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The review provides a detailed analysis of main trends in Russia's economy in 2014. The paper contains 6 big sections that highlight single aspects of Russia's economic development: the socio-political context; the monetary and credit spheres; financial sphere; the real sector; social sphere; institutional challenges. The paper employs a huge mass of statistical data that forms the basis of original computation and numerous charts.

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5.4. The State of Science and Innovation in Russia in 2014

In 2014, key events in the field of science were unfolding around the continuing reform of the Russian Academy of Sciences (RAS) and the associated assessment and restructuring of academic institutions, together with the first competitive tenders run by the Russian Science Foundation (RSF) and the creation of a new list of priorities for scientific and technological development in Russia. Thus, last year could be considered transitional, when the new departments responsible for science development were being structured and their activities were adapting to the new system of management. Innovation went into a decline, the rate of which had increased by the end of the year. No new instruments of innovation policy were introduced and the state of innovation was being significantly affected by the general conditions of economic activity, the business climate and some regulatory measures that were not even directly related to public support for innovation.

5.4.1. Federal budget: change of priorities

The structure of R&D expenditure began to change, such changes being aimed at enhancing support for applied research. The State Programme 'Development of Science and Technology for 2013-2020' envisages a continuous growth in funding for the Federal Target Programme 'Research and Development in the Priority Areas of Development of the Scientific-Technological Complex of Russia for 2014-2020', which was fully re-focused on applied research in the interests of industry. Most of its measures provide for non-budgetary co-funding. Such changes correspond substantially to policies aimed at import substitution. However, in the long run they could have the opposite effect - a dilution of the base for the development of innovative technologies.

Changes have been outlined in the priorities of the programmes which were key recipients of budgetary funds for R&D. By 2017 it is planned to have reduced considerably the funding of the space and aviation programmes that have been the leaders in terms of budgetary spending on R&D for many years. However, it is quite probable that support for them will continue through other budgetary items, including closed ones.

At the same time, the allocation of funds for development of the medical and pharmaceutical sector (which is certainly a positive trend), and for shipbuilding, grew substantially. By 2017 the top five sectors in terms of budgetary allocations for applied research under the heading 'National Economy' will be as follows (in descending order of the funding volumes):

1) the aviation industry;
2) the medical and pharmaceutical sector;
3) the space industry;
4) the electronics industry and radio-frequency engineering;
5) shipbuilding.

Finally, with the creation of the Russian Science Foundation, the grant funding of science has grown significantly, however, after 2016 it is planned to fix this at a predetermined level (*Table 18*). Given inflation, the scales of this are difficult to forecast as yet, but effectively it means a reduction in the grant funding of science, and this corresponds to the tendency towards a reduction in the budget allocations for basic research. If we assume that 1% of the budget

allocations for civil science will be, as previously, provided to the Russian Humanitarian Science Foundation (RHSF) and 6% to the Russian Foundation for Basic Research (RFBR), then the share of funding of basic research from the federal budget for civil science will decrease from 54.5% in 2015 to 47.8% in 2017.

Table18

Dynamics of budget appropriations for scientific foundations, billion rubles

Foundation	2015	2016	2017
Russian Science Foundation	17.2	18.8	18.8
RFBR	12.2	14.0	14.0
Foundation for Assistance to Small Innovative Enterprises in Science and Technology	3.9	3.8	3.5
RHSF	2.0	2.3	2.3
Total for foundations	35.3	38.9	38.6
Total for civil science (estimated)	200.0	230.0	230.0

Source: Federal Law of 1 December 2014 No.384-FZ 'On the Federal Budget for 2015 and the Planned Period of 2016 and 2017' http://minfin.ru/common/upload/library/2014/12/main/FZ384-FZ_ot_011214.pdf

It should also be noted that the range of possible sources for research and development funding is narrowing due to a reduction in the number of foreign sources and the low probability of an increase in R&D funding by the business sector (*Table 19*).

Table 19

Sources of R&D funding: types, volumes and conditions of support

Source	2014 budget	Type (conditions) of financial support	Planned budget for 2015-2017
Federal Target Programme 'Research and Development in Priority Areas of Development of the Scientific-Technological Complex of Russia'	Rb 14bn	Contracts, competitive tenders. Large groups of participants are required; is possible in the case of well-developed research infrastructure	Rb 23.7bn for 2015, increase by 5% in 2016, same level in 2017
Russian Science Foundation	Rb 11.4bn	Competitive grants of various types: to scientific groups, existing and new labs, international teams. Ideology: supports the priorities (thematic and organisational); support of global-level projects	Rb 17.2bn in 2015, Rb 18.8bn in 2016-2017
RFBR	Rb 9.2bn in 2014	Competitive grants. Main competition (50% of funding) - for pilot projects, about Rb 500,000 per year. Ideology: wide support of pilot research of small (up to 10 people) scientific groups	Rb 12.2bn in 2015, Rb 14bn - in 2016-2017
Foreign grants: EU programme Horizon 2020	The available funding for Russian participants is about Rb 5bn	Competitive grants, thematic and for certain categories of participants	Russia is included in the third category: of countries which can participate in Horizon 2020 projects but are not eligible for automatic support from the EU budget
Foreign grants: CRDF Global	Grants for the conduct of joint research by Russian and American universities (generally up to $110,000 for 2 years, per project)	Competitive grants in three areas: 1) nanotechnologies; 2) energy saving and energy efficient technologies; 3) rational use of natural resources. Small number of grants. Modest amount of total funding	Unknown
Funding of Russian industry	Rb 400bn in 2012, increasing to Rb 500bn (estimated) by 2020	Contracts for the conduct of R&D	The Government forecasts an increase in companies' spending, but there are no serious grounds for this yet. In practice the opposite trend can be observed

Russian subdivisions of international companies	As estimated, about Rb 3bn	Contracts for the conduct of R&D	R&D spending is decreasing. Key themes are in the ICT industry

Source: prepared by the author on the basis of data from the Foundations, the Ministry of Education and Science of Russia, the Horizon 2020 programme and CRDF Global.

Thus, the state budget remains the key source of R&D funding and its impact will increase in the future. At the same time, the structure of budgetary outlays for R&D will be significantly adjusted compared with previous years as a result of the following two main factors:

1) restructuring of the scientific sector, including eliminating the RAS, the Russian Academy of Medical Science (RAMS) and the Russian Academy of Agricultural Sciences (RAAS) as spending units, the establishment of a new department - the Federal Agency for Scientific Organisations (FASO), inventory inspections and the possible reshaping of scientific organisations that were formerly under the supervision of state academies;

2) a change in the priorities of applied research and development, which is supposed to ensure a transition to new technologies and products, including for expansion and import substitution.

At the same time as the focus on applied research is being increased the types and volumes of possible funding sources for basic research are being reduced. By contrast, at the end of the year, the U.S. published a report ('Restoring the Foundation: The Vital Role of Research in Preserving the American Dream'[1]) prepared by the Academy of Arts and Science. This stated that America had lost its lead in science and the development of new technologies and therefore proposed increases in federal investment in basic research by 4% annually.

5.4.2. Debates around assessments of the performance of scientific organisations

Throughout 2014 the Government continued to work on determining the principles and developing regulations on assessing the effectiveness of the activities of scientific organisations. The justification of the need for this, as well as the basic rules for assessment, are documented in Resolution of the Government of the Russian Federation No. 979 of 1 November 2013 'On Making Amendments to the Resolution of the Government of the Russian Federation of 8 April 2009 No. 312.[2] In accordance with the Resolution, the principles of assessment are as follows:

- the independent nature of assessment;
- combining scientific organisations into reference groups regardless of their affiliation with particular fields of scientific knowledge or the type of scientific research conducted;
- the use of indicators of the type applied by economically developed countries for assessing the effectiveness of the activities of scientific organisations.[3]

The regulations on the conduct of assessment were clarified and adjusted with regard to the opinion of the scientific community, in particular, the directors of the RAS institutes. However, in the middle of the year the FASO returned to the basic questions of the conduct of such

[1] Restoring the Foundation: 'The Vital Role of Research in Preserving the American Dream', American Academy of Arts and Sciences. Cambridge, MA, 2014. P.16. https://www.aau.edu/WorkArea/DownloadAsset.aspx?id=15491

[2] http://pravo.gov.ru:8080/page.aspx?67047

[3] For more information on these parameters see 'The Condition of Science and Innovation'//Russian Economy in 2013. Trends and Prospects. (Issue 35) - Moscow: Gaidar Institute, 2014. p. 367-369.

assessment and requested commentaries from scientific organisations on such procedural aspects as:

- the frequency of assessment;
- the types of parameters to be used in the assessment - whether it should only consist of quantitative indicators, or of these in combination with expert evaluation;
- the feasibility of also assessing the effectiveness of the scientific teams rather than just the scientific organisations;
- the principles for forming expert commissions.[1]

According to the Government's initial plan, the development of assessment procedures should have been completed by 1 July 2014,[2] but it was not even finished by the end of the year.

