CREST OMC Working Group

Internationalisation of R&D – Facing the Challenge of Globalisation: Approaches to a Proactive International Policy in S&T

Country Report Russia: An Analysis of EU-Russian Cooperation in S&T

Prepared on behalf of the CREST OMC Working Group by
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Preface

This report gives an overview of the existing cooperation in science and technology with Russia at EU, Member States and Associated Country level. It is one of three country reports (Russia, India and Brazil) prepared in the frame of the work of the CREST OMC Working Group on '*Internationalisation of R&D - Facing the Challenge of Globalisation: Approaches to a Proactive International Policy in S&T*' in the year 2008.

The following 20 Member States of the European Union and countries associated to the EU Framework Programme for Research, Technological Development and Demonstration Activities participated in the OMC Working Group in 2008: Austria, Czech Republic, Cyprus, France, Germany, Greece, Iceland, Ireland, Italy, Lithuania, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey and the United Kingdom. Eight meetings of the OMC Working Group were held between January and November 2008.

The chair of the OMC Working Group was Jörn Sonnenburg (International Bureau of the German Federal Ministry of Education and Research at the German AeroSpace Centre); the rapporteur was Marion Steinberger (International Bureau).

The OMC Working Group was supported by Ales Gnamus from the Institute for Prospective Technological Studies at the Joint Research Centre of the European Commission (JRC-IPTS) and three external experts: Manfred Spiesberger, Jan Peter Wogart and José Luis Briansó Penalva.

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This report was prepared by Manfred Spiesberger on behalf of the OMC Working Group. The report sums up the results of the independent individual desk research and the analytical and empirical work (analysis of responses to several short questionnaires that were sent to the members of the OMC Working Group or to national CREST delegates), mutual learning exercises and thematic discussions of the OMC Working Group. It represents experts' opinions and not official positions of individual Member States, countries associated to the EU RTD Framework Programme or the European Commission.

Table of Contents

1. Executive Summary

1.1. Russian S&T and cooperation with the EU and Associated Countries

The current Russian S&T system is characterised by enormous potential, but at the same time by important weaknesses. Russia can rely on a strong R&D base inherited from the Soviet Union and has kept up excellence especially in the sciences. It invests important amounts in R&D efforts and has a comparably big R&D workforce, totalling approximately 30% of the EU R&D workforce potential. Russia educates more graduates in the sciences than most OECD countries do. But this potential can only to a very limited extent be transposed into innovative and high tech products and services. Another major weakness concerns problematic framework conditions for performing R&D and for international S&T cooperation efforts. Unreliable and complicated administrative rules and regulations, intransparent Intellectual Property Rights (IPR) regulations do hamper R&D efforts. Transformation of the Russian S&T sector does - though at a slow pace - take place. A continuous shift to an R&D funding allocation based on excellence and competition is implemented and accordingly new funding programmes have been introduced. Top scientific priorities, such as nanotechnologies are being identified and stimulated with important funding instruments.

Russia has put strong emphasis on S&T cooperation with EU Member States and Associated Countries to the EU's Framework Programme for Research and Development (FP). As regards the 6th FP (2002-2007) Russia has the highest participation in the FP of all "Third Countries" (countries not being EU Member State or Associated Country to the FP). It has agreed with the EU a common space of research and education, which includes strengthening of participation in the EU's FP, implementation of the Bologna process in education in Russia and harmonisation of rules and regulations. Important advancement has been achieved in realisation of this common space: Russia is running coordinated calls with the EU in the 7th FP. The next step in enhancing cooperation would be the association of Russia to the FP7. Accordingly Russia has officially requested in 2008 this association.

Other cooperation instruments at the EU level besides the FP are losing importance or are in liquidation. INTAS,[1] having previously successfully stimulated strong networking among Russian scientists and colleagues from the EU Member States and Associated Countries is currently being winded up. And the ISTC,[2] still caring for non-proliferation via converting military research to civilian research and investing herewith substantial amounts into Russian S&T, has faced a refocusing of priorities and therefore substantial decreases of its budget.

On the bilateral level, a survey in the frame of the CREST OMC Working Group on internationalisation of R&D revealed that a broad range of EU Member States and Associated Countries do have S&T cooperation with Russia in place and use a multitude of instruments such as mobility schemes, joint calls for research projects, etc. for stimulating it. Mature bilateral cooperation includes joint laboratories and shared infrastructure with Russia. A more systematic evaluation of this cooperation has although be undertaken only by few countries. A majority of Member States and Associated Countries are planning to enhance cooperation with Russia and to take new initiatives to this end in the coming years. Accordingly an enhanced coordination of bilateral cooperation activities with Russia, which is linked up to cooperation at the EU level, would provide valuable input for strategic decisions in which direction and with which instruments to advance. Challenges to the cooperation do exist and range from administrative problems such as visa procedures, rules and regulations that do hamper cooperation such as Intellectual Property Rights (IPR) and Russian funding rules, to the challenge of stimulating more innovation related activities and advancement of cooperation via the EU level.

[1] International Association for the promotion of co-operation with scientists of the New Independent States of the Former Soviet Union

[2] International Science and Technology Center

1.2. Lessons learned

Turning to lessons learned from the state of S&T cooperation with Russia, it should be highlighted that Russia has defined the EU as its long term priority in S&T cooperation, which is underpinned by a breadth of ongoing cooperation activities at the EU as well as the bilateral levels. Association of Russia to the FP7 would be a next step with possible positive spill-overs to other policy fields, in the sense of improved and more productive cooperation. A careful evaluation of effects of Russian association will be necessary to avoid disappointments on both sides.

A stronger coordination of bilateral and EU activities with Russia in the frame of appropriate fora would allow for a more strategic shaping of the cooperation. Another lesson learned concerns the available human and financial potential available in Russia, which should be tapped for the advantage of the EU S&T system. A certain complementarity between stimulation of basic oriented research versus application oriented research and innovation should be kept in mind here and accordingly both directions be supported. Complementarity is also necessary between EU level and bilateral level funding activities: cooperation is increasing in the FP and especially via coordinated calls EU-Russia. But the FP does include some fields of excellence of Russian S&T only to a limited extent. Other EU level support programmes are either being closed (INTAS) or have faced substantial budgetary cuts (ISTC). Therefore appropriate complementary R&D stimulation via bilateral support schemes or ERA-NETs should be considered.

1.3. Major recommendations of the OMC Working Group on Internationalisation of R&D

The following major recommendations are given by the OMC Working Group. They are addressed to the EU Member States/Associated Countries and the European Commission in order to have them strengthen S&T cooperation with Russia. The recommendations are divided into those directly targeting S&T cooperation with priority partner countries in general and those that are specifically relevant for the Russian case only. A more elaborate and detailed version of the following recommendations can be found in Chapter 7.

I. Recommendations targeting at S&T cooperation with Russia and other priority partner countries

Fostering knowledge-based strategic agenda setting

It is recommended to

- deepen the knowledge based dialogue between the EU Member States and Associated Countries on the prospects of the S&T cooperation with Russia as a strategic partner of the EU.
- complement the ongoing S&T dialogue between the European Commission and Russia with an S&T dialogue between the EU MS (and possibly AC) and Russia. In view of the Communication of the European Commission on international S&T cooperation[3] and following the respective Council Conclusions of 2 December 2008[4] such a dialogue should aim at identifying joint interest beyond the themes of the EU RTD Framework Programme and at fostering coordination of concrete implementation measures building on MS´(/AC´) instruments.

[3] Communication from the Commission to the Council and the European Parliament "A Strategic European Framework for International Science and Technology Cooperation, COM(2008) 588, Brussels, 24.09.2008

[4] Conclusions of the European Competitiveness Council concerning a European Partnership for International Scientific and Technological Cooperation, Brussels, 02.12.2008

- make regular use and ensure a proper dissemination of results of completed or ongoing EC-funded coordination and support projects targeting Russia.

Offering an optimum framework for S&T cooperation and removing barriers

It is recommended to

- examine how well known existing good practices in funding schemes can be implemented at the individual EU country as well as the Community EU level for joint S&T of MS´/AC´ with Russia and introduce advanced schemes where gaps are found on MS´/AC´ and Community level, aiming wherever possible at reciprocity.
- move towards a more flexible, simplified and harmonized cooperation framework through Community S&T agreements in order to overcome present barriers.
- stimulate an open but coordinated dialogue between European and Russian public and private S&T and innovation stakeholders on themes relevant for the framework of S&T cooperation.

Putting emphasis on the "human dimension" through brain-circulation

It is recommended to

- increase the brain-circulation between the EU, the AC and Russia through promoting the opportunities, advancing funding schemes and removing still existing barriers. New concepts should be developed on national, bilateral and Community level for enhancing outward mobility of researchers from EU-MS/AC towards Russia.
- attract the interest of Russian students and researchers who are supported through European fellowship programmes at national or Community level to work in Russian branches of European industries through dedicated promotion campaigns.
- analyse the impact of the European Visa Directive in order to prepare the ground for a better access of Russian scientists to the European Research Area.

II. Specific recommendations targeted at S&T cooperation with Russia

Enhancing strategic S&T cooperation

It is recommended to

- make better use of the internationally acknowledged research potential of Russia in basic sciences through providing an appropriate framework for partnerships among S&T organisations in EU-MS/AC.
- strengthen the links of MS´/AC´ institutions to public institutional stakeholders of the Russian innovation community and to develop a common framework i.e. through joint innovation programmes.
- widen the scope of the S&T cooperation with Russia towards applied research and innovation through the Community Competitiveness and Innovation Programme (CIP) and through enhanced policy advice by MS.
- increase the impact of the European approach towards the International Science and Technology Centre (ISTC) through appropriate action by MS and the European Commission.

Offering an optimum framework for S&T cooperation and removing barriers

It is recommended to

- consider launching the EU-Russia negotiation on a potential association of Russia to the 7th RTD-Framework Programme.
- link the negotiations implemented by the EC on an association to the creation of a stimulating cooperation framework on the Russian side in order to overcome present barriers.
- analyse the impact of the EC-Russia Visa Facilitation Agreement from 1 June 2007 and take necessary action (once appropriate) in order to prepare the ground for a better exchange of Russian and EU/AC scientists.

Advancing the strategic partnership with Russia

It is recommended to

- provide optimum access on Community level to each others (EU and Russian) S&T infrastructures and to initiate a joint agenda setting for upgrading existing respectively establishing new medium and large scale S&T infrastructure. These activities should be interlinked with the ESFRI process.

2. Introduction

This report provides an analysis of scientific and technological cooperation between EU Member States, Associated Countries (AC) to the EU's Framework Programme for Research and Technological Development (FP) on one hand and the Russian Federation on the other hand. It has been prepared in the frame of the CREST Working Group on Internationalisation of Research & Development (R&D).

The report sets out with highlighting some main features, which characterise the current S&T system in Russia. It then points out strategies as well as priority regions and countries of Russia's international S&T cooperation. In the main part of the report, the cooperation at the EU level and at the bilateral level is discussed. An important input into this chapter has been provided via a survey among EU Member States and Associated Countries on their bilateral S&T cooperation with Russia. In the final chapters lessons learned are deducted from the state of the current Russian S&T system and from ongoing cooperation. Recommendations regarding further improvement of cooperation with Russia are given towards the Community level and Member States and Associated Countries.

3. Overview of current S&T situation in Russia

3.1. Political-economic background

Russia has inherited an important S&T sector from the Soviet Union, which provides enormous potential but poses up to now also serious challenges to its S&T policy making. The Soviet Union had invested heavily in Science and Technology in the civilian and military sector. Strategic projects led to worldwide acknowledged results, such as the successes of the Russian space programme or the development of nuclear weapons. Scientific excellence was built up especially in the sciences, in physics, mathematics, chemistry and biology. Excellence could be kept up until today, traditionally in basic oriented research.[5]

The break-up of the Soviet Union in 1990/91 and the ensuing economic crisis resulted also in a serious crisis and downsizing of the Russian S&T sector, financially as well as concerning the R&D personnel. Spending on R&D was drastically reduced from levels of over 2% of GDP to below 1%; e.g. in 1992 0.74% of GDP were spent on R&D and a spending level of around 1% of GDP on R&D was reached again only towards the year 2000.[6] These spending cuts were the more drastic, as also the Russian GDP contracted over this period importantly.
Budgetary cuts resulted in problems of non-paid salaries and stop of investment in new equipment. In reaction to the difficult situation part of the R&D personnel either migrated Russia-internally to other sectors of the economy, and a much smaller group, but including some of the best scientists, migrated abroad.[7] Estimates give a number of 2,000 researchers that emigrated permanently each year during the most difficult period from 1991-1996; this estimate did not include researchers, which emigrated for research purposes temporarily abroad.[8]
Another effect was an internationalisation of the R&D funding structure. Important foreign funding inflows compensated to some extent the decline in national funding. Funding for R&D from abroad reached 17% in 1999.[9] Since then it has declined again to a value of 8% in 2004,

5 See for example the bibliometric analysis by the Scope-East consortium. Scope-East, Bibliometric report on Russian and Ukrainian research potential, 2007, http://scope-east.net

6 OECD, Main Science and Technology Indicators, 2008-1

7 Loren Graham, What have we Learned About Science and Technology from the Russian Experience?, Stanford, 1998, 61.

8 Irina Dezhina, Loren Graham, Russian Basic Science After Ten Years of Transition and Foreign Support, Carnegie Endowment for International Peace, Working Papers, Number 24, February 2002, 9.

