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R95 **Russian Economy in 2020. Trends and outlooks**. **(Issue 42)** / [V. Mau et al; scientific editing by Kudrin A.L., Doctor of sciences (economics), Radygin A.D., Doctor of sciences (economics), Sinelnikov-Murylev S.G., Doctor of sciences (economics)]; Gaidar Institute. – Moscow: Gaidar Institute Publishers, 2021. – 668 pp.: illust.

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The review "Russian Economy. Trends and Outlooks" has been published by the Gaidar Institute since 1991. This is the 42th issue. This publication provides a detailed analysis of main trends in Russian economy, global trends in social and economic development. The paper contains 6 big sections that highlight different aspects of Russia's economic development, which allow to monitor all angles of ongoing events over a prolonged period: global economic and political challenges and national responses, economic growth and economic crisis; the monetary and budget spheres; financial markets and institutions; the real sector; social sphere; institutional changes. The paper employs a huge mass of statistical data that forms the basis of original computation and numerous charts confirming the conclusions.

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4.9. Science and innovations in Russia in 2020[1]

Over the past year, the pandemic and the resulting crisis whipped up the decision-making process in science and technology policies. A number of top-level programs were revised, alongside some adjustment of budget allocations for R&D projects. Operational decisions were adopted across a number of areas, where discussions and coordinated planning had been underway for several years already (e.g., the transformation of scientific research funds, improvement of coordination and promotion of continuity between the development institutions operating in the science and technology sector, alterations in the current procedures for estimating the cost-effectiveness of budget-funded venture capital investment, etc.), in order to significantly change the situation in that sphere. Besides, some important normative legal changes were introduced, which addressed the science sector and promoted the creation of a favorable environment for developing and implementing technological innovations.

4.9.1. Revision of strategic targets

In July, the RF President signed an Executive Order on the national development goals of the Russian Federation for the period until 2030.[2] Among the national goals set forth in its text, the creation of *"conditions for self-fulfillment and the unlocking of talent"* explicitly refers to the field of science, its implementation indicator being to *"join the world's top 10 countries in the volume of research and development, including through the creation of an effective system of higher education"*. Such a definition of the national goal logically translates into the idea of a closer merger of science and education. And this is exactly what was done by transforming the National Project (NP) "Science" into the National Project "Science and Universities".

One of the key themes in this connection was the integration of education and science. The issue turned out to be especially acute for the research institutes formerly subordinated to the Russian Academy of Sciences. The concerns that research institutes may indeed be merged with higher educational establishments[3] in order to strengthen the scientific research base of the latter have been voiced once again, and repeatedly. This recommendation was put forth in an analytical report prepared for the RF Ministry of Science and Higher Education in October 2020[4] by a team of authors representing several leading Russian universities (in the main the universities participating in the Project 5-100)[5] - "Higher Education:

1 This section was written by *Dezhina I.*, Doctor of Economic Sciences, Leading Researcher, Gaidar Institute; Head of the Analytical Department on Science and Technology Development, Skolkovo Institute of Science and Technology.

2 Executive Order of the RF President on Russia's national development goals through 2030, dated July 21, 2020. URL: http://kremlin.ru/events/president/news/63728.

3 *Volchkova N*. Caution: A reassembly! The scientific community is full of misgivings // Poisk, August 13, 2020. URL: https://www.poisknews.ru/science-politic/ostorozhno-peresborka-nauchnoe-soobshhestvo-polno-durnyh-predchuvstvij/

4 Analytical report "Higher Education: Lessons from the Pandemic. Operational and Strategic Measures for the System's Development". October 2020. P. 54. URL: http://www.tsu.ru/upload/iblock/ аналитический%20доклад_для_МОН_итог2020_.pdf.

5 Out of 61 authors of the report, 82% work in the universities participating in the Project 5-100; some authors are from St. Petersburg State University; none is from Moscow State University.

Lessons from the Pandemic. Operational and Strategic Measures for the System's Development". Among other things, the report points out the inadequacy of State assignment for the provision of funding for scientific research in universities, the lack of research infrastructure unity between research institutes and higher educational establishments, and the difficulties in interaction in the context of growing demand for interdisciplinary projects. Considering these problems, it is proposed *"... to raise the issue of launching pilot projects of legal integration of certain universities and academic institutes."* Thus, the idea of merging or, more precisely, 'joining' research institutes with universities was clearly voiced by representatives of Russia's leading universities. No "full integration" has been planned as yet at the official level, but later on, quite possibly, one can expect the adoption of some decisions aiming at the organizational structure optimization in the science sector.

In fact, the adoption of targets to be achieved by 2030 resulted in a situation where the targets set in the National Projects had been pushed aside. Thus, in particular, while the NP "Science" involved the achievement, by 2024, of the difficult goal of becoming one of the top 5 countries in the fields declared to be national priorities of scientific and technological development, the new document sets the goal of getting, by 2030, to 8th place in the world by the R&D volume. This is an easier target because now Russia ranks 9th in terms of this indicator (based on a calculation of purchasing power parity).[1] However, if one measures the volume of R&D in terms of share in GDP, Russia will belong somewhere between 30th and 40th places.

The national project "Science and Universities" will now include 4 federal projects: "Development of integration processes in science, higher education and industry", "Development of large-scale scientific and scientific-technological projects in priority research areas", "Development of infrastructure for research and training", and "Development of human capital in the interests of regions, industries and the sector of research and development."

Only one of these projects ("Integration") directly concerns the relationship between science and the real sector of the economy, and the growth of socio-economic benefits from research and development activities. This project envisages only a slight increase in extrabudgetary funding. In 2021, it is projected to be at the level of 22% of the total project budget, and by 2024, 26%. Such a modest increase in the planned target indicates either the confidence of the project's developers that businesses are not going to display a significantly increasing interest in investing in research and development, or a lack of any serious potential in universities and research institutions for conducting research that might be useful for the development of businesses.

The current version of the National Project "Science and Universities" aims at strengthening the research potential of higher educational establishments, and these plans should encompass all of Russia's 724 leading universities.[2] This goal

1 Science Indicators: 2020. Data Book. Moscow, HSE University, 2020, pp. 282–284.
2 *Bulgakova, N*. Both an anchor and a driver. Universities are faced with grandiose tasks // Poisk, No. 45–46, November 13, 2020. URL: https://poisknews.ru/edu/i-yakor-i-drajver-pered-vuzami-

appears to be rather unusual because, as demonstrated by world practices, only a small part of universities are engaged in research. Thus, for example, according to the Carnegie Classification of Institutions of Higher Education, less than 10% of universities in the USA are research universities, i.e. those entitled to confer a doctoral degree (PhD); in Germany, research universities constitute a little less than a third of all universities.[1] The involvement in scientific research of such a significant number of universities would be impossible without their closer integration with research institutions. Indeed, it is planned to set up consortia, and this form of interaction has been repeatedly presented by the RF Ministry of Science and Higher Education as a priority, although no clear definition of the concept of a consortium has yet been suggested. As of the year end, the final decision concerning the structure of and targets for the new NP "Science and Universities" had not yet been made, either.

Meanwhile, the budget allocations for R&D were projected without taking into account the revision of the National Project "Science" and the plans for reforming the development institutions, which were made public only as late as November. The budget allocations for civilian R&D were based on the previously established budget projections, and they were downwardly adjusted for the next 3 years (*Table 39*). The budget expenditure projections for civilian R&D are reduced by 5-6% per annum relative to the initially planned targets.

Table 39

The movement of budget allocations for civilian R&D

Indicator	2021	2022	2023
Federal budget expenditure on civilian R&D, total, bn Rb	486.1	514.4	531.7
Change relative to previous year, %	-3.9	+5.8	+3.4
Changes relative to draft law projections for 2020-2022, in given year, %	-6.3	-4.9	–

Source: Annex 10 to the Explanatory Note to the draft federal law on the federal budget for 2021 and the 2022 and 2023 planning period; own calculations.

The budget sequestration had different effects on the programs and research projects of different types. Among the government programs, the core one is the Government Program "Scientific and Technological Development of the Russian Federation", which pools the main budget expenditure projections for R&D, including the National Project "Science". In accordance with the Program, R&D expenditures are to increase at a rate twice as high as that of total federal budget expenditures on R&D: in 2022, by 10.2% (from Rb248.8 bn in 2021 to Rb274.2 bn in 2022), and in 2023, by 8.9% (to Rb298.6 bn). No changes in the amount of allocations for the National Project "Science" have been planned relative to the targets stipulated in Federal Law No 380-FZ. In 2020, Rb47 bn was allocated to the NP "Science", of which 88.53% went to civilian research projects. This is

stavyat-grandioznye-zadachi/

1 Higher Education Institutions in Figures. URL: https://www.hrk.de/fileadmin/redaktion/hrk/02-Dokumente/02-06-Hochschulsystem/Statistik/2017-06-14_Final_Engl._Faltblatt_2017_fuer_Homepage.pdf

the most hi-tech national project. Next comes the NP "Digital Economy" (total federal budget funding in the amount of Rb124.2 bn), where the budget funding allocated to civilian research is 8 times less (Rb5.5 bn, or 4.64 % of the total amount allocated to the project).[1]

The most rapid growth is expected in the expenditures on fundamental research, by 10.8% per annum; their share in the total expenditures on civilian R&D will increase accordingly. However, compared to the previously planned allocations for fundamental research (in the 2020–2022 budget), these were slightly reduced, by 2.3% in 2021 and by 6.9% in 2022.

A significant reduction in budget allocations for R&D is planned under the subprograms/projects aimed at developing advanced technologies. The funding for the Federal Project "Digital Technologies" under the National Program "Digital Economy of the Russian Federation" is to be cut twofold. In addition, the budget allocations for the subprogram "Promotion of Scientific Research and Experimental Development in Civilian Industries" under the Program "Development of Industry and Increasing Its Competitiveness", will be reduced by Rb2.7 bn in 2021, and Rb0.8 bn in 2022; in 2023, the subsidies to Russian organizations designed to compensate them for part of their costs under R&D projects involving modern technologies will likewise be reduced. These changes will result in a tangible reduction in government support for the R&D projects targeting promising technologies across all fields of science.

Thus, the volumes of planned budget allocations for civilian R&D projects have slightly decreased relative to the indicators of the previous planning period; nevertheless, it is envisaged that they should gradually increase every year. The allocations for fundamental scientific research will be increasing at a fastest rate. At the same time, the allocations in the R&D sector for the development of promising and "end-to-end" technologies are being significantly reduced, and if one considers the current low practical impact of science on the economic and technological development of this country, it can be said that Russia's position in hi-tech markets is not going to improve significantly.

The effect of the pandemic on the science sector

A certain shift in the targets was also triggered by the pandemic. The priorities in the field of scientific have become biomedicine, epidemiology, parasitology, and related disciplines. Besides, Gartner Inc. (global data and analytics company) notes a change in technological expectations in response to the pandemic: new social distancing technologies and so-called health passports have been taking the fastest climb up the Peak of Inflated Expectations.[2] Two trends have become the most obvious in the field of international scientific cooperation:

1 Martynova S., Tarasenko I. Allocations for civilian science from the federal budget within the framework of national projects (programs) of the Russian Federation // Science, Technology and Innovation. WP BRP Series. ISSEK, HSE University, March 25, 2020 URL: https://issek.hse.ru/news/352173147.html

2 5 Trends Drive the Gartner Hype Cycle for Emerging Technologies, 2020. URL: https://www.gartner.com/smarterwithgartner/5-trends-drive-the-gartner-hype-cycle-for-emerging-technologies-2020/#:~:text=5%20Trends%20Drive%20the%20Gartner%20Hype%20Cycle%20

- a switchover to online cooperation within the framework of current and new projects as a result of an effective halt in scientific mobility;
- increasing use of digital platforms, online access to data, publications and infrastructure.[1]

The switchover to remote work influenced multiple aspects of scientific cooperation: mutual visits of scientists, student and postgraduate exchanges, joint participation in conferences. A review of best practices in international scientific cooperation has shown that research partners consider their face-to-face communication (what is now called "offline mode") to be indispensable and one of the most important components of a successful scientific partnership. In addition, online contact for the most part can be effective when the researchers have already previously met in person.[2] Establishing a connection and developing a new project entirely in an online mode is a totally new practice, and its effectiveness is still questionable. The same is true of conferences. The important aspects of any conference are the socialization of participants and their private discussions, including those that take place outside of the formal sessions. The idea of keeping on the online or hybrid format of holding conferences even after the end of the pandemic could be attractive from the point of view of cost saving for research and higher educational institutions. However, the longer the pandemic lasts, the more negatively the scientists perceive the online format. Thus, in particular, the results of surveys of researchers across nearly 100 countries around the world in May and October 2020 demonstrated that over time, the number of those who negatively assessed both online conferences and the lack of "live" communication had increased.[3] More particularly, 29% of the scientists surveyed in May, and 37% of those surveyed in October, felt that the switchover to an online mode reduced their scientific productivity.