The approaches to the assessment of institutes proposed by the FASO were criticised by the scientific community. The main complaints were about the conduct of assessment being at the level of organisations rather than individual laboratories, the use of the principle of division into reference groups, and in the reliance on bibliometric indicators, the limitations of which are quite well known. Scientists were almost unanimous in their opinion that assessment at the level of institutes would provide distorted results, particularly because there are many multi-disciplinary institutes in the country in addition to institutes with unique specialisations, which it would be almost impossible to assess correctly using the chosen method. The procedures for conducting the assessment and selecting the experts involved were widely discussed, including the idea of inviting international experts. Opinions were divided, but with a slight bias towards those against the involvement of foreign experts.

The arguments against the extensive use of bibliometric indicators were supported by reference to foreign experience. An especially popular alternative is the UK practice, where the Government has recently introduced new methods for the assessment of scientific achievements (the Research Excellence Framework).[3] Indeed, it took several years to develop this initiative, which is very well-thought-out, with different result measures and assessment regulations being introduced for different fields of science. The key elements of such assessment are its conduct at the level of departments and laboratories, and the recognition of the secondary nature of bibliometric data. Moreover, the impact factors[4] of journals are not taken into account, and neither is the total number of publications of scientific teams being assessed. Bibliometrics may only be used for substantiation and clarification of the expert evaluations. Experts, in turn, assess the publications of scientific laboratories (groups) on the basis of the 4 best publications of the team over the previous 5 years. With the exception of economics and econometrics, citation data and other types of bibliometric analysis are not used at all for assessing the results of research in social sciences and humanities. For economics and econometrics, available data on the citation of publications are taken into account, where necessary, as additional information, but the absence of citation data for a particular piece of research does not affect its assessment. Finally, it is the purpose of this framework which is especially important: the

[1] Letter to directors of scientific organisations from the FASO of Russia No. 007-181-07, 10 April 2014.
[2] Second letter of the Academician Aleksey Parshin on expert examination of scientific organisations FASO, 27 April 2014 http://www.saveras.ru/archives/9059
[3] Research Excellence Framework 2014. Panel Criteria and Working Methods. http://www.ref.ac.uk/media/ref/content/pub/panelcriteriaandworkingmethods/01_12.pdf
[4] Numerical indicator of the importance of a scientific journal (IF).

assessment results are used for the redistribution of funding among administrative structures and for determining the number of additional rates to be allocated to certain subdivisions.

The British experience does look convincing, as is confirmed by its pilot testing. Moreover, the experience accumulated in Russia shows that the demand for bibliometrics breeds their supply, leading to a serious skewing. In particular, it provides incentives not only to pay for the publication of a paper in a third-rate journal included in the Scopus database, but also to buy a position as the co-author of an article published in a decent journal.[1] Hence, a reliance on bibliometrics for the short-term assessment of performance could distract from an understanding of the real state of affairs.

The consolidated opinion of the active scientific community was reflected in a letter from the Council of the Society of Scientists to the Chairman of the Government of the Russian Federation 'On Assessing the Effectiveness of Scientific Organisations',[2] which states that 'the key object of assessment should not be an institute as a whole, but its laboratories and scientific groups. In essence, assessment should be expert-based and should not focus on numerical performance indicators. The division of scientific organisations into three categories (leading, stable, and those which have lost their prospects for development) on the basis of numerical indicators may not be considered valid.'

By the year end, the preliminary composition of the FASO Commission for Assessing the Performance of Scientific Organisations[3] had been determined, based on the results of internet-voting. This caused a new wave of admonitions, because even before the completion of its selection, the Agency had announced the preliminary results, with certain names being emphasised, and this affected the final structure of distribution of votes. Such a pseudo-populist choice indicated a seeming transparency of the commission formation, but probably damaged its quality.

5.4.3. Approaches to the restructuring of former academic institutions

Throughout the year another important process continued - the development of approaches to the restructuring of the system of former academic institutions that were now under the supervision of the FASO. With the creation of the FASO Scientific Coordination Council, [4] the development of regulations on the participation of the RAS in expert work and the performance of the other functions assigned to it, were expected.

However, the relevant decision-making process dragged on, not least because of difficulties in bringing such decisions in line with the new administrative structure. When the FASO appeared, relationships between departments became more tense and were manifested in publicly-made counter claims. For instance, academics were discontent with the fact that the FASO had seriously delayed the creation of the Scientific Coordination Committee. Moreover, in their opinion, the Agency had increased the bureaucratic burden on institutions, was non-

[1] Sterligov I. Simulation of Science as a Response to Management Primitivism//Slon.ru, 27 August 2014. http://slon.ru/economics/simulyatsiya_nauki_kak_otvet_na_upravlencheskiy_primitivizm-1148735.xhtml

[2] Letter of the Council of the Society of Scientists to the Chairman of the Government of the Russian Federation 'On Assessing the Effectiveness of Scientific Organisations', 28 April 2014 http://www.saveras.ru/archives/9102

[3] The FASO of Russia announced interim results of the elections to the Commission for Assessment of Performance http://faso.gov.ru/ru/official/news/index.php?id_4=23641

[4] Established on 25 November 2014. Order 'On Scientific Coordination Committee at the Federal Agency of Scientific Organisations', No. 1087 of 25 November 2014 http://faso.gov.ru/common/upload/library/2014/11/main/prikaz1087.pdf

transparent in its activities, and did not know enough about the essence of scientific work.[1] The FASO management accused the RAS of being passive and of not submitting its proposals for reorganisation of the network of scientific institutions,[2] with the RAS management having taken a number of ill-conceived steps. For example, without any consultation with the directors of the relevant institutes, the RAS had given its consent to the transfer of 42 breeding centres, formerly belonging to the RAAS, to the Ministry of Agriculture, and a number of clinics to the Ministry of Healthcare.[3] According to experts, these institutes were the best candidates for re-specialisation after the transfer, and that breeding science would be destroyed.[4]

In turn, the management of the Ministry of Education and Science was discontent with the fact that the Academy was not taking any actions or developing new regulations on expert examination, the coordination of basic research in the country and a number of other regulations.[5] Furthermore, the RAS union had accused the RAS management of avoiding making important decisions for science.[6] The scientific community, including public organisations, had also voiced complaints in respect of what had been happening.

All this took place against the backdrop of the expected completion on 15 January 2015 of the Moratorium on property transactions and the resolution of personnel issues in respect of academic institutions. It is evident that the year allocated for carrying out preparatory work on the implementation of the reform was not used in the most rational manner. The evidence for this is the extension of the Moratorium for a further year, which was announced in December 2014 at the meeting of the Presidential Council for Science and Education.[7]

This situation occurred can be explained by a number of objective reasons: the RAS has never been an operational structure, the FASO lacks experience in the field of science, and there are also certain difficulties in the development of an agreed position between the Ministry of Education and Science and the FASO. At the same time, the very idea of extra top-loading the management structure, as demonstrated by the first year of work, has not yet proved productive. However, in the field of management of Russian science, interdepartmental coordination has never yet been efficient.

