and new materials, whereby four of these TPs are coordinated or co-coordinated by Rusnano. Other fields with more than one TP are space and ICT (Governmental Commission, 2011).

2.2 STRUCTURE OF THE NATIONAL RESEARCH AND INNOVATION SYSTEM AND ITS GOVERNANCE

Russia is the largest country in the world in terms of area, and spans over nine time zones. It has a population of 142.9m (Federal State Statistics Service, 2012),² which is concentrated in the European part of the country and making it the largest European country. In 2010, Russia invested a share of 1.11% of GDP in R&D (GERD, down from 1.24% in 2009), which was equivalent to €13b (but up by nearly €2b in absolute figures as compared to 2009, EUROSTAT, 2012).

The EU and countries associated to the EU's Framework Programme for RTD are Russia's main international cooperation partners in R&D. Russia has the highest participation rate in the EU Framework Programmes in terms of funding it receives, of all so-called "Third Countries" (non-EU and non-associated countries to the FP). In

² Russia's population has been declining since it became an independent state in 1991. Other sources estimate the population at around 139m in 2011.



addition, around fifteen bilateral S&T agreements and related bilateral R&D and innovation funding programmes underpin its cooperation with the EU. As a consequence and with the aim of strengthening cooperation, in 2008, Russia expressed its interest in becoming an associated country to the EU's FP7. In February 2011, Commissioner Geoghegan-Quinn met with then Russian Minister for Education and Science, Andrei Fursenko, and confirmed that the EU would not open negotiations on Russia's association to FP7 (under the new, general EU-Russia Agreement), stating that the timing for this was no longer meaningful. Instead, it was agreed to build a new 'strategic partnership' between the EU and Russia for S&T.

Apart from cooperation with the EU, international RTDI cooperation is well established with major international R&D players (USA, CN, JP, etc.). A special focus is placed on cooperation with other Former Soviet Union countries, with which Russia is linked through joint funding programmes or cooperation among Academies of Sciences.

Main actors and institutions in research governance

The main player in Russian S&T policy making, strategy and implementation is the *Ministry of Education and Science* (in Russian: Minobrnauki or MON). Several other ministries have responsibilities for R&D and respective budgets: e.g. *Ministry for Economic Development*, Ministry of Industry and Trade, Ministry of Energy, Ministry of Information Technologies and Communication, and Ministry of Defence.

Research policy is coordinated at the governmental level by the Governmental Commission for Economic Development and Integration. Research related advisory bodies to the President are the Council for Science and Education and the Council for Modernisation of the Economy and Innovative Development of Russia. Within the Russian Parliament two committees take care of research policy: in the lower house, the State Duma, the Committee on Science and High Technologies, and in the upper house, the Federal Council, the Committee on Science, Education, Culture and Information Policy. Both committees propose and scrutinise legislation relevant to R&D.

For policy implementation several funding bodies are in place besides the Ministry of Education and Science and the other relevant ministries. For basic research support, the <u>Russian Foundation for Basic Research</u> (RFFI) and the <u>Russian Foundation for Humanities</u> (RGNF) have been established. For the innovation side, the <u>Foundation for Assistance to Small Innovative Enterprises</u> (FASIE), the Russian Foundation for Technological Development (RFTR), the <u>State Corporation for Nanotechnologies</u> – Rusnano, and the Russian Venture Company are available. In a recent development, the Skolkovo foundation has been added to the portfolio of innovation support tools. Since 2011 it has developed a broad spectre of activities, mainly for establishing a high tech centre on the outskirts of Moscow, but also for grant giving.

Some important research institutions have a mixed set of tasks, including research performance and policy implementation. This concerns for example the *Federal Space Agency* which is a major research organisation and at the same time is responsible for implementing the *Federal Targeted (funding) Programme for the space sector*.





Figure 1: Overview of the Russian Federation's research system governance structure

Source: ERAWATCH Country Fiche – Russian Federation

The institutional role of regions in research governance

The Russian Federation is a federal state, structured into so-called *Subjects of the Federation*; these are 46 regions (oblast'), 21 republics, 4 autonomous districts (okrug), 9 territories (kray), 2 federal cities (Moscow, St. Petersburg) and 1 autonomous region (avtonomnaya oblast'). Federal subjects are regrouped for governance purposes into eight Federal Districts, led by representatives of the president. In this analytical country report, the term region(s) is used generally, referring to all Subjects of the Federation.

R&D capacities are concentrated in certain Russian regions and especially in and around big cities. Moscow and the Moscow region have the highest concentration of R&D capacities followed by the second largest city in Russia, St. Petersburg. Then follow a range of important regional centres, such as Rostov-on-Don in the south, Kazan and Nizhny Novgorod in the Volga Federal District, several big cities in Siberia: Irkutsk, Krasnoyarsk, Novosibirsk, Tomsk, and in the Urals: Yekaterinburg.

R&D policy is shaped and implemented predominantly at the federal level, by the government and the responsible ministries, in particular the Ministry of Education and Science. The regions have de-facto limited tasks and resources for R&D available, but their relevance - especially in innovation related support - is increasing. Several regions have developed their own regional S&T programmes, which target the respective regional R&D capacities and which are focused on the innovation and industrial component of R&D. Regional venture funds, technoparks, and innovation incubators are being established and regional co-funding of RFFI and FASIE funding programmes is being provided.



Main research performer groups

Research is performed in Russia de-facto mainly in public institutions, particularly in the academy and institute sectors, and in state owned enterprises. Paradoxically, the share of GERD performed in the business enterprise sector is relatively high and reached 60.5% in 2010. This can be explained by the fact that several public research institutes are organised as companies and also by the important role played by state owned companies in research performance, such as the State Corporation for Atomic Energy (Rosatom) - both of these categories are counted in R&D statistics to the business enterprise sector.

In 2010 Public Research Organisations (PROs) performed a share of 31% of GERD. This sector includes some important organisations such as the *Russian Academy of Sciences* (RAN) which is still a major player in Russia's research system and receives a substantial block grant from the state. The Federal Space Agency (Roscosmos) is another huge public R&D player. Traditionally, universities have cared first and foremost for education, but in recent years, research has been gaining importance in these institutions. This development has been stimulated and promoted by the government's research policy. GERD performed by HEI amounted to 8.4% in the reference year 2010 (up from 7.1% in 2009, EUROSTAT, 2012). The private non-profit sector is still insignificant in Russia.

2.3 RESOURCE MOBILISATION

2.3.1 Financial resource provision for research activities (national and regional mechanisms)

The main strategic document for the S&T sector is the <u>Strategy for the Development of</u> <u>Science and Innovation in the Russian Federation up to the year 2015</u>, which was prepared by the Ministry of Education and Science and approved in early 2006.

Specific targets for R&D intensity measured in Gross Domestic Expenditure on Research and Development (GERD) as a percentage of GDP have been set in the strategy. It foresees an increase in R&D spending to 2% of GDP by 2010 and to 2.5% of GDP by 2015. Russia is currently spending slightly more than 1% of GDP on R&D and is herewith quite far away from its targets - in 2010 R&D intensity was 1.11% of GDP. Meanwhile a more realistic target of 1.77% to be reached by 2015 was set in a Decree by President Putin in May 2012 (Decree No. 599, 2012).

However, in absolute figures funding inflows into R&D have substantially increased, which was due to strong GDP growth of around 7% annually up to the year 2008. This trend was disrupted in 2009 as a result of the international economic crisis. However, in 2010 despite a decrease of GERD as a share of GDP from 1.24% in 2009 to 1.11% in 2010, in absolute figures GERD made another leap from €11b to €13b in 2010.

A target has also been set for R&D funding from national non-governmental sources, where especially the business and enterprise sector is meant to contribute. According to the strategy document, this indicator should increase from around 40% in 2004 to 60% of national R&D funding by 2010 and 70% by 2015. EUROSTAT figures show however, that this indicator is decreasing and reached 25.5% of GERD in 2010. It should also be noted that the state controls several R&D intensive businesses and that R&D funding by private companies is rather limited. Both the R&D intensity (GERD)



and the non-governmental R&D funding targets seem rather difficult to reach for Russia.

The international economic crisis has had strong effects on the Russian economy. After several years of remarkable economic growth, the GDP declined by nearly 8% in 2009. However, in the following years, there was economic growth and as a result, the GDP expanded by 4.3% in the years 2010 and 2011 (OECD, 2012). Still, the effects on R&D and innovation funding were remarkable. The budgets of some ambitious funding programmes were reduced by up to 30% in 2009 and by up to 70% in 2010. This affects for example the main funding programme of the Ministry of Education and Science, the Federal Targeted Programme R&D in Priority Fields of the S&T Complex of Russia 2007-13. To compensate for budgetary cuts in 2009/10, the programme was prolonged for another year until 2013, but the overall budget of the programme was reduced by around RUB20b (around €500m). Similar cuts and prolongations of the duration were applied to a few other Federal Targeted Funding Programmes for R&D. In spite of the cuts in some funding lines, support for innovation has come high on the policy agenda. An anti-crisis programme was adopted by the Russian government in 2010, which foresaw special funds of RUB10b (€250m) and consideration of several policy measures (e.g. tax breaks, grants) for stimulation of innovation activities, particularly in the enterprise sector.

The budgets of the research and innovation funds have also come under pressure. The growth trend of the RFFI budget was disrupted and its annual budget stagnated at around RUB6b (€150m). However, the budget of the innovation fund FASIE was increased in the crisis period, as it got the task of launching and managing a specific anti-crisis programme for the small companies sector. In 2011 hefty budgetary cuts were under discussion for the funds. However, the situation has changed in the course of a year. In early 2012 an additional budget of RUB2b was allocated to RFFI (to reach RUB8b overall), and in May 2012 President Putin issued a decree (Decree No. 599, 2012), which announced significant budget increases for the research funds for the coming years. For RFFI an additional budget of RUB2.5b is under discussion for the budget of the research and innovation funds should increase up to RUB25b (€625m) by 2018 from around RUB10b (€250m) in the last and current years.

