



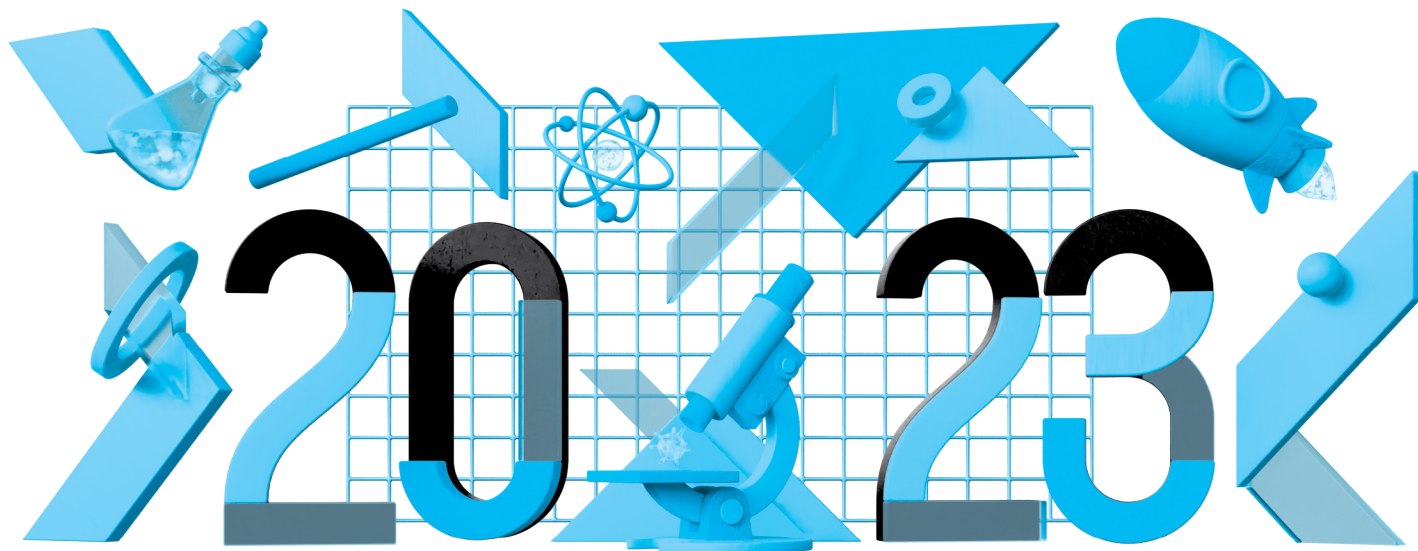
MINISTRY OF SCIENCE
AND HIGHER EDUCATION
OF THE RUSSIAN FEDERATION



FEDERAL STATE
STATISTICS SERVICE



HSE
UNIVERSITY



SCIENCE AND TECHNOLOGY INDICATORS IN THE RUSSIAN FEDERATION

DATA BOOK

MOSCOW 2023

Editorial Board: Nikita Anisimov, Leonid Gokhberg, and Yaroslav Kuzminov

Authors: Kirill Ditkovskiy, Svetlana Fridlyanova, Leonid Gokhberg, Maxim Kotsemir, Irina Kuznetsova, Svetlana Martynova, Anastasiya Nesterenko, Sergey Pakhomov, Valentina Polyakova, Tatyana Ratay, Alevtina Repina, Larisa Rosovetskaya, Galina Sagieva, Ekaterina Streltsova, Irina Tarasenko, Valeriya Vlasova, and Ivan Yudin

With contributions by Irina Varzanovtseva

Science and Technology Indicators in the Russian Federation: 2023 : Data Book / K. Ditkovskiy, S. Fridlyanova, L. Gokhberg et al.; National Research University Higher School of Economics. – Moscow : HSE, 2023.

This data book is another publication in the series describing various aspects of scientific development in the Russian Federation. It begins with the tables, where main science and technology indicators are provided alongside the data concerning basic innovative activities. The publication also presents the most recent statistical data on R&D institutions, personnel, and funding, as well as on R&D assets of the Russian science. Various sections contain information about intellectual property, commercialisation and usage of technologies, and international comparisons. There is also a detailed section representing science and technology of the Arctic zone of the Russian Federation. It highlights the activities of dissertation councils and data on thesis defences (based on the information from the Ministry of Science and Higher Education of the Russian Federation).