The biggest concern is that the development of approaches for assessing the performance of scientific organisations does not correspond, in essence, with the procedures for the restructuring of the former academic institutes. Moreover, while the start of performance

[1] Russian Academy of Sciences. Minutes of the Resolution of the Bureau of the Board of Directors of Institutes No. 5 of 17 September 2014; Year of Troubles. What did the reform of the Russian Academy of Sciences bring?//Search. No. 27-28. 11 July 2014 http://www.poisknews.ru/theme/ran/11060/

[2] Medvedev Yu. RAS institutes can be united with HEIs and 'industrial organisations'//Russian Gazette, 14 October 2014 http://www.rg.ru/2014/10/14/ran-site-anons.html

[3] Volchkova N. The Blitz is Over. Another Stage of the RAS Reform Starts//Search. No. 42. 17 October 2014 http://www.poisknews.ru/theme/ran/12131/

[4] Network Form of Life of Scientific Institutes//Independent Gazette - Science, 22 October 2014 http://www.ng.ru/science/2014-10-22/10_faso.html

[5] Science is the risk zone. Deputy Minister of Education and Science Lyudmila Ogorodova about the RAS Reform, Dissertation Councils, Changes in the Work of Scientists, Etc.//Lenta.ru, 27 October 2014 http://lenta.ru/articles/2014/10/27/ogorodova/

[6] Volchkova N. The Blitz is Over. Another Stage of the RAS Reform Starts//Search. No. 42. 17 October 2014 http://www.poisknews.ru/theme/ran/12131/

[7] Meeting of the Council for Science and Education, 8 December 2014 http://state.kremlin.ru/council/6/news/47196

assessment is planned for the second half of 2015,[1] the restructuring had already started in December 2014, with the approval of the first pilot projects.[2] This is at variance with the normal logic of management actions: first assessing the situation and them attempting to change it.

Indeed, the lengthy development of the assessment procedures contrasts with the speed with which the FASO provided the public with its options for restructuring the scientific organisations under its supervision, proposing four new forms, distinguished by the objectives and nature their work:[3]

1) federal research centres (FRC) - to be established by consolidating several institutions, to carry out break-through research and practical developments in the areas of strategic importance for the country; the FRCs being responsible for achieving concrete results in the realisation of national priorities;
2) national research institutes (NRI) - intended to conduct basic research; created on the basis of current academic institutions which are leaders in particular disciplines;
3) federal scientific centres (FSC) - focused mainly on innovation, and almost analogous to technology platforms; the key goal of their activities is the development and scientific support for the implementation of critical technologies for the modernisation of production facilities;
4) regional scientific centres (RSC) - aimed at ensuring the integrated development of the regions, including their various industrial sectors; created by the consolidation of individual scientific institutes located in each region.

As can be seen from the above list, the key area of transformation is the consolidation of organisations and a reduction in the proportion of those conducting mainly basic research. The idea of such a re-orientation of existing organisations for applied research is not indisputable. Given the situation in respect of the personnel available, the creation of new institutes with a focus on applied research is likely to be more effective than re-training those who are unable to perform applied work for a particular customer.

Almost simultaneously fears were dispelled that academic institutions would be amalgamated with higher education institutions (HEIs). This was confirmed by Andrei Fursenko, Assistant to the President of the Russian Federation, who stated that 'for the next 15-20 years there is no alternative to the RAS institutes, and to scatter them between ministries, corporations and universities would mean to destroy and disintegrate Russian science.'[4]

In early 2015, the FASO plans to define the key parameters of the potential FRSs, FSCs, NRCs and RSCs and to prepare pilot integration projects. The FASO had determined the priority areas for these pilot projects in 2014. They are: *medicine, life sciences, agricultural technology and food products*.

It is remarkable that the RAS management quickly 'adapted' to the consolidation idea being implemented prior to the assessment of the institutes. Various organisations, together with subdivisions of the RAS, began proposing specific options for the creation of new structures on

[1] Sobolevsky A. FASO of Russia and the RAS Siberian Subdivision Find 'the Happy Medium' in Their Interaction// RIA Siberia, 15 December 2014 http://ria-sibir.ru/viewnews/57366.html

[2] Meeting of the Presidential Council for Science and Education, 8 December 2014 http://state.kremlin.ru/council/6/news/47196

[3] Proposal for structuring the network of scientific organisations under the supervision of the FASO of Russia, 14 August 2014 https://www.ras.ru/news/shownews.aspx?id=80e8ca07-f737-4699-a91a-8ffe6a3e80df

[4] On the Prospects of Russian Science: Look from the Old Square. Andrei Fursenko about Reforming the Academy of Sciences and the State's Attitude Towards Scientists//Izvestiya, 25 December 2014 http://izvestia.ru/news/581254

the basis of former academic institutions[1], but not always agreeing them with the directors of the institutes which would be included in the composition of the new organisations[2]. In fact, these events could be characterised as attempts by those who had the relevant administrative resources to save 'their own' institutes.

Andrei Fursenko, in his turn, proposed an alternative set of four pilot projects,[3] the themes of which were different from those chosen by the FASO, namely - *molecular genetics and cellular biology, industrial biotechnology, crop farming and plant genetic resources, and information technology and software*. It is these projects that have been supported by the Russian President and the concepts of the development programmes for each relevant pilot organisation have already been prepared.[4]

The existence of different lists of priorities evidences the lack of an agreed government position on which areas should be supported initially. Indeed, the list of priority areas for the development of science, technology and engineering in the Russian Federation which was to be approved by the President had yet to been established by the end of the year.[5] At that time, in his Address to the Federal Assembly, the President of the Russian Federation offered to start developing a national technological initiative which would help to determine the development priorities and objectives for the next 10-15-years.[6] Thus, an effectively new task was set, to create a mechanism to ensure the conjunction of global tasks, the technological priorities mandated by these tasks, and the mechanisms for implementing such priorities.

So far, the system of state-level priorities has become more complicated – together with the traditional list of priority areas for the development of science, technology and engineering, several additional lists have appeared.

Firstly, there are the so called 'scientific and technological initiatives' determined as priorities for a number of departments, including the Ministry of Education, the Ministry of Industry and Trade and even the RSF. At present there are three of them – advanced manufacturing technologies, neurotechnologies, together with quantum technologies and photonics. For two of these, manufacturing technologies and photonics, the Chairman of the Government of the Russian Federation assigned elaborate methods of accelerated development. The outlining of these priorities was driven, on the one hand, by global trends in both science and technology and, on the other, because such priorities in manufacturing technologies are important in a transition to new methods of organising production, not just of establishing a different technological base. It should be noted that the classifications of priority areas vary by country: for example, in Russia, manufacturing technologies, photonics and nanotechnologies are three separate areas, while in the US photonics and nanotechnologies are a part of a new initiative the 'Advanced Manufacturing Partnership' representing sub-areas of technology in advanced manufacturing.

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[1] By the end of the year about 100 integration projects were proposed. Source: Meeting of the Council for Science and Education, 8 December 2014 http://state.kremlin.ru/council/6/news/47196

[2] Gelfand M. The First One is Out//Troitsky Variant - Science, No. 162, 9 September 2014 http://trv-science.ru/2014/09/09/pervyjj-poshel/

[3] Letter of Andrei Fursenko to the President of Russia V.V. Putin, Pr-2349 of 01 October 2014 Source: Troitsky Variant - Science, No. 166, 4 November 2014 http://trv-science.ru/2014/11/04/shef-vsjo-propalo-2/

[4] Meeting of the Presidential Council for Science and Education, 8 December 2014 http://state.kremlin.ru/council/6/news/47196

[5] The last (currently effective) list was approved in 2011, and in 2014 it was reworked.

[6] Address of the President to the Federal Assembly, 4 December 2014 http://www.kremlin.ru/news/47173

Secondly, as was noted above, new thematic priorities have appeared in connection with the restructuring of the former academic complex and approval of the four pilot projects. The priorities of the FASO and Presidential Administration are different, with the exception of agricultural science.

Thirdly, defence research has become a new priority – considerable budgetary funds will be allocated towards supporting it. Moreover, the RAS President noted that the Academy had considerably extended research on defence and had even introduced the position of Vice-President for defence projects.[1]

The hierarchy and compatibility of the different groups of priorities is not yet quite clear, however, the main problem is in the absence of explicit criteria regarding the basis on which each has been chosen. This is an important question because new lists of priorities require a reconfiguration of the distribution of the financial resources allocated for R&D. Under the general reduction of budgetary expenditure, the focus on particular priorities is justified, but their choice should be well thought through, including assessments of the impact of the chosen areas on adjacent fields of science and other sectors of the economy.