In the Soviet past, R&D funds were allocated generally as block funds, based on planning decisions. Since Russia's independence in 1991 this funding mode has gradually been changing and competitive and project based R&D funding schemes have been established. In 2005 around 25% of the civil governmental R&D funding was allocated competitively. The share of competitive funding is constantly increasing, while the share of block grant funding against reporting requirements is decreasing. In the year 2010 competitive funding has tended towards 50% of civil governmental R&D funding and should be further increased up to 70%. These are ambitious goals, but it should also be noted that effective competition in some sectors is still rather limited.

Research funding is allocated either directly from the state budget to research performing organisations, channelled through the ministries mentioned above or distributed via several agencies. The portfolio of funding instruments has been further diversified over the past five years, with a special focus on support tools for innovation and for universities. Competitive R&D funding allocation is handled by several ministries, in particular the Ministry of Education and Science (MON). It manages the main Federal Targeted Programmes (FTP) for R&D support:



- FTP R&D in Priority Fields of the S&T Complex of Russia (2007-2013); budget RUB172.39b (€4.31b), whereby RUB111.33b (€2.78b) is funded out of the federal budget and the rest should come from non-budgetary sources³
- FTP <u>Scientific and Scientific-Pedagogical Personnel of Innovative Russia for the years</u> <u>2009-2013</u>, budget RUB90.45b (€2.26b), whereby RUB80.39b (€2.01b) are funded out of the federal budget and the rest should come from non-budgetary sources

MON is also responsible for recent new funding tools for the university sector. An amount of RUB90b (\pounds 2.25b) is planned to be invested over the period 2010-2012 in addition to the usual budget allocations for universities:

- Federal Universities programme
- National Research Universities programme
- Attracting leading scientists to Russian Universities
- Programme for stimulating business-university cooperation

Besides the ministry, three main funding organisations had already been set up in the early 1990s: the Russian Foundation for Basic Research (RFFI) and the Russian Foundation for Humanities (RGNF) distribute grants for basic research in the sciences, social sciences and humanities. For applied research and innovation related funding, the Foundation for Assistance to Small Innovative Enterprises (FASIE) takes care of support for small innovative enterprises and start-ups. The Russian Foundation for Technological Development (RFTR) provides zero-interest loans to companies for innovative projects.

More recently additional funding bodies for innovation activities have been introduced. The Russian Venture Company (RVK) was set up in 2006 and operates as a fund of funds for establishing a network of national and regional venture funds. The State Corporation for Nanotechnologies (Rusnano) was established in 2007 and supports commercialisation of nanotechnology. Finally the Skolkovo Foundation, which has been developing a high tech centre at the outskirts of Moscow since 2010, has also started grant giving activities.

Federal Targeted Programmes and innovation related funding are implemented in a collaborative funding mode, requiring to different extents co-funding from private sources. This approach still has some limitations in Russia, as co-funding cannot always be attracted to the extent that it has been planned in certain programmes.

Tax incentives, such as tax breaks on R&D grants, favourable depreciation periods, etc. have been introduced in Russia in the last years, but their role and effects are not yet well studied. It seems that especially companies do not yet well take up these incentives, for lack of trust in the applicability of regulations.⁴

In terms of allocation of resources to thematic priorities, Russia has singled out the fields of energy, nuclear technologies, space, medical, and information technologies in 2009 (see chapter 2.4 Knowledge Demand below). Compared to the grand societal challenges defined by the EU for its new Horizon 2020 research and innovation programme, in particular the fields of energy and health overlap with Russian priorities. These are relevant also in Russia's current R&D and innovation funding

³ With non-budgetary sources it is meant co-funding mainly from business, but also from regional or other sources, which are not directly related to the federal budget.

⁴ See regarding tax policy: Simachev, 2011.



model. Specific funding programmes were established for these priorities. For example:

- Federal Targeted Programme New Generation Nuclear Energy Technologies for the years 2010-2015 and with a perspective up to the year 2020, planned budget for the whole period (from public sources) RUB110.2b ($\in 2.8b$)

- Federal Targeted Programme Development of Pharmaceutical and Medical Industry of the Russian Federation for the period until 2020 and a longer term perspective, planned budget for the years 2011-2020 (from public sources) RUB122.6b (€3.1b).

2.3.2 Providing qualified human resources

Traditionally, science and education are highly valued in Russia. As a country that has achieved major successes in space, nuclear research, and other fields, it has a rich research tradition and prides itself of a range of Nobel laureates, especially in physics. At the point of its independence in 1991, Russia had inherited a huge R&D sector with a significant related labour force. As a result of the transformation processes to a market economy and due to serious cuts in funding, the R&D sector experienced an important downsizing. The R&D personnel shrank by more than 50% since 1991 to reach 736,540 in head count by 2010 (EUROSTAT 2012). The R&D personnel per 10,000 employed reached 126 in 2009, which was slightly lower than the value for Germany on this indicator, but higher than Spain or UK (Higher School of Economics, 2011). ⁵

Tertiary education levels of the population are quite high. OECD data (2011a) indicates that more than 50% of the population in the age range of 25-64 years has attained tertiary education. This is higher as compared to all OECD countries. Russia educates an over proportional share of students in the sciences, although this trend has experienced a certain alteration with more students in social sciences, particularly in economics.

Low salaries, limited career perspectives and outdated equipment distract young talents from embarking on a scientific career and lead them to the business sector for better paid job options. The situation regarding salaries has improved significantly over the past five years, where strong economic growth has allowed increasing financial inflows into the R&D sector.

In spite of a broad reservoir of educated personnel, it needs to be mentioned that qualifications do not always meet the requirements of the labour market and of research. In June 2011, the then President Medvedev held a discussion with scientists, who were selected in a competition to establish research labs at Russian universities in the programme: *attracting leading scientists*. The scientists mainly came from abroad, with a majority being emigrated Russian scientists. They complained that they can barely find enough sufficiently qualified personnel for their labs and that an improvement of the education system needs to be tackled. The Minister of Education and Science, Dmitry Livanov, announced shortly after taking over his duties in May 2012 that a monitoring of the public higher education institutions will be performed until the end of the year 2012. The efficiency of the HEIs shall be increased and a streamlining process is envisaged, which might lead to the merger or closure of 20% of the public HEIs.

⁵ More detailed data on Human Resources in Science and Technology (HRST) are not available for Russia.

On-the-job training, lifelong learning, creativity, communication skills and critical thinking are all elements that need to be significantly enhanced in Russia to ensure that the labour force can meet the requirements of an innovation oriented economy that will no longer rely as strongly as currently on primary goods production. A certain overprovision of tertiary educated human resources may be the case, while qualification on the job in companies would need more attention.

2.3.3 Evolution towards the national R&D&I targets

According to statistical data, the business enterprise expenditure on R&D (BERD) in Russia amounted to 0.65% of the GDP in 2010 and was herewith significantly lower than the EU-27 average, which was 1.23% in the same year. In the preceding years 2006-2009, BERD had been around 0.7% of GDP.

Data for BERD as a share of Gross Domestic Expenditure on R&D (GERD) indicate that business enterprises perform 60.5% of GERD, which is only a single percentage point below the EU-27 level (data for 2010, EUROSTAT, 2012).

But these data need to be considered with some caution. Notably public ownership in the business enterprise sector has to be taken into account. In Russia, a range of fully or partly state owned research institutes are organised as companies and are calculated therefore to the business enterprise sector. Furthermore, big state owned companies represent a major share of research intensive Russian companies. It is quite difficult to discern the R&D funding of private companies, although it seems quite limited. Overall "the extent of *state control* in the Russian economy remains extensive as a result of a high degree of state ownership and control over economic activity" (Conway et al, 2009). The influence of the state and the role of state owned companies have even further increased over the last few years, especially during the financial crisis of 2009-2010. Plans to privatise state companies, e.g. in the transport sector (Aeroflot, Sovkomflot), and in the financial and oil sectors, are in preparation by the Ministry of Finance (Kudrin, 2011). In the next 3-5 years, the state should reduce its role in the economy and Russia should become a more attractive place for private investment, which is indeed much needed.

Leveraging R&D investment from companies is a strategic target. The main tool here is the co-funding requirement in applied research funding programmes, especially the Federal Targeted Programmes managed by the ministries. This mechanism is not yet working properly and business investment cannot be raised to the extent that it was planned in strategic and programme documents.

A new strategy has now become to incite big state owned companies (Gazprom, Russian Railways, Rosatom, etc.) to develop innovation programmes and to outline herewith their support for innovation activities. With this top-down approach the government tries to generate more business enterprise investment into R&D.

The framework conditions for innovative start-up businesses and the business environment in general remains difficult. On the indicator: *ease of doing business*, Russia takes only the 120th place of 183 countries (data for 2011, World Bank, 2012). It is not very quick to establish a business in Russia; 30 days are required, which is longer than in most other countries of the Former Soviet Union. In particular overregulation and bureaucratic procedures, as well as high levels of corruption restrain business and innovation activities. Regulations on Intellectual Property Rights have been improved, but still hinder national and international businesses from investing in Russian R&D and innovation.



These problems may also lead to an underestimation of innovative capacities, as successful firms may not wish to declare their true innovation performance to avoid controls by the authorities. Support for innovative start-up companies is offered through the well-established and relatively renowned funding tools of the Foundation for Assistance to Small Innovative Enterprises (e.g. through its START programme). For more serious investment, venture funds have been established since 2006 through the Russian Venture Company (RVK). For business ventures and implementation of research results in nanotechnologies, the state-owned company Rusnano, has been available since 2007. It also acts as a kind of investment fund.

Public Procurement is very important, but a rather ambiguous tool in Russia. Innovation activities are mostly driven by government policy and public procurement of goods is highly relevant in major publicly dominated industry sectors, such as energy, aeronautics, defence and space. Public procurement is also the main implementation procedure for the most important competitive R&D and innovation funding tools, the Federal Targeted Programmes. These programmes launch their calls for projects according to the Russian public procurement law (FZ-94). But the rules of the law are not well adapted to the needs of R&D and innovation funding and are rather a type of straightjacket than a proper legal framework. The law has been modified more than 20 times over the last few years, and is therefore rather complicated and an example of overregulation. Some of the most pressing problems are:

- Among the selection criteria for projects, the price of a good or service has an overly important role. This leads to price dumping and to the selection of less qualified proposers over scientifically better qualified teams.
- Project Budgets are very rigid. Financial means foreseen for a certain year have to be spent in the same year and cannot be transferred to the next one.
- The purchase of scientific material and equipment has to be tendered. Normally the cheapest offer has to be selected. Therefore scientists end up buying inferior material than would be necessary for their research.