9 For a good analysis of the dilemmas of transformation of the S&T sector in the immediate post-Soviet phase, see Slavo Radosevic, Patterns of preservation, restructuring and survival: science and technology policy in Russia in post-Soviet era, Research Policy 32 (2003) 1105-1124.

which was for this reference year equivalent to the average percentage of R&D funding from abroad measured for the EU-27.[10]

Since the last financial crisis in 1998, the Russian economy has experienced a tremendous upswing with GDP growth rates of more than 6% in the most recent years. These impressive improvements are to a large part due to price rises in export goods of Russia, which are mainly the primary goods oil and gas. As a result of these economic improvements, more investment has trickled through also to the R&D sector. Therefore, while in previous phases of cooperation with foreign partners, a support mode for the Russian R&D sector was dominant, nowadays it is shifting gradually to a cooperation mode. Support for Russian scientists is replaced with jointly financed research funding schemes, where the Russian side is funding the costs of participation of its scientists in bilateral or multinational R&D projects. This shift has given the Russian policy makers a stronger say in definition of S&T priorities for its international S&T cooperation activities.

Still, the Soviet legacy and the ongoing transformation process have left the Russian science sector with several distinct features, which are relevant in this analysis for current cooperation options and strategic recommendations.

3.2. The financial side

Russian R&D spending had reached 1.28% of GDP in 2003 and has since declined to levels slightly over 1% of GDP (see table 1 below). But the funding situation is in absolute figures indeed significantly improving. As GDP is expanding heavily, so are financial inflows into R&D in absolute figures increasing importantly.
When comparing spending on R&D with EU Member States and other competitors, it can be observed that Russia spends in terms of percentage of GDP approximately at the same levels as Spain and Italy. But it is well below this indicator for the EU-27 or for China, which is an important competitor among emerging economies.

Table 1: R&D expenditure as a percentage of GDP

	2003	2004	2005	2006
EU-27	1,76	1,73	1,74	1,76
DE	2,52	2,49	2,48	2,53
IT	1,11	1,10	1,09	n.a.
ES	1,05	1,06	1,12	1,20
PL	0,54	0,56	0,57	0,56
RU	1,28	1,15	1,07	1,08
US	2,66	2,59	2,62	2,62
CN	1,13	1,23	1,33	1,42

Source: Table compiled based on OECD, Major Science and Technology Indicators, 2008-1

The R&D expenditure structure in Russia is marked by two important facts. First fact is the overwhelming domination of the government sector. Although official statistics give around 30% of expenditure in the business and enterprise sector, this value is largely overstated. A range of research institutes and enterprises have been established as independent units and are counted to the business and enterprise sector, but are still controlled by the state, either directly or indirectly via shareholdings. Therefore the R&D expenditure in the government sector is de facto much

[10] Eurostat, Science, Technology and Innovation, 2008, 35, Figure 2.4 Total and business enterprise R&D expenditure by source of funds in percentage of total, 2008.

higher than the 60% that are currently indicated in official statistics and the contribution of businesses to R&D spending is rather limited in comparison to EU countries.[11]
Second fact is the high expenditure on defence related R&D in Russia. The Soviet Union had traditionally spent immense resources on defence and related R&D; a spending pattern, which is to a certain extent continued by Russia. More than 50% of governmental expenditure on R&D is dedicated to defence R&D and is with this only slightly below the US value, but much higher than those of European competitors. The EU front runner is here the UK with slightly more than 30% of government R&D expenditure for defence.[12]

3.3. Human potential

Since the high times of the Soviet Union, the Russian R&D personnel has been declining steadily. The scaling down has been strongest in the first years after the break-up of the Soviet Union, with a 30% shrinking of the labour force in R&D and with another 20% decrease over the ten years 1995-2004 (see table 2 below).

Table 2: R&D Personnel in Russia

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Total	1.061.044	990.743	934.637	855.190	872.363	887.729	885.568	870.878	854.470	839.338
Researchers	518.690	484.796	455.108	416.958	420.212	425.954	422.176	414.676	409.775	401.425
Technicians	101.371	87.769	80.339	74.835	72.442	75.184	75.416	74.599	71.729	69.963
Supporting Staff	274.925	260.020	244.908	220.060	235.841	240.506	238.933	232.636	229.214	223.356
Others	166.058	158.158	154.282	143.337	143.868	146.085	149.043	148.967	147.752	144.594

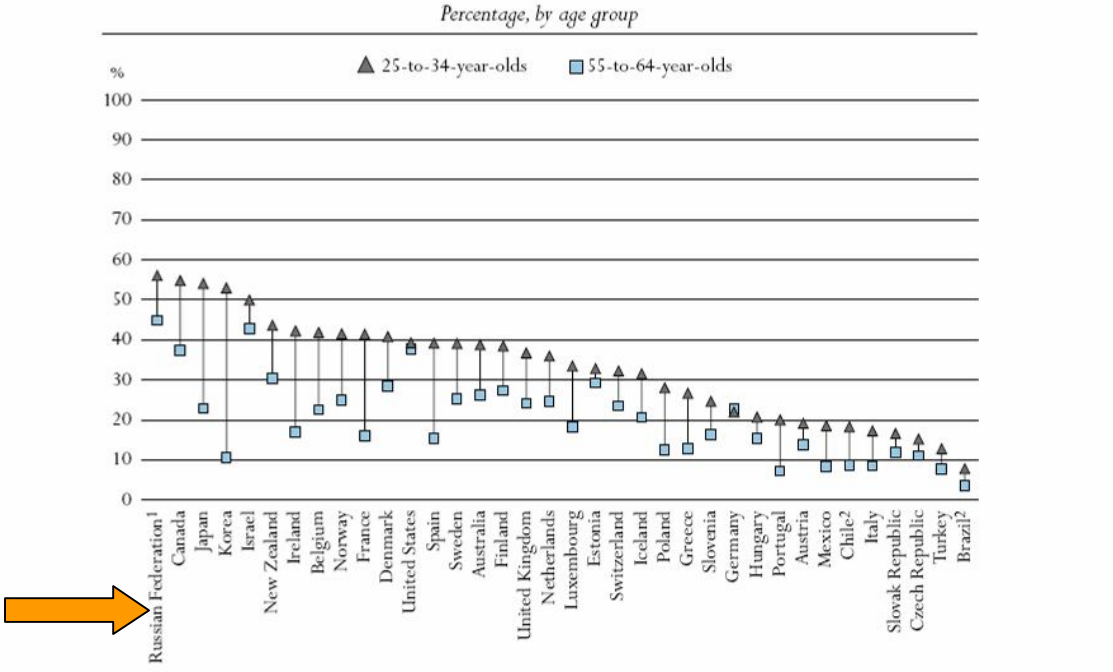
Source: Higher School of Economics (HSE), S&T Indicators in the Russian Federation, Moscow, 2007

Nowadays R&D personnel makes up 1.25% of total employment in Russia and is herewith slightly below the EU average of 1.44% of employment. When comparing R&D personnel in absolute figures (head count) of the EU and Russia, then Russia reached in 2004 with its 839,338 R&D personnel around 30% of the total EU potential in R&D personnel.

In spite of this downsizing, Russia still has good potential for R&D, which is among other factors due to its well educated labour force. An important part of the Russian population has gone through tertiary education. With more than 50% of the younger generation (25-34 year olds) having attained tertiary education, Russia ranks above all OECD countries.[13]

[11] European Commission, Inno-Policy TrendChart – Policy Trends and Appraisal Report Russia, 2007.
[12] Eurostat, Science, Technology and Innovation, 2008, 24, Table 1.5 Total GBAORD in EUR million and by socio-economic objectives as a % of total.
[13] OECD, Education at a glance, 2008, 32, Chart A1.3. Population that has attained at least tertiary education (2006).

Chart 1: Population that has attained at least tertiary education (2006)



1. Year of reference 2002.
2. Year of reference 2004.
Countries are ranked in descending order of the percentage of the 25-to-34-year-olds who have attained tertiary education.
Source: OECD, Table A1.3a. See Annex 3 for notes (*www.oecd.org/edu/eag2008*).

Out of this group, an important part is doing studies in the sciences or engineering. In 2003 Russia had close to 40% of graduates in science and engineering disciplines. This is by far a higher share of graduates in sciences and engineering than all OECD countries (except Korea) have; of EU member states only Germany came next with close to 30% of graduates in science and engineering. Although this picture is changing over more recent years, as a lot of students are turning now to social sciences, business, law and services, Russia still remains in the top group of countries with more than 30% of students in sciences and engineering.[14]

A certain problem constitutes the age structure of the R&D and educational personnel. The internal und external migration trends during the immediate post-Soviet transformation phase have thinned out the middle aged R&D and educational personnel. Important parts of the currently leading senior scientist stratum are retiring now or in the coming years. It will be important for the Russian policy makers to ensure adequate training and preparation of younger layers of the R&D labour force for senior scientific and educational positions. [15]

3.4. Division between education and research

In the Soviet past a division had been established, where R&D was concentrated mainly in the institute and Academy sector, while the universities were mostly devoted to education. Although this division was never so clear cut as sometimes described – there have always been linkages

[14] See OECD, Education at a glance, 2008, 70, Table A2.6. Percentage of new entrants in tertiary education and proportion of females, by field of education (2006). According to the OECD definition, sciences and engineering disciplines include life sciences, physical sciences and agriculture, mathematics and computer science, engineering, manufacturing and construction.

[15] For an analysis of this phenomenon see Irina Dezhina, Izmenenije kadrovoj struktury nauki Rossii I gosudarstvenaja politika (Changes in the Russian R&D personnel structure and state policy), Russie.Cei.Visions, No 4, June 2005.

between Academy institutes and universities and top universities such as Moscow State University always performed excellent research[16] – this division is still a reality, which is in the process of transformation.[17]

New programmes for strengthening the universities have been developed meanwhile, which target the burning issues of bridging education and research and of upgrading the capacities of the universities. In the "Innovative Universities" programme universities could compete for substantial two year grants of up to a maximum of approximately € 29 million[18] per university. Funds are used for the purchase of new equipment, the development of new educational techniques and materials, and for training of personnel (including short training and research stays abroad). In two competitions over the past two years, 57 universities have been selected as innovative universities, among which the programme budget of slightly more than € 1 billion is shared.

A programme to establish top level university centres has been introduced with the "Federal Universities" programme. Two university centres, the Siberian and Southern Federal Universities have been created with support of this programme. Over the period 2007-09 financial resources of close to € 390 million shall be invested into the two institutions from the state budget, which shall be substantially increased by co-funding from regional and business sources. The ambition is to upgrade the performance of both universities to allow them to reach a position within the top 100 universities worldwide by 2015-2020. Ambitions are obviously quite high, though not yet met by reality as advancement in the project is rather slow and cumbersome.[19]

A third important programme, which is relevant for the university sector, has been decided with the Federal Targeted Programme "Scientific and scientific-pedagogical personnel of innovative Russia". It will run from 2009-2013 and invest an approximate amount of € 2.3 billion out of the state budget in efforts to attract and retain talented people, especially the young, in science. The programme is designed to tackle the Russian problem of ageing of the scientific personnel. More than 50% of funds shall be invested in research projects, which need to involve a certain quantity of young scientists and students or which are performed by young scientists. Another important part of the programme budget shall be used for upgrading housing infrastructure for students and scientists. The programme is targeting inner Russian S&T challenges, but comprises some few action lines, which have relevance for international S&T cooperation. The most interesting is an action line, which aims to attract Russian émigré-scientists to direct research projects, involving again young scientists, back in their former home country. Emigré-scientists will have to work on such projects at least two months per year in Russia. 100 such projects shall be supported per year and € 55 million be invested here over the programme duration. The potential of the Russian scientific network abroad shall obviously be tapped for educating young scientists in Russia and for integrating competence and know-how acquired abroad into the Russian S&T system. If this activity proves to be attractive for the émigré-scientists based in Europe, this can be an important point of access on which to build enhanced exchanges between European and Russian research institutions and complementary programmes at bilateral level might be considered.

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16 Analysis by the Scope-East consortium of organisations participating in the INTAS programme has shown that Moscow and St. Petersburg State Universities have systematically top or high participations in research projects over most of the scientific disciplines funded under INTAS. Scope-East, Statistical Analysis on Russian and Ukrainian participation in the Sixth EU Framework Programme, INTAS, ISTC and STCU, 2007, http://scope-east.net

17 According to Eurostat figures, only a minor part of Russian R&D personnel is employed in the Higher Education sector, which contrasts strongly with patterns in EU member states. Eurostat, Science, Technology and Innovation in Europe, 2008, 46, Table 3.2 R&D personnel (HC) by sector of performance, as a percentage of total employment.

18 Russian Rouble amounts have been converted in this paper to EURO by applying the reference rate of the European Central Bank (www.ecb.int) at 31 October 2008: 1 EURO = 34.5256 Russian Roubles.

19 Irina Dezhina, North and South Federal Universities, Nezavisimaja Gazeta, 28 May 2008.

3.5. Lack of innovation

While a lot of R&D is financed and produced in Russia, this can only to a very limited extent be transposed into innovative high tech products or services.[20] The absorption capacity for R&D of the Russian market is rather limited, due to low R&D investment of Russian companies, lack of adequate innovative companies and lack of linkages between companies and R&D performers. Innovation outputs are low in comparison to EU or OECD partners.

A major challenge for the Russian economy and innovation system is to stimulate R&D spending in the business and enterprise sector and to develop new small and medium sized innovative enterprises based on R&D or linked up to R&D institutions.

Several measures have been taken to facilitate innovation. Special Economic Zones have been selected and established, which provide tax breaks for innovative companies being set up in these zones. A range of Technoparks and Venture Capital Funds were created in Russia in the past years, whereby the effectiveness of these interventions must still be shown in the future.