Finally, a separate topic of discussion which arose in the course of the development of measures for restructuring the academic complex was the age restrictions imposed on the heads of scientific organisations and their deputies. The changes were based on the currently effective standards for principals of HEIs, providing for a maximum age of 65 with a possibility to extend the term of office on the basis of a special contract until the age of 70. Estimates for the academic sector showed that, out of more than 800 directors of scientific institutes of the Academy of Sciences, half were over 65. Additionally, between 2,000 and 2,500 of their deputies were older than the maximum permissible age.[2] By the end of the year supplements were made to the Law on science, according to which age restrictions were introduced for the heads of institutes and their deputies, with the possibility to transfer to the position of Scientific Supervisor (but without the rights to dispose of financial funds).[3] The age restriction will be introduced gradually: principals older than 65 will be able to occupy their positions until the expiry of their contracts (but for no longer than three years). Thus, about half of the heads of the former academic NRIs will be likely to change, even though, not long ago, few had even thought of preparing their successors. Such a change in leadership is complicated by a serious 'gap' in the availability of middle-aged personnel, which is why, in a number of cases the effective leaders will be replaced by younger staff lacking appropriate administrative and scientific experience, at least in terms of their age.

It should also be noted that, at the last meeting of the Council for Science and Innovation, Academicians were offered financial compensation for losses incurred by them as a result of changes in the status and role of the RAS. Based on the results of the meeting, the President ordered the preparation, by June 2015, of a legislative act on doubling the bonuses for the title of 'Academician' (up to Rb 100,000 per month) and of a 'Corresponding Member' (up to Rb

[1] Speech of the RAS President V.E. Fortov at the meeting of the Council for Science and Education, 8 December 2014 http://state.kremlin.ru/council/6/news/47196

[2] Chukov A.. The Government Has Dismissed the Scientific Elite of the Country//Arguments of the Week, No. 21, 10 June 2014 http://argumenti.ru/politics/n441/344580

[3] Gorbatova A. Competitive Science. 11 December 2014 http://www.strf.ru/material.aspx?CatalogId=358&d_no=91368

50,000 per month).[1] Arguably, this places an increased burden on the Academy. However, the justification for this appears strange, for at least two reasons. The first is that, across the globe, expert review is generally considered an honourable duty of leading scientists. Expert opinions and reports prepared by national academies of sciences (for example, the U.S. National Academy of Sciences) do not involve payments to the academic experts. The second reason is that it is not only Academicians and Corresponding Members who currently do, and will, take part in expert reviews, but it is only they who will be provided with this permanent bonus, while such payments to Doctors and Candidates of Science will be ended. This decision reminds us of the liquidation of the Kazakh Academy of Sciences when academicians were actually provided with life-long benefits for their titles, in exchange for their consent to turning the national academy into a 'club for scientists.'[2]

5.4.4. Science in HEIs: successes of the leading institutions

Last year the state and society paid close attention to the activities of elite HEIs that had received particular status or additional budgetary funds under special development programmes. In terms of the scientific component, the HEIs were assessed on the basis of data on the dynamics of the publication activities of their teaching staff and research assistants, and the frequency of their citations. The available data, which have been collected and analysed by experts from Thomson Reuters during the year, record improvements, but these improvements occur very slowly. This evidences the difficulty of increasing the scientific quality of publications in areas where research activity has not been a priority for a long time.[3] In particular, this can be illustrated using the data for the group of universities which received the most generous funding from the Government - the 15 universities under the '5-100' project. The project assumes that at least 5 out of the15 supported universities will enter the top 100 leading global university rankings by 2020.

Quarterly assessments showed that all leading universities were increasing their number of publications and, what is more important, that by the year end, for 13 of the 15 universities their share of cited articles exceeded the average for Russian HEIs.[4] There are three consistent leaders on almost all the bibliometric indicators - these are the Novosibirsk State University (NSU), the National Research Nuclear University (NRNU), the Moscow Engineering Physics Institute (MEPhI) and the Moscow Institute of Physics and Technology (MIPT). The National Research University Higher School of Economics (NRI-HSE) may be named as a fourth leader because the level of citation in social sciences is generally lower and builds up more slowly than in the natural and technical sciences. From 2009 to 2013 the NRI-HSE increased its

[1] List of assignments made, based on the results of the meeting of the Presidential Council for Science and Education. Pr-3011, cl. 2k, 27 December 2014 http://www.kremlin.ru/assignments/47367

[2] Interview-conversation of the grandson of the first Kazakh Academician Kanysh Imantaevich Satpaev, with the senior research assistant of the K.I. Satpaev Museum (House of Scientists of the former Academy of Sciences of Kazakh SSR) Nurlan Zharmagambetov, 21 July 2008 http://www.meierhold-poesie.narod.ru/interview_satpayevs_ansci.htm

[3] Until recently, for HEIs, in contrast to NRIs, the data on publication activities and, more so, in foreign editions have not been included in the list of key indicators for the assessment of the performance of scientific and academic staff. There was a formal requirement to publish 1-2 papers, preferably in journals from the list of the State Commission for Academic Degrees and Titles, and it was sufficient to use an annual report on work performed.

[4] Kasiyanov P. The Ratio of Cited and Non-Cited Works of the Leading Russian Universities , 8 December 2014 http://pavel-kasyanov.blogspot.ru/2014/12/iv.html

scientific productivity by a factor of seven[1], meaning that it developed at the highest rate among the leading HEIs.

The stable composition of the group of leaders is confirmed, to a certain extent, by the December rating of universities QS ranking for 18 counties of Eastern Europe and Central Asia.[2] In terms of the publication activities of its teachers[3] the NSU occupies 14th position out of 100 (and is in the first place among the Russian HEIs), while the MSU follows it – but only in 25th position. At the level of citation of its scientific publications the absolute leader is the MEPhI, followed by the NSU.

At the same time, an analysis of the causes of the increase in the number of publications and citations shows that it is partially the result of a particular set of external circumstances. At the request of the management, employees of both the MIPT and NSU working in academic institutions started referencing their university affiliation in articles, which ensured an increase in the number of publications and citations. The MEPhI also demonstrates extremely high indicators due to the participation of its employees in large international joint projects and programmes, such as ATLAS, BELLE and ALICE. Only the NSU publishes more than one paper per employee per year. In general, no more than 10% of the scientific and academic personnel of the 15 leading HEIs publish their papers in international editions, while in foreign HEIs of similar specialisation (in a reference group which includes the HEIs of both Western Europe and Asia) this indicator is three times higher.[4]

Indicators of the citation of works of the leading Russian HEIs remain the lowest – on average for this group, they are 20 times lower than the average for the foreign reference HEIs per scientific and academic employee (for the NSU, MEPhI and MIPT – 13 times lower).[5] This is, in part, due to the fact that the major proportion of the foreign-language publications of Russian HEIs are simply translated domestic editions which, as a rule, have low impact.

Thus, despite the improving quantitative indicators of the publication activities of the leading Russian HEIs, the qualitative results of scientific activity are still far from occupying leading positions. Not many teachers undertake scientific research and they prefer to publish their papers in more accessible journals (with lower ratings). The most cited papers are those that are published with international co-authorship.

5.4.5. First results of the activities of the Russian Science Foundation

Last year saw active work on the part of the country's largest scientific foundation - the Russian Science Foundation. Several funding tenders were held, aimed at supporting both small research groups, including international ones, and existing and newly created laboratories.

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[1] Arefiev P. International Publication Activities of the Leading Russian Universities in 2013. Part 1. 26 October 2014 http://www.unkniga.ru/vishee/3588-mezhdunarodnaya-publikatsionnaya-aktivnost-veduschih-rossiyskih-universitetov-v-2013.html

[2] QS University rankings: Emerging Europe and Central Asia 2014/15. 17 December 2014 http://ria.ru/abitura/20141217/1032737392.html

[3] Number of published papers per teacher calculated based on the data of Scopus/Elsevier.