Discussions on the appropriateness of the law for R&D and innovation funding have been ongoing for years. Some improvements have been made, but a satisfying solution could not yet be achieved.

2.4 KNOWLEDGE DEMAND

Knowledge demand is driven above all by government or the government sector. Major R&D intensive sectors of the economy - aeronautics, space, defence, and nuclear energy - are dominated by state owned companies. The picture is a bit more diversified in the overall main economy sectors - oil, gas, and metallurgy - where relevant private players are active alongside state owned companies. An encouraging exception in knowledge demand is the ICT sector, where several private R&D intensive companies have become internationally renowned service providers (e.g. Yandex, Kaspersky Labs, etc.).

Thematic priorities for modernisation were defined in 2009. Prime Minister Medvedev (who at the time was still President) suggested focusing on five thematic areas for modernisation of Russia's economy:

- Energy efficiency and energy saving, including alternative fuels;
- Nuclear technologies;



- Space technologies, especially related to telecommunication (GLONASS);
- Medical technologies;
- Information technologies, including supercomputers

These priorities come into focus for governmental knowledge demand and are also relevant for the project to establish a top international innovation centre in Skolkovo, near Moscow, which was pushed by the Prime Minister. Another more recent initiative concerns a top-down stimulation of innovation activities within big state owned companies (e.g. Rosatom, Russian Railways, etc). Under the guidance of the Ministry of Economic Development, 47 state owned companies have developed specific innovation plans to stimulate knowledge demand.

Knowledge demand is also driven through public R&D and innovation funding programmes. The main funding programme, the FTP R&D in Priority Fields, solicits in a first step of a call specific topics from potential proposers. The topic of a call is then specified by the responsible FTP bodies. The development of this FTP indicates that knowledge demand from companies has some weaknesses: the funding line, where the highest co-funding share of more than 50% was required, had to be cancelled, because of lack of interest by business.

The Technology Platforms (TP), which were selected in spring 2011, also provide thematic input for calls in FTPs. These TPs are coordinated mostly by big R&D intensive state owned companies (e.g. Rosatom) or governmental R&D funding bodies (e.g. Rusnano) and cover the usual thematic fields: energy, nanotechnologies, space, etc. It is a question for the future about how far private businesses will collaborate on TPs, how far TPs will reach beyond the usual topical fields, and whether they will not be another support tool focusing on the big state-owned R&D players. They claim to be modelled to the European TPs – which are industry-led and bottom up – whereas it appears that the Russian TPs are more policy-driven and top-down.

2.5 KNOWLEDGE PRODUCTION

2.5.1 Quality and excellence of knowledge production

In terms of input into the R&D and innovation system, Russia invests substantial amounts into knowledge production. In 2010, GERD as share of GDP reached 1.11% which was equivalent to €13b. It can rely on a considerable number of R&D personnel (more than 730,000 in head count in 2010) and quite a high share of more than 50% of tertiary educated population. The situation with research infrastructure has improved considerably in the last few years. Significantly more funding has flown into R&D and innovation and this has allowed upgrading and bringing equipment up-to-date at leading institutes and research organisations, such as the National Research Centre (NRC) Kurchatov Institute.

Analysis of the R&D and innovation system usually finds out that input does not match with output and that the latter is limited and stagnating.⁶ This concerns publications, citations and patents for research. Russia produces roughly 27,000 articles per year in journals referenced in the Web of Science (2008). It has herewith

⁶ See for example OECD Reviews of Innovation Policy: Russian Federation 2011 (OECD, 2011b), or the strategy of the Ministry of Economic Development (2011): Innovative Russia 2020.



a share of 2.6% of world production. Despite some fluctuation, output of scientific articles has remained at this level since 1981, whereas other competitors (e.g. Brazil and China) have significantly increased their shares (Adams/King, 2010). Triadic patent families are similarly stagnating for Russia, as compared to China or other countries (Gokhberg/Agamirzyan, 2011).

Training of human resources is not up to the requirements of research and the knowledge intensive labour market. What is especially lamented, is the transfer of new knowledge into innovations and application in the business sphere.

Several institutes, which were previously subordinated to ministries or agencies (socalled branch institutes) and which are still linked somehow to governmental bodies, continue working with very limited output. Also, within the main public research organisation, the Russian Academy of Sciences, the picture is ambiguous. Research institutes or groups, which are well equipped, successful in competitive funding acquisition, and internationally well-connected exist together with decaying institutes, which survive on traditional block grant funding and produce little output.

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

The government authorities are to some extent aware of the limitations of the R&D and innovation system. Russian and international studies have been commissioned and strategic documents have been prepared, which reveal the weaknesses. For example the recent <u>"Innovative Russia 2020</u>" strategy, which was approved by the government at the end of 2011, points explicitly to the weaknesses in knowledge transfer to business.

The situation with statistical indicators has improved a lot for Russia and many major indicators for the R&D and innovation system can now be found within OECD or EUROSTAT databases. International benchmarking is herewith facilitated and the benchmarking tool is therefore already widely used.

The evaluation of research institutions and funding programmes, gives an ambiguous picture, reflecting the transformation processes the country is still undergoing. In 2009 a general regulation was issued by the government (Decree No 312), which obliges public research organisations to provide reporting on a defined set of indicators. However, a systematic evaluation is not yet well established; discussions are ongoing among scientists, about how to best evaluate and which indicators to use. Accountability of research organisations has been enhanced and several funding schemes now include obligatory evaluations. The Russian Academy of Sciences (RAN) is obliged to provide annual reporting and measurement of indicators against its large block grant from the federal budget. One of the striking findings in the OECD Review of Innovation Policy: Russian Federation 2011 (OECD, 2011b) is that no systematic evaluation of the Academy of Sciences had already been undertaken. However, the new Minister of Education and Science, Dmitry Livanov announced quickly after his appointment in May 2012 that an evaluation of RAN will be undertaken. Moreover, a monitoring of the public higher education sector has also been brought on the way after his appointment, and should be accomplished by the end of 2012.

Approximately 50% of civil R&D funding in Russia is provided through competitive funding programmes. Project proposals to the research funds (RFFI, etc) and funding programmes are usually evaluated. Recently introduced funding programmes,

especially for the HEI sector are accompanied by a monitoring. For example in the *National Research Universities* the funded universities have to provide figures on indicators such as number of articles produced per year, number of foreign students, etc. (Ministry of Education and Science, 2009). Some evaluation procedures, for example in Federal Targeted Programmes, have some flaws and competition is sometimes limited.

International experts have so far been involved in project evaluations for the *Leading Scientists* programme of the Ministry of Education and Science, which was launched in 2010. Furthermore, international evaluation has been used for few funding lines of the research funds RFFI and FASIE, and in the framework of international research cooperation programmes (e.g. participation in ERA-NETs, bilateral funding programmes). It is however the policy of the ministry to increase international evaluations. The numerous Russian researchers working abroad should especially be more intensively consulted for evaluations.

2.6 KNOWLEDGE CIRCULATION

2.6.1 Knowledge circulation between the universities, PROs and business sectors

Knowledge circulation between the universities, PROs and business sectors is weak. The sectors operate in a rather separated mode, while interaction and circulation between them is limited. However, several initiatives have been taken to stimulate knowledge circulation.

As a result of a competition in 2005, four Special Economic Zones (SEZ) for Technology Development were established in St. Petersburg, Tomsk, Zelenograd and Dubna (the latter two situated in the surroundings of Moscow). All four zones have been created around important public scientific centres, to which private companies would be attracted with the incentive of tax breaks. The presidential innovation flagship project *Skolkovo Innovation Centre* (near Moscow), shall provide an environment for interaction among higher education, research organisations and business, which comes with tax breaks and modern infrastructure.

In 2010, the Ministry of Education and Science launched a new funding programme for stimulating business-university cooperation. The budget of the programme was RUB19b (€475m). Two calls were implemented in 2010 and overall 112 projects received financial support. A single project could receive public support of maximum RUB100m per year (€2.5m), and the project could last up to three years. The business partner in the project needed to provide co-funding of the project with at least the same amount as the public support.

While there is even a proliferation of different measures for stimulating knowledge circulation, and in general for innovation activities, proper evaluations of the effects of the measures have yet not been undertaken. Gokhberg/Agamirzyan (2011) mentions that SEZs and technoparks have not yet met the expectations. For some of the more recent measures (Skolkovo, HEI-business programme) it is too early to provide judgements.



2.7 OVERALL ASSESSMENT

In terms of resource mobilisation the situation in Russia has significantly improved over the last few years up to the current year 2012 and more funds have become available for R&D and innovation. GERD has in absolute figures constantly increased in national currency and reached RUB523.4b (€13b) in 2010. This has allowed introducing specific measures to strengthen knowledge demand and knowledge circulation, e.g. through Technology Platforms, through stimulation of cooperation between HEI and business, etc. The situation is marked by a strong focus on government driven measures, while business enterprise R&D and innovation funding is even decreasing. The opportunities offered by the new stimulation measures will have to mature and its efficiency needs to be verified at a later stage. First effects are already visible; for example, the share of research performed in the HEI sector is increasing steadily and reached 8.4% of GERD in 2010 (up from 6.3% in 2007). A stronger focus on the efficiency of research institutions and a certain streamlining of this sector, as well as measures regarding ageing of the R&D personnel will have to be considered.