At the same time, the pandemic has become an incentive for developing the various forms of "open science": unified platforms pooling data from observations andexperiments;openaccesstopublicationsandexpertestimations;crowdfunding; and even an open (remote) access to scientific infrastructure. "Openness", in all its aspects, began to be actively promoted by international organizations, including UNESCO.[4] A large-scale open science project is still undergoing the phase of coordination and approval, but the pandemic has sped up some of the ongoing processes. Thus, for example, the European Commission, on April 21, 2020,

for%20Emerging%20Technologies%2C%202020,-Trends&text=The%20Gartner%20Hype%20Cycle%20for%20Emerging%20Technologies%2C%202020%20highlights%2030,next%20five%20to%20ten%20years

1 *Dezhina, I.* International scientific cooperation: What does the pandemic change? Analytical materials from the Russian International Affairs Council's website. May 14, 2020. URL: https://russiancouncil.ru/analytics-and-comments/analytics/mezhdunarodnoe-nauchnoe-sotrudnichestvo-chto-menyaet-pandemiya/

2 *Grove J.* Pandemic 'frees' researchers from 'hampering' habit of travel // Times Higher Education, September 1, 2020. URL: https://www.timeshighereducation.com/news/pandemic-frees-researchers-hampering-habit-travel

3 Locked Down, Burned Out Publishing in a Pandemic: the Impact of Covid on Academic Authors. De Gruyter Publishing, December 15, 2020. URL: https://blog.degruyter.com/wp-content/uploads/2020/12/Locked-Down-Burned-Out-Publishing-in-a-pandemic_Dec-2020.pdf

4 URL: https://en.unesco.org/sites/default/files/open_science_brochure_en.pdf

launched a new portal for the scientists from any country to exchange their data and research results on the coronavirus, obtained from both national and regional sources.[1] Meanwhile, "open science" and scientist cooperation have most strongly affected the biological and medical fields, although the pandemic has also highlighted a whole spectrum of problems, including economic, psychological and social ones. In response to the development of open science in this country, the stratification of research organizations may become more pronounced, because they all differ in their technical potential enabling them to work with online data and platforms. The increasingly widespread use of online formats has created more advantages only for a limited number of Russia's leading universities and research institutes, most of which are situated in the capital, because by no means all of these organizations, especially those scattered across the regions, can boast of their adequate digitalization level.

4.9.2. The strategic academic leadership program

Throughout the past year, by way of further developing the new National Project "Science and Universities", the RF Ministry of Science and Higher Education was working on a new Strategic Academic Leadership Program (PSAL), designed to replace Project 5-100 and the support program for cornerstone universities.

Initially, the PSAL had a narrow focus, since it was formed as a version of continued Project 5-100. Project 5-100 was officially completed in 2020, and so it was no longer relevant from the point of view of its initially declared goals. The universities participating in the Project failed to enter the top 200, let alone the top 100 universities in the major world rankings. Some success has been achieved in by-subject university rankings; besides, it can be viewed as a successful outcome that now, more universities in principle have been actually included into international rankings. However, this is true not only of Project 5-100 participants.

It should be noted that in recent years, the excellence or perfection initiatives, which also include Project 5-100, have increasingly become subject to criticism. Such programs, as a rule, are implemented under strict supervision based on a limited set of indicators; as a result, universities focus on those specific disciplines and fields for which it is easier to obtain funding, and these are quite often mainstream ones.[2] Thus, in particular, the example of Germany's Excellence Initiative, with its 15-year history, demonstrates its positive effect on the quantitative parameters of scientific research in the participating universities, while "the effect on the quality of research is opposite."[3] If we look at the higher education system as a whole (and not just at the select group of elite universities), we will see that stratification has become more pronounced, the administrative burden has become heavies,

1 URL: https://www.timeshighereducation.com/news/europe-seeks-centralise-fractured-coronavirus-data?utm_source=THE+Website+Users&utm_campaign=a9f9eb90f5-EMAIL_CAMPAIGN_2020_04_24_02_50&utm_medium=email&utm_term=0_daa7e51487-a9f9eb90f5-74904797.

2 *Baker S*. Do university excellence initiatives work? Times Higher Education, June 11, 2020. URL: https://www.timeshighereducation.com/features/do-university-excellence-initiatives-work.

3 *Matthews D*. German excellence strategy 'harmed research quality'. Times Higher Education, August 10, 2020. URL: https://www.timeshighereducation.com/news/german-excellence-strategy-harmed-research-quality.

and there has emerged a tendency towards institutional fragmentation. Thus, the German initiative influenced positively the participating universities, while it failed to strengthen the national scientific research and educational system, and to a certain extent even contributed to its erosion.

Russia's Project 5-100 was no exception among the other excellence initiatives. It led to changes in the management patterns of the participating universities designed to accommodate them to achieving a limited number of goals. As a result, the system became more focused on certain functions, and thus more hierarchical, with heavier bureaucracy and higher risks of voluntarist decision-making. Along with the fact that some progress was indeed noted in the number of created scientific products, the quality of those products has not yet been fully ascertained. There is some evidence that quantity was achieved to the detriment of quality.[1]

During the first phase of its development, the PSAL was known as the Russian Academic Excellence Program (RAEP). Its goal was more modest than that of Project 5-100: to get to 10th place in the world by the inclusion of Russian universities into the top 500 global university rankings. The scope of the program was to be slightly increased, up to 30 universities, and to allocate funding at the level of Rb1.2 bn per university per annum.[2] At the same time, in addition to the goal of improving Russia's position in the rankings, it was intended to *increase the economic yield* of universities, in the sense that they should focus on the priority areas outlined in the Strategy for Scientific and Technological Development, build partnerships with businesses, take lead in digitalization processes, and develop "the third mission". In June 2020, RF Minister of Science and Higher Education Valery Falkov said that in the new program, *"Key Performance Indicator (KPI) will be based not so much on scientometrics as on the assessment of the real contribution to economic growth, welfare growth, creation of a more comfortable environment in our regions and cities."*[3]

The higher educational establishments that were eligible for the program were divided into 2 groups: those that, starting from 2018, were at least once included in the top 500 rankings by ARWU, QS or THE; and those that met at least four of the following five criteria: inclusion in a ranking; a student population of not less than 6,000, where foreign students number not less than 3%; an income of not less than Rb1.5 bn, where R&D projects yield not less than 10%. So, an applicant university must be sufficiently large, and have a history of getting into international rankings.

In June, the program was assigned a new name: the Strategic Academic Leadership Program, with a 10-year implementation period and a budget of Rb52

1 *Trubnikova E.* (2020) Project 5-100: a view through the prism of the theory of institutional corruption // Universe of Russia. V. 29. No 2. P. 72–91. DOI: 10.17323/1811-038X-2020-29-2-72-91.

2 The RF Ministry of Science and Higher Education suggested that the funding to support Russia's leading universities should be increased // Future of Russia. National Projects. April 8, 2020 URL: https://futurerussia.gov.ru/nacionalnye-proekty/minobrnauki-predlozilo-uvelicit-finansirovanie-na-podderzku-vedusih-vuzov-rossii

3 *Reznichenko A.* Valery Falkov: science is made not by structures, but by individuals // TASS, June 4, 2020. URL: https://tass.ru/interviews/8644947

bn for 2021–2024.[1] The selection criteria were changed, and the planned number of participants was increased. It was intended that the new version of PSAL was to cover the former participants in Project 5-100, the cornerstone universities, and some other eligible higher educational establishments, so that 150-200 universities in total would be included in the program. Meanwhile, in comparison with the first version of the program, the eligibility indicators were brought down to 4,000 students, a total income of Rb1 bn, and 5% of R&D expenditures.[2] The easing of eligibility criteria was justified by the broader range of participants, which increased from the original target of 30 universities to that of nearly 200. The planned budget for the program was increased accordingly, to Rb116.2 bn for the period 2021–2024. The option of introducing two main categories of supported higher educational establishments (those oriented to leadership in scientific research and to territorial/sectoral leadership) was also discussed. The trend towards increasing the number of participants in the PSAL can be viewed as a positive change, because the degree of stratification inside the system of state higher educational establishments will thus be reduced: now, more of them will be able to receive state support.

The word "academic" in the program's title attracted the attention of the Russian Academy of Sciences (RAS), both from the point of view of the role in this project of the Academy itself, and that of its subordinated institutes. In particular, among other things, the Presidium of the Russian Academy of Sciences suggested that its importance within the framework of program should be strengthened, and that it should be emphasized that one of the goals would be to develop human resources, including for the science sector, and so the institutes formerly subordinated to the RAS would become potential employers. As the PSAL envisaged the creation of consortia of higher educational establishments and research institutions, the Presidium of the RAS believed it to be important to thoroughly elaborate the guidelines for setting up such consortia, including the mechanisms for their financing. In those cases when it is planned to alter the legal status of a research institutions entering a consortium, it would be necessary to stipulate a mandatory coordination with the RAS of all the aspects of that procedure.[3] The orientation to integration of research institutes and higher educational establishments that is laid down in the program somewhat resembles the Program "Integration",[4] but in this particular case the leading role is obviously assigned to universities.

Judging by the indicators to be applied in the selection of universities, scientometrics will remain the focus of attention. For the universities oriented to leadership in scientific research, the total weight of the indicators relating in

1 Valery Falkov: not less that Rb52 bn will be allocated for the development of universities. June 8, 2020. URL: https://na.ria.ru/20200608/1572628732.html.

2 *Erokhina E*. "Anyway, the people must be forced to learn". On academic leadership and scientific integrity // The Indicator, June 16, 2020. URL: https://indicator.ru/humanitarian-science/vse-taki-narod-nado-zastavlyat-uchitsya.htm.

3 Strategic Academic Leadership Program // Scientific Russia, October 23, 2020. URL: https://scientificrussia.ru/news/programma-strategicheskogo-akademicheskogo-liderstva.

4 The Federal Target Program "State Support of the Integration of Higher Education and Fundamental Science for 1997-2000" was developed in accordance with the Executive Order of the President of the Russian Federation dated June 13, 1996.

one way or another to their position in international rankings is 3 times greater than that of all the other parameters taken together. For the other universities the relative weight, in their total assessment score, of the indicators describing their interaction with industry is likewise not so great, and thus it is easier for them to develop a purely "scientific" direction of their activity, which is assessed by their publication activity. In addition, it is planned to introduce the requirement for a mandatory international expert estimation of their projects. This makes more difficult their possible cooperation with big state-owned enterprises and private companies, in the interests of which the universities could launch R&D projects, because research projects frequently address certain themes that are sensitive from the point of view of international competitiveness, and so they cannot be reviewed by international experts. Thus, the proposed system of indicators gives rise to a conflict between the declared goals of the PSAL and the reporting indicators of the universities. In particular, this has to do with the goal of developing "the third mission" of universities.