[4] Arefiev P. International Publication Activities of the Leading Russian Universities in 2013. Part 1. 26 October 2014 http://www.unkniga.ru/vishee/3588-mezhdunarodnaya-publikatsionnaya-aktivnost-veduschih-rossiyskih-universitetov-v-2013.html

[5] Arefiev P. International Publication Activities of the Leading Russian Universities in 2013. Part 1. 26 October 2014 http://www.unkniga.ru/vishee/3743-mezhdunarodnaya-publikatsionnaya-aktivnost-veduschih-rossiyskih-universitetov-v-2013-okonchanie.html

The main types of competitive tender and the level of participation in them are shown in *Table 20*. One can particularly notice the very high level of competition among the applicants, especially from international scientific groups. In two other scientific foundations - the RFBR and the RHSF - the typical level of competition is 3–4 applications per grant. Experts believe that impartial selection is possible only if the level of competition does not exceed 8–10 applications per grant. Otherwise, the selection of projects for funding is complicated because the quality of applications is greater than the amount of funding available for supporting them. Then, other selection factors begin to operate in addition to the key criteria - including geographical location and the sex and age of the project managers. Moreover, the risk of arbitrary decisions increases because of intensified lobbying, which can only be kept in check by the smooth-running of expert assessment councils.

Table 20

Types of competitive tender run by the RSF and the activities of applicants in applying for grants

Type of tender	Funding volume, per year	Number of applications	Number of grants	Number of applications per grant
Projects of individual scientific groups	Up to Rb 5m	11,775	876	14:1
Projects of existing scientific labs	Rb 5-20m	1,760	161	11:1
Newly created labs	Rb 10-25m	467	38	12:1
International scientific groups	Rb 5-10m	487	30	16:1

Source: http://www.rscf.ru/

The activities of the new foundation in which, on the one hand, considerable funding is concentrated and which, on the other hand, has initiated mostly large-scale projects with a relatively small number of grants (compared with the levels typical of Russia) aroused the close attention of the scientific community and caused much active discussion within it. Almost every winning project found itself a centre of attention. An analysis of the composition of grant recipients showed that a number of projects lacked impartiality in their support, including several grants received by career-oriented directors. Nevertheless, the overall list of problems and complaints[1] against the Foundation did not contain any which were unique. Almost all of these complaints could be levelled at the tenders run by other scientific foundations: that the work of the experts and expert councils was not always thorough and impartial; that there were some cases of conflicts of interests; of less than optimal expert questionnaires which complicated the project assessments; poor science classificatory. Furthermore, the Foundation initially found itself in the position of being set against others: claims that the funds received by the RSF were not actually additional budgetary investments in science but were simply redistributed from other programmes, including those of the Federal Target Programme 'Scientific and Academic Staff of Innovative Russia', within the framework of which many more researchers had received funding. As a result, the RSF activities were, from the very beginning, compared with this programme which, all in all, was approved by the wider scientific community.

The response of the RSF to such criticism was twofold - on the one hand, the Foundation promptly responded to a number of the observations. In particular, as early as September changes were made to the procedure for the selection of experts, in order to ensure minimisation

[1] Fradkov A. Ideal Expert Review//Troitsky Variant – Science, No. 159, 29 July 2014 http://trv-science.ru/2014/07/29/idealnaya-ehkspertiza/

of any conflicts of interest.[1] On the other hand, the Foundation was sufficiently tough in defending its principal approaches, including its choice in favour of variety of tenders with a limited number of grant recipients. For now the Foundation policy is aimed at continuously initiating new tenders, including those with specific conditions - the support of young scientists, particular regions, selected themes, etc. This means that, unlike the RFBR and RHSF, where almost identical sets of tenders are announced every year, there is no cyclical support from the RSF as yet. Hence, scientific teams which have not received funds for establishing laboratories or support for groups or institutes in a particular year will not simply be able to repeat the attempt the following year. This contributes to a strengthening of the stratification of scientific teams, which has both positive and negative sides.

Despite the short period of its activity, the data from RSF tenders are already sufficient to allow several meaningful conclusions to be drawn on the current condition of scientific research in Russia.

1) Despite the Foundation's fairly strict formal requirements for the project managers applying to the RSF for funding (in terms of the number of publications, previous grants and other characteristics of scientific merit) it turns out that many scientists actually do meet these criteria. Thus, it appears that at least in a number of areas, Russian science is viable and competitive.

2) The structure of applicants and grant recipients in terms of the place of project execution (scientific organisations, primarily under the supervision of the FASO, or HEIs) evidences that the most active among the applicants for grants were the HEIs - in substantially all the tenders they accounted for more than half of the applications. At the same time, among grant recipients, teams from the FASO institutes are the leaders (*Table 21*), with the exception of competition for the creation of new laboratories. This result can be interpreted both positively and negatively. It evidences either that basic and exploratory research, which the RSF supports in accordance with its mandate, is being performed at a higher level in institutes that formerly belonged to the State Academy of Sciences, or, that the Expert Council of the Foundation, consisting mainly of representatives of academic science, has made the choice on the basis of its own interests.

Table 21

Participation of FASO institutes and HEIs in RSF tenders, as a percentage of the total number of applications and grants

Type of tender	Share of FASO institutes, %		Share of HEIs, %	
	Applications	Grants	Applications	Grants
Projects of individual scientific groups	35.0	59.0	57.0	32.0
Projects of existing scientific labs	41.0	58.0	49.0	34.0
Newly created labs	26.0	34.2	62.0	55.3
International scientific groups	38.0	50.0	55.0	47.0

Source: http://www.rscf.ru/

The level of grant support for basic and exploratory research through the system of scientific funds could increase compared with the current budgetary projects because the Russian President's assignments, based on the results of the December meeting of the Council for Science and Education, include the requirement for removing such types of research from the federal target programmes by the end of April 2015, and to support them instead in the form of

[1] Ponarina E. Three Plus Two. The New Form of Expert Review Organisation Accelerates the Application Review Process//Search, No. 37, 12 September 2014 http://www.poisknews.ru/theme/science/11775/

grants.[1] It will be important to distribute the released funds among the three state science foundations so that none of them has a monopoly.

5.4.6. Development of a new draft bill on science

Another area of reform, along with the restructuring and introduction of the new research funding programmes was in legislative activity, namely the development of fundamental laws regulating key relations in the science field. Last year it was decided to redraft the Law on Science and Public Scientific and Technical Policy (No. 127-FZ) effective since 1996 and to unite all types of policy in the new version – scientific, technological and innovative.[2] The very formulation of this goal seems inappropriate due to the differences between the subjects being regulated, but the Ministry of Education and Science argued that, in Russia, with the significant role which the state plays, such unification is justified, while a corresponding orientation towards similar regulation abroad, is not.[3] In other words, the proposals are not aimed at overcoming the problem faced by Russian science – of the excessive involvement of the state, but, quite the opposite, it is planned to consolidate this position in the new law.

The 'structure' of the law announced at the year-end does not stand up to scrutiny. Currently it does not have the structure of a draft law, but is an unprofessional guide containing all the currently used terms and definitions without room for any which may appear in the future. A number of key concepts and, more importantly, the scope of the state's functions are not defined. This conflicts with the key intent of the initiators of the new law – not to 'fix' the current situation but to 'design for the future'.[4] For example, the classification of the organisational structure of science is laid out, highlighting areas with special status, but without mentioning the organisations which the FASO plans to create, – the FRCs, RRSs, etc. The list is closed, although such a law should present only a framework, if it is not to require annual updates.

The draft bill has more serious flaws. In the section devoted to planning, the planning tools are mixed up with those of plan implementation (state programmes and even the stimulation of creative scientific work by young people). The same applies to its treatment of funding - grants and agreements are outlined. However, agreements represent the form in which the conditions of a grant or contract should be laid out, but contracts are not even mentioned.

Thus, even at the level of its table of contents, the new draft bill is considerably inferior to the current one, both in terms of the logic of its construction and the professional level of its description of the scope of regulation.