Advancement has been achieved in the creation of intermediate organisations, which support the linkages between R&D performers and potential customers. Technology Transfer Offices have been established at several research institutions. Some of those have been established with the support of the EU's TACIS programme. For example the Russian Technology Transfer Network (RTTN), which includes now around 60 Russian Technology Transfer Offices from 25 regions, has been set up with support via TACIS.[21]

The main funding body for support of technology development, commercialisation and the creation of small innovative companies, the Foundation for Assistance to Small Innovative Enterprises (FASIE) has been put in place already in the 1990ies. FASIE has meanwhile diversified its funding instruments and is also jointly funding calls with national companies (e.g. Lomo), foreign companies (e.g. Microsoft) or foreign funding bodies (e.g. INTAS, DLR). Budget of FASIE for the year 2007 was approximately € 40 million.

Foreign Direct Investment (FDI) into the Russian economy has increased over the past year, although this is partly due to Russian investment units based abroad, which re-invest funds in their home country. FDI flows are mainly directed towards the resource based industry and only marginally towards the high tech sectors. Accordingly FDI in Russian business R&D is still very low.

In the opposite direction, some Russian companies have developed the strategy to buy in foreign technology companies with the aim of acquiring know-how and building of more technology based businesses. An example here is the purchase of the Swiss technology companies Oerlikon and Sulzer by the Russian Renova.[22]

Within Russia, the government has been trying to consolidate the forces of major domestic R&D entities and producers by merging them into state corporations. This concerns the "United Aircraft Corporation" embracing the country's main aircraft manufacturers and designers, or the state corporation "Russian Technologies" integrating RosOboronExport and Avtovaz for the technologies and automobile sectors. A third example is "Rosatom", a state-owned nuclear corporation, which incorporates all civilian and military nuclear facilities, research institutes and organizations in the field of nuclear energy and which has replaced the Federal Atomic Energy

[20] See for an analysis of challenges of the current innovation situation: Christian Gianella, William Thompson, Stimulating Innovation in Russia: The Role of Institutions and Policies, OECD Economics Department Working Papers No. 539, 2007.

[21] For more detailed information see www.rttn.ru Another TACIS project "Science and Technology Commercialisation" provided support to the Russian Academy in setting up fourteen Technology Transfer Offices, which are now part of the RTTN; see http://ras-stc.ru.

[22] For details see Neue Zürcher Zeitung, Achse Moskau-Zürich, 18. Mai 2008.

Agency (Rosatom) as its full-fledged successor. It will have to be seen, whether big state companies and monopolies can generate better results for R&D activities, innovation performance and high tech exports in the future. Previous experience lets room for doubt here.

Some successes have been achieved in the rapidly developing ICT sector in Russia. Software outsourcing to Russia has grown impressively in recent years, and the software industry is among more sophisticated products and services produced by Russia, according to the OECD "the only major sub-sector with substantial export successes: software exports reached an estimated $ 1bn in 2005, up from less than $ 100m in 1999".[23]

3.6. Framework conditions

Unclear and unstable framework conditions and regulatory deficiencies of the Russian market continue to hamper the development of the S&T sector and foreign investment in Russian R&D. This concerns insufficient protection of property rights and intellectual property rights (IPR), deficiencies of laws and their application, corruption, bad infrastructure, etc.

Difficult framework conditions have immediate repercussions on international S&T cooperation. For example cumbersome visa procedures, language barriers or harsh living conditions in Russia do limit scientific exchanges.

Some advancement regarding framework conditions is taking place. The government has continued to improve the legal framework for IPR in Russia in general and the allocation of IPR in Russia's publicly funded research sector in particular. Thus, Part IV of the Civil Code devoted to IPR came into force in 2008, proclaiming the author of created IP as its primary owner. New laws on technology transfer and on patent attorneys are in preparation, which should continue to bring more clarity on treatment of publicly created IP and its selling to private investors.

Improvements of laws are not sufficient, they need to be applied properly too. But Russia is still far from a state, where the "rule of law" is held high. The reality in Russia is one of widespread corruption and of a judiciary that interprets laws in the interest of the powerful.

3.7. Transformation takes place

Policy measures and increased funding have indeed positively contributed to transformation and modernisation of the public as well as private Russian R&D sector. Funding inflows have helped to modernise equipment and to raise salaries of R&D personnel. A streamlining process is touching the institute sector, although reform of the Russian Academy of Sciences is still limited. New innovative companies are being set-up; state support for this process is available. Some R&D intensive companies especially in the ICT sector have become successful exporters.

Transformation has produced substantial changes and actual results on the side of the R&D funding structure. Two major funding bodies, the Russian Foundation for Basic Research (RFBR) for support of basic research and the above mentioned FASIE for technology development and support of commercialisation had been established already in the 1990ies. These funding bodies introduced calls for research and development projects and distribute funding on the basis of competition and peer review. This marked an important shift from funding allocated solely by the state to an R&D funding allocation based on excellence and competition, which is gradually introduced in Russia.

A more recently established funding body is the Federal Agency for Science and Innovation (FASI), the policy implementation agency of the Ministry of Education and Research. It manages

[23] Christian Gianella, William Tompson, 2007, 11.

several of Russia's Federal Targeted Programmes relevant for the R&D sector[24] and other R&D support programmes. Funding in these programmes is distributed competitively, enhancing herewith this policy shift.

The major competitive Federal Targeted R&D funding programme is "R&D in Priority Fields of the S&T Complex of Russia". Currently the second such programme is being implemented.[25] It runs in the period 2007-2012 and has a budget of RUR 195 billion (~ Euro 5.7 billion). The programme budget is only partly financed out of the state budget and an important contribution of approximately 30% is expected from private sources. The programme is de-facto modelled on the example of the EU's Framework Programme and shall support application oriented research, technology development and commercialisation. It consists of six main "building blocks" namely:

1. "Generation of knowledge" (€ 1.0 billion), i.e. applied research in the areas of
   1.1. Medium- & long-term forecasting of development of S&T sector,
   1.2. Life Sciences,
   1.3. Nano-systems & Materials Industry,
   1.4. Information- & Telecommunication Systems,
   1.5. Sustainable Use of Environment,
   1.6. Energy & Energy Efficiency,
   1.7. Conferences & Seminar support in the above areas);
2. Technology Development (€ 3.0 billion, in the same thematic areas as in 1.!);
3. Technology Commercialisation (€ 1.0 billion);
4. Institutional basis (infrastructures) for R&D (€ 0.2 billion);
5. Innovation infrastructure (€ 0.5 billion); and
6. Programme management.

An important new feature of this programme is the possibility of participation of foreign entities. According to this possibility, coordinated calls of Russia with the EU's Framework Programme are funded out of a budget line of this programme.

Several other newly conceived competitive funding programmes for stimulating specific scientific fields or players of the innovation system have been established. Programmes for improving the capacities of the universities have been mentioned already briefly above.

Regarding specific thematic stimulation, several measures have been taken in the field of nanotechnologies, which is a top priority for the Russian government. It is planning to invest RUR 180 billion (~ € 5.2 billion) in the seven years' period up to 2015 in a "nanotechnology plan" to help diversify the country's economy and to re-develop its civilian & military high-tech sectors.

In 2007 the State Corporation "ROSNANO" has been established, which supports nano-infrastructure, innovative projects in nanotechnologies and other initiatives. It is designed to have a close to the market role, bridging the gap between mature and tested R&D results and market ready high tech products. It shall therefore care for investments into commercialisation of nanotechnology. A Federal Targeted Programme for Nanotechnology for the period 2008-2010 has been adopted (overall budget of RUR 27.7 billion (~ € 800 million)) to create advanced infrastructure and to establish a national nanotechnology network coordinated by the Russian Research Centre "Kurchatov Institute".[26]

It is still difficult to judge in which direction ROSNANO will evolve. It had a slow start and most of its funds are parked. Investment in projects was until recently low and still in the single digit number range. But things are set to change and developments should be followed very closely.

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[24] Russia has introduced "Federal Targeted Programmes" as a funding tool for reforms in different policy fields.

[25] The first "Federal Targeted R&D Programme" had been implemented in the period 2002-2006.

[26] Federal Targeted Programme "Development of infrastructure of the nano-industry in the Russian Federation for the years 2008-2010", accessible at FASI, www.fasi.gov.ru

The priority that the Russian government is putting on nanotechnologies is underpinned by a recent change in management of ROSNANO. The former minister and director of the Russian electricity giant "United Energy Systems" Anatoly Chubais has been nominated director of ROSNANO in September 2008.[27] Chubais is famous, but not very popular in Russia for his role in economic reforms and especially the privatisation process during the Yeltsin years. But being an able manager, who is internationally well known, his nomination promises that implementation of planned ROSNANO activities shall move forward quickly from now on. This nomination is also a signal to the outside world of the importance that Russia is putting on nanotechnologies.

4. Russia's internationalisation strategy

When looking at the forty nine cooperation agreements Russia has concluded with foreign partners,[28] a strong focus on cooperation with countries of the European Union and the countries associated to the Framework Programme is obvious. The Russian Federation has active agreements in place with fifteen out of the twenty seven EU members[29] and with five associated countries to FP7 (Israel, Norway, Macedonia, Serbia and Turkey).

Another regional focus of S&T cooperation is what is defined by Russia as "Near Neighbourhood", meaning countries of the Former Soviet Union and Mongolia. Agreements are in place with all Central Asian Republics except Turkmenistan, with the three Caucasus Republics, with Moldova, Ukraine and Mongolia. These agreements reflect on the one hand Russian foreign policy priorities, which put importance on cooperation and linkages with, but also on domination and control of the "Near Neighbourhood". On the other hand they reveal still existing ties of scientists, which have shared the same education and which have collaborated for years still within the Soviet Union and in its post Soviet period. As a matter of fact a lot of scientists in Former Soviet Union countries have received higher education in Russian cities; several, including some of the best scientists have stayed at least for a short period in Moscow or St. Petersburg and have established long lasting contacts. In addition, this cooperation is facilitated by the use of the Russian language in the region, which is, although declining, still widely spoken in the region and which serves the function of "lingua franca".

A third focus is on cooperation with major S&T players worldwide, which are Japan and the USA and with the emerging S&T players Argentina, Brazil, China, Egypt, India, Malaysia, Mexico, South Africa and South Korea.

The final group of countries with cooperation agreements includes two particular cases of international politics, Iran and North Korea, with which Russia has established special ties. The cooperation in the atomic energy field with Iran should be emphasized in this context, which gives cause for political tensions with the USA and other international players.

International research funding activities of the Russian Foundation for Basic Research jointly with foreign R&D funding bodies confirm this picture of cooperation priorities. The RFBR has established joint calls for research projects or seminars with funding bodies of several European countries, of countries of the Former Soviet Union, the USA, Japan, China and India.

Russian policies regarding internationalisation of R&D are defined in a variety of policy documents. The "concept of state policy of the Russian Federation in international S&T cooperation" was approved in 2000. It emphasizes the intensification of cooperation with the EU in the framework of European S&T programmes. Another priority is cooperation with leading

[27] Kommersant', Anatoly Chubais komandirovan v mikromir, 23.09.2008

[28] Information according to the Ministry of Education and Science of the Russian Federation at www.mon.gov.ru, accessed on 09.09.2008

[29] The countries listed at the Russian Ministry's website are: Austria, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Italy, Netherlands, Poland, Romania, Slovakia, Slovenia, Spain, and United Kingdom.

countries in S&T, especially USA, Germany, Japan, France, UK, in order to acquire new knowledge for domestic research and to acquire foreign experience for the reform of the Russian S&T sector. Exchange of S&T information and data, joint basic research and development, S&T collaboration in the frame of contracts and grants, technical assistance are identified as main forms of cooperation in this document.

A more recent document dating from 2006 is the "Strategy for the development of science and innovation in the Russian Federation for the period up to 2015".[30] The strategy includes a short chapter on positioning of the Russian research sector in a global context. Here again cooperation with other Former Soviet Union countries and the EU is stressed. Concerning the EU, Russia is emphasizing first the implementation of the common space of research and education, which shall include harmonisation of legal regulations. And second, it mentions new (more advantageous for Russia) forms of cooperation within FP7. Both postulates have been followed up and implemented to a certain extent: advancement on the common space has been achieved and new forms of cooperation have been introduced with coordinated calls EU-Russia within FP7.

Overall the focus on cooperation with the EU is obvious and is confirmed in the recent Commission Communication on international S&T cooperation, as Russia "has made it clear that it sees the EU as its long-term priority in S&T cooperation".[31]

5. S&T cooperation with Russia

S&T cooperation between Russia on one side and EU Member States, Associated Countries to the FP and the EU level on the other side have a long standing tradition and showcase a positive example of collaborative efforts between the two regions. Instruments for supporting this cooperation have been established and have helped enhancing the scientific networks. When looking at the cooperation between the EU and so-called "Third Countries",[32] it can be observed that Russia is one of the countries, with the highest cooperation in S&T with the EU and Associated Countries to the FP.