The data book includes information of the Russian Federal State Statistics Service, Ministry of Science and Higher Education of the Russian Federation, Federal Service for Intellectual Property (Rospatent), CIS Interstate Statistical Committee, Organisation for Economic Co-operation and Development (OECD), European Commission, Eurostat, UNESCO, World Intellectual Property Organisation (WIPO), and results of methodological and analytical studies of the HSE Institute for Statistical Studies and Economics of Knowledge.

In some cases, the presented data specify those published earlier

*The publication was prepared within the framework of the Basic Research Programme
at the National Research University Higher School of Economics (HSE).*

© National Research University Higher School of Economics, 2023
Reference is mandatory in case of reproduction

CONTENTS

Infographics: 2021	15		
Main science and technology indicators	24		
1. Institutions.....	33		
1.1. R&D institutions by type	34		
1.2. Trends in the number of R&D institutions	35		
1.3. Percentage distribution of R&D institutions by type ..	36		
1.4. R&D institutions by ownership	37		
1.5. Percentage distribution of R&D institutions by size ...	39		
1.6. R&D institutions by type of economic activity	40		
2. R&D personnel.....	41		
2.1. R&D personnel	42		
2.2. R&D personnel by occupation	42		
2.3. Percentage distribution of R&D personnel by occupation.....	43		
2.4. R&D personnel by ownership of R&D institutions	44		
2.5. Percentage distribution of R&D personnel by size of R&D institutions.....	46		
2.6. R&D personnel by type of economic activity	47		
2.7. R&D personnel by educational attainment.....	49		
2.8. Researchers by age	50		
2.9. Percentage distribution of researchers by age.....	52		
2.10. Average age of researchers.....	53		
2.11. Researchers with scientific degrees.....	54		
2.12. Researchers with scientific degrees as a percentage of the total number of researchers	54		
2.13. Researchers by field of science and technology	55		
2.14. Percentage distribution of researchers by field of science and technology: 2021.....	56		
2.15. Flows of R&D personnel: 2020–2021	57		
2.16. Flows of R&D personnel	58		
2.17. Inflow of higher institution graduates in R&D institutions.....	59		
2.18. Trends in inflow and outflow of R&D personnel	60		
Training of R&D personnel.....	61		
2.19. Main indicators of postgraduate studies.....	61		
2.20. Postgraduate enrolment, entrants, and graduates of foreign states by type of R&D institutions	65		
2.21. Postgraduate enrolment by gender and age: 2021	67		
2.22. Postgraduate enrolment, entrants, and graduates by field of education.....	68		
2.23. Postgraduate enrolment, entrants, and graduates by field of education corresponding to priority areas of economical modernisation and technological development	71		
2.24. Main indicators of postdoctoral studies	73		
2.25. Postdoctoral enrolment by gender and age: 2021.....	77		
2.26. Postdoctoral enrolment, entrants, and graduates by group of scientific professions.....	78		

Activity of dissertation councils, defence of doctoral and candidate's theses.....	83
2.27. Number of diplomas issued by the Ministry of Science and Higher Education of the Russian Federation to individuals who defended their doctoral thesis by field of science and technology	83
2.28. Number of diplomas issued by the Ministry of Science and Higher Education of the Russian Federation in the reporting year for individuals who defended their doctoral thesis by group of scientific professions	85
2.29. Number of diplomas issued by the Ministry of Science and Higher Education of the Russian Federation in the reporting year to individuals who defended their candidate's thesis by field of science and technology.....	89
2.30. Number of diplomas issued by the Ministry of Science and Higher Education of the Russian Federation in the reporting year to individuals who defended their candidate's thesis by group of scientific professions	91
2.31. Distribution of doctoral thesis defences in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation by field of science and technology	95
2.32. Distribution of candidate's thesis defences in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation by field of science and technology.....	96
2.33. Distribution of doctoral thesis defences in dissertation councils established by institutions independently by field of science and technology	97
2.34. Distribution of candidate's thesis defences in dissertation councils established independently by institutions by field of science and technology	98
2.35. Number of doctoral and candidate's thesis defences in dissertation councils established the ministry of science and higher education of the Russian Federation and dissertation councils established independently by institutions by field of science and technology: 2021	99
2.36. Distribution of doctoral and candidate's thesis defences in councils established by the ministry of science and higher education of the Russian Federation and councils established independently by institutions by critical technology	101
2.37. Average number of publications per Doctor of Sciences and Candidate of Sciences candidate who defended their thesis in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation and dissertation councils independently established by institutions	104
2.38. Doctor of Sciences candidates who have completed postdoctoral studies and defended their thesis in 2021 in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation by field of science and technology.....	105