3 NATIONAL POLICIES FOR R&D&I

3.1 LABOUR MARKET FOR RESEARCHERS

3.1.1 Stocks of researchers

There were 368,915 researchers counted in 2010 in Russia, which is less than half of the researcher stock in 1991 (EUROSTAT, 2012). This heavy decline illustrates the strong downsizing of R&D capacities and the migration trends of researchers, both internally in Russia to other sectors of the economy (e.g. to business) and externally as brain drain abroad. It is estimated that around 30,000-35,000 researchers emigrated abroad during this period.⁷

Postdoctoral researchers in Russia include Candidates of Science (equivalent to PhD) and at a higher level Doctors of Science (equivalent for example to habilitation in Germany); in 2010 the number of Candidates among researchers was 78,325 and the number of Doctors was 26,789. While the overall number of researchers has been declining steadily, the number of Candidates and Doctors of Science has been increasing over the last few years. Concerning postgraduate studies, in 2010 there were 157,437 students (Aspiranty) enrolled in the postgraduate study programme, the Aspirantura, to become a Candidate of Science. In this same year 33,763 students graduated (CSRS, 2012). The trends at the postgraduate level are encouraging. The number of postgraduate students is increasing steadily, as well as the number of new entrants. In 2010, the number of new entrants was nearly 10,000 higher than in 2005 and reached 54,558. This shows that research is becoming more attractive for the young generation. Still, the age structure remains a specific problem of the R&D personnel and researcher stocks. Because of the strong migration trends, the age bracket 30-49 is thinned out, whereas the age bracket 50-70 and over constitutes more than 50% of researchers (CSRS, 2012).

3.1.2 Providing attractive employment and working conditions

For many years it has not been very tempting to embark on or follow-up a research career in Russia. The important and valued scientific tradition (with several Russian Nobel laureates), which makes research attractive, has to be seen against the difficulties of today's R&D and innovation system. A research career necessitated either true commitment to research, or it was triggered by a lack of alternatives. Otherwise many talented students and researchers have moved on to better paid jobs in business or abroad.

However, the situation has been improving over the last few years. Salaries of researchers have been increasing significantly. Nevertheless, basic salaries of researchers still remain low, especially when considering regional disparities in price levels. In Moscow and St. Petersburg, where most of the R&D capacities are situated, price levels are usually higher than in the rest of the country. The average monthly salary of the R&D personnel amounted to RUB 19,263.3 or around €480 in 2008 (HSE, 2010b).

Researchers are employed by their organisation, e.g. the Academy of Sciences or universities, and are paid according to the internal salary regulations. Additional non-

⁷ See "Round table: Emigration abroad and brain circulation in the scientific-technological sphere of Russia" (in Russian), published at <u>www.strf.ru</u>, last accessed 2 September 2011.



financial benefits, such as cheap housing, offer incentives for researchers to enter or stay in science. But it is with competitive grants from the research foundations (RFFI, RGNF, FASIE), funding from competitive FTPs and other ministerial programmes, and with international projects that the leading researchers can improve their salaries. Another alternative is to follow-up a second job or additional paid activities besides the regular research employment.

As a consequence of the economic crisis in 2009/2010, not only were funding programmes cut, but also were the budgets of research organisations. This has led to an additional pressure on salaries; cumulated with the already limited level of payment, it has increased dissatisfaction. Here, an indicator is the demonstrations organised in autumn 2010 by the union of academy collaborators and ongoing discussions on the salary levels within the academy.

Other working conditions are also not very conducive to embarking on a scientific career. Equipment in many institutions is outdated, although increased research funding over the last years has helped improve the situation and the leading research groups now have up-to-date equipment at their disposal. There are however no modern big infrastructures available and researchers have to move abroad in this case.

Other discouraging factors include: ageing of the mentoring and supervisory staff for young researchers and limited career perspectives (e.g. because of the favouring of male colleagues over female for the top positions).

As in many countries, career breaks are not advantageous for professional advancement. Women therefore usually take short maternity leave. They also do this because of the need to earn a salary. Birth rates are in general rather low in Russia. Parental leave is regulated in chapter 41 of the Russian labour code (197-FZ). The duration of the leave is specified in the code and the right to return to the same position after the leave is guaranteed. The father of a child is also entitled to take parental leave.

More of a problem is the de-facto domination of male colleagues in leading positions. For example there is not a single woman among the 56 members of the Presidium of the Russian Academy of Sciences, its top governing body.⁸

3.1.3 Open recruitment and portability of grants

In general, there are not many foreign staff working in Russian research institutions. The approach to employment of foreign specialists has up to 2010 been restrictive and regulated through quotas. Migration regulation is confusing. At a hearing of the Federation Council, it was stated that 846 legal acts regulate migration, whereby many are contradictory.⁹ The attractiveness of moving to a Russian research institution is limited by the framework conditions for research: harsh living conditions, quality and availability of housing, language barriers, low payment, outdated infrastructure, etc.

However, attitudes in Russia are changing and in the last several years the country has become more open to international cooperation. This also extends now to

⁸ See <u>http://www.ras.ru/presidium/headquarters/presidiummembers.aspx</u>, last accessed on 28/08/2012.

⁹ See the article "A migration codex shall be established for the R[ussian] F[ederation] " on <u>http://www.strf.ru/material.aspx?CatalogId=221&d_no=35218</u> (in Russian), last accessed on 20.08.2012.



recruitment. Some research institutions, especially universities (e.g. Higher School of Economics) are trying to attract foreign staff on their own initiatives. The Ministry of Education and Science stimulates scientists from abroad, including from the Russian scientific diaspora, to establish labs in Russia through the attracting leading scientists to Russian universities support programme, which was introduced in 2010. At the moment the programme follows an elite approach, and does not yet aim at a broader internationalisation of research institutions. In the call in 2010, in the frame of this programme, 40 scientists were selected to establish research labs at universities. Only five of the selected scientists were permanent Russian residents (MON, 2011a). Another call in this programme was launched in 2011 and 39 scientists were selected. Interestingly, it is planned that in the future (probably still in 2012) the programme will be opened to non-university research institutions. Recruitment of foreign specialists is also essential for the success of Russia's innovation flagship project, the Skolkovo innovation centre.

The more open attitude has also brought about some changes in regulations. Registration rules for foreign specialists have been relaxed. Highly qualified foreign specialists are defined by income. Since 2010, if they earn at least RUB2m (€50,000) per year, they only need a confirmation of their status from their employer to get a work permit for three years.¹⁰

The recognition of qualifications is improving due to Russia's adhesion to the Bologna process and adoption of European rules. The recognition of foreign diplomas will be further simplified for attracting highly qualified specialists and for enhancing academic mobility. A modification of the law on recognition of diplomas is under preparation, which would lead to recognition of diplomas issued by "leading institutions" without specific recognition procedures in Russia. A list of such leading higher education institutions will be provided by the Ministry of Education and Science.

Research positions are to a certain extent published at the websites of research institutions, but usually only in Russian.

The portability of grants depends on the funding agencies, which provide the R&D or innovation support. The R&D funds RFFI and RGNF as well as few ministerial programmes provide grants, which are usually linked to the individual researcher and which are therefore portable. The innovation fund FASIE and the major funding tools Federal Targeted Programmes (of ministries) provide financial support through state contracts. These are linked to the research institution and are therefore not portable. Most competitive R&D and innovation funding is allocated through FTPs and related state contracts.

3.1.4 Enhancing the training, skills and experience of researchers

The postgraduate training is with the so-called Aspirantura quite formalised. Since Russia joined the Bologna process, the system is in the process of a transformation to European standards. A credit system has already been introduced as a consequence. There are some examples of joint international postgraduate schools, e.g. the Postgraduate Training Network in Biotechnology of Neurosciences (BioN), a project supported by the EU's TEMPUS programme.¹¹ Through several international joint

¹⁰ See

http://www.economy.gov.ru/minec/activity/sections/investmentpolicy/doc20100810 01

¹¹ See http://neurobiotech.ru/



master programmes and through intensive exchanges in the ERASMUS Mundus programme, many students move to EU countries and use English in their studies. The same holds true for researchers, where many move abroad for research stays and some stay on for longer periods of employment. For exchanges with the USA, various tools such as the Fulbright Program in Russia or the programmes of the Civilian Research and Development Fund (CRDF) Global are available.

Curricula modernisation at universities is supported by the various programmes introduced by the Ministry of Education and Science for enhancing the university sector: innovative universities programme, national research universities, etc.

3.2 RESEARCH INFRASTRUCTURES

Russia has a wide a range of major research infrastructures, in particular in physics. As a leading scientific power in nuclear energy, military technologies and in aeronautics and space research, respective research infrastructures have been built. A significant number of scientific infrastructures are situated under the roof of the Academy of Sciences. Some universities, for example Moscow State University, and organisations subordinated to federal agencies (e.g. Roscosmos) and state corporations (e.g. Rosatom), possess similarly unique facilities.

Some of the main installations are situated at the Kurchatov Institute in Moscow (synchrotron centre, beam technology), at the Joint Institute for Nuclear Research in Dubna (Moscow region – neutron reactor, beam technology), at the St. Petersburg Institute of Nuclear Physics in Gatchina (Leningrad region – high flux beam reactor), at institutions for space research, such as in Korolev (Moscow region) and Baikonur (in Kazakhstan).

New space related infrastructure is under construction with a cosmodrome in Vostochny and Russia's earth observation system GLONASS. An important programme for upgrading infrastructures in Russia was the *Federal Targeted Programme Development of the nanoindustry infrastructure in Russia for 2008-2011*.

Besides this programme, substantial funding for major scientific infrastructure projects is currently under discussion. In 2011, under the heading *Megascience*, six projects, mainly in the field of physics, were preliminarily shortlisted for support over the coming years.¹²

- The tokamak IGNITOR project at Gatchina in St. Petersburg, will be implemented with international partners, especially from Italy, in a 50-50% cost-sharing arrangement;
- The NICA collider project at the Joint Institute for Nuclear Research in Dubna, for which an international 50-50% co-funding arrangement is also in preparation;
- The neutron research reactor PIK in St. Petersburg;
- The synchrotron facility ISSI-4 at the Kurchatov Institute in Moscow;
- An ultra-high intensity laser complex in Nizhny Novgorod;
- The collider "Super Si-tau fabrika" (Super C-tau factory) at the Institute of Nuclear Physics in Novosibirsk.

¹² See <u>http://mon.gov.ru/press/reliz/8629/</u>



The project costs range from RUB5b to RUB40.3b and overall an amount of RUB133b (\in 3.3b) would have to be invested over a period of up to 10 years. Some of the projects have already been in preparation for a while, e.g. construction of the PIK reactor in St. Petersburg had already started some 20 years ago, but works had to be stopped because of the serious cuts in research funding after Russia's independence in 1991. With a significantly improved funding situation for research, this project has been taken up again and construction of the infrastructure will be finished.