The importance of the regions for each other is in general very high and embraces a wealth of contacts and exchanges, which is proven by several indicators. Regarding trade, Russia is the third most important trading partner of the EU after the USA and China, and is responsible for around 9% of EU trade (imports and exports, data of 2007). Russia has a positive trading balance towards the EU, which is due to primary goods exports and on dependence of several EU member states on Russian energy supplies respectively. The EU is by far Russia's most important trading partner both in imports and exports, being responsible for more than 50% of Russia's trade. When adding to the EU value also Russia's trade with the Associated Countries, then this percentage increases even to 60%. Russia's second most important trading partner is China with a mere 8% of trade.[33]

In Higher Education, Russia is participating in the Bologna process and adapting its educational system to European rules. This is an important and far reaching decision by the Russian government, which will certainly facilitate further exchanges and cooperation in S&T and which confirms the priority which Russia has laid on cooperation with Europe. In October 2007 a new law has entered into force introducing the two cycle system with bachelor and master degrees, but not yet concerning the PhD level. Over a transition period of two years until September 2009, universities have to introduce the two cycle system. Russia has made until now most progress in adapting to Bologna principles "in adopting comparable higher education degrees, introducing a

30 Document is accessible at the website of the Russian Ministry for Education and Research at www.mon.gov.ru

31 Communication from the Commission to the Council and the European Parliament, A Strategic Framework for International Science and Technology Cooperation, COM(2008) 588 final, Brussels, 24.09.2008, 7.

32 "Third Country" meaning here countries, which are neither members of the EU nor associated to the FP7.

33 European Commission, DG Trade, Russia, 28 July 2008.

credit system and in cooperating in the provisions of learning quality".[34] European programmes for stimulating cooperation in higher education and for assisting the alignment with Bologna principles are in place with TEMPUS and the ERASMUS MUNDUS external cooperation window.

5.1. Cooperation with Russia at EU level

The wish to closer cooperation in S&T between the EU and Russia has been formalised in a Science and Technology agreement, which was concluded in 1999 and renewed in 2003 for a five year period. The agreement underpins legally the participation of Russian scientists in the FP and the cooperation in the frame of INTAS. It provides for a coordination forum, the Joint EC-Russia S&T Cooperation Committee. The agreement needs to be prolonged in February 2009. Since 2001 S&T agreements are also in place for EURATOM covering fission as well as fusion.

A more operational framework for intensifying cooperation had been agreed in 2003 between the EU and Russia with the project of four common spaces:

- a common economic space,
- a common space of freedom, security and justice,
- a common space of external security,
- and finally a common space of research and education, including cultural aspects.

For the implementation of the spaces, roadmaps had been agreed in 2005 and the foreseen measures are currently being implemented. In the case of research, measures include among others establishing a Permanent Partnership Council (PPC),[35] identification of thematic priorities for cooperation, facilitating the participation of Russian teams in the FP, furthering the mobility of researchers.

The whole set of formalised S&T cooperation (S&T agreement and common spaces) shall be taken up in a new framework agreement on cooperation between the EU and Russia. Negotiations on this agreement have been launched in June 2008 at the last EU-Russia summit in Khanty-Mansiysk.[36]

At the EU-level research support instruments are in place for stimulating the cooperation between scientists from Russia, the EU and Associated Countries.

5.1.1. EU Framework Programme for Research and Technological Development

Looking first at the cooperation in the EU Framework Programme for Research and Technological Development, we can observe that Russia has consistently the highest participation of all "Third Countries" in past FP's and the current FP7 (see Table 3 below for FP6 comparison). In FP6 in the period 2002-2006, Russian teams have been involved in 312 projects funded in the different programmes of FP6 (including Euratom). In these projects 470 Russian teams participated and received an EC contribution of around € 50 Mio. 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): [37]

- Sustainable development, global change and ecosystems;

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34 European Commission, EU-Russia Common Spaces Progress Report 2007, 37.

35 The PPC held the first meeting in May 2008 in Ljubljana, with the participation of EC Commissioner for Research, Janez Potocnik, and Russian Minister of Education and Science, Andrei Fursenko.

36 Council of the European Union, 11214/08, Joint Statement of the EU-Russia summit on the launch of negotiations for a new EU-Russia agreement, Khanty-Mansyisk, 27 June 2008.

37 European Commission, FP6 Data, 2008.

- Nanotechnologies and nanosciences;
- Information society technologies (IST).

Table 3: Comparison of BRIC participation in FP6, 2002-06

	FP6 Participations	Success Rate	M € Received
RUSSIA	470	20%	50
CHINA	392	20%	35
BRAZIL	159	19%	14
INDIA	139	18%	10

Source: European Commission, FP 6 Data, 2008

In FP7 the pattern is up to now (data of spring 2008) similar and Russia is still the strongest third country performer.

Coordinated EC-Russia calls within FP7: A renewed self-perception as important international actor and financial strength of Russia, but of course also the interest in intensifying cooperation is reflected in coordinated calls between the EC and Russia in thematic priorities of the Specific Programme "Cooperation" of FP7. In these calls, the EC and Russia jointly define specific topics in the frame of a standard call of the cooperation programme. The Russian participants in selected projects will then be funded by the Russian Federal Agency for Science and Innovation (FASI). Such coordinated calls and topics have been agreed until now in the following areas: Food, Agriculture and Biotechnology, Energy, Health, Nanotechnology and New Materials. Discussions on coordinated calls are ongoing for aeronautics, nuclear fission and space research. The specific topics of the call are agreed among Russian and EU experts in joint Working Groups, involving representatives of the Commission, FASI and Russian ministries. In some cases workshops have been organised with participation of scientists from Russia and the EU/AC, which served the definition of call topics. Working Groups are currently in place for the FP specific programmes Nanotechnologies, Health, Food/Agriculture/Biotechnologies, Sustainable Energy, Aeronautics, Space, Nuclear Energy Fission Research, Environment, Mobility.

Good practice example: the Call FP7-ENERGY-2008-RUSSIA[38]

This call was launched on 30 November 2007, with a closure date on 26 February 2008. The call included two topics coordinated between the EU and Russia, selected by DG Research and the Russian Federal Agency for Science and Innovations (FASI).

Topic ENERGY.2008.2.2.1: Enhancing strategic international cooperation with Russia in the field of power generation from biomass

Topic ENERGY.2008.7.2.3: Innovative operational and monitoring tools for large power systems

In this call collaborative projects were funded with a „balanced" - meaning more or less equal - partnership of Russian teams and teams from the EU and/or Associated Countries (AC). The minimum requirement was three teams for the EU/AC side and two teams from Russia. The call budget was € 4 million for the EU/AC partners and an equal amount of € 4 million was made available by FASI for the Russian partners, bringing the overall call budget up to € 8 million.

The call procedure was implemented twice and in parallel by the Commission and FASI; the project had to be submitted to the Commission, and by the Russian participants in Russian to FASI. Evaluation was performed once according to FP7 rules and the Russian proposal according

[38] European Commission C(2007)5765 of 29 November 2007, Work Programme 2008, Cooperation, Theme 5, Energy and the presentation of Gilles Lequeux, International Cooperation, FP7 Energy Theme, Energy EU-Russia call, Energy Info day FP7-ENERGY-2008-RUSSIA, 19 December 2007.

to FASI rules, but both times using European as well as Russian evaluators. A provision was made for allowing a small amount of the EU budget to be used also for the Russian partners; a maximum of 5% of the budget of the EU/AC partners could be calculated for the Russian partners and could be used for travel or coordination costs. This takes account of Russian funding rules, which make funding of foreign travel difficult.

As foreseen in the programming of this call, in each topic one project was selected for funding as a result of the competition. This is certainly not enormous, but the positive effects should be highlighted: a flexible mode for stimulating research in specific topics of joint interest could be found. Furthermore such coordinated calls are taking place over a range of thematic areas of the cooperation programme of FP7. The overall call budget is being increased, as the Russian participants are funded by own Russian sources. It would of course be recommendable to reduce the administrative procedures to one joint call with one joint evaluation and contracting procedure, and to reduce herewith the administrative burden for the scientists involved.

Networking and strategic projects have been funded within FP6 and FP7, to clarify the priorities of scientific cooperation between the EU and Russia, to provide a platform for regular dialogue and to prepare and implement a multinational call for R&D funding instruments in the frame of a regional ERA.NET project. The following projects can be mentioned as examples: Scope-East, INCO-Net EECA, BILAT-RUS, ERA.Net RUS.

Good practice example SCOPE-EAST:

SCOPE-EAST stands for „Scenarios for a Co-ordinated approach to sustainable S&T co-operation with the Eastern Neighbours of the EU. The objectives of SCOPE-EAST are as follows:

- to take sustainable steps in view of an enhanced coordination of the R&D cooperation of interested EU-Member States and Associated States to the FP with Russia and Ukraine
- to achieve optimum coherence between national cooperation strategies and the EU R&D cooperation strategy and of how cooperation in R&D can contribute to other policies of the EU such as the European Neighbourhood policy.

Pre-condition for the achievement of these goals is an adequate knowledge base on the current status of R&D cooperation as well as future strategic approaches. This is a major element of SCOPE-EAST.

To achieve these goals, analysis was carried out on the status of R&D cooperation and future strategic approaches. Analysis consisted of the following components:

- personal interviews with representatives of ministries and key organisations in charge of S/T cooperation in selected EU-Member States (MS), States associated to the RTD Framework Programme of the EU (Associated States - AS) and in Russia and Ukraine
- bibliometric analysis of research potential in Russia and Ukraine
- quantitative and qualitative analysis of Russian and Ukrainian participation in FP 6 including cooperation links to EU-25 within FP 6, INTAS, ISTC, STCU

These analyses were in particular designed to identify strategic research areas of mutual interest with potential for future cooperation and enhanced coordination between the Member States/Associated States and Russia and Ukraine.

Association to FP7: In spring 2008 Russia has officially declared its interest in becoming associated to FP7.[39] This would of course mean a significant new quality and intensity of cooperation. Russian association would be an important political signal for enhanced cooperation

[39] European Commission, Eastern Europe and Central Asia Meeting doc. 137/08, Joint Statement of EU-Russia Permanent Partnership Council on Research, Ljubljana, 27.05.2008.

in general between the EU and Russia and a positive stimulus and showcase for the development of relations in other policy fields beyond S&T.

According to the recent Communication from the Commission on international S&T cooperation, association "would contribute to the implementation of the EU-Russia Common Space of Research and Education, including Cultural Aspects";[40] de facto it would be the major step towards realisation of this Common Space.

Countries included in the EU's neighbourhood policy have been given the perspective and opportunity for association to the FP.[41] When the neighbourhood policy was introduced, Russia had insisted that being a special partner of international weight, it should not be treated similarly to a whole group of neighbouring countries, some of which it regards as its area of influence. The EU accommodated the Russian concerns and proposed the privileged arrangement of the Common Spaces. In this sense of a privileged partnership, the Russian request for association has politically at least the same legitimacy as do have possible association requests of countries included in the neighbourhood policy.

The effects of a possible association must though be evaluated thoroughly, in terms of financial effects, in terms of effects for participation of Russian teams in the FP and gains of such enhanced cooperation, in terms of Russian participation and influence in EU committees/comitology, in terms of the possibility for Russian colleagues to collaborate as National Experts directly in EU structures, in terms of effects on other possible third country associations, and last but not least in terms of effects on political cooperation. A careful evaluation is necessary to prepare the EU for associating a country to FP7 that is far bigger than any of the EU Member States or Associated Countries. It should help avoid raising too high expectations on the Russian side and prevent disappointment herewith. Association will mean important new opportunities for Russian scientists and further integration in European scientific networks, but it will also mean a significant financial contribution by Russia to the FP7 budget.

Association will be discussed in the context of the new EU-Russia Agreement, for which negotiations have been launched in June 2008, but which have been perturbed by the Georgian-Russian crisis of this summer.

5.1.2. INTAS

INTAS, the International Association for the promotion of cooperation with scientists of the New Independent States of the Former Soviet Union was created in 1993, as a specific instrument for the support of scientific cooperation between EU member states, Associated Countries to the FP and the states of the Former Soviet Union.[42] It was in the early 1990ies a European reaction to the serious situation of the S&T sector in the countries of the Former Soviet Union and was initiated by leading European scientists, such as the physicist and nobel laureate Carlo Rubbia, who had been working with Russian colleagues. INTAS is an international association according to Belgian law, which is based in Brussels and which involves as its members the EU Member States and Associated Countries. INTAS is currently being winded up and did not launch any new research funding activities after 2006.

The INTAS approach was to integrate scientists of the Former Soviet Union into existing European scientific networks, by providing grants of on average € 150,000 for research projects. Grants were herewith on a significantly smaller scale than compared to the FP. But the effect in the countries of the Former Soviet Union was quite significant. Due to exchange rates and price differences, the invested budget provided important contributions to salary and other costs of

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40 Communication from the Commission to the Council and the European Parliament, A Strategic Framework for International Science and Technology Cooperation, Brussels, COM(2008) 588 final, Brussels, 24.09.2008, 7.

41 Communication from the Commission, 2008, 6-7.

42 The region is today referred to as Eastern Europe and Central Asia (EECA).

entire research teams. An INTAS funded project usually involved at least four research teams, two from INTAS members and two from the Former Soviet Union. Grants were given for a two to three year project period. INTAS supported foremost scientists from Russia, which is due to the size of the country and its more important scientific potential. Thematically it had no limitation and followed with a thematically "open call" tool a bottom-up approach. It was in this sense complementary to the Framework Programme, which puts emphasis on thematic focus and larger scale grants.

INTAS traditionally experienced oversubscription, especially of its "open calls" with usual success rates of around 10% of submitted proposals which could be funded. Although low success rates are problematic, it does prove the interest in the joint cooperation and the existence of well working scientific networks. The more as the European partners normally did not receive more than 25% of the modest project budget, which limited interest.