In Russia, "the third mission" is often described in terms of the types of activities assigned to a given university, e.g., supplementary education, technology transfer, social involvement, and participation in solving global problems. From this list, which is by no means exhaustive, it becomes clear that the fulfillment, by universities, of their "third mission" should be assessed on the basis of a combination of quantitative and qualitative parameters. Part of "the third mission" is the involvement in the economic development of the region where the university is situated. It is this particular indicator that is measured by foreign universities when they want to determine the degree of their influence outside of their academic environment. Besides, there exist estimates of a university's impact on the country as a whole, and even on the global economy, but these only make sense for a handful of outstanding universities; e.g., such estimates were applied by the Massachusetts Institute of Technology (MIT) and Oxford University. The economic effects are subdivided into direct ones, which have to do with the revenues and expenditures of a university, its staff, and its students inside its native region (including the creation of startups); indirect ones, determined by the movement of the revenue and employment indices reported by the businesses and other structures responsible for smooth functioning of a university; and induced ones (those that become manifest, e.g., in their influence on the value of property, on the influx of new companies into the region caused by the fact that there is a university there, etc.).[1] In Russia, there have already been some examples of the contribution of Russian universities to the development of technological entrepreneurship being measured by the number of startups set up by their graduates.[2] However, such an assessment is based on the amount of funding (investments) attracted by those startups, and not on the amount of their

1 *Dezhina I.* Universities outside the academic environment // The Independent Newspaper - Science, November 10, 2020, pp. 9-10. URL: https://www.ng.ru/science/2020-11-10/9_8010_universities.html.

2 *Chukavina, K., Tolmachev, D., Perechneva, I., Volganova, E.* Make startups the foundation of a new economy // The Expert, No 42, October 10, 2020. URL: https://expert.ru/expert/2020/42/sdelat-startapyi-fundamentom-novoj-ekonomiki/

proceeds. More likely, this is indicative of the development potential of one or other startup, but not the effect of its influence on the economy. Unfortunately, the PSAL does not envisage an assessment of the economic impact of universities, although it proclaims the necessity to develop their "third mission".

At the very end of the year, on December 31, 2020, the RF Government issued a directive (No 3697-r),[1] whereby the PSAL was renamed "Priority-2030". The program is to be implemented until 2030 on a competitive basis, and the RF Ministry of Science and Higher Education should submit the financial and other parameters of the program by March 1, 2021.

4.9.3. The measures to be implemented within the framework of the national project "Science"

Last year, in spite of the National Program "Nauka" being re-formatted, the measures launched within its framework in 2019 continued to be implemented. In particular, there was a contest for the formation of world-class scientific centers (WCSC); a selection of world-class science and education centers (SEC), in addition to the five centers that had already been established 'in a manual mode' in 2019, was conducted;[2] and the mega-grant program was carried on.

World-class scientific centers

World-class scientific centers are set up in the form of consortia. According to the certificate of the Federal Project "Development of Scientific and Scientific-Production Cooperation", at least 9 world-class scientific centers involved in the implementation of research and development projects in conformity with the established scientific and technological development priorities should be selected within the framework of the National Project "Science". Based on the results of a contest, 10 centers were selected from among 60 applicants.[3] It is noteworthy that the WCSCs were selected with due regard not only for the level of their submitted applications, but also the thematic fields addressed by their projects. In this connections, the effect of the pandemic was also obvious, in that 4 out of the 10 winner projects will focus on those fields on study where medical science merges with promising technologies (*Table 40*). Each WCSC unites 2 to 7 organizations, each of which will receive unequal amounts of funding. One of these WCSCs is established on the basis of a just one organization (the National Medical Research Center for Endocrinology under the RF Ministry of Health), and so no consortium has been formed.

A number of WCSCs are attached to science education centers (SEC) or genomic centers (the WCSC "Advanced Digital Technologies" is attached to the West Siberian Interregional SEC; the WCSC "Agrotechnologies of the Future", to the Kurchatov World-class Genomic Center and the SEC "Innovative Technologies in the Agroindustrial Complex"). Thus, there has emerged an obvious trend towards

1 URL: http://publication.pravo.gov.ru/Document/View/0001202101050007.
2 For more details, see Russian Economy in 2019. Trends and Outlooks. Issue 41. Gaidar Institute Publishers, Moscow 2020, pp. 520–523. URL: https://www.iep.ru/files/text/trends/2019/06.pdf.
3 10 world-class scientific centers will receive government support. August 28, 2020. URL: http://www.fcntp.ru/events/news/1282.

intertwining the existing scientific policy instruments, and this happens, not least, because of the similarities between those "instruments" (science education centers, world-class scientific centers, and genomic centers).

Table 40

The specialization, number of participants, and funding of the WCSC set up in 2020

WCSC	Number of organizations in consortium	Funding allocated for 2020, Rb mn	Including the minimum / maximum amount of financing of organizations in the consortium, RUB mn.
Digital Biodesign and Personalized Healthcare	5	242.3	133.3 / 12.1
Center for Personalized Medicine	2	242.3	211.9 / 30.4
National Center for Personalized Medicine of Endocrine Disorders	1	242.3	–
Integrative Physiology for Medicine, High Tech Healthcare and Stress Resilience Technologies	4	213.9	73.9 / 30.0
Center for Photonics	3	242.3	155.1 / 24.3
Advanced Digital Technology	4	242.3	162.5 / 6.9
Rational Development of Planet's Liquid Hydrocarbon Reserves	4	242.3	135.0 / 28.8
Supersonics	6	242,3	211.0 / 3.5
Agrotechnology of Future	7	242.3	82.0/7.3
Center for Interdisciplinary Research of Human Potential	4	242.3	113.9 / 19.4

Source: RF Government Directive No 2744-r dated October 24, 2020. URL: http://static..ru/media/files/XY4j5lFwu64NWFt0GU3dmKOlDz5u2bip.pdf.

Rosneft Company began to play an important role in the field of genomic research, having received the status of the main technological partner of the WCSCs operating in this field. In 2019, 3 WCSCs were established, to address the themes of research outlined in the Federal Research Program for Genetic Technologies Development for 2019–2027; the National Research Center "Kurchatov Institute" was appointed to be the core organization under the Program. In April 2020, Rosneft established an autonomous non-profit organization (ANO) to conduct research in the field of genetics, which was to become a platform for developing proposals for improving the existing regulatory, legislative and normative frameworks, and adapting international best practices.1 Rosneft also becomes involved in scientific research, planning to examine its own employees and their family members in order to obtain primary genetic data for the development of

1 Meeting on developing genetic technology in Russia. Vladimir Putin chaired a meeting, via videoconference, on the development of genetic technology in the Russian Federation. May 14, 2020. URL: http://kremlin.ru/events/president/news/63350

health care and research work. It should be noted in this connection that the company currently employs over 350,000 people. Thus, a major research center and a state-owned company have been cooperating and assuming leadership roles within the framework of genetic technology development.

Science education centers (SEC): the achievements of the first centers and new projects

The first 5 SECs, which had been created in a "manual mode" in 2019, completed their first year of operation. Judging by the information provided by SECs about their activities (*Table 41*), the results are more obvious in those areas where the companies operating in the real sector of the economy and acting as industrial partners of the SECs have expressed their vested interests in those activities. This has been true, first of all, of the Perm and Belgorod SECs, which managed to attract the largest extrabudgetary funding. The volume of extrabudgetary funds involved in the projects launched by SECs amounted to Rb5,356 mn in 2019; the planned target for 2020 was Rb7,400 mn.[1]

Table 41

The characteristics of the functioning SECs

Center's name	Number of participants, including from real sector	Description of ongoing projects	Results
SEC Kuzbass	16, including 8 (50%) from real sector[2]	29 projects, with ongoing working groups (of about 1,000 people)	107 patents issued; Rb567 mn raised
Nizhny Novgorod SEC	27, including 19 (70%) from real sector	Infrastructure development, including plans for setting up innovative science and technology center (ISTC) (science and technology valley)	Rb220 mn raised; attached WCSC is set up*
West Siberian Interregional SEC	30, including 7 (23%) from real sector	Creation of laboratories; purchase of equipment; several joint projects were launched	Rb578 mn raised;[3] attached WCSC is set up*
Belgorod SEC	38, including 10 (26%) from real sector	30 projects on 5 platforms	Rb2 bn raised;[4] attached WCSC is set up*
Perm SEC	58, including 50 (86%) from real sector	190 contracts for R&D research for businesses	Rb2 bn raised;[5] 50 patents issued; 120 hi-tech jobs created

* World-class scientific center.
Source: own compilation based on data from the SECs' websites and information from the mass media.

1 Science education centers: a year later. November 23, 2020. URL: https://www.minobrnauki.gov.ru/press-center/news/?ELEMENT_ID=25903
2 URL: https://xn--42-bmce4b.xn--p1ai/tpost/36aeixio31-itogi-raboti-nauchno-obrazovatelnogo-tse
3 URL: https://ria.ru/20201010/tyumen-1579154236.html
4 URL: https://belregion.ru/press/news/index.php?ID=45759
5 URL: https://www.newsko.ru/news/nk-5689267.html

The SECs vary broadly by the composition and number of their participants. At the same time, there is no connection between the number of their participants and the number of regions involved in the formation of a SEC. Thus, for example, the West Siberian Interregional SEC has 30 participants, while the Perm SEC consists of nearly twice as many (58). Meanwhile, the current size of the SECs is rather modest, in terms of the number of participants. By comparison, the number of participants in the National Technology Initiative (NTI) Competence Centers (CC) established in universities is not less than, and quite often exceeds, the number of participants in SECs. Thus, the NTI CC for Wireless Communications and the Internet of Things consists of 70 participants, and their number is growing because the consortium is being joined by other interested universities and businesses.

The official estimation of the SECs' performance, which in late October 2020 was publicly presented by the RF Minister of Science and Higher Education, was rather restrained: the results of their activity were considered to be modest,[1] and the expectations for a better outcome were linked to a cumulative effect. One achievement of the SECs was claimed to be the creation of large teams and their conformity with the specific interests of the regions where they were situated. It was emphasized that within the framework of the SECs, it was important to shift the focus from the publishing articles to providing some real solution to the problems of regional development. The same aspect of the SECs' activity was also highlighted by the regions' heads, who believed their main goal to be that of bridging the gaps between the science and business communities, and making them share their responsibilities and funding sources.[2]

Last year, a contest was held with the aim of setting up another 5 SECs. In this connection, many of the applicants had used the experience of the first 5 SECs, e.g., in establishing interregional structures which, "all other factors being equal," had had a better chance of receiving the status of a SEC. When the applications were ranked according to their scores received from the experts and compared with the list of winners, it became obvious that the quality of an application and its expert assessment are the factors that are important, but by no means decisive. The other relevant factors are geopolitical ones, and probably the field of specialization of a future SEC.

As follows from the list of 5 new SECs (*Table 42*), the winners were the two 'strongest' applications (both were interregional ones), and 3 projects from the top ten finalists. Each SEC has its own strengths: for the Eurasian SEC, it is the international status; for the Tula SEC, it is the orientation to the defense industry; for the Arctic SEC, it is important geopolitical issues. Another relevant factor was that of their anchor partners: for the SEC oriented to Arctic issues, these were Rosatom and the Kurchatov Institute; and for the SEC "Engineering of the Future", these were Rostec, Roskosmos, and Russian Railways.

1 Meeting with members of the Government. October 28, 2020. URL: http://kremlin.ru/events/president/news/64293.

2 *Erokhina E*. SEC is not science // Indicator, December 18, 2020. URL: https://indicator.ru/engineering-science/noc-eto-ne-nauka.htm

Table 42

The ranking of the winning SEC projects in the project evaluation system (1 corresponds to the highest experts' score)

SEC	Ranking by score
Ural Interregional SEC "Advanced Production Technologies and Materials" (Sverdlovsk, Chelyabinsk, and Kurgan regions)	1
"Engineering of the Future" (Samara, Penza, Ulyanovsk, and Tambov regions; Republic of Mordovia)	2
Eurasian SEC (Republic of Bashkiria)	7
"Russian Arctic: New Materials, Technologies and Research Methods"	8
"TulaTECH" (Tula region)	9

Sources: Contest Commission's Protocol. URL: https://www.minobrnauki.gov.ru/common/upload/library/2020/11/main/Protokol_N_2020-15-NOTS-1-2.pdf; meeting. December 3, 2020. http://.ru/news/41012/.