There are some ongoing discussions, whether or not all the projects are still up-todate and if they are all necessary for Russia given its strong investment in international physics related research facilities abroad (especially in Germany). There is a certain danger of duplication of efforts at international and Russian level, whereas a concentration of resources on fewer projects and a greater diversification might yield more significant results.

3.3 STRENGTHENING RESEARCH INSTITUTIONS

3.3.1 Quality of National Higher Education System

In Russia Higher Education Institutions (HEI) are differentiated into three types:

- Institutes,
- Academies
- Universities.

Institutes and academies are usually thematically focussed on a certain speciality (e.g. Mining Academy), while universities normally have a broader approach (classical universities, technical universities or economic universities). In June 2012 there were 2,704 HEIs searchable at the Russian Federal Education portal (including branches of universities), the majority of which were state institutions (1,778 HEI).¹³

There are two Russian universities in the top 500 of the Academic Ranking of World Universities (2012): Moscow State University at 80th place and St. Petersburg State University, which is ranked in the span of 401-500th place. In this ranking both institutions have a lower ranking as compared to the previous reference year. There are different national rankings of universities established (e.g. by media), which are accessible at the federal education web-portal. These help potential students when choosing an appropriate higher education institution.

Russian universities have traditionally mostly cared for education, while research was concentrated in institutes of the Academies of Sciences and branch institutes of ministries. The share of GERD performed by the Higher Education sector (HERD) is therefore rather low as compared to EU countries, but it has been steadily increasing over the past years. HERD as share of GERD climbed from 6.1% in 2006 to 8.4% in 2010. In comparison, the average for the EU-27 reached 24.2% in 2010. Against this general picture, it needs to be mentioned that some of the main universities (Moscow State University, etc.) have always been performing research. Staff have been involved both in university teaching and research at institutes.

The Ministry of Education and Science tries to differentiate the university sector and single out an elite group of universities. To this group belong:

¹³ See <u>http://www.edu.ru/</u>



- universities subordinated to the government: *Moscow State University* and *St. Petersburg State University*;
- a group of eight *Federal Universities*;¹⁴
- a network of 29 National Research Universities.¹⁵

Federal Universities are established on the basis of already existing universities. National Research University is a status, which an existing university receives as a result of a competition. With improved and targeted funding, the research component at universities will be strengthened and the innovative capacities enhanced. It is intended that linkages with business will be fostered, curricula will be improved and human resources will be better qualified.¹⁶ It is without doubt an important and necessary policy initiative to focus more funds on a group of strong universities and to enhance their capacities. The broad field of public and private organisations offering higher education will undergo a significant transformation and streamlining process, whereby weaker HEIs will have to shut down. This will be triggered by the ageing trends in Russia, which lead to fewer students entering HEIs. Estimates of the Ministry of Education and Science project a reduction of more than 40% in student figures from 7.4m in 2009 to 4.2m in 2013 (MON, 2011b). Meanwhile a monitoring of the public higher education institutions was announced by the ministry in August 2012.¹⁷ It will be implemented until the end of 2012 and may lead to the merger or closure of around 20% of public higher education institutions and their branches. The most prestigious and best universities are public; the broad and diversified field of private HEIs includes few well renowned institutions, such as the New Economic School in Moscow.

¹⁴ The Federal Universities are: Southern federal university in Rostov-on-Don, Siberian federal university in Krasnoyarsk, Northern federal university in Arkhangelsk, Privolzhsky federal university in Kazan, Ural federal university in Yekaterinburg, Far Eastern federal university in Vladivostok, North-Eastern federal university in Yakutsk, Baltic federal university in Kaliningrad.

¹⁵ The National Research Universities are National research nuclear university (established on the basis of Moscow Engineering-Physics Institute), National research technological university (established on the basis of the State technological university "Moscow institute of steel and alloys", State university - Higher school of economics in Moscow, Kazan state technical university of A.N.Tupoley, Moscow aviation institution (state technical university), Moscow state technical university of N.E.Bauman, Moscow institute of physics and technology (state university), Nizhni Novgorod state university of N.I.Lobachevsky, Novosibirsk state university, Perm state technical university, Samara state aerospace university of academic S.P.Korolev, Saint-Petersburg state mining institute of G.V.Plekhanov (technical university), Saint-Petersburg state university of information technologies, mechanics and optics, Tomsk polytechnic university, Belgorod state university, Irkutsk state technical university, Kazan state technological university, Mordovian state university of N.P.Ogarev, Moscow state institute of electronic technology, Moscow state university of civil engineering (MGSU), Moscow power engineering institute (technical university), Perm state university, Russian state medical university of the federal agency of public health and social development in Moscow, Russian state university of oil and gas of I.M.Gubkin in Moscow, Saint-Petersburg state polytechnic university, Saratov state university of N.G.Chernyshevsky, Tomsk state university, Institution of the Russian Academy of sciences - Saint-Petersburg academic university - Scientific-educational centre of nanotechnologies of the RAS, South Ural state university in Chelyabinsk.

¹⁶ See for research related reforms of the university sector Dezhina, 2011.

¹⁷ See: <u>http://минобрнауки.pф/документы/2521</u>



Access to universities is possible through the Unified State Exam (EGE in Russian) at the end of secondary education. Universities may require additional entry exams. Tertiary education levels of the population are quite high for Russia. More than 50% of the population in the age range of 25-64 years attains tertiary education, which is higher as compared to all OECD countries (OECD, 2011a). It has to be considered here that half of the tertiary educated population attains only the shorter and usually more practical oriented tertiary type 5B education level (according to ISCED) and the other half attains the higher levels (ISCED 5A and 6). Although Russia does not lead in the latter case of the more advanced levels, the indicator is still rather high and it is part of a high ranking group of countries.

In 2003, Russia took the important and far reaching decision to participate in the Bologna process and to adapt its educational system to European rules. This is an important basis for researcher mobility. It will certainly facilitate further exchanges and cooperation in S&T and confirms the priority which Russia has laid on cooperation with Europe. In October 2007 a law (Federal Law 232-FZ) entered into force introducing the two cycle system with bachelor and master degrees, but not yet concerning the PhD level. Universities should introduce the two cycle system over a transition period, which is currently (in 2012) ongoing and most students still study according to the traditional five year scheme. Until now, Russia has made the most progress in adapting to the Bologna principles in adopting comparable higher education degrees, introducing a credit system and in the provisions of learning quality.

In 2008, the number of foreign students at Russian universities was 1.3%, which is lower than in most EU countries (HSE, 2010a). The highest share of foreign students originates from countries of the Former Soviet Union.

3.3.2 Academic autonomy

The Russian Higher Education system comes from a rather rigid origin in the former communist system, where central control and guidance through the ministries were the rule. This has been liberalised and a certain degree of autonomy introduced in the system with the law on education of 1992. This allowed the formation of private universities, which have now proliferated. Presently the number of public and private universities taking into account demographics with a steady decline of the younger population and potential students is rather high. Moreover, the educational standards are not up to the necessary quality level at certain institutions. The law on education has been completely revised and has undergone an open consultation. It was approved by the government in July 2012 and still needs to go through the second chamber of parliament. The law shall simplify and make the regulation of education more coherent, because in addition to the basic law on education many other legal acts have been issued by different authorities. Moreover, the law would be adapted to the new realities of the institutional structure (Federal Universities, etc.). The academic autonomy shall be specified now in a dedicated article.

HEIs are in Russia accredited by the Federal Service for Supervision of Education and Science (Rosobrnadzor), which also takes care of quality control of educational activities and of the curricula. Private universities are relatively autonomous, given that they are accredited by Rosobrnadzor and given that they can generate income through tuition fees for running their institution. The autonomy of public universities depends on their capacity to generate income besides the federal budget. Additional means through tuition fees, acquisition of research projects or additional funding



from ministerial programmes (e.g. National Research University programme) give room to define new research fields and for hiring research personnel.

At the individual level, university personnel usually have huge teaching loads and often second or third jobs to prop up their salaries. This limits their capacities to perform research, and in this sense their academic autonomy is restricted by availability of time for research.

The governance structure of HEIs differs slightly from institution to institution. HEIs are headed by the rector and the vice rectors. The rectors of the Federal Universities are appointed by the government, and the rectors of the two universities directly linked to the government – Moscow and St. Petersburg State Universities – are appointed by the Russian President. Other rectors in public universities are elected by the representative body of the university personnel, the conference of the university personnel. A scientific council takes care of scientific and educational directions of a university. Several universities have established advisory councils or boards of trustees, where the participation of business representatives is still the exception (e.g. St. Petersburg State University).

3.3.3 Academic funding

Spending on tertiary education from public and private sources reached 1.4% of GDP in 2008 (UNESCO-UIS, 2012). Public block funding for universities is allocated only to public universities and makes up the main share of their funding. It is based on the number of students they educate and on some other indicators, e.g. the regional situation. Scientific performance criteria are of only limited relevance for block funding, but they are gaining in importance. Tuition fees are another important source of university income. Public HEIs have to educate a certain quota of students without payment of tuition fees, and their costs are covered through funding from the federal and regional budgets. In addition to this minimum quota, they are free to accept additional students on the basis of tuition fees. Since 2005 there are more students on tuition basis than on free publicly funded basis. The relation of public block funding (from federal, regional and municipal sources) versus income generated through tuition fees and from competitive sources differs largely between HEIs.

The budget of the major public universities, Moscow State University and St. Petersburg State University, is directly included as a specific funding line in the federal budget. Private universities are funded by donors, tuition fees and generate income from competitive funding.

Funding for university research comes usually from competitive funding sources. These include projects supported under Federal Targeted Programmes and by the Russian competitive research and innovation funds (RFFI, RGNF, FASIE). Other competitive sources are grants for *leading scientific schools* and contract research. In the last years several specific programmes for strengthening university research have been introduced (e.g. National Research Universities), through which additional funds for research were made available. Own university funds, generated for example through tuition fees, may also be used for supporting research. Universities are relatively free to set their research priorities, but depend on thematic priority setting of competitive funding programmes.