In the course of its operation, INTAS diversified its funding tools and provided small scale grants for young scientists from countries of the Former Soviet Union. Grants amounted to € 15,000-20,000 for a two year period. Young scientists were supported mainly to perform research in their home country, but they were requested to have in the frame of this grant a research stay in one of the INTAS member states for at least one month per year. This tool kept with relatively modest investment in single grants, young scientists in science in their home country, but allowed in parallel to develop networks with European researchers. The tool allowed annually more than 100 Russian young scientists to come for research stays to European institutions. Other funding tools were grants for summer schools and innovation grants for exploitation of research results and cooperation with companies.

INTAS jointly funded thematically focussed calls with organisations such as CERN, Airbus, CNES (the French space agency), which were especially interested in R&D cooperation with Russia and the other states of the Former Soviet Union. Jointly funded activities were launched also with Russian institutions, with RFBR, FASIE and the Siberian Branch of the Russian Academy of Sciences (SB-RAS). INTAS received the major part of its budget out of the FP's International Cooperation (INCO) sub-programme; its annual budget was approximately € 20 million, whereby between 60-70% of INTAS funding was flowing to Russia.

Over the period of FP6 from 2002-06, INTAS has funded 420 research projects, involving more than 800 teams from Russia.[43] INTAS was in this sense very successful as it provided a strong networking effect, reaching out to broad groups of scientists not only in the major cities Moscow and St. Petersburg, but also to top scientific centres in the regions such as Novosibirsk, Kazan, and Tomsk. Quantitatively, in number of projects and research teams involved, INTAS did support significantly more projects than the FP or ISTC. Project output measured in terms of joint publications and patents did confirm the true collaborative efforts undertaken in projects between the European scientists and their colleagues from the Former Soviet Union. Excellence was proven by publications in top scientific journals.

Thematically INTAS funded projects in all different scientific fields, but in order of importance the top three global fields were:

- physics,
- life sciences,
- and chemistry.

During FP6, Russia has received as a result of INTAS calls an amount of € 50 million of R&D support from the EU, in addition to support via the FP. INTAS is well renowned in Russia for its broader outreach to scientific disciplines and for providing support to science during difficult times.

[43] INTAS, A bridge to partnership in research, Activities over the FP6 Period 2002-06, Brussels, 2007, 4 and 30.

5.1.3. ISTC

Non-proliferation through support for Russian weapons scientists is the key word for activities of the International Science and Technology Centre (ISTC) in Moscow. It was established in 1992 by the USA, Japan, the Russian Federation and the EU as an international organisation aiming at conversion of military to civilian research and, as a result, prevention of proliferation of nuclear and bio-weapons of mass destruction. The governing parties of the ISTC include besides the founding countries also Belarus and Canada, Norway and South Korea.

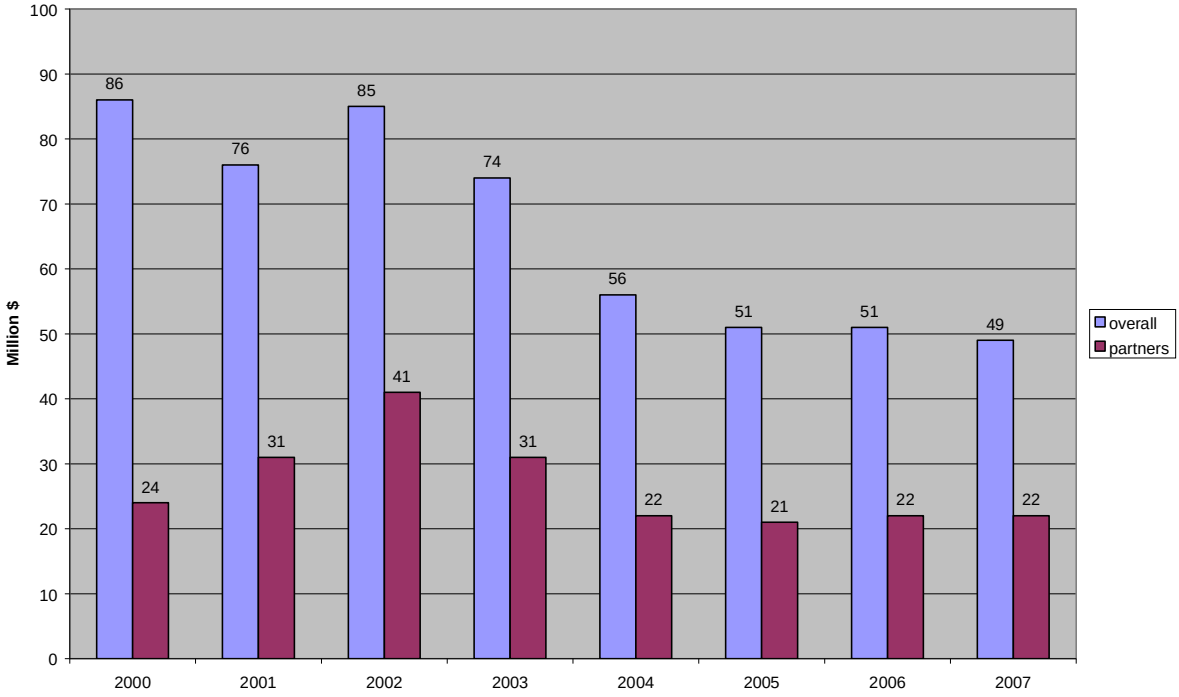
The ISTC supports civilian R&D projects primarily in Russia, but also in the following other countries of the Former Soviet Union: Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, and Tajikistan. The approach is to integrate military scientists with civilian teams and to facilitate herewith the reorientation of military to civilian research. Projects funded by the ISTC have therefore to involve usually at least 50% of scientists having previously worked on weapons. Support is given for the scientific teams in the countries of the Former Soviet Union. Collaborators and partners from the Western ISTC parties have usually been involved at the fringes of the project and have provided in first line guidance for the scientific and managerial progress of the project. This pattern has changed over the past years and more significant cooperation between the involved scientific teams and Western collaborators and partners has developed. A trend towards true collaborative projects can be observed, especially in the sector of nuclear security.

The ISTC budget is financed from two major sources, either from Western parties to the ISTC or from so-called partners, which may be governmental agencies or companies. Funding from both sources has decreased substantially from peaks in 2002. Especially the USA and Japan have reduced funding contributions. The EU is now following the example of the other parties and has slashed its budget for the ISTC for the coming year to a quarter of previous funding levels. Whereas the ISTC received from the EU until 2007 a more or less stable amount of around € 20 million, this amount has been nearly halved for 2008 and will be cut again to a mere € 5 million for the year 2009. The reasoning behind this reduction is availability of financial resources on the Russian side and a redirection of priorities to threat prevention such as prevention of proliferation of illegal materials.

The EU budget for the ISTC is allocated by the European Commission (DG Relex) (via the Instrument for Stability), but managed by the Directorate General for Research of the European Commission.

Reductions in the ISTC budget are reflected in investments into new projects. This has declined from peaks in 2002 and stood in the year 2007 at a level of around US $ 50 Mio per year. Approximately 50% of this amount was covered by funding from the EU; the other major part of funding of approximately 40% was provided by the USA. Taking into account the depreciation of the US $ towards the Rouble, de-facto investment in Russian science via the ISTC has significantly declined. Russia is absorbing approximately three quarters of ISTC project funding.

Chart 2: ISTC – new project funding/year in million US $



Source: Compiled according to annual reports of the ISTC, accessible at www.istc.ru

Partners in the ISTC context are mostly governmental agencies from the US or other Western ISTC parties, but also companies. The fact that this partner funding does constitute a substantial part of the ISTC budget, proves the interest in collaboration with Russian scientists in general and the need for an appropriate vehicle for operating this cooperation.

The situation for the ISTC has changed over the period of its existence. Non-proliferation is still a legitimate worry, but which has through the stabilisation in Russia lost some of its pressing importance. More funds for research, and also for military research are nowadays again available in Russia, but much work remains to be done to also upgrade the research institutes. Russia is interested in the ISTC for supporting conversion to civilian research for parts of weapons scientists. Problematic for Russia is conversion of large closed scientific cities dedicated to weapons research, such as Sarov, which are among the most important clients of the ISTC. Lay-offs of staff in these closed cities are expected in 2009, which will pose new challenges.

The ISTC has value for developing international contacts for Russian teams, but a stronger focus on cooperative research and a shift to a co-funding gets more important. Russia does provide already some co-funding of ISTC projects, via tax exemptions for ISTC grants (which is particularly attractive for partners) and by funding the overheads of institutes participating in ISTC projects. Discussions are ongoing on possible additional co-funding by Russia for ISTC projects, something that has been implemented to some extent already in Belarus.

The ISTC supports research in a broad range of scientific disciplines. Most projects are funded in biotechnology and life sciences, physics, nuclear fission and environment.

5.1.4. Other instruments and areas of cooperation

Russian scientists and teams participate in projects of the European initiatives **COST and EUREKA**. COST is designed to facilitate and support with moderate financial support the networking of scientists of its member countries, but allows also participation of non-member countries. It is conceived as thematically open and supports actions in a broad range of scientific

topics. Among the group of non-members, Russia is in parallel to the FP again the country with the highest participation of scientists in COST actions.[44]

EUREKA is targeting market-oriented and industrial R&D. It is thematically open and bottom-up, allowing proposers to the programme to come up with ideas from a broad spectre of scientific disciplines. It does provide the EUREKA label, but is based on national funding. Russia is member of EUREKA since 1993; participation of Russian organisations in comparison to the duration of its involvement is rather low.[45] This confirms the limited innovative capacities available in the country and lack of appropriate innovative companies. Russia is not yet member of EUROSTARS, which is EUREKAs new funding tool, programmed jointly with the EC and funded out of national resources and the FP. EUROSTARS distributes financial resources to proposers to the programme. Similar to EUREKA itself this funding programme is targeting close to market research and market implementation of innovations involving SMEs.

Substantial cooperation with Russia has been developed over the past years in the field of **space and space research**. In the frame of the "EU-Russia Dialogue on Space Cooperation" the Russian space agency (Roskosmos) regularly meets with representatives of the European Commission and of the European Space Agency (ESA). This allows coordinating ongoing joint projects and preparation of new initiatives, including a range of research projects. The Russian side can provide here its know-how and technology for earth observation, satellite navigation, launcher technologies and basic and applied space research. Russian technology and instruments are integrated in European space missions. Currently the Russian Soyuz launcher technology is transferred and adapted for use as European launcher system at the European Space Centre in Guyana.

In the **nuclear field** is Russia participating in projects funded under the Euratom Framework Programme. In the ITER project it has supported the European quest for bringing the reactor project to Europe and contributes substantial financial resources to the project. Long standing successful research cooperation is ongoing among European and Russian scientists at CERN. Jointly funded calls INTAS-CERN have helped stimulating joint research and facilitated research stays of Russian colleagues at CERN.

5.2. Cooperation with Russia at bilateral level

This chapter goes into details of S&T cooperation of EU Member States and Associated Countries to the Framework Programme with Russia. It sheds light on the strategies and challenges of cooperation at this bilateral level. Science cooperation with Western Europe was ongoing already during the period of the Soviet Union. Russian scientists cooperated internationally mainly within the former Eastern Block, with colleagues in the communist satellite countries. But scientific contacts with Western Europe, USA, and other countries did take place already during the Soviet period. Formal S&T agreements between Western European countries and Russia date back to the eighties of last century and were at that time concluded still with the Soviet Union.

The bilateral cooperation with Russia will be analysed over a number of dimensions, covering strategic aspects, instruments of cooperation, scientific priorities in the cooperation, challenges and good practice. The chapter is based on results of a questionnaire regarding policies and experiences of S&T cooperation with Russia, which has been filled in by a majority of EU Member States and Associated Countries to the FP in spring and summer 2008. [46] Overall 23

[44] Russia has 44 institutions participating in COST actions and advances by far the second best non-COST-member, which is the USA with 27 participations. COST website www.cost.esf.org accessed on 17/10/2008.

[45] Russian organisations have been involved in 57 finished projects at EUREKA. EUREKA website www.eureka.be accessed on 17/10/2008.

[46] The questionnaires to Member States and Associated Countries on their cooperation with Russia have been analysed by Dr. Ales Gnamus, Institute for Prospective Technological Studies of the Joint Research Center, which did provide valuable input to this chapter.

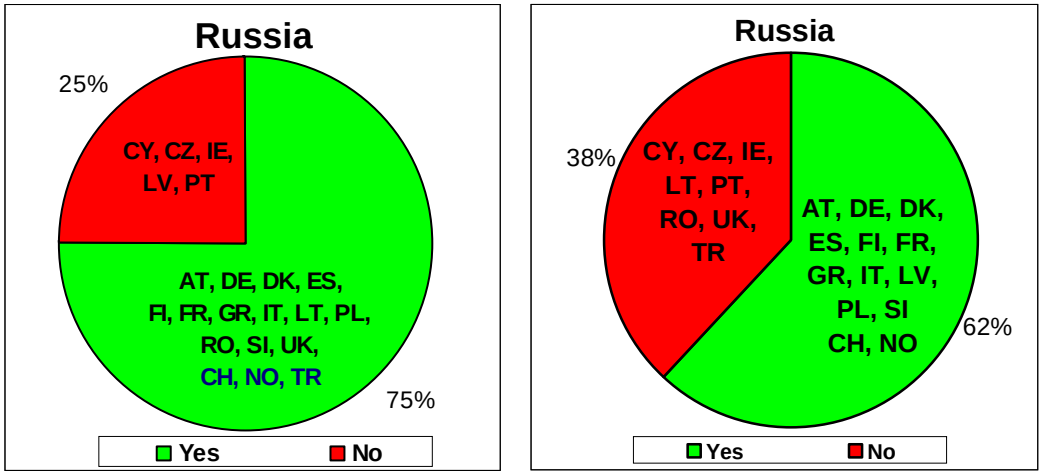
countries have provided information on their cooperation with Russia out of a potential number of currently 37 Member States and Associated Countries. The survey has been submitted only to 32 countries, as several newly Associated Countries have not yet participated in the CREST Working Group.