2.39. Candidate of Sciences candidates who have completed postgraduate studies and defended their thesis in 2021 in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation by field of science and technology.....	106
2.40. Candidate of Sciences candidates who have completed postgraduate studies and defended their thesis in 2021 in dissertation councils established independently by institutions by field of science and technology.....	107

3. R&D funding..... 109

3.1. Gross domestic expenditure on R&D by type of R&D institution.....	110
3.2. Gross domestic expenditure on R&D.....	110
3.3. Growth rates of gross domestic expenditure on R&D and GDP.....	111
3.4. Federal budget appropriations on civil S&T at current prices.....	112
3.5. Federal budget appropriations on civil S&T at constant 2010 prices.....	113
3.6. Federal budget appropriations on civil S&T as a percentage of GDP.....	114
3.7. Federal budget appropriations on civil S&T as a percentage of federal budget expenditure.....	115

3.8. Percentage distribution of federal budget appropriations on civil S&T by subsection of the budget expenditure classification and type of R&D.....	116
3.9. Gross domestic expenditure on R&D by source of funds.....	117
3.10. Trends in gross domestic expenditure on R&D by source of funds.....	119
3.11. Subsidies, grants and other competitive R&D funding: 2021.....	120
3.12. Gross domestic expenditure on R&D funded from abroad.....	121
3.13. R&D funding by sector of performance: 2021.....	122
3.14. Gross domestic expenditure on R&D by ownership of R&D institutions.....	123
3.15. Gross domestic expenditure on R&D by type of economic activity.....	125
3.16. Gross domestic expenditure on R&D by type of expenditure.....	126
3.17. Gross domestic expenditure on R&D by type: 2021.....	128
3.18. Gross domestic expenditure on R&D by priority S&T area and source of funds: 2021.....	129
3.19. Percentage distribution of gross domestic expenditure on R&D by priority S&T area and source of funds: 2021.....	130

3.20. Gross domestic expenditure on R&D by socio-economic objective.....	131	5.1.2. Percentage distribution of R&D institutions by sector of performance.....	149
3.21. Percentage distribution of gross domestic expenditure on R&D by socio-economic objective.....	133	5.1.3. R&D personnel by sector of performance and occupation.....	150
3.22. Current expenditure on R&D by type of R&D activity and field of science and technology.....	134	5.1.4. R&D personnel by sector of performance and educational attainment.....	151
3.23. Percentage distribution of current expenditure on R&D by type of R&D activity.....	136	5.1.5. Researchers with scientific degrees by sector of performance.....	153
3.24. Gross domestic expenditure on R&D as a percentage of GDP by type of R&D activity.....	137	5.1.6. Percentage distribution of researchers with scientific degrees by sector of performance.....	154
3.25. Average monthly salary of R&D personnel.....	137	5.1.7. Gross domestic expenditure on R&D by sector of performance.....	155
3.26. Tax incentives on R&D by type.....	138	5.1.8. Percentage distribution of gross domestic expenditure on R&D by sector of performance.....	156
4. R&D fixed assets.....	139	5.1.9. Gross domestic expenditure on R&D as a percentage of GDP by sector of performance.....	157
4.1. R&D fixed assets.....	140	5.1.10. Gross domestic expenditure on R&D by sector of performance and source of funds.....	158
4.2. Trends in R&D fixed assets value.....	141	5.1.11. Subsidies, grants, and other competitive R&D funding by sector of performance: 2021.....	160
4.3. Machinery and equipment as a percentage of the total R&D fixed assets value.....	142	5.1.12. Gross domestic expenditure on R&D by priority S&T area and sector of performance: 2021.....	161
4.4. R&D fixed assets by ownership of R&D institutions.....	143	5.1.13. Percentage distribution of gross domestic expenditure on R&D by priority S&T area and sector of performance: 2021.....	162
4.5. Percentage distribution of R&D fixed assets by ownership of R&D institutions.....	145	5.1.14. Sources of funds for gross domestic expenditure on R&D by priority S&T area and sector of performance: 2021.....	163
4.6. R&D fixed assets by type of economic activity.....	146		
5. Sectors of R&D performance.....	147		
5.1. Composite indices.....	148		
5.1.1. R&D institutions by sector of performance.....	148		