3.4 KNOWLEDGE TRANSFER

3.4.1 Intellectual Property (IP) Policies

Intellectual Property Policies are a long standing problem of the Russian innovation environment. IPR rules have long been contradictory and restrictive about ownership of IPR and its possible usage. According to the legislation, the Intellectual Property generated within public research organisations or publicly funded research projects mostly remain in the hands of the governmental bodies. This limits the private initiative to implement research results. A modification in the sense of providing the IPR to researchers or private bodies would help the implementation and stimulation of innovative activities.

In 2009, a law (217-FZ) regulating spin-offs and Intellectual Property Rights (IPR) came into force. It was pushed by the then President Medvedev and allows universities and research institutions to establish companies together with other partners (e.g. businesses) for the commercialisation of generated innovations. Universities have an exclusive right on intellectual property generated at their institution, but they can transfer IPR through a licensing agreement and against a shareholding to a spin-off company.

Knowledge Transfer Offices have been established in the course of the economic transformation process at the major research and higher education institutions. Some of them (around 70) coordinate their activities under the roof of the Russian Technology Transfer Network (RTTN).¹⁸

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

Russian framework conditions are not yet very conducive for public-private knowledge transfer and innovation activities in general. The Russian Ministry of Economic Development admitted in a draft of its Innovation Strategy 2020 (2011) that the quality of tax and customs regulation and its application have a "repressive" character regarding innovative business. Given this difficult starting point, some encouraging policy measures have been taken over the previous years.

Spin-offs

Spin-offs from research institutions have been stimulated specifically since 2009, when the above mentioned law 217-FZ on spin-offs was introduced (see chapter 3.4.1 on Intellectual Property Policies). Preliminary data indicate that 700 spin-offs were created from universities in 2010, but only 13 from the biggest Russian research institution, the Academy of Sciences (Shepelev, 2011). The rather solid figure for the university sector seems to be triggered firstly by a backlog of spin-offs, which made use of the new opportunities, and secondly by a certain need to provide figures, as spin-off creation is a priority of the Russian top leadership and an indicator for university performance. Given that there was a certain reservoir of spin-offs, then the comparably low figure for the academy may be explained by more bureaucratic procedures which have to be circumvented in this case. The law is still a short lived measure, and the data will have to be observed over a longer period of time, especially for survival rates and development paths of spin-offs.

Before this law came into force, potential spin-offs had the possibility to turn to FASIE for start-up funding; this is an option which is still available for the now

¹⁸ See: <u>http://www.rttn.ru/?&lang=eng</u>



"official" spin-offs and which can underpin their activities. Furthermore, a broad infrastructure of around 80 technoparks has been established in Russia, however, their efficiency is doubted by analysts (Gokhberg/Agamirzyan, 2011). The public support programme for technoparks will be continued up to 2014, but a co-funding from regional or municipal budgets will be required.

Inter-sectoral mobility

Researcher mobility between the education, research and business sector is rather low. The government tries to encourage interactions between the sectors through new support tools, such as Technology Platforms and the funding tool for HEI-business projects (see for more details on these tools in chapters above). Technology Platforms have received funding for starting up their activities. To complement them, the Russian Foundation for Technology Development (RFTR) was reactivated in 2011 and provides zero interest loans to projects on a competitive basis, which emerge from the TPs.¹⁹

The new Skolkovo High Tech Centre mixes different elements of the knowledge triangle and also serves as an example for intersectoral mobility. It combines a higher education institution, research institutes with national and international staff, R&D labs of national and international companies, and stimulation tools for applied research and innovation activities (e.g. consulting on technology transfer, grant giving).

The measures are quite new and have just started the implementation of funded projects; therefore no information on its effects is available.

Promoting research institutions - SME interactions

Since 1994, interactions between research institutions and small innovative companies have been stimulated by the Foundation for Assistance to Small Innovative Enterprises (FASIE). Several funding tools have been developed by FASIE for specific aims: its UMNIK programme is designed for young scientists, or its main programme, START, provides support for market oriented R&D and establishing of start-up companies. The FTPs are other major tools, where in several funding lines cooperation between research organisations and business is required.

Involvement of private sector in the governance bodies of HEIs and PROs

Few universities have already established advisory councils or boards of trustees, where business representatives participate. Examples are St. Petersburg State University or St. Petersburg State Mining University. The board of trustees of the latter one, which is a key educational institution for the oil and gas and the metallurgy sectors, is composed only of business representatives (Gazprom, Alrosa, Surgutneftegas, Total, etc.). For PROs involvement of private sector representatives is usually not the case. But this depends on the PRO and its structure. The Federal Space Agency, which by its nature is a PRO, includes in its structure a broad range of companies, which are interlinked with research units and the central unit.

¹⁹ Until summer 2012, RFTR has supported 10 projects related to the TPs. See <u>http://www.rftr.ru/</u> and <u>http://rftr.ru/src/Projects.pdf</u>



Regional Development policy

Four different types of special economic zones (SEZs) have been established since 2005 under the guidance of the Ministry of Economic Development:²⁰

- **Technology Innovative SEZ**
- **Industrial Production SEZ**
- Port SEZ
- **Tourism and Recreational SEZ**

In this context, the most interesting SEZ is the one for technology development (see also chapter 2.6.1 Knowledge circulation between the universities, PROs and business sectors). The zones offer preferential tax and social security regimes for their residents (companies that establish themselves there). Its effects are doubted by observers. In addition, the Skolkovo High Tech Centre is defined as a special zone with tax and other preferences for its residents.

The most recent initiative of the Ministry of Economic Development (mineconomomrazvityia) concerns Innovative Territorial Clusters. These clusters promote cooperation among companies, research and higher education institutions. They also encourage the development of SMEs. A competition was held in spring 2012 and 25 pilot clusters were selected. Out of this group 13 clusters will receive financial support of up to RUB5b (€125m) starting from 2013 and for a period of five years.21

3.5 ASSESSMENT

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Russia has a relatively well educated labour force at hand, with more than 50% tertiary educated in the age bracket of 25-64 years. However the quality of education is not always guaranteed, and the curricula and infrastructure are in several cases outdated. Specific stimulation measures (e.g. National Research Universities, etc.) for improving the higher education sector and for enhancing its research capacities have been taken by the Ministry of Education and Science. The new Minister Dmitry Livanov appointed in May 2012, who was previously rector of one of Moscow's main technical universities, has stated on several occasions that education and research need to be more strongly interlinked in the frame of universities. A continuation and enhancement of the current policy towards the higher education sector is therefore to be expected.

In knowledge transfer, Russia has used the opportunity of economic growth to provide funds for and to introduce new innovation stimulation tools. Meanwhile a broad portfolio of measures is available (e.g. RVK, Rusnano, Technology Platforms, Skolkovo Foundation, Innovative Territorial Clusters, etc.), which have been designed to cover the whole innovation chain from applied research, start-up funding, close to market and product introduction support. It will be important to see, how far new innovative products and new innovative private players will be generated with this multitude of tools.

See http://www.economy.gov.ru/wps/wcm/connect/economylib4/en/home/activity/sections/ specialeconomicareas/main/index

²¹ See <u>http://www.economy.gov.ru/minec/activity/sections/</u>innovations/politic/



4 INTERNATIONAL R&D&I COOPERATION

4.1 MAIN FEATURES OF INTERNATIONAL COOPERATION POLICY

International S&T cooperation policy is shaped in first place by the Ministry of Education and Science, but other players such as the Ministry of Foreign Affairs are also relevant.

Russia has put an important focus on RTDI cooperation with the EU. This policy focus is triggered by the long standing cooperation among researchers and the importance of the EU as an economic partner. Russia participates traditionally in the EU's Framework Programme for RTD and other EU multilateral S&T cooperation tools (e.g. INTAS, ERA-NETs). Other important partners are the USA and countries in the Asia-Pacific region, such as China, Japan, and South Korea.

An important aim of cooperation with the EU and these other countries is certainly to increase excellence of the own research and to integrate in international networks. It should also be taken into consideration that many emigrated Russian researchers are working in these main cooperation partner countries. Cooperation programmes are also used to promote cooperation with this scientific diaspora.

Another priority group of countries are the independent states of the Former Soviet Union (in the Russian diction the "near neighbourhood"). International S&T cooperation is an important tool for keeping the scientific contacts up among the researchers and as a policy for cooperation with these countries.

Russia cooperates on several global challenges with international partners. For example it cooperates in energy on nuclear fusion in the framework of the international ITER project. In the space field it cooperates with ESA, NASA and other international partners on joint space missions.

4.2 NATIONAL PARTICIPATION IN INTERGOVERNMENTAL ORGANISATIONS AND SCHEMES

A multilateral S&T cooperation forum is the International Science and Technology Center (ISTC), situated in Moscow. It was founded in 1992 as an international organisation by Russia and its main research partners: the EU, Japan, and the USA. Through the ISTC substantial support to the Russian R&D sector has been provided with the aim of conversion of military to civilian research. The relevance of the ISTC has been declining over recent years. Until 2007 slightly more than € 20 million were invested annually through the ISTC in the Russian S&T sector by the EU. But EU contributions to the ISTC were slashed to reach around € 5 million in the year 2009 (Spiesberger, 2008). Since then, it has been further reduced. In summer 2010, then Russian President Medvedev signed a decree on the withdrawal of Russia from the ISTC.²² Consequently, the ISTC activities will be winded down in Russia by 2015 and in the future the main ISTC office will be located in Kazakhstan.

Until 2010 R&D cooperation between EU countries, countries associated to the FP6 and Russia was supported through the European INTAS programme (International Association for the cooperation with scientists of the Former Soviet Union). INTAS supported small scale multilateral research projects, grants for young scientists,

²² Decree No. 534-rp of the President of the RF, 2010.



summer schools, and innovation and conference grants. INTAS was discontinued in 2010.

Russia has a certain tradition of cooperating with international partners on research infrastructures. Contacts between Russian scientists and CERN date back to 1964. The first formal agreement was concluded in 1967. Currently Russia has a special observer status in CERN and is considering upgrading it to an associated member status. It participates in its major R&D programmes, for example in the Large Hadron Collider. Russia is also a member of the international ITER consortium for building a fusion reactor.