5.2.1. Strategies

The starting point is here that more than 50% of Member States and Associated Countries responding to the survey have a general strategy towards Russia over a broader range of policy fields. Countries with a comprehensive strategy are Czech Republic, France, Germany, Italy, Latvia, Netherlands, Slovenia, Spain, and Switzerland, Turkey, United Kingdom. When it comes to S&T cooperation, the picture becomes more concrete; three quarters of responding countries have taken **strategic initiatives** in S&T cooperation with Russia over the past three years and approximately two thirds are planning such initiatives over the coming five years.

Chart 3: Strategic initiatives to strengthen the bilateral S&T cooperation with Russia:

Over the past 3 years: In the coming 5 years:



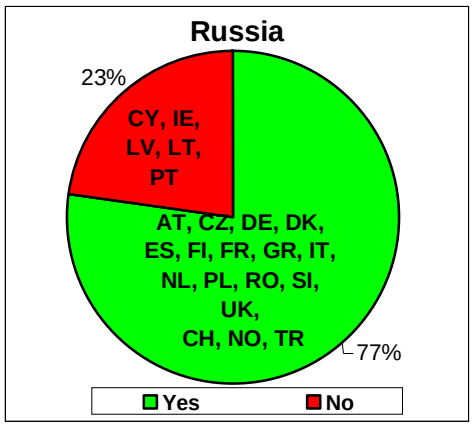
Source: Ales Gnamus, Analysis of Responses to the MS/AC Questionnaire on S&T Cooperation with Brazil, India & Russia, 2008.N=21 for both charts.

Most countries intending to take initiatives in cooperation have taken initiatives in the past. The difference being Lithuania, Romania, United Kingdom and Turkey having taken initiatives in the past years, but not planning new ones in the years to come. The only country having switched from less to more active is Latvia, which plans to undertake new initiatives in the coming years. The stability in countries having taken initiatives and planning new ones points to a fruitful cooperation, as obviously positive experience leads to further stimulation of the S&T cooperation. Initiatives in this context range from joint working groups and dialogue on S&T, joint funding programmes, use of infrastructure and scientific workshops, to enhancing cooperation in the frame of EU funded projects.

S&T agreements: a large majority of countries has underpinned the cooperation with Russia with a formalised S&T cooperation agreement. Roughly three quarters of countries responding to the questionnaire, which are 17 countries, have agreements in place.[47] Most of these countries have concluded the agreements already in the 1990ies. France and Germany have the longest tradition of an agreement with Russia; its agreements date back to 1966 for France and 1986 for Germany and were concluded at that time with the Soviet Union.

[47] The Swiss agreement has already been counted as active, although it was still under preparation at the time of the survey in spring 2008.

Chart 4: Cooperation agreements with Russia:

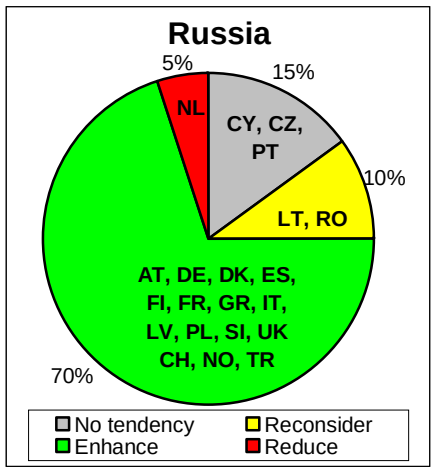


Source: Ales Gnamus, 2008. N=22

According to the Russian ministry for education and science, S&T agreements have been concluded with 20 member states or associated countries out of a total of 37. The difference to the CREST Working Group survey is due to the fact that not all countries have answered the questionnaire, and that not all recently associated countries are represented in the WG.[48]

Future strategies: an important question concerns the future strategies of S&T cooperation with Russia. 70% of responding countries are willing to enhance the cooperation with Russia, Lithuania and Romania reconsider cooperation and only the Netherlands tend to reduce cooperation.

Chart 5: Future tendency regarding S&T cooperation with Russia:



Source: Ales Gnamus, 2008. N=21

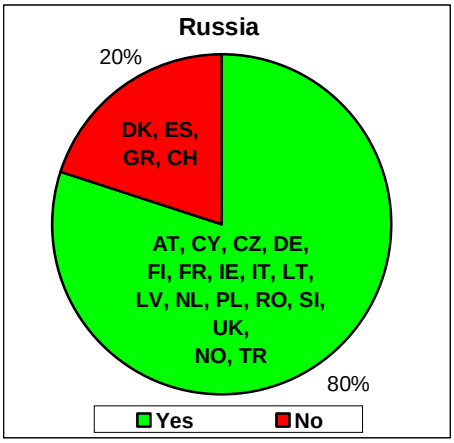
Evaluation: Another strategic survey issue concerned evaluations of S&T cooperation programmes with Russia. Only few countries, such as the Netherlands, Norway, and Slovenia have reported to have performed evaluations of their programmes until now. In the Dutch case it revealed a generally positive experience of scientists, whereby cooperation in basic oriented research in the sciences was highlighted as particularly successful. Other countries such as Austria and Germany perform a regular monitoring of programmes through their organisations managing the programmes or have established inventories and recommendations on cooperation and its instruments towards Russia.

[48] See chapter 4 Russia's Internationalisation strategy for the countries listed with the Russian ministry as having S&T agreements.

A more systematic programme evaluation would provide valuable input for all Member States and Associated Countries for developing and coordinating their S&T cooperation with Russia. Analysis of programmes helps reveal successes, challenges and results of these programmes and gives strategic guidance for improving and for ways forward of cooperation with Russia.

Enhanced coordination: The final strategy related survey question tested the support among Member States and Associated Countries for exploring options regarding enhanced coordination and regarding joint approaches or actions towards Russia. 75% of responding countries do support this idea, which is an indicator for the necessity of coordination and for the willingness to join forces on EU level. But it is also an indicator for the need of a "variable geometry" approach, where only a group of willing countries moves forward in developing a coordinated and/or joint approach. This result is confirmed by the different regional ERA.Net projects, targeting for example the Western Balkan Countries or Russia, where only an interested group of countries joins forces to develop new mechanisms of collaboration with the targeted region.

Chart 6: Explore options for enhanced coordination and joint approaches/actions for S&T cooperation with Russia



Source: Ales Gnamus, 2008. N=21

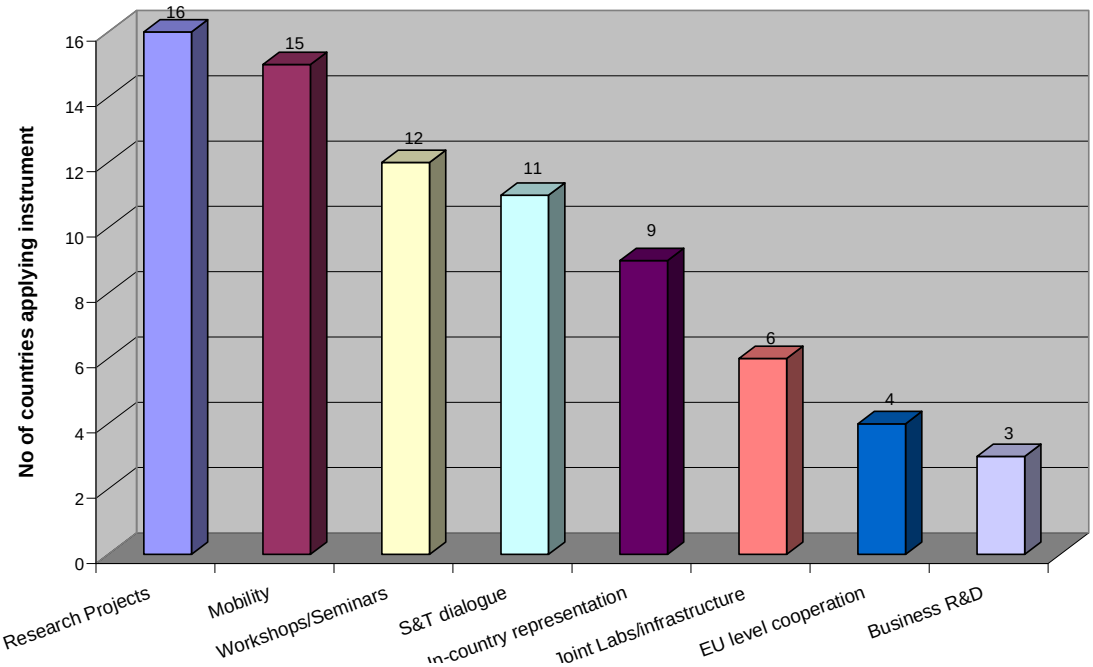
5.2.2. Instruments

Member States and Associated Countries use a variety of instruments to provide platforms and for stimulating the S&T cooperation with Russia. In the following, these instruments have been charted according to the frequency of country responses. Each mentioned instrument represents a broader category into which the distinct forms of cooperation of each country have been grouped.

The chart shows that funding of joint research projects and measures for stimulating mobility are the most common instruments used by Member States and Associated Countries in its S&T cooperation with Russia; sixteen and fifteen out of twenty one responding countries explicitly mentioned the use of these instruments. With "research projects", it should here be understood that this instrument ranges from support of few bilateral research projects to entire joint funding programmes for research projects. Mobility support includes measures such as fellowships, grants for visits, and joint mobility support programmes.

Twelve countries mentioned the support of scientific seminars, workshops for matchmaking, and scientific and informational conferences as an instrument for stimulating the S&T cooperation. Eleven countries use joint committees or other forums for dialogue, exchanges of views and development of bilateral cooperation instruments. S&T dialogue is targeting the policy level and involves therefore mainly S&T policy makers, ranging from officials to representatives of scientific organisations.

Chart 7: Instruments for bilateral S&T cooperation with Russia:



Nine responding countries have either placed an S&T attaché at their embassy in Russia, or have representations of research organisations or research funding bodies in Russia. Countries with long standing and comprehensive cooperation have established joint laboratories, joint institutes or share infrastructure with Russia; these six countries are France, Germany, Italy, Netherlands, Norway, and Switzerland.

Four responding countries try explicitly to enhance bilateral cooperation via the EU level. Mentioning of cooperation via the EU-level explicitly as an instrument reflects the fact that several responding countries are actively involved in EU funded projects for enhancing cooperation with Russia, such as BILAT-RUS and the upcoming ERA.Net RUS (due to start in February 2009).

The last instrument, business R&D, includes cooperation in applied research and R&D involving businesses. It is highlighted only by three responding countries. This reveals again the Russian weakness in application oriented research versus its strengths in basic oriented research.

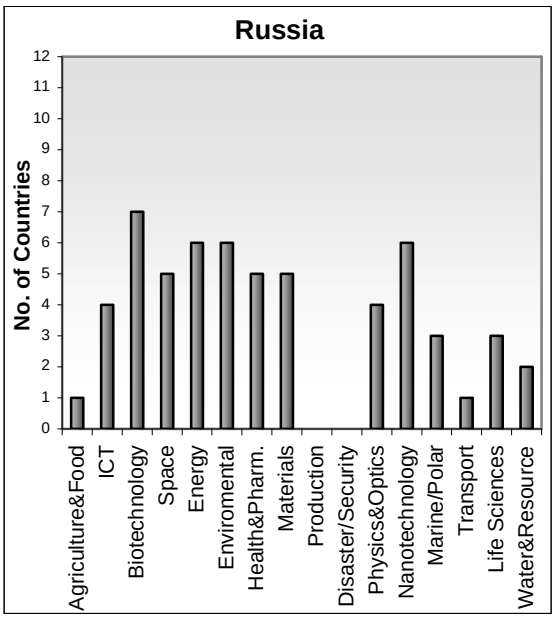
It should be mentioned that although some countries do not have formal instruments available, they have de-facto a lot of cooperation ongoing on informal level. This is the case for example in the Baltic countries, where scientists still have well established links with their colleagues in Russia and where joint projects, mobility and workshops are supported on institutional level.[49] The non-existence of formal agreements is to some extent a sign of the sometimes prickly political relationship between Baltic countries and Russia, which hinders the formalisation of cooperation at an official level.

[49] Estonia reported in this context that co-publication of its scientists with Russian colleagues is similar in size to co-publication with German or French colleagues.

5.2.3. Thematic Priorities

Member States and Associated Countries were also asked about thematic priorities in S&T cooperation with Russia. There are several scientific topics, mentioned rather evenly by the responding countries. The front runner is biotechnology, but narrowly followed by energy, environment and nanotechnologies, all mentioned six times by respondents. Then follow space, materials, as well as health and pharmacology as next important priorities. Thematic priorities at the bilateral level are relevant and supported by funding also at the EU-level. For comparison a more profound analysis of projects supported at bilateral level would be very useful.

Chart 8: Thematic Priorities for bilateral S&T cooperation with Russia:



Source: *Ales Gnamus, 2008. N=22*

5.2.4. Challenges for bilateral cooperation

The survey among Member States and Associated Countries tested the experiences and challenges in bilateral S&T cooperation with Russia. Several countries reported very good scientific results, successful and smoothly running collaboration, and positive feedback from scientists.