5.1.15. Percentage distribution of gross domestic expenditure on R&D by priority S&T area, sector of performance, and source of funds: 2021	164	5.2.8. Percentage distribution of researchers in the government sector by age	180
5.1.16. Gross domestic expenditure on R&D by sector of performance and socio-economic objective	165	5.2.9. Average age of researchers in the government sector.....	181
5.1.17. Percentage distribution of gross domestic expenditure on R&D by sector of performance and socio-economic objective: 2021	168	5.2.10. Researchers with scientific degrees in the government sector.....	181
5.1.18. Current expenditure on R&D by sector of performance and type of R&D activity.....	170	5.2.11. Researchers with scientific degrees as a percentage of the total number of researchers in the government sector.....	182
5.1.19. Average monthly salary of R&D personnel by sector of performance	172	5.2.12. Researchers in the government sector by field of science and technology	183
5.2. Government sector.....	173	5.2.13. R&D personnel turnover in the government sector by occupation: 2020–2021.....	184
5.2.1. R&D institutions in the government sector by type.....	173	5.2.14. R&D personnel turnover in the government sector by occupation.....	185
5.2.2. R&D personnel in the government sector by type of R&D institutions.....	173	5.2.15. Inflow and outflow of R&D personnel in the government sector.....	187
5.2.3. R&D personnel in the government sector by occupation.....	174	5.2.16. Inflow of higher education graduates into government sector institutions	188
5.2.4. Percentage distribution of R&D personnel in the government sector by occupation	174	5.2.17. Gross domestic expenditure on R&D in the government sector by type of R&D institutions	189
5.2.5. R&D personnel in the government sector as a percentage of the total number of R&D personnel by occupation	175	5.2.18. Gross domestic expenditure on R&D in the government sector.....	190
5.2.6. R&D personnel in the government sector by occupation and educational attainment.....	176	5.2.19. Gross domestic expenditure on R&D in the government sector by source of funds	191
5.2.7. Researchers in the government sector by age.....	178	5.2.20. Government sector as a percentage of gross domestic expenditure on R&D by type of expenditure.....	193

5.2.21. Gross domestic expenditure on R&D in the government sector by type	194	5.3.7. Researchers in the business enterprise sector by age	207
5.2.22. Current expenditure on R&D in the government sector by type of R&D activity and field of science and technology	196	5.3.8. Percentage distribution of researchers in the business enterprise sector by age	209
5.2.23. Current expenditure on R&D in the government sector as a percentage of the total current expenditure on R&D by type of R&D activity	198	5.3.9. Average age of researchers in the business enterprise sector	210
5.2.24. Percentage distribution of current expenditure on R&D in the government sector by type of R&D activity	199	5.3.10. Researchers with scientific degrees in the business enterprise sector	211
5.2.25. Average monthly salary of R&D personnel in the government sector	200	5.3.11. Researchers with scientific degrees as a percentage of the total number of researchers in the business enterprise sector	211
5.3. Business enterprise sector	201	5.3.12. Researchers in the business enterprise sector by field of science and technology	212
5.3.1. R&D institutions in the business enterprise sector by type	201	5.3.13. R&D personnel turnover in the business enterprise sector by occupation: 2020–2021	213
5.3.2. R&D personnel in the business enterprise sector by type of R&D institutions	202	5.3.14. R&D personnel turnover in the business enterprise sector by occupation	214
5.3.3. R&D personnel in the business enterprise sector by occupation	202	5.3.15. Inflow and outflow of researchers in the business enterprise sector	216
5.3.4. Percentage distribution of R&D personnel in the business enterprise sector by occupation	203	5.3.16. Inflow of higher education graduates into business enterprise sector institutions	217
5.3.5. R&D personnel in the business enterprise sector as a percentage of the total number of R&D personnel by occupation	204	5.3.17. Gross domestic expenditure on R&D in the business enterprise sector by type of R&D institutions	218
5.3.6. R&D personnel in the business enterprise sector by occupation and educational attainment	205	5.3.18. Gross domestic expenditure on R&D in the business enterprise sector	219
		5.3.19. Gross domestic expenditure on R&D in the business enterprise sector by source of funds	220