International cooperation on research infrastructures is particularly strong with Germany. Russia has pledged an important contribution of around €300m for the European XFEL project, an X-ray Free-Electron Laser facility which is under construction in Hamburg. The XFEL convention was signed in November 2009; Russia has with approximately 23% the second biggest share in the project after Germany.²³ Russia is also involved in other major research infrastructures based in Germany, such as the international FAIR (Facility for Antiproton and Ion Research) at GSI in Darmstadt, and the synchrotron source BESSY in Berlin.

Russia hosts an international research infrastructure with the Joint Institute for Nuclear Research (JINR) in Dubna near Moscow. In this framework it cooperates mainly with countries of the Former Soviet Union and from Central and Eastern Europe.

4.3 COOPERATION WITH THE EU

4.3.1 Participation in EU Framework Programmes

In the analysis of cooperation in the EU Framework Programme for Research and Technological Development (FP), it can be observed that Russia consistently has one of the highest participations of all "Third Countries" (countries not being EU Member States or Associated Countries to the FP) in the past FP's and the current FP7.

According to data from the European Commission, in the period between 2002 and 2006, Russian teams have been involved in 309 projects funded in the different FP6 sub-programmes (including Euratom). In these projects more than 450 Russian research organisations have participated and received an EC contribution of around ε_{50} million (without INTAS). Most projects with Russian participation were funded in the following scientific fields of FP6 in order of importance (citing here only the top three priorities):

- Sustainable development, global change and ecosystems;
- Nanotechnologies and nanosciences;
- Information society technologies (IST).

In the FP7, Russia is still the strongest "Third Country" performer in terms of funding it receives through the FP. In terms of participants in funded projects, Russia is in second place after the USA. The status in June 2012 was that 627 Russian research organisations have been involved in 394 funded projects.²⁴ Most projects with Russian participation have been funded in the FP7 sub-programmes People (101

²³ See <u>http://www.xfel.eu/news/2009/20091130</u>

²⁴ Data provided by the European Commission in June 2012.



projects), Transport (TPT – 51 projects), and Knowledge Based Bio Economy (KBBE – 43 projects). Then follow: ICT (31 projects), Space (SPA – 27 projects), Environment (ENV – 25 projects), Nanotechnology, Materials and New Processes (NMP – 24 projects), Infrastructure (INFRA – 23 projects), Health (21 projects), Energy (13 projects) and Fission (11 projects). All other FP7 sub-programmes (e.g. SME, etc.) have less than 10 projects with Russian participation. These data depend of course on the size (in terms of available budget) of the respective FP7 subprogrammes.

Figure 2: Number of funded projects in FP7 sub-programmes with Russian participants



Source: European Commission, 2012.

Russian scientists and teams participate in projects of the European initiatives COST and EUREKA. COST supports networking among researchers of its member states. Researchers from other international partners may, however, also participate in COST actions. By December 2011, Russian researchers had been involved in 42 running COST actions. Russia is herewith in third place in participation rates among non-member countries of COST (after Australia and the USA).²⁵

Russia is a member of EUREKA since 1993. But participation of Russian organisations in comparison to the duration of its involvement is rather low. This confirms the limited innovative capacities available in the country and lack of appropriate innovative companies. But it also seems to some extent to be due to organisational arrangements within Russia. In 2011, the responsibility for EUREKA in Russia was moved to the Skolkovo Foundation, and there are some signs of more intensive funding activities, such as a joint Israel-Russia call for EUREKA projects in 2012. Russian participation has been fairly stable over the past 10 years, with an average of around five project participations per year. Russia is not yet member of EUROSTARS, the EUREKA funding tool co-funded by EUREKA member states and the European Union.

²⁵ COST 2012. COST Overview February 2012:

<u>http://www.cost.eu/download/COST_Overview_February2012</u>, last accessed on 14 June 2012.



Finally, Russia has participated or is still participating in the following ERA-NET projects:

- ERA.Net RUS Linking Russia to the ERA (*www.eranet-rus.eu*), which is running from 2009-2013. The ERA.Net RUS aims at coordinating bilateral funding programmes with Russia. As a result, it has implemented a joint multilateral call for R&D and innovation projects, financed by funding organisations from Russia, the EU Member States and countries associated to FP7. Furthermore, the project includes a foresight exercise on joint thematic priorities for the EU and Russia and on how the cooperation can be structured in a more efficient way, in particular through a sustainable joint funding programme. The Russian funding partners were RAN, the regional branches of the Academy (Siberian, Ural and Far Eastern Branches), RFFI, RGNF and FASIE.
- BONUS -Baltic Sea Science _ Network of Funding Agencies (http://www.bonusportal.org/) was an ERA.NET project implemented under FP6 in the years 2004–2008. Under FP7, Bonus continued as an ERA.Net PLUS project and implemented a call with Russian participation (through RFFI). Bonus has meanwhile evolved to a European Economic Interest Grouping (EEIG) and a joint research programme with EU participation according to article 185 of the EU Treaty (TFEU). Russia is not yet a member of the Bonus EEIG.
- ERASysBio Towards a European Research Area for Systems Biology (*http://www.erasysbio.net/index.php?index=311*) was implemented under FP6 in the years 2006-2010.
- EUROPOLAR The Strategic Coordination and Networking of European Polar RTD Programmes (<u>http://www.europolar.org/</u>) was implemented under FP6 in the years 2004-2008.
- ERA-IB 2 the ERA-NET "Towards an ERA in Industrial Biotechnology" 2 (*http://www.era-ib.net/*) is a follow-up project to ERA-IB. The Russian FASIE participates in this ERA-NET as funding partner since 2011.
- EuroTransBio an ERA-NET in Biotechnology (*http://www.eurotransbio.eu/*). The Russian FASIE participates in thisERA-NET since 2012.
- ASPERA 2 an ERA-NET on Astroparticle Physics (*http://www.aspera-eu.org/*). The Russian funding partner is the RFFI.

4.3.2 Bi- and multilateral agreements with EU countries

On the bilateral level, Russia has concluded Science and Technology agreements with a broad range of EU Member States and Associated Countries to the FP. According to the Ministry of Education and Science,²⁶ the Russian Federation has active agreements in place with thirteen out of the twenty seven EU members (Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Italy, Poland, Romania, Slovakia, Slovenia, Spain, and United Kingdom) and with four associated countries to FP7 (Israel, FYR of Macedonia, Serbia and Turkey). Another agreement was signed with Croatia in May 2011. Agreements with Austria, Netherlands, Norway and Switzerland were previously active, but are still in the process of renewal. Agreements have been established similarly on the level of research funding bodies, between the Russian Foundation of Basic Research (RFFI), the Foundation for Assistance to Small Innovative Enterprises (FASIE), the Russian Foundation for Humanities (RGNF) and

²⁶ See <u>http://mon.gov.ru/work/mez/dok/</u>



European counterparts. Among research organisations, the Russian Academy of Sciences (RAN) has a dense network of cooperation agreements with academies in EU Member States and countries associated to FP7 in place.

Not all of these agreements have resulted in substantial cooperation. But comprehensive cooperation with Russia has been developed between some of the bigger EU countries such as France, Italy and especially Germany, which ranges from mobility schemes, funding of joint research projects, co-funding of research infrastructure to joint laboratories. Also smaller EU countries such as Austria, Finland and Greece and countries associated to FP7 such as Israel, Norway and Switzerland have substantial ongoing cooperation on bilateral level with Russia and have established joint mobility and research funding schemes.²⁷

Russia's most important partner country in S&T cooperation, not only among the EU countries but overall, is Germany. Bilateral RTDI cooperation dates back to an agreement between Germany and the USSR in 1987, which was renewed in 2009. In 2005 the countries agreed on a Strategic Partnership in Education, Research and Innovation. A variety of funding organisations cooperate on joint programmes; this includes Fraunhofer, Helmholtz Association, German Research Foundation, Federal Ministry for Education and Science and its International Bureau, Max Planck Society on the German side. On the Russian side the Ministry of Education and Science, RFFI, RGNF, FASIE, RAN and others are involved. From the financial point of view, Russia invests substantial means in the cooperation, especially for the participation in research infrastructure situated in Germany (e.g. it committed €300m for the FAIR facility).

The second most important partner among the EU countries is France. France signed an Intergovernmental Agreement on Scientific and Technological Cooperation with the USSR on the 30th of June 1966 and with the Russian Federation on the 28th of July 1992. Many joint programmes are funded by the French National Centre for Scientific Research (CNRS) with counterparts such as RFFI and RAN in Russia.

For example the Russian Foundation for Basic Research invested in the cooperation with EU countries the following amounts in 2011:

²⁷ A detailed overview of bilateral cooperation between Russia and its most important partners among EU Member States and countries associated to the FP7 was prepared in the frame of the FP7 funded BILAT-RUS project: <u>http://www.bilat-rus.eu/media/D 2.2 Good practice instruments.pdf</u>





Figure 3: RFFI budget 2011 for cooperation with EU countries

Source: Russian Foundation for Basic Research, 2012.

In cooperation with France €1.6m were invested (mainly CNRS) and with Germany (DFG and Helmholtz) €1.4m. Then follow relatively far behind joint funding activities with UK (Royal Society) and Austria (Austrian Science Fund) with around €200,000 invested by RFFI in 2011. The third group of funding partners is Finland and Spain with slightly more than €80,000 invested each.

In addition other funding instruments need to be calculated, e.g. bilateral cooperation programmes in applied research and innovation, which the Russian FASIE has established with funding partners in Finland, France and Germany.

In the frame of the FP7 funded regional ERA-NET, the ERA.Net RUS project, a survey on unilateral or bilateral funding programmes relevant for cooperation with Russia was conducted in 2009/10 among R&D and innovation funding organisations (so-called Programme Owners – PO) in EU Member States, countries associated to the FP7 and in Russia. It revealed that mainly basic research is supported in this R&D and innovation funding cooperation: 29 of the 32 responding organisations mentioned that they support basic research. Far less organisations support applied research (17 out of 29 responding organisations), technology development (10) and innovation (8) (Kougiou et al, 2010).