But there are a range of challenges to this cooperation too. These challenges concern first administrative problems, such as problems with exchange of scientific material, and cumbersome visa procedures, which render scientific work difficult. A visa facilitation agreement between Russia and the EU has entered into force in June 2007, which includes rules for cost-free visa and an administratively simplified visa application procedure for participants in scientific exchange programmes. But the agreement has obviously not yet come to full fruition and did not yet facilitate the scientific exchange procedures in reality as expected. Administrative problems concern also a rather complex and bureaucratic Russian governmental administration and corruption.

A second pressing issue for responding countries concerns Intellectual Property Rights (IPR). Clear rules for IPR are essential as a stable framework for fruitful S&T cooperation. They secure that parties participating in an R&D project do safeguard their rights on inventions and know-how and may use them in further investigations or for applications in the business sphere.

Not surprisingly a third challenge mentioned by quite a few respondents relates to the innovation aspect in the cooperation, the economic application of jointly funded research, and technology transfer. This aspect is still underdeveloped in Russia and its international S&T cooperation. Accordingly respondents highlighted that it shall be further stimulated in the cooperation. This response is coherent with findings regarding the overall S&T situation in Russia, which let state already above a lack of innovation for Russian R&D efforts and a lack of business R&D.

A fourth point mentioned by respondents reveals problems with the R&D funding system on the Russian side. Funding by the Russian counterpart is not always available or paid to scientists. This challenge should hopefully improve because of Russia's more solid financial state and increased financial inflows into R&D. Differences in legal systems and administrative regulations do hamper cooperation too. This concerns for example the cooperation of funding bodies, where the Russian side has limitations in funding mobility of their scientists or in transferring funds for joint R&D projects abroad.

A fifth frequently mentioned issue is stimulation of cooperation via the EU-level. On the one hand this allows building up of critical mass in terms of scientific scope and financial resources towards the big partner Russia, which is especially important for the smaller countries. An example here is once again the ERA.Net Russia project, bringing a group of ten countries[50] together with the aim of developing a jointly funded call for research projects. On the other hand countries with limited bilateral cooperation aspire to enhance exchanges via joint EU initiatives or collaboration within FP funded research projects.

Finally some responding countries highlighted the challenge of developing the cooperation further to more advanced forms such as joint research institutions, shared infrastructure and joint funding programmes.

5.2.5. Good practice in bilateral cooperation

Germany has the most developed bilateral cooperation with Russia and has consequently entered into a strategic partnership on education, research and innovation. The cooperation between the two countries is broad in scope and in a comparatively mature state, including several support schemes for mobility and research projects, and on a more important scale, joint laboratories and shared infrastructure. Russia has committed itself to substantial co-funding of more than 400 Mio € as contribution to international R&D infrastructures located in Germany, for instance for the European X-ray laser project XFEL at DESY in Hamburg or the Facility for Antiproton and Ion Research (FAIR) in Darmstadt. German research funding organisations (DFG) or research organisations (Helmholtz and Fraunhofer) have representatives based in Moscow.

But also smaller countries such as Finland or Austria have entered into comprehensive cooperation. Austria has fellowship schemes available, which are open for applications from Russian scientists. They are indeed used and bring a certain number of Russian scientists for research stays to Austria. Fellowships are available also in the opposite direction, but more modestly used by Austrian scientists. Short term mobility is supported via a scientific-technical agreement on governmental level. This scheme is implemented jointly by the Austrian Exchange Service and the RFBR. In 2008 the Austrian Science Fund and the RFBR have launched its first thematically open joint call for research projects. This development has been strategically important for Austria, as it helps offset the breaking away of INTAS as a support tool. Austria had traditionally used INTAS for promoting its scientific cooperation with Russia and had placed therefore a national expert in the INTAS secretariat.

[50] The ten countries participating in ERA.Net RUS are Austria, Estonia, Finland, France, Germany, Greece, Hungary, Norway, Russia, and Turkey.

5.3. Cooperation with major EU competitors

5.3.1. USA

Cooperation between Russia and the USA in the S&T sector is marked by the presence of private or semi-official foundations. The International Science Foundation (ISF) had been established by George Soros in the mid 1990ies and provided substantial support to Russian science, especially in the most difficult years. The ISF had after some few years of operation quickly decreased activities in Russia. But the Open Society Institute (OSI), also set up by George Soros, runs until now some support programmes for science and education, which are open to Russian participation. The OSI representation in Russia was closed in 2003 due to political pressures.

Other private foundations have and are still providing support for the Russian science and education sector and some have still representations in the country. These funds include the MacArthur Foundation, the Ford Foundation, and the Carnegie Corporation. The programmes of these funds focus mainly on in-country support of the higher education sector.

A foundation dedicated to support of research, is the Civilian Research and Development Fund (CRDF), established in 1995. It is providing research grants for cooperative projects of Russian and US scientists, it funds partnering with US companies, and runs non-proliferation and infrastructure related support programmes. It is managing official US funds such as of the Department of State and funds of private foundations. It has also established a Grant Assistance Programme, which channels, against a service fee, R&D related funds of companies and other organisations – mainly from the US – to Russia and other Former Soviet Union countries. The interesting feature is here that these funds are treated as tax free by recipient countries. The annual expenses on CRDF programmes are approximately US $ 20 Mio,[51] whereby an important share of these funds is dedicated to Russia.

An interesting example of a successful support programme is CRDF's Basic Research and Higher Education programme (BRHE), established in 1998. This programme tries to improve the research capacities of selected universities in Russia through funding of new equipment and of salaries, and by providing funds for scientific exchanges, for young scientists, and for new curricula. On the US side the programme is managed by CRDF, but the financial resources are made available by the MacArthur foundation and the Carnegie Corporation. The programme is co-funded since its inception (in financially still difficult times) by the Russian Ministry for Education and Science. The programme supports research groups, which were already and are still at the forefront of Russian science at universities. It certainly helped to attract new talent to these groups and to develop their research capacities and international contacts.[52] It influenced to some extent current Russian reform programmes for the university sector, especially the innovative universities programme, aiming at bridging education and research.

On the level of funding organisations, CRDF and the US National Science Foundation (NSF) have established joint calls for research projects with the Russian Foundation for Basic Research. The calls with NSF are thematically focussed on condensed matter physics and materials. The NSF follows here a more narrow approach by combining a focus on topics of most interest for the USA and excellence in Russia. This is in contrast to several other cooperation partners of RFBR, following a topically broad bottom-up approach.

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[51] Civilian Research and Development Fund (CRDF), Bridging Science and Solution, Annual Report 2006, Arlington, at www.crdf.org

[52] An interesting phenomenon in this respect is that with support of US-Russian funds, international contacts of research groups were developed mainly to European colleagues. Europe profited therefore of this programme as a free rider. This phenomenon was shown in an international evaluation of the BRHE programme: Peter Idenburg, Manfred Spiesberger, Ivan Bortnik, Anne Harrington, Mark Johnson, Klaus Schuch, Integration of Teaching and Scientific Research in Russia, An independent evaluation of the Basic Research and Higher Education Programme, 1998-2007 Evaluation report for CRDF, 2007.

US-Russian cooperation is ongoing on Academy and ministry levels, on the levels of research organisations and in the framework of the ISTC. The US have traditionally provided higher financial shares to the ISTC budget than other parties, but its contributions have been reduced generally and eroded over the past years as a result of the decreasing value of the US $ towards the Rouble. Involvement and extent of the US in the ISTC is under scrutiny, as is overall US policy on non-proliferation in the frame of the "Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism" set up by Congress in last year.

Official US support for Russian S&T is channelled through the ISTC and other foundations such as CRDF to research teams in Russia. The US government funds, which are directly invested by governmental departments for new projects at the ISTC have substantially decreased over the past years and stand currently below US $ 1 Mio; in the year 2000 the US government had provided funding of close to US $ 40 Mio. US funds for the ISTC come currently mostly from public organisations (governmental agencies, research labs, etc.) and to a much lower extent from companies.

In general the US strategy in S&T cooperation with Russia is more oriented towards support programmes for capacity building within the country, while Europe is more oriented towards intensifying contacts and establishing scientific networks via support through research grants. But the USA have attracted more scientists and are more focussed on involving companies for application of research results in the USA. Vehicles for stimulating cooperation with companies are specific programmes in the frame of the ISTC (partner programme) and CRDF (next steps to the market programme).

The US strategy is currently controversially discussed and leading experts request a re-orientation from a support to a cooperation mode with Russia.[53] The argument being that nowadays there is no foreign support requested, but opportunities and funding for cooperation among scientists are necessary. But overall activities of US organisations in support of Russian science and education and of scientific exchanges between the two countries are declining. The US National Science Foundation has recently terminated support for the scientist-exchange programme with Russia of the US National Academy of Sciences; CRDF has fewer funds for Russia and other countries of the Former Soviet Union available, as official US science cooperation strategy is refocusing on Middle East, North Africa and Asia. Consequently CRDF has become active in Iraq, Libya and other new focus countries of US foreign policy. This shrinking interest and decreasing investment in the cooperation with Russia is reinforced by currency fluctuations over the past years, which saw the Rouble appreciate substantially against the US $.

5.3.2. Cooperation with major Asian countries

Japan runs cooperation with Russia through the ISTC and the RFBR. Japan is a founding partner of the ISTC. But engagement patterns are similar to the US; Japanese investment in new projects has steadily declined over the past years. The Japanese Society for the Promotion of Science is running regular joint calls together with the RFBR, which cover the main broad scientific fields (mathematics, physics, chemistry, biology, environment, IT and engineering).

South Korea is a party to the ISTC, but invests in comparison to other ISTC parties, only marginally in Russian S&T via the ISTC. South Korean companies (e.g. LG, Samsung) are active on the Russian market and trying to attract Russian scientists to their research labs in South Korea.

Regarding China, joint calls for research projects and seminars are organised by the RFBR in cooperation with the State Fund for Natural Sciences of China. Topics of these calls are broadly defined (as with Japan); according to response to calls, major research fields are physics, earth

[53] Glenn Schweitzer, Engaging Russian Scientists, Science, VOL 321, 18 July 2008, 317.

sciences and chemistry. Russian-Chinese cooperation via RFBR is substantial in comparison to other international partners of RFBR. Annually on average 90 joint Russian-Chinese research projects are supported and roughly around € 600,000 is invested by RFBR in this cooperation.[54] This is approximately the level in number of projects and funding that RFBR was spending on cooperation with Germany. Scientific links to China have been furthered by the fact that Russia has been traditionally educating Chinese students at its universities. Joint student festivals are organised regularly by the two countries. Important cooperation between Russia and China is ongoing in the space field; China has drawn extensively on Russian expertise with manned space flights in its own space programme.

In the context of China, it is worth mentioning that cooperation reaches out also to Taiwan; joint calls for research projects and symposiums are launched via the RFBR with this country.

With India S&T cooperation has a long tradition and covers a broad range of topics and instruments. An Indo-Soviet Union S&T agreement dates back to 1972 and has been adapted to the Russian Federation in 1994. The main cooperation instrument is an Integrated Long Term Programme (ILTP) on S&T cooperation established in 1987, which includes funding of joint research projects, workshops and seminars, and fellowships. Under this programme 8 joint Indo-Russian R&D Centres have been established and work in the domains powder metallurgy and new materials, biotechnology and biomedical sciences, IT, earthquake research, and gas hydrates. Cooperation is strong also in aerospace and aviation. Various scientific fields are stimulated via joint calls of the Indian Department of Science and the RFBR. A focus on basic research is put in the cooperation programme of the Indian National Science Academy and the Russian Academy of Sciences.

6. Lessons learned

Russian leaders have underlined the priority, which they dedicate to education and research. There is obviously understanding among Russian policy makers of the importance to improve the innovative capacities and to diversify the economy in a period of strong GDP growth. A good basis is given, as Russia disposes of scientific excellence in a broad range of scientific fields, ranging from more basic oriented research in physics, mathematics, chemistry and biology to more applied research in aerospace, biotechnology and health research, ICT, nanotechnologies, materials, nuclear technologies, energy, and environment.[55]

There is commitment and willingness for cooperation in S&T with the obvious partner(s), the EU, its Member States and Associated Countries. The Russian commitment is illustrated through jointly funded calls with the EU and its Member States and Associated Countries, and the interest in association to the FP7. The Russian focus on the EU is also explained by the fact that the USA are obviously reducing its cooperation with Russia. But Russia is also a very important partner for the EU. The EU's and Associated Countries' cooperation in S&T is significantly more advanced with Russia than with other third countries, except the USA.

6.1. Need for a well-coordinated approach

S&T cooperation is a field where the interest for cooperation from the Russian side is huge, expressed in the interest for FP7 association. Europe is the obvious partner for Russia in international S&T cooperation, because of cultural and geographical proximity, because of a long track record of mutually beneficial S&T cooperation on bilateral and EU level, because of an existing network of Russian scientists in EU Member States, and last but not least, because Russia is in need of know-how and support in innovative R&D for diversifying its economy. These

[54] Data for 2005 & 2006 averaged and according to Scope-East, 2007.
[55] Concluding report on areas for enhanced cooperation with Russia and Ukraine, Scope-East, 2007, 13.

comparative advantages of the EU should be kept in mind when advancing cooperation. S&T is a field of strategic importance where cooperation from the EU-side can be offered on exchange for cooperation from Russia in other fields. It could also serve as an exemplary field where successful joint cooperation could show a way forward for cooperation in other policy fields. But it is in any case important to have a well coordinated approach among Member States towards Russia.