5.3.20. Business enterprise sector as a percentage of gross domestic expenditure on R&D by type of expenditure	222	5.4.5. R&D personnel in the higher education sector as a percentage of the total number of R&D personnel by occupation	233
5.3.21. Gross domestic expenditure on R&D in the business enterprise sector by type.....	223	5.4.6. R&D personnel in the higher education sector by occupation and educational attainment.....	234
5.3.22. Current expenditure on R&D in the business enterprise sector by type of R&D activity and field of science and technology	225	5.4.7. Researchers in the higher education sector by age.....	236
5.3.23. Current expenditure on R&D in the business enterprise sector as a percentage of the total current expenditure on R&D by type of R&D activity	227	5.4.8. Percentage distribution of researchers in the higher education sector by age	238
5.3.24. Percentage distribution of current expenditure on R&D in the business enterprise sector by type of R&D activity	228	5.4.9. Average age of researchers in the higher education sector.....	239
5.3.25. Average monthly salary of R&D personnel in the business enterprise sector	229	5.4.10. Researchers with scientific degrees in the higher education sector	239
5.4. Higher education sector	230	5.4.11. Researchers with scientific degrees as a percentage of the total number of researchers in the higher education sector	240
5.4.1. R&D institutions in the higher education sector by type.....	230	5.4.12. Researchers in the higher education sector by field of science and technology	241
5.4.2. R&D personnel in the higher education sector by type of R&D institutions.....	231	5.4.13. R&D personnel turnover in the higher education sector by occupation: 2020–2021	242
5.4.3. R&D personnel in the higher education sector by occupation.....	231	5.4.14. R&D personnel turnover in the higher education sector by occupation	243
5.4.4. Percentage distribution of R&D personnel in the higher education sector by occupation.....	232	5.4.15. Inflow and outflow of R&D personnel in the higher education sector	245
		5.4.16. Inflow of higher education graduates into higher education sector institutions	246

5.4.17. Gross domestic expenditure on R&D in the higher education sector by type of R&D institutions.....	247	6.2. Publications by Russian authors in scientific journals indexed in Web of Science by type.....	261
5.4.18. Gross domestic expenditure on R&D in the higher education sector.....	248	6.3. Publications in the selected research fields as a percentage of the total number of publications in scientific journals indexed in Scopus	262
5.4.19. Gross domestic expenditure on R&D in the higher education sector by source of funds	249	6.4. Publications in the selected research fields as a percentage of the total number of publications in scientific journals indexed in Web of Science.....	263
5.4.20. Higher education sector as a percentage of gross domestic expenditure on R&D by type of expenditure	251	6.5. Russia's scientific specialisation indices by publications indexed in Scopus by field of science and technology.....	264
5.4.21. Gross domestic expenditure on R&D in the higher education sector by type.....	252	6.6. Russia's scientific specialisation indices by publications indexed in Web of Science by field of science and technology	266
5.4.22. Current expenditure on R&D in the higher education sector by type of R&D activity and field of science and technology.....	254	6.7. Main indicators of Russian authors' contribution to the world total number of publications indexed in Scopus by field of science and technology: 2021	268
5.4.23. Current expenditure on R&D in the higher education sector as a percentage of the total current expenditure on R&D by type of R&D activity	256	6.8. Main indicators of Russian authors' contribution to the world total number of publications indexed in Web of Science by research field: 2021	270
5.4.24. Percentage distribution of current expenditure on R&D in the higher education sector by type of R&D activity	257	6.9. Main citation indicators of publications by Russian authors indexed in Scopus	272
5.4.25. Average monthly salary of R&D personnel in the higher education sector	258	6.10. Main citation indicators of publications by Russian authors indexed in Web of Science	273
6. R&D output	259		
Publication activity	260		
6.1. Publications by Russian authors indexed in Scopus by type.....	260		