New megagrants

There was also a megagrant contest: towards the year's end, 43 winning projects were selected out of the 465 submitted applications.[1] The fact that more than 10 grant applications had been submitted is indicative of the high popularity of this program, which has existed for 10 years already. It is characteristic that higher educational establishments prevailed among the applicants: they submitted 3.5 times more applications than did research institutes. Judging by the contest results, the quality of projects was higher in case of academic institutes: they submitted 22% of applications, but then they received 30% of grants. Besides, some of the higher educational establishments received more than one megagrant (there were 30 projects for 21 higher educational establishments); i.e., the level of 'university science' is higher in a limited number of universities.

It is also important to note that the share of projects directed by foreign scientists other that former compatriots has increased: they will manage 32 projects out of 43 (74.4%). At the same time, there are surprisingly few projects (only 3) to be directed by Russian scientists. This points either to a shift in the megagrant program's priorities towards foreign specialists, or to an insufficient number of world-class domestic scientists.

With due regard for the past contest, the total number of laboratories created in this country over the years since the launch of the megagrant program is 315. If we look at their by-discipline distribution, most of them belong in the field of medicine and medical technology (36 laboratories), next comes physics (34 laboratories), which is a traditionally "strong" field. The field of "economics and business" is an absolute "outsider": during all the years of the program's existence, ~~only 4 laboratorie~~s with this specialization have been created.[2] As far as Russia's

1 In the eighth mega-grant contest, the winners were 43 scientific research projects // TASS, December 1, 2020. URL: https://nauka.tass.ru/nauka/10145439

2 Own calculations based on data for 8 contests. Data source for the past megagrant contests: Megagrants in pictures and numbers. Ten years of attracting scientists and creating laboratories // The Indicator, September 1, 2020. URL: https://indicator.ru/engineering-science/megagranty-v-kartinkakh-i-cifrakh.htm

global positioning in this field is concerned, it has traditionally been among the laggards. So one cannot say that the laboratories have been created in order to address the fields where the help of world-class scientists is most needed.

Large-scale scientific research projects

Among the implemented measures, one should also note one more contest held by the RF Ministry of Science and Higher Education: for winning the funding for large-scale research projects, in the form of grants amounting to up to Rb100 mn per year, for 3 years. The expert estimation was done by the RAS, since this program was supposed to replace the previous Fundamental Research Program launched by the RAS Presidium. Similarly to the other events where the distribution of significant amounts of funding had been involved, the competition was tight – the support was granted to only 41 projects out of 367 applicants. The list of winners[1] and the specific methods of their selection gave rise to some heated discussions. In particular, the "July 1 Club" expressed its dissatisfaction,[2] claiming that "*the results of the contest in some cases were notoriously odd-looking*." The strongest criticism was targeted at the allocation of grants to Sirius University, which had been created a year before but had not yet actually begun to function (the project "Genetic History of the Ancient Population of the Russian Plain"), and to the Institute for System Programming of the RAS (a small organization with modest publication activity indicators).

Criticism was also aimed at a number of fundamental issues. First, it was argued that the expert estimation was not transparent,[3] was carried out within too short a time, and the choice of experts was not clear to the scientific community. These circumstances are especially noticeable when compared with the megagrant contest, where the amount of funding is significantly less (Rb90 mn for 3 years, while in this contest it is Rb300 mn), and so the cost of an error is lower. Nevertheless, each application for a megagrant is evaluated by two Russian and two foreign experts. Secondly, criticism was also caused by the fact that the majority of projects received maximum funding (Rb100 mn each per year), while the research costs in natural and human sciences cannot be equal. Thus, among other things, there is no need for social scientists and humanitarians to buy expensive laboratory equipment. However, this feature of the contest is by no means unique. World-class scientific centers likewise received equal amounts of funding, regardless of their field of activity and the number of organizations participating in a consortium: for example, the WCSCs doing research in the field of social sciences received the same funding as the WCSCs belonging in other

1 Ministry of Science and Higher Education of the Russian Federation. Protocol No 2020-1902-01-3 dated July 28, 2020, for evaluating applications for participation in the contest for grants in the form of subsidies for major research projects in the priority directions of scientific and technological development. URL: https://m.minobrnauki.gov.ru/ru/documents/card/?id_4=1299&cat=/ru/documents/docs/

2 On the results of the contest of large-scale scientific projects. URL: http://www.1julyclub.org/node/349

3 *Fradkov A.* RAS-damaged contest / TRV-Science, No. 310, August 11, 2020, p. 14. URL: https://trv-science.ru/2020/08/11/ranenyj-konkurs/

fields (*Table 40*) Apparently, the Ministry in its approach to such competitions relies on the principle of even distribution of money among all.

And thirdly, and lastly, the choice of research subjects was also criticized, in particular that among the projects that had been granted support, none was in the field of fundamental and applied mathematics, and few in the field of modern physics. At the same time, given such a small number of grants for the entire country, the "loss" of a number of fields is quite possible, and this fact is further confirmed by the megagrant contest.

Thus, we can note the mix of several mechanisms involved in the support of science: SEC, WCSC, megagrant, and large-scale scientific project; and they are similar not only in their goals and achievement indicators, but also in the contest procedures and results. A comparison of the lists of winners in different contests shows an increasing concentration of budget funding in a select number of organizations, and especially in a limited number of universities. Thus, on a nationwide scale, the problems typical of excellence programs may be becoming more prominent – when there emerges a group of elite organizations, while overall, the system of scientific knowledge reproduction gains nothing.

4.9.4. Research evaluation: the debate over composite publication performance scores

Over the past year, the principles and indicators for research evaluation were coordinated and approved at the government department level. The methodology itself was named the "Composite Publication Performance Score" (CBPR). It is designed to be applied in evaluating research in the framework of projects implemented on government orders, with due regard for each specific field of science. It should provide a base for determining the amount of funding to be allocated to the state assignments for the next year. The methodology was compiled for the former academic institutes, but in the future it is also expected to be applied in evaluating the fulfillment of state assignments in universities. The initial version of the methodology had been adopted as early as December 2019, but there were so many complaints about it that a task force was set up by the RF Ministry of Science and Higher Education to examine the comments and responses from the scientific community.

As is known from the experiences of the past years, the orientation to international databases and quartiles of journals boosted the global visibility of Russian scientists, while at the same time it gave rise to misuse and falsification of data, and an immoderate race for publications in the "necessary" journals to the detriment of the target audience and research quality. Therefore, it was important to draw up a system of indicators and coefficients that would create incentives not only for the quantity, but also the quality, of scientific publications.

Initially, the performance bar was set very high: it was intended that research institutes should increase their CBPR by 10-30% per annum, which, according to experts, is problematic even for the 'strongest' institutes.[1] There were also some

1 *Erokhina E.* For multifacetness and diversity. One more month for a composite publication performance score // Indicator, March 13, 2020. URL: https://indicator.ru/engineering-science/

funny counting errors, up to the eighth decimal place,[1] due to the peculiarities of the new coefficients (for example, 0.12 for the journals on the Higher Attestation Commission's list). The most frequently discussed issues were as follows:

1) the introduction of a fractional count as a way to eliminate pseudo-affiliations, i.e. splitting the points assigned to each publication according to the number of co-authors and the affiliations of the author who works in the organization for which the score is calculated;

2) the determination of the coefficient values for the publications indexed in international and Russian databases;

3) the optimal way of evaluating monographs (by publication data; number of copies; monograph length; the publisher's standing; or a combination of all of these).

In April 2020, it was unanimously decided that different scores should apply to humanities and social sciences as compared with all the other disciplines. With regard to the studies in humanities and social sciences, significantly lower citation scores were established for publications in WoS/Scopus indexed journals compared with other fields of science (a score of 3, vs Q1 WoS - 20, Q2 WoS - 10, Q3 WoS - 5, Q4 WoS - 2.5 in the other fields). At the same time, the scores for the publications in the fields of social sciences and humanities appearing in the journals from the RSCI/Higher Attestation Commission's lists were upwardly adjusted. It was decided to evaluate published books in terms of their length (based on word count).

In September 2020, the final version of the CBPR methodology was issued. It still retained the requirement for lagging organizations to grow at a rate that would make them outstrips the leaders. The fractional count principle was approved, which would bring down the scores applied to the articles resulting from the work of large international collaborations with thousands of co-authors. At the same time, the methodology makes it unprofitable to attract scientists from abroad solely for the sake of increasing the citation index, because in this case the multiple affiliations would result in a lower final score for a given publication.

Some changes were also introduced for social sciences and humanities: the coefficient for the journals on the Higher Attestation Commission's list (which is perhaps the "weakest" among all the other existing lists) was increased from 0.12 to 1. For books, a very complex system was adopted, which includes, among other things, an expert estimation by the RAS: a monograph gets a certain number of points based on its word count; a score of 0.75 corresponds to a collection of articles; 0.5 goes for comments to works by classical authors, dictionaries, archival and other similar publications; the final scores will be determined by the RAS after each work has been submitted by its department responsible for a given field of science. As far as published books are concerned, these will be assigned a score

za-mnogoukladnost-i-raznoobrazie.htm.

1 *Vaganov A*. Russian science was swept by an outbreak of the CBPR epidemic // The Independent Newspaper - Science, May 2, 2020. URL: http://www.ng.ru/science/2020-05-02/100_200502falko.html.

on condition of a recommendation for their publication issued by an institution's academic council, and their registration with the RF Book Chamber.[1]

Thus, while in the first versions of the CBPR methodology the requirements for social sciences and humanities were too high, later on they were set too low, especially with regard to publications in WoS/Scopus indexed journals and the journal quartiles. This lack of proper balance creates incentives for publishing mostly in Russian journals; on the one hand, this is good, since the majority of their readers are in Russia, while on the other hand, there is little motivation to get into the best foreign publications. Perhaps the methodology will be further refined in 2021; among other things, the changes may include the elimination of the flat scale quality score applied to journals in the fields of humanities and social sciences.[2]

It should be noted that the movement itself towards the introduction and adjustment of the CBPR methodology, especially for social sciences and humanities, runs contrary to what is actually happening in the catch-up development economies. One example is China, where quantitative assessment scores were applied until recently, but now this practice is being abandoned. And particular concern were aroused by the reorientation of the social sciences and humanities to those topics that are most easily accepted by the editors of foreign journals, instead of focusing on in-depth studies of the problems that are vial to Chinese society.[3] In February 2020, two Chinese ministries, the Ministry of Education and the Ministry of Science and Technology, officially announced the refusal to use the Science Citation Index (SCI) in their system of assessing universities and academic institutions,[4] and to use the Social Science Citation Index (SSCI) in research evaluation in the field of social sciences.

4.9.5. The expert role of the RAS

The Russian Academy of Sciences, in accordance with its status, should carry out scientific and methodological supervision and guidance of the activities in the science and technology fields of research institutions and higher educational establishments, as well as conduct expert examinations. As far as the latter is concerned, over the course of the past year, some alterations were introduced whereby a number of organizations were no longer required to undergo the expert examinations conducted by the RAS. At the same time, at the end of last year, its function of scientific and methodological guidance was further elaborated.