5.4.7. Mobility and the exodus of scientific personnel

The illogical and not fully transparent process of reforming the scientific complex could not but affect the mood in the scientific community, whose active representatives being members of various public organisations and councils tried to participate in the adjustment of managerial decisions. They started to revive the ideas of the strategy realised in the early 1990s, during the

[1] List of assignments made based on the results of the meeting of the Presidential Council for Science and Education. Pr-3011, cl. 2z. 27 December 2014 http://www.kremlin.ru/assignments/47367

[2] https://www.ras.ru/news/shownews.aspx?id=2183e50e-14f1-4fcf-b08a-5b89cac34a64#content

[3] Volchkova N. No patch! The Concept of a New Law on Science is Introduced/Search, No. 48, 28 November 2014 http://www.poisknews.ru/theme/science-politic/12509/

[4] Volchkova N. No patch! The Concept of a New Law on Science is Introduced/Search, No. 48, 28 November 2014 http://www.poisknews.ru/theme/science-politic/12509/

biggest and fastest collapse of national science. Repeating this strategy would involve enhancing the independence of scientific subdivision and laboratories within institutions.[1] When everything is unravelling, it is easier for individual groups to survive. By contrast, the more passive portion of the scientific community began to favour the approach widely practised in the early 1990s – to go work abroad.[2] The outflow of personnel from the country recorded in just 8 months of 2014 was larger than for any full year in the last 15 years. Those who left were mostly scientific staff and businessmen.[3]

Indeed, as shown by the latest (April 2014) survey conducted by the Russian Venture Company (RVC), Russia does not offer the most favourable conditions for scientific research. Only 6% of respondents thought that the conditions offered in Russia were good enough to encourage scientists to come back.[4] The overwhelming majority – 67% – believes that there are many more opportunities for researchers to realise their aspirations abroad.

Nevertheless, in the last year there has been no discussion of measures for preventing such a 'brain drain'. Some attention was paid to developing measures that could contribute to the enhancement of geographic mobility within the country. Russia is one of the countries with the least mobile scientific and technical staffing infrastructure, inferior even to the 'conservative' countries Japan and China. There are practically no direct measures for stimulating internal mobility, while measures of indirect stimulation that have been widely used in foreign countries for many years are only at the stage of planning - for example, the introduction of post-doctoral positions to encourage young Candidates of Science to seek work in an organisation other than the one where they defended their dissertation. The implementation of this and other measures were postponed due to the reorganisation of the scientific complex of the country, related, among other things, to significant changes in the mechanisms of the budgetary funding of research and development, including the closing of a number of personnel-related programmes. Increased attention to internal mobility can be expected in 2015 when the implementation of a number of new programmes initiated by the Russian Science Foundation will begin. In accordance with the plans of the RSF, two of its new invitations to tender will be aimed at stimulating the internal circulation of personnel. The emphasis will be on geographic mobility.

The first tender envisages the funding of projects led by Russian or foreign scientists, the latter having to come to work in Russia for at least 183 days per year (in order to be considered residents for tax purposes). Russian scientists will also be able to lead laboratories in the regions (Moscow and St. Petersburg are not participating in this tender). The idea is to stimulate the development of science in the regions through an influx of qualified personnel from the largest cities and foreign countries. It is planned to provide grants for 3-5 years and the initiative will be considered a success if between 50 and 100 worthy projects can be identified. The second tender will be for post-doctoral research fellows. The requirement will be, not just to change their place of work (to work in a place other than where their dissertation was defended), but to move to a completely different region. Given the current infrastructure of the country the focus

[1] Council for Science: No Positive Changes in FASO Institutes Are Yet Observed, 22 October 2014 http://sovet-po-nauke.ru/info/22102014-decision

[2] It Is Not about Mega-grants. RAS Vice-Presidents about the New Generation of Scientists//Lenta.ru, 30 October 2014 http://age.lenta.ru/generation/articles/2014/10/29/kozlov/

[3] Mereminskaya E. Emigrants of a New Wave. More People Have Started Leaving Russia//Gazeta.ru, 01 November 2014 http://www.gazeta.ru/business/2014/10/30/6282685.shtml

[4] 174 respondents took part in the survey, out of which 19% were teachers and researchers, 16% - representatives of government authorities and development institutes, 37% - businessmen and representatives of industry. Source: Russia: Focus on Innovation. Issue II. Moscow: RVC, 2014. p. 44.

on geographical mobility is not fully justified, taking into account the limited number of advanced scientific centres outside Moscow and St. Petersburg.

Such an approach is different from the practice typical of other countries. In countries with developed scientific infrastructure the focus on mobility is mostly displayed in the context of measures for stimulating connections between universities (scientific organisations) and business to accelerate the transfer of knowledge.[1] Moreover, it involves a gradual transition from direct measures (when, for example, target grants are provided, or other tools with a direct influence on mobility are used) to indirect measures relating to regulating the conduct of the consulting and business activities of professors, different types of joint initiatives, the training of personnel, etc.

The level of mobility of scientific personnel, which is vividly evidenced by the examples of the US, France and Japan, is significantly affected by the general economic regulation and associated characteristics of the established systems of innovation. For instance, in the US policy measures for stimulating mobility appeared as a result of an analysis of the effectiveness of governmental tools for supporting partnerships between science and business. This resulted in the implementation of the direct measures that had been most actively used in the 1980s. They have proved to be effective in the context of the current economic conditions that generally encourage workforce movement. However, a major part was played by indirect stimulation of inter-sector mobility. One of the most common tools is built into the programmes of support for small innovative enterprises. In this case, the transfer of professors from universities to companies, and the opportunity for them to open their own small businesses where they then work on a part-time basis, is encouraged.

5.4.8. The impact of sanctions

2014 was marked by a new situation, that of economic sanctions, which have already had some impact on the conditions for scientific research in Russia. Formally, the science sector is excluded from sanctions and, moreover, the goals and objectives of the reform and development of the scientific infrastructure involve an expansion of international cooperation and a reliance on international partnerships. This applied both to the development of science in HEIs and the realisation of priority scientific and technological areas. However, the situation has turned out to be asymmetric - with the Russian scientific sector suffering from the worsening political relations with scientifically and technologically developed countries, both in explicit ways, and other implicit ones which have yet to be fully assessed.

The first reaction appeared in April 2014 on the part of the US that limited, in some cases on a temporary basis, contacts between Russian and American scientists cooperating within the framework of projects implemented in national laboratories of such American departments as NASA and the Department of Energy. It was officially declared that this related only to inter-state interactions but not directly to the cooperating scientists. In practice, the situation turned out to be more complicated, and, on a number of occasions, work under the projects was suspended, the employees of Russian scientific organisations were banned from national laboratories and American scientists were prohibited from even holding teleconferences and electronic correspondence with their Russian colleagues.[2]

[1] Dezhina I. Inter-Sector Mobility of Scientific Personnel - World Trends and Peculiarities of Russia//Issues of State and Municipal Administration. 2014. No. 3, pp. 30-48.

[2] Kotlyar P. Bring Our Astronauts Back on Whatever You Want// Gazeta.ru, 04 April 2014 http://www.gazeta.ru/science/2014/04/04_a_5980353.shtml; Chernykh A., Belyaninov K. Sanctions Left Their

Later, in the autumn, the impact of sanctions became more implicit in nature, which made them more painful from a medium-term perspective. For example, problems arose with contracts with Western firms supplying scientific devices and equipment,[1] important foreign companies which could have launched production of component parts in Russia started leaving the technoparks.[2] By November information had appeared on the prohibition of the supply of a number of components required, among other things, for purely academic activities.[3] Thus, the sanctions started affecting not only possible dual-use technologies but also international basic research projects. In prospect, the implications of sanctions will affect the possibilities and speed of development of new technologies in Russia. Virtually all the high technology sectors in Russia depend considerably on imports - from chemical reagents to components of sophisticated machinery.

The development of universities, the realisation of top-priority scientific projects, resolving allied scientific and technological tasks - all these goals have been based on the absorption of foreign experience and encouraging the development of international cooperation. The situation in the field of international cooperation will most probably worsen as the negative impact of sanctions is aggravated by the devaluation of the ruble.

5.4.9. The state of innovation

In the last year innovation activity decreased, not so much because the measures for supporting innovation were insufficient or principally incorrect, but because the new measures were not implemented, while the old ones were still applied by rote. This is why the decline in innovation activity can be primarily related to the worsening overall economic climate in the country, affecting the conditions in which large, small and medium companies operate.

The current situation was accurately and concisely described by the Deputy Minister of Economic Development of Russia, Oleg Fomichev: 'There is a feeling that the innovation economy was built a long time ago, but that Russia still has no innovations.[4]

In large Russian companies one could note the expansion of the 'welfare mentality', a certain Soviet nostalgia. In addition to a supply of sufficient budgetary funds for R&D, such companies seem to be requesting more and more often that the state ensures a demand for their products or becomes their long-term customer. In particular, this was confirmed in a recent survey by the Russian Venture Company.[5] However, a state order which guarantees demand, at the same time sets specific requirements for the results of the work. This can slow down the rate at which companies enter global markets because a total state order decreases the competitiveness of its contractors.