6.11. Number of internationally-collaborated publications by Russian authors indexed in Scopus by partner country: 2021	274	6.22. Development of advanced manufacturing technologies by degree of novelty and type of economic activity.....	286
6.12. Number of internationally-collaborated publications by Russian authors indexed in Web of Science by partner country: 2021	275	6.23. Use of advanced manufacturing technologies by type and duration: 2020–2021	287
6.13. Number of Russian scientific journals indexed in various databases	276	6.24. Use of advanced manufacturing technologies by type and duration	288
Patent activity	277	6.25. Use of advanced manufacturing technologies by type of economic activity and duration	290
6.14. Patent applications and grants.....	277	6.26. Use of advanced manufacturing technologies by type and source of acquisition.....	291
6.15. Patent activity indicators.....	278	6.27. Use of advanced manufacturing technologies by type of economic activity and source of acquisition	292
6.16. Patent applications filed in the Russian Federation by technological area.....	279	6.28. Use of advanced manufacturing technologies developed using patents by type: 2020–2021	293
6.17. Percentage distribution of patent applications filed in the Russian Federation by assignee and technological area: 2021	281	6.29. Use of advanced manufacturing technologies developed on the basis of invention patents by type	294
6.18. Utility model applications and grants	282	6.30. Enterprises' assessment of the impact of advanced manufacturing technologies	295
6.19. Registration of intellectual property items in the field of information technology	283	6.31. Implementation of technology strategy by enterprises.....	296
Development and use of advanced manufacturing technologies	284	6.32. Enterprises' assessment of factors hampering introduction of advanced production technologies	297
6.20. Development of advanced manufacturing technologies by degree of novelty and type: 2020–2021	284		
6.21. Development of advanced manufacturing technologies by degree of novelty and type.....	285		

Commercialisation of technology in domestic market	299	6.42. Number and value of technology exports and imports by category of contract.....	308
6.33. State registration of dispositions of the exclusive rights to inventions, utility models, industrial designs by patent assignment and patent licensing contracts.....	299	6.43. Technology balance of payments by country	309
6.34. Percentage distribution of dispositions by type of agreements	300	6.44. Percentage distribution of technology exports and imports by country group	312
6.35. State registration of dispositions under agreements and patents with registered dispositions by type of intellectual property	301	6.45. Technology balance of payments by sector of performance	312
6.36. Percentage distribution of dispositions under agreements and patents with registered dispositions by type of intellectual property: 2021	301	6.46. Technology balance of payments by type of economic activity.....	313
6.37. State registration of dispositions of exclusive rights to inventions, utility models, and industrial designs by technology field.....	302	7. Science and technology in the Arctic Zone of the Russian Federation	315
6.38. Percentage distribution of dispositions of exclusive rights to inventions, utility models, and industrial designs by technology field.....	303	R&D institutions.....	316
6.39. Percentage distribution of dispositions of exclusive rights to inventions, utility models, and industrial designs by category of economic entity	304	7.1. R&D institutions by type	316
International technological exchange.....	305	7.2. Trends in the total number of R&D institutions.....	316
6.40. Technology balance of payments by category of contracts	305	R&D personnel.....	317
6.41. Percentage distribution of technology exports and imports by category of contracts	307	7.3. R&D personnel by occupation	317
		7.4. Percentage distribution of R&D personnel by occupation.....	317
		7.5. Researchers by age	318
		7.6. Percentage distribution of researchers by age.....	320
		Training of R&D personnel.....	321
		7.7. Main indicators of postgraduate studies.....	321
		7.8. Main indicators of postdoctoral studies	321
		R&D funding.....	322
		7.9. Gross domestic expenditure on R&D	322
		7.10. Gross domestic expenditure on R&D by source of funds...	323