1 URL: https://www.minobrnauki.gov.ru/common/upload/library/2020/09/main/Metodika_novaya.pdf

2 *Erokhina E*. We tried to come up with a methodology that it would be most difficult to crash. On the winners and losers in the new state scientometrics. // The Indicator, September 17, 2020. URL: https://indicator.ru/humanitarian-science/my-pytalis-pridumat-metodiku-kotoruyu-uronit-trudnee-vsego.htm

3 *Lau J*. Research relevant to China 'cast aside in race for citations' // Times Higher Education, 05. 08.2020. URL: https://www.timeshighereducation.com/news/research-relevant-china-cast-aside-race-citations

4 *Yaobin H*. China to move away from Science Citation Index in academic evaluation. February 25, 2020. URL: https://news.cgtn.com/news/2020-02-25/China-to-move-away-from-Science-Citation-Index-in-academic-evaluation--Onk82wPOlW/index.html

The strengthening of the scientific and methodological leadership of the RAS was formally consolidated by the signing, on December 4 at the RAS Presidium meeting, of an agreement between the Russian Academy of Sciences and 12 institutes doing research in the fields of chemistry and materials science. The agreement had been initiated by the Department of Chemistry and Materials Science of the RAS.[1] The purpose of the new consortium was to coordinate joint activities and viewpoints concerning the functioning of the involved institutions in cooperation with the RF Ministry of Science and Higher Education. The Consortium Council was created, while the RAS was assigned the right to present the consortium's unified position on issues related to the activities of its participants. The consortium could be further expanded, and several other institutes have already expressed their interest in joining it. Besides, the RAS Presidium believes that this form of interaction may be of interest to the institutes subordinated to the other RAS departments. It is possible that the joint efforts that resulted in setting up the consortium were a form of response to the Ministry's policy of giving more attention to higher educational establishments, since most of its programs and projects are aimed specifically at supporting scientific research projects implemented by the latter.

It should be noted that during the same period, the National Research Center (NRC) "Kurchatov Institute" also strengthened its positions, and so much so that it was informally dubbed "Academy of Sciences 2.0".[2] True, the amount of federal budget funding for R&D projects allocated for the Kurchatov Institute is almost 4 times higher than the corresponding allocations to Moscow State University and St. Petersburg State University (*Table 43*).[3]

The positions of these organizations were strengthened both through exercising their coordination function and through the addition of new institutes. In 2020, the NRC "Kurchatov Institute" became the founder of the Institute of Molecular Genetics of the RAS, and later on it merged with F.V. Lukin State Research Institute of Physical Problems. Thus, the range of topics addressed by the NRC in its research expanded significantly. In addition, the Kurchatov Institute was appointed to be the core research organization under the government program for

1 The Academy of Sciences and chemical institutes merged into a consortium // RAS, December 7, 2020. URL: http://www.ras.ru/news/shownews.aspx?id=4f139008-a38c-4114-a611-202651d0842d#:~:text=4%20декабря%202020%20года%20в,институтами%20химического%20и%20материаловедческого%20профиля.&text=Создание%20Консорциума%20с%20участием%20РАН,и%20наук%20о%20материалах%20РАН

2 The Kurchatov Institute as a substitute for the Academy of Sciences. The State has finalized its decision as to what will become the core of its scientific and technical policy // The Independent Newspaper - Science, June 4, 2020. URL: http://www.ng.ru/editorial/2020-06-04/2_7879_editorial.html

3 The Higher School of Economics also receives substantial funds. However, as NRU HSE is not one of the chief administrators of budget funds, the amount of budget funding that it receives for its research and development projects can only be determined on the basis of its statistical reporting data. According to the latest available data for 2019, the allocations for this purpose that NRU HSE received from the federal budget amounted to Rb2.7 bn. However, part of these funds was received as a result of participation in various contests. Source: Form 2-science. Information for 2019 on the implementation of research and development projects, p. 6 "Sources of funding for internal research and development costs." URL: https://www.hse.ru/data/2020/06/13/1604760852/Москва%20за%202019%20год%202%20Наука%20(годовая).pdf

genetic technologies development; it is also the core research organization under the Federal Program for the Development of Synchrotron and Neutron Research (a megascience-class project). While the RAS lost its institutes, the NRC acquired new ones and became responsible for several priority development areas.

Table 43

The comparative amounts of federal budget allocations for civilian R&D received by the organizations appointed to be chief administrators of budget funds, Rb bn

Organization	2021	2022	2023
NRC Kurchatov Institute	18.6	24.1	23.9
Moscow State University	4.1	4.0	4.2
RANEPA	1.8	1.8	1.9
St. Petersburg State University	0.9	0.9	1.0

Source: Appendix No 10 to the explanatory note to the draft Federal Law "On the Federal Budget for 2021 and the Planning Period of 2022 and 2023", titled "Federal Budget Expenditures on Civilian Scientific Research and Development (Analytical Group)".

At the same time, over the past year, the RAS lost some of its expert role. The Academy was deprived of the right to conduct expert estimations of the fundamental research projects implemented by the National Research Center "Kurchatov Institute" and several other research organizations. The changes were introduced by the RF Government Decree "On the introduction of alterations into the Rules for the conduct, by the Federal State Budgetary Institution "Russian Academy of Sciences", of scientific and methodological guidance of the scientific and scientific-technical activities of scientific research organizations and higher educational establishments, as well as expert estimations of the scientific and scientific technical results obtained by these organizations",[1] whereby the evaluation of research themes, draft plans and reports for those scientific research organizations and higher educational establishments, in respect of which the functions and powers of their founder are exercised by the Government of the Russian Federation, should be performed by the Russian Academy of Sciences on the basis of decisions made by the aforesaid organizations, and thus the resolutions issued by the RAS in respect of such organizations could be only advisory. The organizations that have been granted the right to decide on their own whether they need an expert estimation conducted by the Russian Academy of Sciences are equal in their status to the Academy itself, because they, similarly to the RAS, are subordinated directly to the RF Government. Consequently, the RAS cannot perform the functions of control and oversight over the organizations of an equal status. ~~Besides, the previ~~ous version of the RF Government Decree[2] had actually granted

1 RF Government Decree No 1659 dated October 12, 2020. URL: http://www.garant.ru/products/ipo/prime/doc/74658338/.

2 Decree of the RF Government No 1781 dated December 30, 2018 "On the conduct, by the Federal State Budgetary Institution "Russian Academy of Sciences", of scientific and methodological guidance of the scientific and scientific-technical activities of scientific research organizations and higher educational establishments, as well as expert estimations of the scientific and scientific

to the RAS an unjustified monopoly right for making decisions concerning the effectiveness of budget-funded research and development projects implemented all over this country, whereas the RAS does not possess the resources to assess the entire spectrum of work carried out by different organizations.

During the phase of agreeing on the draft of the new Decree, the leadership of the RAS tried to appeal to the idea of the necessity of a comprehensive expert estimation across the entire field of science, where no research organization would be left out.[1] This standpoint was reflected in the decision of the RAS Presidium, which held an emergency meeting on September 2, 2020.[2] In October 2020, President of the RAS Alexander Sergeev, at a meeting with the President of the Russian Federation, once again raised the issue of the need to create in Russia a unified expert estimation system in the field of science and technology, from which it followed that no selective organizations could be left out of that system. The President of the RAS highlighted the point that, if the Academy's expert estimations were considered not to be trustworthy, that task should be delegated to another institution.[3] Nevertheless, the adopted RF Government Decree gave no consideration to the desire of the Russian Academy of Sciences to retain the ability to conduct expert estimations of all the organizations receiving budget funds for their R&D projects.

Thus, in the past year, the functions of the Russian Academy of Sciences in terms of evaluating the R&D projects, areas of research and reports conducted and submitted in this country were reduced. However, the role of the Russian Academy of Sciences as a coordinator for some of the institutes formerly subordinated to it somewhat gained in importance. At the same time, the NRC "Kurchatov Institute" significantly strengthened its position.

4.9.6. Technological development

The situation in the high tech business sector

Last year, Russia dropped one place in the Global Innovation Index 2020, becoming 47th in the list of 131 countries.[4] As before, in terms of innovation inputs, this country's position is better (42nd place) than that in terms of innovation

technical results obtained by these organizations, and on the introduction of amendments to some acts of the Government of the Russian Federation". URL: http://www.consultant.ru/document/cons_doc_LAW_315478/.

1 The scandal around the Kurchatov Institute goes on: the young scientists rise up in opposition. An appeal to President of the RAS Sergeev has been prepared. August 30, 2020. URL: https://www.mk.ru/science/2020/08/30/skandal-vokrug-kurchatovskogo-instituta-prodolzhaetsya-molodye-uchenye-vzbuntovalis.html

2 *Erokhina E.* "It is a shame to hear that the expert estimations by the RAS slow down scientific and technological progress in this country". The Presidium of the Russian Academy of Sciences has risen to defend its right to evaluate // The Indicator, September 2, 2020. URL: https://indicator.ru/humanitarian-science/ekspertiza-ran.htm

3 *Volchkova N.* About the earthly and the heavenly. The head of State met with proper understanding the proposals of the RAS // Poisk, No 40, October 2, 2020, p. 3.

4 Global Innovation Index 2020. Who Will Finance Innovation? 13th edition // Soumitra Dutta, Bruno Lanvin and Sasha Wunsch-Vincent (eds.). Cornell University, INSEAD, WIPO, 2020. P. xxxii. URL: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

outputs (58th place).[1] The weakest components of the innovation environment remained as follows: institutions; infrastructure; and market sophistication. Russia has failed to make it into the top 100 of global rankings with regard to GDP/unit of energy use (115th); rule of law (114th); ISO 14001 environmental certificates/ bn PPP$ GDP (106th); investment (106th); and regulatory quality (105th).[2] The overall level of innovation activity in this country has been on the decline, and so far there are no signs of a reversal in that trend, as only every tenth company plans to implement innovations in 2020–2022.[3]

However, the picture was far from being uneven. In particular, six Russian companies (1C, Mail.ru, Playrix, Tinkoff Bank, Wildberries, and Yandex) were among the top 100 contenders for world leadership in the technology sector, according to BCG (global management consulting firm).[4] In the previous 4 years, the average annual proceeds of these companies amounted to $1.8 bn, which is below the statistical average of $2 bn; but the companies grew at a rate 6 times higher than the technology players in the S&P 500.

The pandemic had an adverse effect on innovation, and even on IT companies, although the latter seemed to have more opportunities for development. The issue of additional support for small and medium-sized technology companies was raised as early as April, because for them it was more difficult than for many other companies to recover from the crisis. A survey of technology companies conducted in March by the Russian Venture Company (RVC JSC)[5] demonstrated that their main problems were how to pay taxes (52% of respondents), preserve jobs (51%), ensure product sales (46%), and interact with international partners (32%). In addition, some problems arose in connection with the reduced volume of import contracts and the payments under the existing contracts, because the national currency's exchange rate changed, followed by a surge in prices for imported components.

The issue of keeping the existing teams turned out to be a most pressing one, because high-tech companies had managed to pool specialists with unique competencies. The greatest demand (voiced by 2/3 of companies) was a specific measure of support – to subsidize part of their employees' salaries. The second most popular measure was tax incentives (59.3% of respondents), which would enable them to redirect resources to business development and purchases of raw materials. Slightly more than half of the respondents (51.9%) also mentioned

1 Global Innovation Index 2020. Who Will Finance Innovation? 13th edition // Soumitra Dutta, Bruno Lanvin and Sasha Wunsch-Vincent (eds.). Cornell University, INSEAD, WIPO, 2020. Pp. xxxiv, xxxvi. URL: https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf

2 Ibid, p. 315.

3 Science, Technology and Innovation. URL: https://issek.hse.ru/news/422172387.html

4 Technological leadership: six Russian companies are on the list // The Expert, No 48, November 23, 2020. URL: https://expert.ru/expert/2020/48/tehnologicheskoe-liderstvo-shest-rossijskih-kompanij---v-spiske/

5 The survey was conducted by RVC JSC among small (startups) and medium-sized technology businesses (TECHUP rating) over the period from March 25 to March 30, 2020. The surveyed companies operated mainly in the sectors of electronics, robotics, IT, industrial technologies. Source: Results of the survey of technology companies "Measures to Support Technology Businesses." RVC JSC, April 6, 2020.
URL: https://services.rvc.ru/upload/iblock/2c8/2c8c37b900d9814d53bc79f591512a9a.pdf.

another measure - a moratorium on business inspections until the situation stabilized. Experts spoke of similar measures,[1] as well as of the importance of additional budget funding for the R&D projects implemented by small companies.[2] And finally, there is one more problem – that of the existence of two extremes: it is relatively easy to obtain grants in the amount of Rb1–2 mn during the seed stage of a project, and there are also investments in the amount of Rb300 mn and more, which are a focus of tight competition. However, there are practically no intermediate option between these two 'poles'. A separate discussion centered around the support for medium-sized technology companies, including those in TECHUP rating. They are the ones who most often become the connecting link between science and the business community. However, high-tech businesses did not receive the support that they needed most.