For small companies, in turn, business conditions have worsened substantially in all regions, mainly due to the more complicated conditions of registration of companies (long terms, the

Trace in Science. Russian Physicists Banned from the U.S.//Kommersant.ru, 11 April 2014 http://www.kommersant.ru/doc/2449664

[1] Shatalova A. Attendance is Obligatory! Helmholtz followers settle in Russia//Search. No. 41. 11 October 2014 http://www.poisknews.ru/theme/international/12067/

[2] Bolokhova K. House of High Technologies//STRF. Science and Technologies of RF. 14 January 2015 http://www.strf.ru/material.aspx?CatalogId=223&d_no=92801#.VMOP1C4yTGw

[3] Cheberko I. The U.S. Prohibits the Supply to Russia of Devices for Scientific Satellite//Izvestia, 27 November 2014 http://izvestia.ru/news/579970

[4] Expert and analytical report 'Russia: Focus on Innovation' presented on the forum 'Open Innovations', 16 October 2014. http://www.mskit.ru/news/n173581/

[5] Russia: Focus on Innovation. Issue II. Moscow: RVC, 2014, p. 76.

difficult and multiple stages involved in obtaining permits, licensing, etc.)[1] The high rates of taxation, and predicted further increases, were another factor slowing down the development of small innovative business. At the same time, the mechanisms forcing large companies to cooperate with small ones, through the outsourcing of a proportion of the tasks involved in developing technologies, and through the purchase of products from small companies, have not yet started working. According to the Government's plans, state-owned companies should increase their purchasing from small business, however, the state-owned companies (primarily those engaged in the extraction of natural resources) are resistant to any government quotas in respect of such purchases, justifying this position mostly by claiming that their orders for products are large, and that small businesses are unable to fulfil them.[2] At the same time, while a number of large state-owned companies do cooperate with small firms, they are also against hard-quota purchasing volumes from small companies. Thus, in the current situation, the domination of self-procurement by large companies and their limited interest in cooperation persists.

Furthermore, as shown by surveys of companies and scientific organisations, most Russian entities do not use Russian developments (R&D and technologies), because, on average, 70% of them purchase ready-made technology from outside of Russia (in certain sectors, for example, in machine building, imports account for 95%).[3] Domestically generated innovations are used by only 24% of manufacturing companies, of which 58% note the low level of scientific and technical originality offered by national scientific organisations and HEIs (and the small companies created by them).[4] With the devaluation of the ruble this has become an almost dead-end situation: it is impossible to start quickly creating new technologies from a weak science base.

Thus, the absence of demand on the part of large companies for cooperation with small business can also be explained by the low level of novelty and quality of the products offered by those small companies. There is also a personnel-related aspect: the lack of skills. Despite the various training and retraining programmes that have been implemented over the space of more than 20 years, experts are continuing to name this factor among key obstacles to developing innovation-creating activities in the country. It is remarkable that here we can also observe an alarming trend: the demand for educational programmes related to technological innovations is actually declining both from individual entrepreneurs and from large companies.[5] It is possible that the reason is not that market participants consider themselves sufficiently educated, but rather, the dearth of relevant programmes being proposed. The question of who

[1] Grigorieva E. Little Ones Have Been Cornered. The Conditions for the Conduct of Small and Medium Business in Many Russian Regions Has Worsened Considerably//Novie Iznestiya, 30 July 2014 http://www.newizv.ru/economics/2014-07-30/205499-malyshej-zagnali-v-ugol.html

[2] Titov S., Cheppanova M. The Market Is Not for Small Ones. State-owned Companies Fight Against Quotas Obliging Them to Give 18% of Orders to Small and Medium Business//Vedomosti, 11 November 2014 http://www.vedomosti.ru/newspaper/article/789101/rynok-ne-dlya-melkih

[3] Data of the Ministry of Industry and Trade of the Russian Federation. Dependence of the Industry of Russia on Import Will Decrease 1.5 Times by 2020//RBC, 11 July 2014 http://www.rbc.ru/fnews.open/20140711091003.shtml

[4] Survey conducted by the NRU HSE among 2,000 companies and more than 1,000 scientific organisations. Source: Volkov M. HSE: Russian Enterprises Ignore Innovations. 24 July 2014 http://i.rbc.ru/anons/item/vshe_rossijskie_predpriyatiya_ignoriruyut_innovatsii

[5] Ponomarev I. Stanislav Rozmirovich: the Innovation System in Russia is Being Rebooted//Trade and Industrial News, 1 December 2014 http://www.tpp-inform.ru/analytic_journal/5236.html

teaches and what is being taught becomes more and more topical with the accumulation of experience in the business community and the aging of scientific and educational staff.

Overall, there are varied and ambiguous factors which negatively impact on the formation of added value chains, with not all of the players being ready to cooperate. At the moment companies of all sizes are oriented not towards mutual cooperation but towards support from the state, both financial and in other ways.

Finally, foreign policy and the associated capital outflow also negatively affect the innovation sector. Investment volumes and the likelihood of the owners of foreign capital participating in Russian foundations have both decreased. The volume of private funds in the venture market has decreased by more than a half - from the beginning of the year corporate funds have cut their support for projects by 61%.[1] The importance of broadening the sources of funding for venture investments by permitting the use of pension funds has already been under discussion for several years.[2] However, in the current economic climate the appearance of this source is unlikely radically to change the overall negative trend.

By late November 2014 the exodus of Russian investors from the country to international markets became apparent. The main reason for this was the absence of demand for innovation in Russia, following the failure of both the stimulation of innovation development programmes aimed at state-owned companies and other measures of 'forcing innovation'. Another reason was the increasing problem of innovative business exiting the market (i.e. selling-out to large high-tech companies) as foreign companies left or reduced their presence in the Russian market.[3]

However, despite the generally insignificant number of global-level achievements, one area has continued developing relatively successfully - innovations in the field of information technology.[4] In this field the imposition of sanctions has become an additional incentive for development, due to the sharp rise in prices for imported engineering software.

The economic conditions which have been generally unfavourable for innovation and the necessity for import substitution were the reasons behind the Government's decision to review its basic goal-setting document - the 'Strategy for Innovation-Driven Development of the Russian Federation for the Period until 2020.'[5] The available data indicates that, as of the end of 2014, about one third of its 45 target indicators had not been achieved, while for sections of the Strategy such as 'innovative business', 'effective science' and the 'innovative state', two thirds of the indicators had not been achieved. The best results were achieved in the 'financial support' sector, and the worst - in 'participation in the world system of innovation' (failure

[1] RVC Assessment. Source: Edovina T. The Market Model in Real Size. Venture Capitalism is Now Waiting for Orders and Investments from State-Owned Companies//Kommersant, 8 December 2014 http://www.kommersant.ru/doc/2628437

[2] Soloviev A. Why Medvedev is Giving Pension Money to Start-ups. 13 August 2014 http://top.rbc.ru/economics/13/08/2014/942690.shtml

[3] Turkot A. Why Venture Funds are Leaving Russia, 25 November 2014 http://daily.rbc.ru/opinions/business/25/11/2014/5473190acbb20f2a143fe496

[4] Igor Agamirzyan: One Has to Run Fast to Stay in the Same Place, 18 December 2014 http://russiancouncil.ru/inner/?id_4=4992#top

[5] Welcoming speech of Dmitry Medvedev at the meeting of the Presidium of the Presidential Council of the Russian Federation for Economy Modernisation and Innovation-Driven Development of Russia 'On the Progress of Implementation of the Strategy of Innovation-Driven Development of Russia for the Period until 2020', 19 December 2014 http://government.ru/news/16196/

against 75% of the indicators).[1] New decisions were announced on 30 December 2014 as a result of the meeting of the Presidium of the Presidential Council of the Russian Federation for Economy Modernisation and the Innovation-Driven Development of Russia, at which issues of adjustment of the Innovation Development Strategy had been considered. By mid-November 2015, an updated draft strategy should have been developed,[2] with the further assurance of annual monitoring of its implementation.