7.11. Gross domestic expenditure on R&D by type of expenditure	324
7.12. Gross domestic expenditure on R&D by priority S&T area and source of funds: 2021	326
7.13. Percentage distribution of gross domestic expenditure on R&D by socio-economic objective	327
R&D fixed assets	328
7.14. R&D fixed assets.....	328
Development and use of advanced manufacturing technologies	330
7.15. Development of advanced manufacturing technologies by degree of novelty and type.....	330
7.16. Use of advanced manufacturing technologies by type and duration	331
7.17. Use of advanced manufacturing technologies by type and source of acquisition	332
7.18. Enterprises' assessment of the impact of advanced manufacturing technologies: 2021.....	333
7.19. Implementation of technology strategy by enterprises: 2021	334
7.20. Enterprises' assessment of factors hampering introduction of advanced production technologies: 2021.....	335
8. Public attitudes towards science and technology	337
8.1. Public opinion on the Russian science and scientists: 2020–2021.....	338

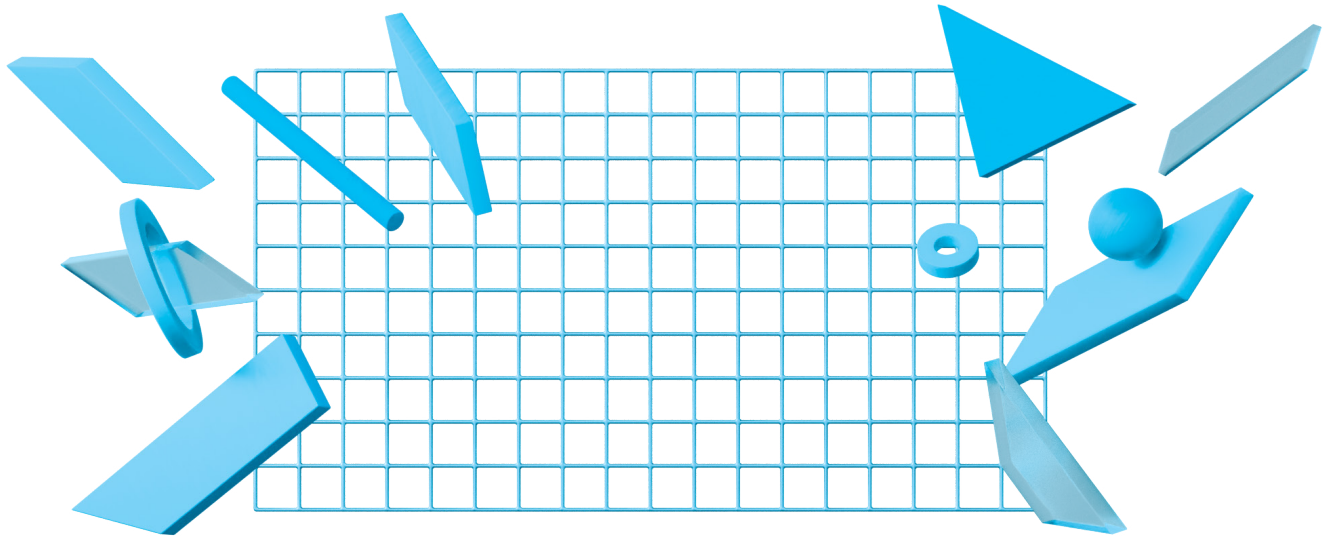
8.2. Public opinion concerning the positive impact of technological development: 2022.....	339
8.3. Public opinion on the negative impact of technological development: 2022.....	340
8.4. Public discomfort and distrust from interacting with new technologies: 2022.....	341
8.5. Public interest in new technologies: 2022	342
8.6. Public interest in new technologies by age: 2022.....	343
8.7. The popularity of digital devices: 2022	344
9. International comparisons.....	345
9.1. Gross domestic expenditure on R&D	346
9.2. Gross domestic expenditure on R&D as a percentage of GDP	349
9.3. Gross domestic expenditure on R&D as a percentage of GDP: 2021	352
9.4. Percentage distribution of gross domestic expenditure on R&D by sector of performance: 2021.....	353
9.5. Percentage distribution of gross domestic expenditure on R&D by source of funds: 2021.....	356
9.6. Percentage distribution of gross domestic expenditure on R&D by sector of performance: 2021.....	360
9.7. Percentage distribution of current expenditure on R&D by type of R&D activity: 2021	362
9.8. Government budget appropriations on R&D	365
9.9. R&D personnel: 2021.....	367
9.10. R&D personnel per 10,000 employment: 2021.....	370