IT businesses likewise had their own peculiarities. Only a few segments of the IT market revived due to the increasing number of employees switching to remote work. The greatest demand was for comprehensive solutions involving secure remote work in combination with rental of assets. At the same time, due to the pandemic, consumers began to spend less on information technologies, and many organizations froze their large capital investments in technical support. There were disruptions in the supply chains of IT equipment due to the incomplete workload of manufacturing plants and the restrictions imposed on international transport flows.[3] According to the surveys by the association of software developers (RUSSOFT), in April-May 2020, the proceeds of the majority of domestic software developers fell by 45–47% compared to the same period of the previous year.[4]

To improve the working conditions of IT companies, a "tax maneuver in the IT industry" was developed and introduced from January 1, 2021.[5] The changes have to do with the taxation regimes for VAT, corporate income tax, and the taxation of insurance premiums. Basically, only the income derived from software can be exempted from VAT, and the software products must be entered in a special register of Russian software. The corporate income tax rate is reduced from 20% to 3%, and that on insurance premiums from 14% to 7.6%; the new rules also apply to those companies that generate 90% of their income from software that they had developed independently. On the one hand, tax benefits are increasing, but on the other, the number of organizations entitled to them is decreasing. Not many companies qualify for the requirement of 90% their proceeds being derived from sales of software rights. Therefore, even during the discussion phase, the tax

1 *Mekhanik A*. We could lose another generation of scientists. April 22, 2020. URL: http://vybor-naroda.org/vn_exclusive/162576-mehanik-my-mozhem-poterjat-esche-odno-pokolenie-uchenyh.html

2 *Firsov A*. Viscous environment. What is happening in the sphere of innovations in Russia // Snob, March 26, 2020. URL: https://snob.ru/profile/32368/blog/165914/.

3 *Grammatchikov A*. Digitalization under pressure // The Expert, No 15-16, April 13, 2020. URL: https://expert.ru/expert/2020/16/tsifrovizatsiya-pod-davleniem/

4 *Grammatchikov A*. Where are IT maneuvers going // The Expert, No. 28, July 6, 2020. URL: https://expert.ru/expert/2020/28/kuda-vedut-it-manevryi/

5 Federal Law No 265-FZ dated July 31, 2020 "On the Introduction of Amendments to Part Two of the Tax Code of the Russian Federation". The amendments come into force from January 1, 2021. URL: http://base.garant.ru/74450972/

maneuver was heavily criticized. Thus, in particular, the situations when a company creates several legal entities, some of which sell licenses and thus are entitled to exemptions, while others offer services, are by no means uncommon. As a result, the procedure of receiving the exemption becomes excessively complicated, as well as that of tax administration. Some calculations were made demonstrating that the budget will benefit from the maneuver, but not the IT sector.[1]

Venture investments

In H1 2020, venture investment shrank, especially in the seed and startup stages, both in terms total capital and average transaction volume.[2] In this connection, not only private investors, but also state corporations and funds reduced their venture capital investments, although in 2019, it had been these players who showed significant growth at year-end, having invested Rb4.3 bn in new projects, vs Rb1.8 bn a year earlier.[3] Private fund investments remained at the same level of about Rb1.4 bn.

It is possible that in the future, venture capital investments might increase, since the normative legal regulation of budget funds invested in venture projects was relaxed. This will primarily affect development institutions. From the start of the year onwards, the Federal Law "On the Introduction of Amendments to the Federal Law "On Science and the government scientific and technical policy" was discussed, and on July 31 it was adopted.[4] The Law stipulates that an innovative project is associated with a high level of acceptable risk, and provides for the option of not achieving the planned result. At the same time, it is envisaged that beside other sources, the funding of venture and direct investment can be allocated from the budget. Development institutions will be required to develop a methodology for assessing the risks of budget financing of venture projects, and then approve it in coordination with a federal body of executive authority or the body of executive authority of a subject of the Russian Federation. Most importantly, the Law introduces the principle of an overall assessment of the cost-effectiveness of budget funds invested in innovative projects across all investments in all projects, and not of each of them separately: "... the assessment should target the final and intermediate results, as well as the planned (projected) results of innovative activities, with due regard for the actual and projected schedule for achieving the said results across the entire set (portfolio) of innovative projects, from the moment when an innovative development institution initially receives funding in the form of state support for innovative activities".[5] Thus, a development

1 *Chachava A.* "In effect, this is a raise of business taxes": what is wrong with the tax maneuver in the IT industry // Forbes, June 30, 2020. URL: https://www.forbes.ru/tehnologii/403863-eto-fakticheskoe-povyshenie-nalogov-na-biznes-chto-ne-tak-s-nalogovym-manevrom-v

2 Venture Russia. Results for H1 2020. DSIGHT, 2020. URL: https://ict.moscow/research/venchurnaia-rossiia-rezultaty-pervogo-polugodiia-2020/

3 *Bykova N., Mamedyarov Z.* Risk at the expense of the State // The Expert, No 25, June 15, 2020. URL: https://expert.ru/expert/2020/25/risknut-za-schet-gosudarstva/

4 Federal Law No 309-FZ dated July 31, 2020 "On the Introduction of Amendments to the Federal Law "On Science and the government scientific and technical policy". URL: https://rg.ru/2020/08/07/nauka-dok.html

5 Amendment to Item 12 of the Law.

institution (venture fund) is to be recognized as successful when the entire project portfolio grows in value, while some individual projects may be unprofitable. The new approach can create incentives for development institutions to more actively invest in risky technology projects.

Infrastructure: technological valleys

The development of technological valley projects began after the adoption, in 2017, of the Federal Law "On Innovative Science and Technology Centers" (ISTC). ISTCs resemble the model implemented at Skolkovo, in that these are territories with a special tax and financial regime, where the participants are exempt from VAT and corporate income tax for 10 years (the benefit is lost if their proceeds exceeds Rb1 bn per annum), and they pay reduced insurance premiums (14% over the first 10 years, or until they reach a profit threshold of Rb300 mn). The funds that manage the ISTCs are exempt from property and land taxes for 10 years.

In 2020, 3 ISTCs were actually put into operation: Sirius, Mendeleev Valley, and the Project Vorobyovy Gory on the basis of Moscow State University. In November 2020, one more ISTC emerged on Russky Island, on the basis of Far Eastern Federal University.[1] The RF Government Decree explicitly recommends, in connection with that particular ISTC, for the "state corporations operating in the field of high technologies to take part in the creation and development of the Center's facilities, as well as the scientific, technological and experimental base of the Center."[2] At the end of the year, the ISTC Composite Valley (Tula) was also undergoing the stage of approval with the government.

The ISTCs are designed to supplement the already existing infrastructure models (clusters, science cities, closed administrative-territorial entities). Besides, they can promote a closer interaction with the "scientific-research" entities within an innovation system. The RAS signed agreements with two ISTCs; the RAS expects that, through the mechanism of an ISTC, it will become possible to accelerate the transformation of knowledge into technology.[3] In addition to their interaction with the RAS, the ISTCs supplement the tools available within the National Project "Science" through their interaction with science education centers (SEC). To a certain extent, these tools are similar, in that they imply the involvement of the regions, and close interaction between scientific and educational organizations with businesses and regional administrations.

The ISTC Sirius occupies a special place among all the other ISTCs, because it will receive the status of a federal territory (FT). In November 2020, a draft law to this effect was submitted to the State Duma. The concept of "federal territory" itself was put forth with the adoption of amendments to the RF Constitution. It is

1 Decree of the RF Government No 1868 dated November 18, 2020 "On the creation of the Innovative Science and Technology Center "Russky". URL: http://static.government.ru/media/files/yqAADxgCJVK0ApAc6HmA7ZdKeXbPQlO5.pdf

2 Item 7 of the RF Government Decree.

3 *Kravchuk M*. The RAS, CTUR, and Mendeleev Valley agreed on cooperation // Scientific Russia, March 18, 2020. URL: https://scientificrussia.ru/articles/ran-rhtu-i-dolina-mendeleeva-dogovorilis-o-sotrudnichestve; The RAS and MSU will jointly raise the INTC Vorobyovy Gory // Poisk, March 18, 2020. URL: https://www.poisknews.ru/ran/ran-i-mgu-budut-vmeste-podnimat-intcz-vorobevy-gory/

assumed that the law is going to be promptly adopted, and the formation of the new federal territory's governing bodies will be launched in 2021. However, the transition period will last until December 31, 2025.

The federal territory is subject only to federal regulations, and its own regulations. Regional and municipal legislation will operate only in the part that does not contradict these regulations. A FT will resemble a city of federal significance; science cities are one example of such an entity. The main idea behind the concept of Sirius is to create a city with a strong university, focused on the third mission (both economic and social). At the same time, the status of a FT makes it possible to quickly resolve various issues by directly addressing the RF President. Towards the end of last year, the functionality of the FT had not yet been fully determined.[1]

A new concept implemented in relation to ISTCs was reflected in the amendments, suggested by the RF Ministry of Economic Development, to Federal Law No 216-FZ "On Innovative Science and Technology Centers", which imply a more systematic approach to setting up technological valleys. In particular, it should be based on a valley development strategy, and its management company should submit annual reports on the course of its implementation. In addition, it is suggested that the criteria for selecting ISTCs, including those concerning the assessment of their technological specialization, availability of investment projects, potential investors, and extrabudgetary funding feasibility studies should be determined more precisely. The budget funding investment payback period for a newly created ISTC should be not more than 15 years.[2] Indeed, the already established ISTCs experienced some difficulties with securing the obligations of investors and, in general, with their attraction into the ISTCs. Part of the problem was that, until September 2020, the government funding mechanism for ISTCs had not been properly defined.[3] Then, the RF Government issued its Decree No 1443 dated September 15, 2020, which addressed the issue of subsidizing the ISTCs.[4] Helped by the subsidies, businesses will be able to cover part of their costs associated with the payment of customs duties on the goods imported in order to implement the ISTC project and conduct scientific research in the territories of the valleys, as well as to pay value added tax.

1 *Khodykin M*. A province of federal scale // The Expert, No 50, December 7, 2020. URL: https://expert.ru/expert/2020/50/provintsiya-federalnogo-masshtaba/

2 *Edovina T.* Innovators are asked to present their investors. The RF Ministry of Economic Development clarifies the rules for creating scientific and technological centers // The Kommersant, No 101, June 9, 2020, p. 2. URL: https://www.kommersant.ru/doc/4373284

3 *Bykova N*. What will grow in Mendeleev Valley from the billion-rubles investments // The Expert, No 36, August 31, 2020. URL: https://expert.ru/expert/2020/36/chto-vyirastet-v-doline-mendeleeva-iz-milliardnyih-vlozhenij/

4 Decree of the RF Government of September No 1443 dated 15, 2020 (MOSCOW) "On the provision of subsidies from the federal budget to the Russian organizations created in the organizational legal form of joint-stock companies for the purpose of performing the functions of managing innovative science and technology centers, in order to provide financial backing for the costs associated with the subsequent compensation of the costs of paying import customs duties and value added tax incurred by legal entities, individual entrepreneurs, who are the entities involved in the implementation of the project for the creation and operation of innovative science and technology centers." URL: http://static.government.ru/media/files/l1JhFBqpDMT35Ai8Aw97mDSqZGVmggpo.pdf

It cannot be rules out that in the future, the ISTCs may become the main driver of regional technological development, while the previously existing forms of support (e.g., clusters) will either be transformed into ISTCs, or will officially cease their existence (which no longer be supported by state resources).