5.4.10. Infrastructure development: technology platforms and innovation clusters

In 2014 the state continued working on forming connections within the system for innovation, including by its support for innovation clusters and increasing the importance of the expert function imposed on technology platforms. Infrastructure projects remain among the most successful support measures for technological information. For instance, in innovation clusters the R&D expenditure of cluster participants increased from Rb 72.9bn in 2012 to Rb 85.4bn in 2014 (expressed at 2012 prices).[3]

Technology platforms and clusters therefore received a new impetus for development but it has not been fully realised as yet. As a result of new industrialisation, the importance of localisation (ensured by clusters) and network interactions (the function of technology platforms) have increased. In late 2014 clusters received additional funds for their development from the federal budget - the amount of distributed funds was increased to Rb 2.5bn (against Rb 1.3bn in 2013), and all 25 clusters supported by the Government could apply for it. However, the budgetary funds can only be spent on a limited number of activities (maintenance of the specialised cluster organisations, personnel training and retraining, exhibitions and trade fairs, support of the work of engineering centres and other infrastructure objects). Typically, most requests were received for the support of engineering centres and specialised cluster organisations,[4] which indicates a better understanding of the purpose of clusters as systemic entities rather than just a set of facilities located in the same area. It should be noted that, in 2014, the activities of engineering centres were evaluated by the Government as 'absolutely effective' because each of the supported centres earned revenues that were greater than the amount of their state subsidy.[5]

It should also be noted that, in terms of funding priorities, Russian clusters are supported by the Government in a different manner from that in other countries. In Europe much more attention is paid to the funding of joint research and development projects, which contributes

[1] On Implementation of the Strategy for he Innovation-Driven Development of the Russian Federation for the Period until 2020. Presentation. by the Ministry of Economic Development of the Russian Federation. Moscow, 19 December 2014 http://government.ru/media/files/A6DTgyvkUo8.pdf

[2] Decisions made based on the results of at the meeting of the Presidium of the Presidential Council of the Russian Federation for Economy Modernisation and Innovation-Driven Development of Russia, 30 December 2014 http://government.ru/orders/16381/

[3] According to data from the constituent entities of the Russian Federation as of September 2014. Source: On Implementation of the Strategy for Innovation-Driven Development of the Russian Federation for the Period until 2020. Presentation by the Ministry of Economic Development of the Russian Federation. Moscow, 19 December 2014 http://government.ru/media/files/A6DTgyvkUo8.pdf

[4] Ministry of Economic Development Distributed 2014 Subsidies for Support of Pilot Clusters//Russian Cluster Observatory, 19 November 2014 http://cluster.hse.ru/news/1574/

[5] Ministers discussed the development of engineering centres in Polytechnic University, 23 January 2015 https://www.spbstu.ru/news/2015_01_23/2015_01_23.asp

to the technological development and expansion of added value chains. In Russia this aspect is, as yet, missing, with clusters being interpreted simply as infrastructure projects.

What also stands out is that the development of clusters reflects many of the systemic problems of the Russian innovation sector that are difficult to resolve at a local level. For instance, experts at the Russian Cluster Observatory note that Russian clusters include only a small proportion of private organisations, small and medium enterprises, and exhibit weak competition within the cluster.[1] Thus, experience of cluster development suggests that the primary task of innovation policy should be to change the business climate and to create favourable conditions for the development of small and medium enterprises, and connections within the innovation system. Clusters may have a small effect on adjusting and accelerating technological development, but as tools, they are secondary and can hardly change the innovation environment as a whole.

Technology platforms, as opposed to clusters, have never received targeted budgetary funding for their development and preparation of strategic documents. However, their access to budgetary funds from federal target programmes was facilitated because the platforms, de-facto, began to play the part of collectives of experts for conducting the preliminary selection and assessment of relevance of particular projects within individual FTPs. For example, in some of the competitive tenders for the Federal Target Programme 'Research and Development in Priority Areas for the Development of the Scientific-Technological Complex of Russia for 2014-2020' applications have only been accepted where documentation is available confirming that they are supported by technology platforms. This means that the subject of the application has to be within the strategic programme of research of a particular platform.[2] On the one hand, such pre-selection is important and links the interests of different stakeholders. On the other hand, as with any formal requirement, it distorts the demand for funding. For example, organisations which had not previously participated in platforms have sought to become members, not for the purposes of enhancing their interactions and clarifying development strategies, but simply to facilitate the process of obtaining the documents that are important for successful participation in tenders for budgetary funds.

The aspect of the quality of expert review should also be noted. Since the platforms have developed without state support, they have yet to become serious collectives of experts and, hence, their evaluations of particular areas of technology should be looked at critically. In particular, at a meeting of the Foresight Session in the NRU-HSE it was noted that the platforms do not yet represent the consolidated opinion of science and business in the field of technological development.[3] Out of 35 technology platforms, no more than 20% can justify their proposals on areas of strategic development. Platforms still contribute very little to changing the educational environment, namely to creating training courses, laboratories or departments for developing fields of new technology.

In part, the weakness of the platforms' potential is confirmed by their insignificant involvement in international networks and partnerships (*Table 22*). The extent of the international connections of platforms can be assessed on the basis of two parameters: a) their

[1] Kutsenko E. Areas for Increasing the Effectiveness of Cluster Policy in Russia. Presentation during Russian Cluster Week. Moscow, 27-28 November 2014 http://www.slideshare.net/evgenykutsenko/kutsenko-27112014

[2] Shatalova N. Pluses of the New Formats. Changes in FTP Did It Good//Search. No. 29-30. 25 July 2014 http://www.poisknews.ru/theme/science-politic/11182/

[3] Foresight as a platform for resolving development problems, 2 April 2014 http://conf.hse.ru/2014/news/120086267.html

degree of activity in developing partner relationships and of participation in international conferences and exhibitions, and b) the presence of foreign organisations in the composition of platform participants. The first indicator is the more objective because foreign members in the composition of platforms may perform only a nominal representative function and do not necessarily contribute to internationalisation.

Table 22

Technology platforms: degree of international involvement connections

Platform	Active in development of international connections	Foreign organisations in the composition of platform members
Medical Science of the Future	+	+
Bioindustry and Bioresources - Biotech 2030	+	-
Bioenergy	+	+
Innovative laser, optical and optoelectronic technologies - photonics	+	-
Radiation technology	+	-
Ocean exploration	+	-
Textile and consumer goods industry	+	+
3 platforms in the field of extraction and processing of hydrocarbons	-	+
Environmentally friendly transport 'Green Car'	-	+
Construction and architecture	-	+

Source: prepared by the author on the basis of data from: 'Russian Technology Platforms'; the Moscow International Forum 'Open Innovations'; the Ministry of Education and Science of Russia and the Ministry of Economic Development of Russia, RFTD, Moscow, 2014.

As can be seen from *Table 22*, only three platforms successfully combine both the parameters of international activity, and in two of them the coordinating organisations had developed such international connections before they became members of the platforms.

* * *

Thus, 2014 was characterised by a slow implementation of scientific and innovation policy under increasingly complicated external conditions and economic problems. The development of further steps for reforming scientific infrastructure was not adequately coordinated, and resulted in poor coupling and insufficient development of key measures, as well as a year's extension of the moratorium for dealing with the issues of property and personnel changes in the institutes that had previously been included in the RAS, RAMS and RAAS. The emergence of a new management structure - the FASO - did not optimise, but rather complicated, and muddied the waters for the distribution of functions between the key departments responsible for the development of science in Russia. By the year-end, signs of an increased exodus of scientists to other countries started to become more and more apparent.

Budgetary projects evidence that the state funding of R&D will not be growing in the way that it used to do, and from 2016 it is planned to fix the amount of allocations. Taking into account inflation, this effectively means a reduction in budgetary expenditure. At the same time, foreign policy problems have started to affect international scientific and technological cooperation, forcing a transition to a mobilisation-oriented model of science. However, this is

difficult to realise due to the weakness of the scientific infrastructure in a whole range of otherwise promising scientific and technological areas.

The innovation sector has seen an outflow of Russian and foreign capital, especially visible in the field of venture capital investment in innovation, due to the reduction in the number of possible options to exit high-tech businesses. At the same time, the state's focus on policy measures aimed at strengthening relationships between key players in the innovation system has increased noticeably.