Figure 4: Type of research priorities



n=32

In the same survey, thematic priorities relevant for cooperation with Russia were questioned. The thematic priorities most frequently mentioned by the 35 responding organisations were nanotechnologies/materials (20), energy (19), environment (including climate change) (19), socio-economic sciences and humanities (18), ICT (18), and biotechnology (16).

Figure 5: Thematic fields of bilateral cooperation



n=35



The question of instruments used to support R&D and innovation cooperation with Russia was also investigated. Instruments most frequently support mobility. Out of the 40 responding organisations, 30 use this instrument. Funding of R&D and innovation projects, and dissemination of R&D and innovation results are supported by slightly more than 20 organisations each. When it comes to more institutionalised and mature cooperation instruments, such as access to R&D infrastructure and joint laboratories, the number decreased to 12 and 9 supporting organisations respectively.



Figure 6: Funding instruments

Source: ERA.Net RUS survey, 2009.

4.4 COOPERATION WITH NON EU COUNTRIES OR REGIONS

4.4.1 Main Countries

The main non-EU partner countries of Russia in S&T cooperation can be classified in three groups:

The USA is the most important non-EU partner country. Cooperation dates back to the times of the cold war, when arms control was an important issue. Today the scientific excellence, the know-how in innovation and the many Russian researchers working in the USA provide incentives for the cooperation. Cooperation traditionally takes place in the frame of several forums. Within the ISTC, in the frame of bilateral cooperation programmes funded and co-funded by the Civilian Research and Development Fund (CRDF Global). Other partners are the US National Academies of Sciences and US ministries. Furthermore, several private American Foundations have been active in research support in Russia, e.g. the Carnegie Foundation, Mc Arthur Foundation, the Open Society Institute, etc., but most of them have either stopped or reduced their activities. Several US organisations are now involved in Russian innovation stimulation tools, e.g. in Skolkovo.

The second group of countries is formed by other countries of the former Soviet Union. The basis for the cooperation with these countries is the regional proximity, and the close ties and common research interests established in the past in the Soviet Union. Cooperation programmes are in place with Armenia, Belarus, Moldova and Ukraine. Discussions are also ongoing to establish a research fund in the frame of the



Eurasian Union, which shall emerge out of the customs union between Russia, Belarus and Kazakhstan.

The third group includes countries of the Asian region, such as China, India, Japan, Mongolia, South Korea, Taiwan, and Vietnam. This group has become more important over recent years and its relevance might increase further, as Russia is trying to diversify its economy regionally more towards Asia.

4.4.2 Main instruments

The main instrument for cooperation with non-EU countries are joint funding programmes between the Russian Foundation for Basic Research (RFFI) and counterparts in the partner countries, and between the Russian Academy of Sciences and its counterparts. Usually joint research or mobility projects are funded in the framework of these programmes.

The annual budget dedicated to international cooperation in basic research through the Russian Foundation for Basic Research illustrates the country priorities. It does, however, not grasp the full range of cooperation with non-EU countries. US cooperation is relevant for innovation in particular and therefore not so strongly represented in the RFFI budget.

Data indicate that most funds were invested in cooperation with the neighbouring countries Ukraine and Belarus with more than €1m each in 2011. On the next places are major partners in Asia, with slightly below €1m for cooperation with China and Taiwan. India with a budget of more than half a million EURO and Mongolia with €327,000 follow. Only then comes the USA and Japan with around €300,000.



Figure 7: RFFI budget 2011 for cooperation with non-EU countries

Source: Russian Foundation for Basic Research, 2012.



4.5 OPENING UP OF NATIONAL R&D PROGRAMMES

Russian national funding programmes are in principle open to participants from EU Member States. This openness is based on reciprocity between the EU and Russia, as Russian entities may also participate in the FP7. Openness of Russian programmes concerns above all the main public competitive funding instrument, the Federal Targeted Programme R&D in Priority Fields of the S&T Complex of Russia (2007-2013). Several other Federal Targeted Programmes are confidential and not accessible, as they are targeted at support of defence related research. An EU supported project, which has facilitated access to Russian funding programmes, is ACCESSRU.²⁸

Besides these schemes, there are particularly cooperation links in the applied research and innovation fields. The Russian innovation support tools Rusnano, RVK and the Skolkovo High Tech Centre are open to international cooperation and involve several international partners.

4.6 RESEARCHER MOBILITY

4.6.1 Mobility schemes for researchers from abroad

There are several Russian schemes in place, which support researcher mobility to Russia.

1. At the level of R&D and innovation funding organisations, all three major Russian Funds, RFFI, RGNF and FASIE have established bilateral funding programmes with partner organisations in EU Member States and countries associated to the FP7, in the frame of which mobility of researchers is supported.

2. Dedicated mobility schemes have been established by research organisations, especially between Academies of Sciences. The Russian Academy of Sciences for example has exchange programmes with several partner academies in the EU (e.g. Austria, Hungary, Poland, etc.).²⁹

3. Two recently (in 2009 and 2010) introduced programmes of the Ministry of Education and Science have been designed for enhancing mobility.

- The first funding activity targets Russian scientists established abroad (*scientific diaspora*), to work with research groups in Russia. Two calls for this support scheme were launched in 2009 and 2010 in the frame of the Federal Targeted Programme Scientific and Scientific-Pedagogical Personnel of Innovative Russia for the years 2009-2013. 110 projects were supported in the first call and 125 projects in the second call.
- With the second support scheme, Russia tries to attract leading scientists from Russia and especially from abroad (irrespective of whether they belong to the Russian scientific diaspora), to establish research groups at Russian universities. Leading scientists selected for support have to spend at least four months per year in Russia. This scheme comes with solid funding of approximately €3.5 million per project for a period of usually two to four years. In the first call, 40 scientists were selected for support of their projects, whereby half of the scientists were

²⁸ See <u>http://www.access4.eu/russia/index.php</u>

²⁹ Funding schemes of funding and research organisations (type 1 and 2) are searchable at a database prepared within the ERA.Net RUS project. See <u>http://www.eranet-rus.eu/en/167.php</u>

foreign nationals and only five selected scientists were permanent Russian residents. Most scientists from abroad were from the USA (ten - with four having double Russian and US nationality) and then from Germany (seven) (MON, 2011a). Importantly, foreign experts were also involved in the evaluation of proposals, which underlines the opening up tendencies of Russia in R&D and innovation. A second call in this scheme was implemented in 2011 and 39 researchers were supported. For the second half of 2012 a third call is planned, and in addition a call for prolongation of grants of the first competition in 2010.

4.6.2 Mobility schemes for national researchers

Mobility of researchers mainly flows from Russia to abroad, with far less researchers moving to Russia. Mobility flows from Russia were for some time and are still to some extent driven by the need for international cooperation, which allowed access to modern infrastructure and equipment.

The Russian research and innovation funds (RFFI, RGNF, FASIE) have established bilateral cooperation programmes with a broad variety of countries. They usually support research and innovation projects, which include means for mobility. RFFI also manages a small dedicated mobility programme for Russian researchers.

The Russian Academy of Sciences has established a large network of exchange programmes with partner Academies in the EU, in Former Soviet Union countries and many other parts of the world.



5 CONCLUSIONS

The interactions and exchanges within the knowledge triangle education, research and innovation are not yet working very well in Russia. Research has been traditionally performed mostly in research institutes, whereas it was much weaker established in universities and business enterprises. Measures to stimulate interactions within the knowledge triangle were designed by policy makers and introduced with the aim that they will all create environments for cooperation among education, research and business organisations. These measures concern Technology Platforms, Special Economic Zones, the innovation flagship project Skolkovo, the HEI-business cooperation programme, Innovative Territorial Clusters, etc. Since 2009, specific support tools for enhancing research within universities were introduced with the programmes for selecting and supporting National Research Universities and for attracting leading scientists to Russian universities. Innovation infrastructure at universities was enhanced and spin offs from HEIs and PROs facilitated through a new law. Public venture funding instruments were introduced with RVK, Rusnano and RFTR. With the new Minster of Education and Science, Dmitry Livanov, a continuation and acceleration of this policy may be expected. A stronger focus on the efficiency of HEIs and PROs may also be expected.



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7 LIST OF ABBREVIATIONS

BERD	Business Expenditures for Research and Development
CERN	European Organisation for Nuclear Research
CIS	Commonwealth of Independent States
COST	European Cooperation in Science and Technology
CRDF	US Civilian Research and Development Fund
ERA	European Research Area
ERA-NET	European Research Area Network
ERDF	European regional development fund
ERP Fund	European Recovery Programme Fund
ESA	European Space Agency
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EU-27	European Union including 27 Member States
FASIE	Foundation for Assistance to Small Innovative Enterprises
FDI	Foreign Direct Investments
FP	European Framework Programme for Research and Technology Development
FP	Framework Programme
FP7	7th Framework Programme
FTP	Federal Targeted Programme
GBAORD	Government Budget Appropriations or Outlays on R&D
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
GOVERD	Government Intramural Expenditure on R&D
GUF	General University Funds
HEI	Higher education institutions
HERD	Higher Education Expenditure on R&D
HES	Higher education sector
ICT	Information and Communication Technologies
INCO	International Cooperation
IncoNet	S&T International Cooperation Network for Central Asian and South
CA/SC	Caucasus Countries
IncoNet	S&T International Cooperation Network for Eastern European and
	Infrastructures
	International Association for the Promotion of Co-operation with
INTAS	Scientists from the New Independent States (NIS) of the Former Soviet Union

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IP	Intellectual Property
IRSES	International Research Staff Exchange Scheme
MON	Ministry of Education and Science
NATO	North Atlantic Treaty Organisation
OECD	Organisation for Economic Co-operation and Development
PRO	Public Research Organisations
R&D	Research and development
RAN	Russian Academy of Sciences (RAS)
RFFI	Russian Foundation for Basic Research (RFBR)
RGNF	Russian Foundation for Humanities (RFH)
RI	Research Infrastructures
RTDI	Research Technological Development and Innovation
RVK	Russian Venture Company
S&T	Science and technology
SF	Structural Funds
SME	Small and Medium Sized Enterprise
TP	Technology Platform
UIS	UNESCO Institute of Statistics
UNESCO	United Nations Educational, Scientific and Cultural Organization
VC	Venture Capital