Artificial intelligence as a priority area of technological development

Over the past year, the issue of artificial intelligence (AI) was very widely discussed in many countries of the world, including Russia. By a large margin, the USA and China are the leaders in terms of the amount of investment in the development of AI technologies (about 48% and 38% of total global spending on these purposes), followed by the UK (4%).[1] Russia lags significantly behind them in many aspects, especially in the number of supercomputers and the science intensity (the number of published scientific articles on AI is 18 times less than that in China, 10 times less than that in the USA, and 3.5 times less than that in the UK) (*Table 44*). One of the factors holding back the development of this field in Russia is the necessity to invest in computing power assets, which fully consist of imported components. Almost half (48%) of Russian investments in AI development is earmarked for these purposes.[2]

Table 44

The indicators the AI development potential: leading countries vs Russia

Indicator	USA	China	UK	Russia
Place in international AI rankings				
Global AI Index 2020 (1/62)	1	2	3	31
AI Readiness Index 2020 (1/172)	1	19	2	33
Science and technology base and performance				
Supercomputer number in TOP500, June 2020	113	226	10	2
Number of universities in 2020 THE World University Rankings 2020 for computer science (1/750)	117	60	54	17
Journal articles on AI subjects, 2015–2019 (Scopus AI Index)	41,920	78,862	15,382	4,354

Sources: URL: https://www.tortoisemedia.com/intelligence/global-ai/; https://www.oxfordinsights.com/-ai-readiness-index-2020; URL: https://top500.org/statistics/list/; https://www.timeshighereducation.com/world-university-rankings/2020; Scopus SciVal. URL: https://www.scival.com/landing.

The pandemic spurred increased spending on AI research. The drivers of development were two counter-processes: an increasing demand for AI technologies triggered by the growing number of businesses and industries relying on automation, and the emergence of new algorithms and data processing technologies (primarily Machine Learning and Deep Learning).

1 By 2022, the global market for artificial intelligence technologies will amount to $52.5 bn. January 29, 2020. URL: https://ww2.frost.com/news/press-releases/ к-2022-году-объем-мирового-рынка-технолог/

2 *Krasnova V.* Machine mind in action // The Expert, No 4, January 18, 2021. URL: https://expert.ru/expert/2021/04/mashinnij-razum-v-dejstvii/

In August 2020, the government commission on digital development approved the certificate of the Federal Project "Artificial Intelligence".[1] The amount of funding was greatly reduced compared with the previously planned target: according to the explanatory note, Rb36.3 bn will be allocated for the project implementation until 2024. Meanwhile, in the previous July, the budget allocation target had been Rb89.69 bn.[2] Thus, the expected of budget-funded support for AI research, most likely, will be insufficient for actually reducing the gap with the leading countries. At the same time, it would be unrealistic to rely on extrabudgetary investment sources, because the venture capital market for AI research financing in Russia is very poorly developed. According to the Stanford Institute's 2020 AI Index Report, Russia accounts for 0.3% of global investment in AI. For the most part, the obstacle to development has been the low demand of big companies and government departments for the AI products developed by small and medium-sized companies. As a result, the market remains fragmentary and uncompetitive.

The potential for development exists primarily in the "niche" areas, including those related to the implementation of applied projects (large-scale projects launched by Yandex, Sberbank, Mail.ru Group; and startups, e.g., iPavlov, itSeez3D). These projects target fields like autopilot, computer vision, industrial and predictive analytics, medical data analysis, augmented and virtual reality.

In world practices, increasing attention has been paid to issues like the impact of AI on human life and the ethical aspects of its application and development. The general consensus was that these technologies should be controlled, and their feasibility depends on how AI technologies are researched, developed and regulated. Standardized approaches to risk assessment may not fully capture the important ethical implications (many of which are not quantifiable, and some are not yet observable). The Concept for Developing AI in Russia also raises this issue, and the priority goal of regulating the AI sphere was defined as the promotion of development, implementation and use of safe and trustworthy AI technologies and systems for the benefit of society and the State. At the same time, in the opinion of the CEOs of the RF Ministry of Economic Development, the Russian economy is not yet ready for the introduction of AI technologies.[3]

Reform of development institutions in the science and technology sector

At the end of last year, the government announced its plan to reform 40 development institutions, some of which operate in the science and technology sector. The reform had been prepared covertly, and the forthcoming changes were announced quite unexpectedly, including those targeting the relevant development institutions, as it had also been the case during the liquidation of the RAS, RAMS, and RAAS systems in 2013.

1 *Skobelev V., Balashova A.* Nearly Rb37 bn will be spend on the State Project "Artificial Intelligence". // RBC, August 28, 2020. URL: https://www.rbc.ru/technology_and_media/28/08/2020/5f4900119a7947026b495660

2 Data as of July 6, 2020 Source URL: https://ria.ru/20200706/1573937886.html

3 *Syutkina V.* Rb36 bn to be allocated for artificial intelligence // The Expert, No 38, September 14, 2020. URL: https://expert.ru/expert/2020/38/na-iskusstvennyij-intellekt-vyidelyat-36-milliardov/.

According to RF Government Directive dated December 31, 2020 (No 3710-r),[1] the majority of the development institutes in the technology sector (RusNano, the Fund for Assistance to Innovation, Skolkovo Foundation, the Industrial Development Fund, the Fund for Infrastructure and Educational Programs, the Russian Fund for the Development of Information Technologies) will be transferred to VEB.RF. The Russian Venture Capital Company is to be taken over by the Russian Direct Investment Fund, and the Russian Fund for Basic Research (RFBR) will be merged with the Russian Science Foundation (RSF). It is noteworthy that two of the development institutions to be reformed, the Fund for Assistance to Innovation and the RFBR, are direct administrators of budget funds (*Table 45*).

Table 45

Current and projected budget allocations to development institutions, Rb bn

Development institute	Funding type	Budget allocations			
		2020	2021	2022	2023
RusNano	Contribution to charter capital	–	–	–	2.0
Fund for Assistance to Innovation	Allocations (chief administrator of budget funds)	13.7	12.0	14.4	17.4
Industrial Development Fund	Allocations	41.0	1.2	1.2	1.2
Skolkovo Foundation	Subsidies	10.8	10.3	10.3	10.3
Russian Venture Company	Contribution to charter capital	4.5	1.5	2.8	4.8
Russian Foundation for Basic Research	Allocations (chief administrator of budget funds)	25.0	22.6	22.2	22.0
Russian Science Foundation	Property contribution	9.0	22.9	24.8	25.3
TOTAL:		**101.4**	**70.5**	**75.7**	**83.0**

Sources: Federal Law "On the federal budget for 2020 and the planning period of 2021 and 2022", URL: https://minfin.gov.ru/common/upload/library/2019/12/main/380-FZ.pdf; Annex 12 and Annex 15 to the draft Federal Law "On the federal budget for 2021 and the planning period of 2022 and 2023"; Annex 10 to the Explanatory Note to the draft Federal Law "On the federal budget for 2021 and the planning period of 2022 and 2023".

The implementation of new formats for the development institutions should be completed in 2021. So far, we can only discuss the intention to optimize their operation, increase their efficiency, revise the tools that they have been relying upon, and develop a unified approach to their key performance indicators. Besides, the development institutions should be distinctly focused on Russia's national development goals until 2030.[2] Generally speaking, all these goals belong in the science and technology field, because science and technology contribute to the solution of almost all problems, and their key performance indicators to consider in this connection are as follows:

1 URL: http://publication.pravo.gov.ru/Document/View/0001202101090037
2 *Butrin D.* There will be definitely no "golden parachutes" // The Kommersant, No 219/P, November 30, 2020, p. 1. URL: https://www.kommersant.ru/doc/4593111

- real growth of exports of non-primary non-energy goods of not less than 70% relative to 2020;
- increasing number of people employed in small and medium-sized businesses;
- fourfold growth of investment in domestic solutions in the field of information technologies relative to 2019.[1]

The reform of development institutions also implies the so-called "seamless" transition from one support instrument to another. This idea has long been attractive to managers: the idea of an "innovative lift" (that is, the formation of a financial system capable of providing a project with opportunities for receiving support at all stages of its development, from a scientific idea to a new product or technology) had been discussed in the past, but it was not implemented. At the end of the year, six development institutions[2] in the technology field took a first step towards providing seamless support for small businesses, by signing a memorandum on the integration of their measures through exchange of information about projects, teams and companies.

The reform plans gave rise to many negatively charged discussions of the current state of affairs in various development institutions, since many of them have long been subject to criticism from both the government authorities and their clients. The criticism was first voiced in the spring, when Prime Minister of the Russian Federation Mikhail Mishustin instructed his first deputy Andrey Belousov to analyze the performance indicators of development institutions. At the same time, it was also claimed that some of these development institutions had been performing "the functions of gaskets" in the channels for pumping money from the federal budget, and "some of them were created just for providing the right people with lucrative jobs";[3] they were unable to attract sufficient private investment, spent too much effort in supporting only startups, etc. After the reform plan had become publicly known, VEB.RF itself became a target of criticism, because it was going to be joined with many heterogeneous structures. Thus, in particular, VEB's assets are shrinking, it has been suffering losses, while over the past 13 years, it has received government funding in the form of contributions to its capital and other types of subsidies in excess of Rb1.4 trillion.[4] If we compare this amount with that of budget-funded "injections" into the development institutes in the science and technology sector that will shortly be reformed, the total assets of the latter would appear to be modest by comparison with those of VEB.RF, and so they may "dissolve" inside the VEB system.

1 Executive Order of the RF President on Russia's national development goals through 2030 dated July 21, 2020. URL: http://kremlin.ru/events/president/news/63728

2 The Russian Direct Investment Fund, Russian Venture Capital Company, Skolkovo Foundation, the Fund for Assistance to Innovation, the Fund for Infrastructure and Educational Programs, National Technological Initiative Platform (NTI Platform). Source: Six development institutions signed a memorandum on seamless integration of support measures for technology entrepreneurs. December 28, 2020. URL: http://government.ru/news/41235/

3 Belousov will analyze the performance of development institutions in 2019, with the option of issuing operational instructions and reprimands // Interfax, March 16, 2020. URL: https://www.interfax.ru/russia/699303

4 *Ivanter A., Mekhanik A., Obukhova E., Ulyanov N.* Reform of the negative KPI system // The Expert, No 49, November 30, 2020. URL: https://expert.ru/expert/2020/49/reforma-sistemyi-otritsatelnogo-kpi/

NTI 2.0

The discussion of the new format of the National Technology Initiative (NTI) can also be viewed in the context of development institutions reform. The NTI, in accordance with Paragraph 23 of the Strategy of Scientific and Technological Development of the Russian Federation (approved by Executive Order of the President No 642 dated December 1, 2016), is one of the "main instruments that ensure the transformation of fundamental knowledge, exploratory and applied scientific research into products and services contributing to the achievement of leadership of Russian companies in the promising markets within the framework of existing and emerging priorities (including after 2030)." Thus, the NTI should be integrated into the seamless system and, like that of the development institutions, its impact on the economy should become manifest in structural shifts and scalability of effects.