A possible association of Russia to the FP7 is certainly a chance for improved cooperation not only in S&T, but generally for politics. It has in this sense to be treated with careful consideration and will need a proper evaluation of gains and risks in advance, what it will mean financially, for improved S&T cooperation, for political cooperation, for possible other third country associations, and for EU structures (committees, National Experts). Participation in the FP is a generous offer from EU side which is needed by Russia. The reality of strong scientific cooperation with a dense network of scientists working in joint projects obliges to find joint solutions.

Only few countries have evaluated their S&T cooperation with Russia. A more systematic approach towards impact evaluations should be followed. Evaluation results would provide valuable input for improving cooperation by giving strategic guidance for future cooperation, by revealing successes, challenges and ways forward. Additionally this would facilitate coordination of policies at EU level and with other MS and AC. Another valuable input to a well coordinated approach is provided by strategic projects funded in FP6 and FP7, such as RUSERA, Scope-East, ERA.Net RUS and the Russian "Window" in the INCO.net EECA. The results of these projects should be well considered in strategic planning.

6.2. Tap the resources

Tap the existing network of Russian scientists in EU member states and associated countries: As is obvious in numerous research projects, such as those funded under the INTAS programme, there is a strong network of scientists of Russian origin or from other countries of the Former Soviet Union, who have migrated and work nowadays at research institutions in all different EU member states or associated states. They have kept ties to their colleagues and institutions in their former home country. These émigré scientists and their network are a valuable source to build on further cooperation. A systematic analysis of existing contacts and topical fields of cooperation would support setting priorities for bilateral and multilateral S&T cooperation.

Tap the financial resources available in Russia: The overall approach should be to continue to move to jointly funded R&D support schemes with Russia. The financial resources are available and the wish on the Russian side for an equitable partnership is there. Russia perceives itself again as a major player in international politics and does not want to be treated any more as a receiver of aid.

Tap the human potential: Russia has higher rates of tertiary education attainment of its labour force than all OECD states. Important parts of this group of its labour force are theoretically well educated graduates in the sciences and engineering. Mobility schemes are in place in several member states for building up contacts and attracting Russian colleagues to work for a certain period in the EU/AC area. But improvement seems possible here; the more as the INTAS mobility scheme for Young Scientists is since 2007 no more available.

6.3. Complementarity

As was found out in the Scope-East project and in other frameworks, there is a lack of complementarity of EU level activities and bilateral cooperation with Russia. It is therefore important to continue regular information exchange and policy coordination on national activities and activities ongoing on the EU-level in EU-fora such as CREST.

The range of EU-funded networking projects for Russia (e.g. BILAT-RUS) do provide a good basis for information exchange, although not all MS and AS are participating in these projects. An inclusive approach to member states and associated states shall be followed here and information be exchanged in permanent EU-fora and through dissemination activities of the projects.

More attention regarding complementarity between EU and bilateral level funding activities is necessary due to changes in the EU level instruments INTAS and ISTC. As INTAS is in liquidation, several previously successfully implemented funding instruments are no more available: smaller scale multinational research grants (than in the FP), support for multinational basic research projects, grants for Young Scientists and Summer Schools, etc. These instruments provided also those EU member states and AC with funding and linkages to Russian scientists, which had no proper national cooperation programme with Russia. EU member states and Associated Countries will need to consider appropriate compensation in the form of funding instruments at bilateral level.

What concerns the ISTC, funding from the EU has been slashed to a quarter of previous levels. As a result the ISTC partner programme becomes much more important as a possible cooperation tool, but which will in the long run only be relevant, if the tax free status for ISTC grants can be secured. The partner programme will need therefore appropriate promotion in the EU and AC and guarantees for tax free status of grants needs to be secured with the Russian authorities.

When looking at topical complementarity of EU and bilateral level, it is obvious that the FP covers only part of scientific topics. Several disciplines, where Russia disposes indeed of excellence, such as physics and mathematics, are only marginally included in the FP. Complementarity could focus therefore on these topics, by supporting on bilateral level or via ERA-NETs research in these fields. This is the more important, as the support instrument INTAS, where physics was the most important scientific field, is being winded up.

Another strategy concerns complementarity of funding instruments at the bilateral level. Several member states have established jointly with Russia administratively “light” mobility schemes, which help developing contacts among scientists. On a second level more serious research project grants are available in some member states. At a more mature state of cooperation joint laboratories, shared infrastructures and joint funding programmes have been devised. These instruments facilitate cooperation on EU level and prepare the ground for more important projects in the FP.

Strive to establish complementarity also in the sense basic science versus cooperation in innovation. Russia is now developing its innovation infrastructure and setting up funding programmes for innovation support. This is certainly a chance to enhance cooperation in this field, as the Russian policy makers are aware that they need international know how and that they will benefit importantly from cooperation here. But in this context, the Russian potential and scientific excellence in basic science should not be forgotten and also be stimulated.

7. Recommendations for enhancing S&T cooperation with Russia

Building on the present analytical report, as well as on the analysis of the questionnaires of the status of the bilateral cooperation between Member States/Associated Countries and Russia[56] and on the conclusions of the OMC-Working Groups´ discussion, this section proposes a number of recommendations addressed to EU Member States/Associated Countries and the European Commission in order to have them strengthen S&T cooperation with Russia and increase the respective impact.

The first part of the recommendations is generic in character and closely corresponds to the recommendations on S&T cooperation with other priority partner countries.

The second part summarises specific recommendations targeting the S&T cooperation with Russia.

7.1. Recommendations targeting at S&T cooperation with Russia and other priority partner countries

Fostering knowledge based strategic agenda setting

It is recommended to

- deepen the knowledge based dialogue between the EU Member States and Associated Countries on the prospects of the S&T cooperation with Russia as a strategic partner of the EU. The knowledge base should be provided among others by
  - the outcome of further mutual learning exercises,
  - systematic information gathering on Russian S&T including policies through ERAWATCH and pooling MS´/AC´ efforts,
  - (joint) efforts of the MS´/AC´ and Community Science Councillors,
  - deliverables of relevant EU funded Coordination and Support Activities,
  - impact assessment of bilateral S&T agreements on MS´/AC´ and Community level.
- complement the ongoing S&T dialogue between the European Commission and Russia with an S&T dialogue between the EU MS (and possibly AC) and Russia. In view of the Communication of the European Commission on international S&T cooperation[57] and following the respective Council Conclusions of 2 December 2008[58] such a dialogue should aim at identifying joint interest beyond the themes of the EU RTD Framework Programme and at fostering coordination of concrete implementation measures building on MS´(/AC´) instruments.
- make regular use and ensure a proper dissemination of results of completed or ongoing EC-funded coordination and support projects targeting Russia[59] in order to improve S&T cooperation with Russia by building on information which
  - address the Russian S&T landscape, key institutions, existing co-operation patterns as well as barriers for the cooperation,
  - draw conclusions on cooperation potentials and ways to further enrich the cooperation. These data could provide a valuable input to political dialogue at MS´/AC´ and Community level, could add new momentum to the implementation of S&T co-operation

[56] See "Comparative Summary Report and Summary of Recommendations on the cooperation with Brazil, India and Russia", CREST OMC-Working Group on Internationalisation of S&T, Brussels, December 15, 2008

[57] Communication from the Commission to the Council and the European Parliament "A Strategic European Framework for International Science and Technology Cooperation, COM(2008) 588, Brussels, 24.09.2008

[58] Conclusions of the European Competitiveness Council concerning a European Partnership for International Scientific and Technological Cooperation, Brussels, 02.12.2008

[59] SCOPE-EAST, IncoNet EECA, BILAT-RUS, ERA.Net RUS, INCOMAT, BIOSTRAT, ASCABOS, ADAGIO, EUROPOLAR etc.

and should prepare the ground for strategic scheduling future Coordination & Support Activities of the EC.

Offering an optimum framework for S&T cooperation and removing barriers

It is recommended to

- examine how well known existing good practices in funding schemes can be implemented at the individual EU country as well as the Community EU level for joint S&T of MS´/AC´ with Russia and introduce advanced schemes where gaps are found on MS´/AC´ and Community level, aiming wherever possible at reciprocity. This could be done through
  - pooling experiences of MS/AC and from Community activities taken into consideration the deliverables of relevant completed and ongoing coordination and support projects,
  - analysing funding schemes as regards driving motivations, strategic orientations, immanent research priorities, rules and regulations, evaluation practices, budgets and legal implications, as well as corresponding restrictions and developing scenarios to overcome these barriers,
  - promote the integration of Russian programme owners in thematic ERA-NETs.
- move towards a more flexible, simplified and harmonized cooperation framework through Community S&T agreements through
  - making sure intellectual property rights as stipulated in Russia's laws are implemented and that fair access to Russian intellectual property is ensured respecting the interest of the Russian partners.
  - allowing easy transfer of S&T equipment (donations) to Russia without custom fees, easy trans-border shipping of scientific material , and open access to S&T infrastructure in Russia,
  - permitting tax free allocation of S&T funding from EU program owners to Russian institutions,
  - offering simple administrative procedures for EU S&T organisations to establish representations in Russia, including the provision of working visas for EU personnel.
- stimulate an open but coordinated dialogue between European and Russian public and private S&T and innovation stakeholders on themes relevant for the framework of S&T cooperation, ranging from a full mutual understanding of each others IPR rules and regulations to joint participation in tri- or multipartite R&D undertakings. For implementing such dialogue schemes ongoing and upcoming coordination and support activities funded under the Specific "Capacities" Programme within the RTD Framework Programme should be applied.

Putting emphasis on the "human dimension" through brain-circulation

It is recommended to

- increase the brain-circulation between the EU, the AC and Russia through promoting the opportunities, advancing funding schemes and removing still existing barriers. New concepts should be developed on national, bilateral and Community level for enhancing outward mobility of researchers from EU-MS/AC towards Russia including to
  - promote Russian research potential and out-standing research infrastructure in order to better attract EU researchers,
  - foster the creation of national scientific personnel mobility centres in Russia and their involvement in the ERA-MORE network of European mobility centres,
  - make use of the EURAXESS Portal (building on the examples for Australia, Canada, Chile and Japan).

  Following examples of good practice, MS´/AC´ should consider offering return - fellowships for high-qualified Russian scientists in order to pave the way for sustainable cooperation. Along that line the temporary funding of joint research groups consisting of young Russian

and EU talents could be considered by MS/AC. At Community level the introduction of return fellowships for Russian scientists as a new component of the Marie-Curie programme could be taken into consideration.

- attract the interest of Russian students and researchers who are supported through European fellowship programmes at national or Community level to work in Russian branches of European industries. Dedicated promotion campaigns could be foreseen by MS´/AC´s programme owners and by the European Commission. It should be envisaged by the respective programme owners to establish a European alumni-database to map the flow of Russian students and researchers to stay in touch.
- analyse the impact of the European Visa Directive in order to prepare the ground for a better access of Russian scientists to the European Research Area.

7.2. Specific Recommendations targeted at S&T cooperation with Russia

Enhancing strategic S&T cooperation

It is recommended to

- make better use of the internationally acknowledged research potential of Russia in basic sciences. MS/AC should provide an appropriate framework for partnerships among S&T organisations in EU-MS/AC and Russia building among others on existing good practice for advanced cooperation schemes applied by French (CNRS, …) and German (MPG, Helmholtz and DFG) research organisations.
- strengthen the links of MS/AC´ institutions to public institutional stakeholders of the Russian innovation community such as the Russian Foundation for Small Innovative Enterprises or ROSNANOTEC and to develop a common framework i.e. through joint innovation programmes. Wherever appropriate, coordinated activities of the MS/AC should be considered in variable geometries in order to allow a better trans-European networking of innovation stakeholders.
- widen the scope of the S&T cooperation with Russia towards applied research and innovation. Along that line it should be considered to
  - consider to promote an association of Russia to the Community Competitiveness and Innovation Programme (CIP) beyond its integration in the Enterprise Europe Network
  - enhance policy advice by MS through promoting additional strategic EU twinning projects to the Ministry of Education and Science and the Ministry of Industry and Energy of the Russian Federation.
- increase the impact of the European approach towards the International Science and Technology Centre (ISTC) through appropriate action by MS and the European Commission to
  - prepare the ground for enhanced cooperation of EU S&T institutions and innovative enterprises with high performing Russian beneficiaries of the ISTC through encouraging the Russian S&T institutions to participate to the RTD Framework Programme (FP) including promoting the FP to ISTC target institutions and through stimulating partnerships with their EU counterparts,
  - strengthen the promotion of the ISTC partner programme to EU stakeholders to allow the use of ISTC services and privileges.

  In addition the EC should ensure with the Russian authorities that grants via the ISTC continue to have in a long term perspective tax free status.

Offering an optimum framework for S&T cooperation and removing barriers

It is recommended to

- consider launching the EU-Russia negotiation on a potential association of Russia to the 7th RTD-Framework Programme. Since the association is expected to offer a number of opportunities and at the same time is related to substantial challenges a careful evaluation of the association should be foreseen. Member States should actively contribute to the formal discussions of the Council bodies in order to avoid problems at a later stage.
- link the negotiations implemented by the EC on an association to the creation of a stimulating cooperation framework on the Russian side in order to overcome present barriers.
- analyse the impact of the EC-Russia Visa Facilitation Agreement from 1 June 2007 and take necessary action (once appropriate) in order to prepare the ground for a better exchange of Russian and EU/AC scientists.

Advancing the strategic partnership with Russia

It is recommended to

- provide optimum access on Community level to each others (EU and Russian) S&T infrastructures and to initiate a joint agenda setting for upgrading existing respectively establishing new medium and large scale S&T infrastructure. These activities should be interlinked with the ESFRI process.