The NTI includes a wide range of initiatives, from scientific research to educational and infrastructure projects, which are being implemented on the basis of roadmaps. Each roadmap follows its own logic, they had not been plotted to address an established set of uniform indicators, and therefore the NTI was designed to ensure the *unification* of the performance indicators of the roadmaps. This is by no means an easy task, because in the framework of the NTI, support is granted not only to new projects, but also to existing companies, as well as to non-profit organizations (such as universities) and associations of entrepreneurs. Over the period 2016–2019, nearly Rb30 bn was spent on various measures implemented as part of the NTI. Among these, the most noteworthy ones are the NTI roadmap projects, research and development projects sponsored through the Fund for Assistance to Innovation, the NTI Competence Centers, and NTI University. Based on the national goals, the unification of the performance assessment system can be achieved on the basis of indicators like total proceeds of the companies that had received funding under the NTI, their value, the creation of jobs, and volume of exports. However, they are not applicable for all the types of measures implemented within the framework of the NTI, and moreover, they may display a delayed effect over time. In particular, this could be true with regard to development and introduction of regulatory changes in the normative legal system. The NTI working groups proposed some changes to legislation designed to reduce barriers, and to date, 40 laws and normative acts have been approved on the basis of the regulations proposed by the NTI.[1]

However, NTI 2.0 implies not only the introduction of a unified performance assessment system, it also aims at expanding initiative – among other things, by bringing together businesses and expert communities, so that they could develop a common vision of the new promising markets, promote regional involvement, and promote export support of companies and projects.[2] Thus, the NTI can evolve not only towards unifying the performance monitoring and assessment procedures,

1 What is NTI 2.0, and how does it differ from NTI 1.0? URL: https://nti-new.nti2035.ru/

2 NTI 2.0. How startups could find new markets and make money in face of uncertainty // VC.RU, March 30, 2020 НТИ 2.0. URL: https://vc.ru/future/116286-nti-2-0-kak-startapam-nayti-novye-rynki-i-zarabotat-v-usloviyah-neopredelennosti

but also towards increasing the number of target markets and reformatting the activities of the NTI community.

The transformation of scientific funds

It is planned to merge the Russian Foundation for Basic Research with the Russian Science Foundation in the course of reforming the development institutions. Among all the proposed changes, it is only this particular takeover of one fund by another that has attracted significant attention of the Russian scientific community. Official statements in favor of preserving the RFBR were issued by the "July 1 Club", the Presidium of the RAS, the RAS Departments, and the Society of Scientific Workers. The Russian public initiative launched a campaign to collect signatures under the statement "Prevent the closure of the RFBR".[1]

According to the government plans, the budget of the new fund will pool the budgets of the two funds to be merged; during the transition period, the volume of financing allocated for some core activities of the RFBR will remain the same, and it is only later on that certain directions of support will be transformed.[2]

The issue of creating a single scientific foundation is especially sensitive because in Russia, private charity scientific foundations are practically nonexistent, and the access to foreign funding for scientific research is likewise being curtailed. The latest statistics indicate that the share of foreign sources in domestic R&D expenditures has shrunk to 2.4%.[3] In such a situation, only government funds will be capable of providing a variety of opportunities.

Moreover, the question as to which fund should be the one to be joined to the other, is pretty controversial. From the point of view of budget allocations assigned to these two funds, the RFBR is larger than the RSF, and it is only from 2021 that they have become practically equal in this respect (*Table 45*). However, if we compare the RFBR and the RSF by the number of grants allocated to each of the two, then the RSF will appear to be a "chamber fund" (*Table 46*). Meanwhile, the contest levels of both funds differ only slightly.

Table 46

A comparison of scientific funds, by the number of grants and the share of approved grant applications

Fund	Number of funded projects, per annum	Share of approved grant applications
RFBR	17,999 (8,198, including initiative scientific projects contest)	20%, young scientist contests 25%
RSF	4,700	25%, groups projects 19.5%, young scientist contests 29-32%

Sources: RFBR performance report for 2019; RSF annual report for 2019.

1 URL: https://www.roi.ru/65945/
2 The leaders of the RSF and the RFBR agreed on the terms of their merger. December 8, 2020. URL: https://www.minobrnauki.gov.ru/press-center/news/?ELEMENT_ID=26553
3 *Ratay T.* The structure of science expenditures, by funding source, in Russia and the leading countries of the world // Science, Technology and Innovations. Express Information. ISSEK NRU HSE. December 10, 2020. URL: https://issek.hse.ru/mirror/pubs/share/424274138.pdf

Thus, the decision to join the RFBR to the RSF, and not the other way round, is insufficiently justified from the point of view of the size of their budgets and the scope of the coverage of researchers by research grants.

All the issues discussed in connection with the reform of the two funds can be divided into pro and contra arguments. The arguments in favor of setting up a single fund on the basis of the RSF can generally be boiled down to the following provisions:

1) elimination of duplication (the existence of similar contests), administrative apparatus optimization;

2) simplification of the budget expenditure administration in the science sector;

3) strengthening the focus on quality performance: the RSF has achieved great progress in increasing publication output in international databases (by way of rather stringent requirements to both scientific groundwork and the obligations involved in writing articles);

4) it is logical to join a fund with a shrinking budget to a fund that receives growing allocations from the state budget;

5) building a unified grant support policy (a kind of seamlessness; e.g., the winner of a young scientist contest can then apply for support within the framework of contests for scholars over 35 years of age following clearly defined procedures).

Among the arguments listed above, only the first can be considered to be a truly controversial one. The duplication of programs across the two funds, even if it does exist, is insignificant, because the functional characteristics of the two funds have been quite different, just like their target orientation: the RFBR creates and maintains the environment, including in the regions, while the RSF supports the leaders in different categories (research groups and laboratories, young scientists, organizations). Ideologically, these are likewise two different organizations. Besides, no optimization of the administrative apparatus may actually be achieved as a result of reform. Thus, studies of the experiences of mergers and takeovers, e.g., those occurring in the university environment, show that these transformations frequently produce an opposite effect in the form of increased administrative staff.

From the point of view of the research quality, it is by no means easy to compare the two funds, because no open data is available on the total numbers of publications prepared with the support of the RFBR and the RSF based on Scopus/ Web of Science databases. Indirectly, quality can be assessed by the number of papers published in the so-called predatory journals. We reviewed data released by the RAS Commission on Counteracting Falsification of Scientific Research on the results of a study of 94 “junk” journals (as of mid-February 2020). According to these data, it turns out that RFBR grants funded 2.5 times more articles published in “junk” journals than did RSF grants (*Table 47*). Since the RSF supports leading research teams and laboratories, in theory there should not be any publications in “junk” journals at all.

Table 47

The number of articles published by Russian authors in predatory journals within the framework of projects implemented under RFBR and RSF grants

Funding organization	Articles in predatory journals indexed in Scopus	Articles in predatory journals indexed in WoS	Articles in predatory journals, total
RFBR	439	116	555
RSF	171	38	209

Source: RAS Commission on Counteracting Falsification of Scientific Research. Foreign predatory magazines indexed in Scopus and WoS: translation plagiarism and unscrupulous Russian authors. Moscow, 2020. 64 p. URL: https://kpfran.ru/wp-content/uploads/plagiarism-by-translation-2.pdf.

For reference, the US National Science Foundation annually provides information to Congress on the incidence of plagiarism, falsification, and fabricated data in the articles and materials prepared in relation to the Foundation's grants. The number of such cases is on the decline, and it is measured in not more than dozens. According to data for 2020, there were 28 cases of plagiarism (vs 85 in 2011), 4 cases of falsification, and 5 of fabricated data (vs. 17 and 15, respectively, in 2011).[1]

The opponents of the RFBR's accession to the RSF put forward a number of arguments, many of which are based on their intuitive fear of a deterioration in the system of grant-based funding, and in the main, these can be boiled down to the following provisions:

1) loss of diversity (in all the developed countries, there is a variety of scientific foundations). Monopoly will lead to voluntarism in the fund's policy, because it is constrained by the views of the board members and the expert council, and by their personal understanding of the prospects for development in a particular field of knowledge.[2] As a result, support could be granted, e.g., only to those projects that are "closer and more pleasing to the management and employees of the Fund";[3]

2) normative and legal considerations: the RFBR is a direct recipient of budgetary funds, while the RSF is not a budget-funded organization. When the RFBR joins the RSF, there will remain not a single state scientific foundation in this country.[4] However, there is one reservation: the RSF was created on the initiative of the RF President, and its activities are regulated by a special federal law; currently, this special status results in more advantages than disadvantages;

1 National Science Foundation. Office of Inspector General. Semiannual Report to Congress. April 1-September 30, 2020, NSF-OIG-SAR-63. P. 19.

2 Statement of the Society of Scientific Workers' Council on the RFBR joining the RSF. URL: http://onr-russia.ru/content/Sovet-ONR-o-prisoedinenii-RFFI-k-RNF

3 *Oganov A., Shtarev D.* The merged RFBR and RSF will work according to Parkinson's law // Vedomosti, No 169, December 4, 2020. P. 7.

4 *Komarova E.* All research grants go into one pair of hands. December 8, 2020. URL: https://www.vtimes.io/2020/12/08/vse-nauchnie-granti-v-odni-ruki-a1884; The RAS is preparing an appeal to the government in connection with the merger of the RSF and the RFBR // TASS, November 24, 2020. URL: https://nauka.tass.ru/nauka/10085233?fbclid=IwAR30JvjFRJJOrp8KOS8DNr-qx5m6ZUEpVV_hyM4QdhSUxZARUfaJeNPY39I

3) increasing stratification: grants will be concentrated even more in the leading organizations,[1] and it is regional researchers that are going to suffer in the first place;

4) loss of seed funding to test ideas (as a result of the likely termination of the most popular RFBR contest designed to support the research projects of individual scientists and research groups);

5) cuts in funding for social sciences, which already happened after the Russian Humanitarian Science Foundation (RHSF) was joined to the RFBR. It is highly likely that this could happen once again.

The danger of cuts in the funding allocated for the humanities and social sciences is real, while these areas truly need to be supported and developed. According to Clarivate, it is in social sciences that Russia currently lags behind in terms of "research fronts", being in 47th place (for reference: in mathematics, Russia is in 7th place; in physics, in 15th place).[2] Apart from this, the most realistic risks are the loss of diversity and the possible consequences of the resulting monopoly. These risks obviously outweigh the potential benefits of budget optimization and seamlessness. In fact, in a seamlessness paradigm, it would be more expedient to have two scientific funds (a seed fund and an elite fund), because seamlessness is not about creating a monopoly, but about providing opportunities for making a choice.

* * *

The past year was characterized by an intensification of government policies in the field of science and technology, which had to do with the change of government and the crisis caused by the pandemic. A revision of the strategic documents for science and technology development, as well as of the National Project "Science", was launched. In particular, the policy was adjusted according to the new national development goals until 2030, and this concerned not only science, but also technological innovations. In the future, most probably, the key document – the Strategy of Scientific and Technological Development of the Russian Federation - will also be revised, and the revision will also involve the Government Program "Scientific and Technological Development of the Russian Federation".

In the field of science, there was an increasing interconnection between the development instruments like science education centers, world-class scientific centers, megagrants; and the course towards the growth of integration of the former research institutes of the RAS with higher educational establishments became obvious, including within the framework of the new Priority 2030 Program. At the same time, the stratification of the science and technology sector became

1 *Komarova E.* All research grants go into one pair of hands. December 8, 2020. URL: https://www.vtimes.io/2020/12/08/vse-nauchnie-granti-v-odni-ruki-a1884

2 Research Fronts 2020: Active Fields, Leading Countries. Institute of Science and Development, Chinese Academy of Sciences, Clarivate. P. 12.

more pronounced due to a greater concentration of resources in a limited number of organizations. The ongoing monopolization can be viewed as the upshot of dwindling resources.

In the field of technological innovation, there have been no major changes, the innovation activity remained at low ebb, and venture capital investments have been on the decline. The crisis even affected the IT sector, which seemed to possess adequate incentives for development in the contest of the pandemic that translated into the proliferation of telecommuting jobs. The most serious changes in technological policies happened in connection with the reform of development institutions aimed at their optimization and the creation of a general system of targets and indicators designed to assess their contribution to this country's economic development. This will be a radical change, similar to the one that occurred in the past as a result of reform in the system of state academies of sciences. The logic of reforming development institutions toward their unification can potentially increase the degree of monopolization, and thus reduce the available spectrum of types and forms of support, what is called a "policy mix". This poses a serious threat to the innovation system, because its stability, as demonstrated by the results of studies, is based on a variety of mechanisms and capabilities.