9.11. Percentage distribution of researchers by sector of performance: 2021.....	372	9.20. Publications co-authored with foreign researchers as a percentage of the total number of country's publications indexed in Web of Science: 2021	395
9.12. Female researchers as a percentage of the total number of researchers: 2021	375	9.21. Global research fronts by country: 2017–2022.....	396
9.13. Main publication activity indicators for publications indexed in Scopus by country: 2017–2021	376	9.22. Percentage distribution of publications within global research fronts in Russia and the world by field of science and technology: 2017–2022	397
9.14. Main publication activity indicators for publications indexed in Web of Science by country: 2017–2021	380	9.23. Resident and abroad patent applications by patent office	398
9.15. Main citation indicators for publications indexed in Scopus by country: 2017–2021.....	384	9.24. Percentage distribution of patent applications by applicant and country: 2021	401
9.16. Main citation indicators for publications indexed in Web of Science by country: 2017–2021	388	9.25. Resident and abroad patent applications by country of origin.....	402
9.17. Countries' shares in the world total number of publications indexed in Scopus: 2021	392	9.26. Percentage distribution of patent applications by applicant and patent office: 2021	405
9.18. Countries' shares in the world total number of publications indexed in Web of Science: 2021	393	9.27. Number of triadic patent families	406
9.19. Publications co-authored with foreign researchers as a percentage of the total number of country's publications indexed in Scopus: 2021	394	Technical notes.....	408

SYMBOLS USED IN TABLES ARE:

- ... data not available and not included in the totals,
- data not applicable,
- 0.0 insignificant value.

In some tables, the sum of the breakdown may not add to the total because of rounding.



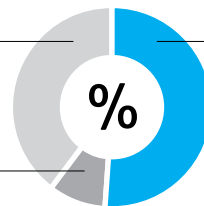
INFOGRAPHICS: 2021

R&D personnel

662.7 thousand persons

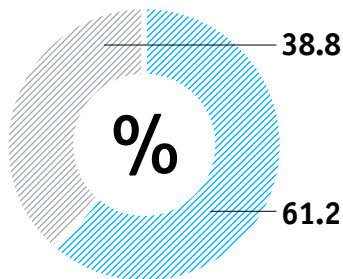
39.5
Supporting staff
and others

9.1
Technicians



340.1 thousand persons
Researchers

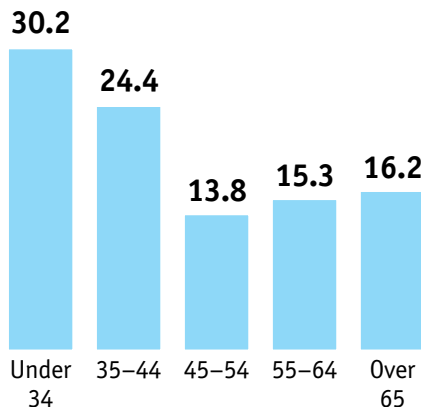
Gender



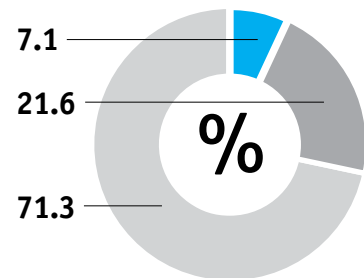
Male

Female

Age, %



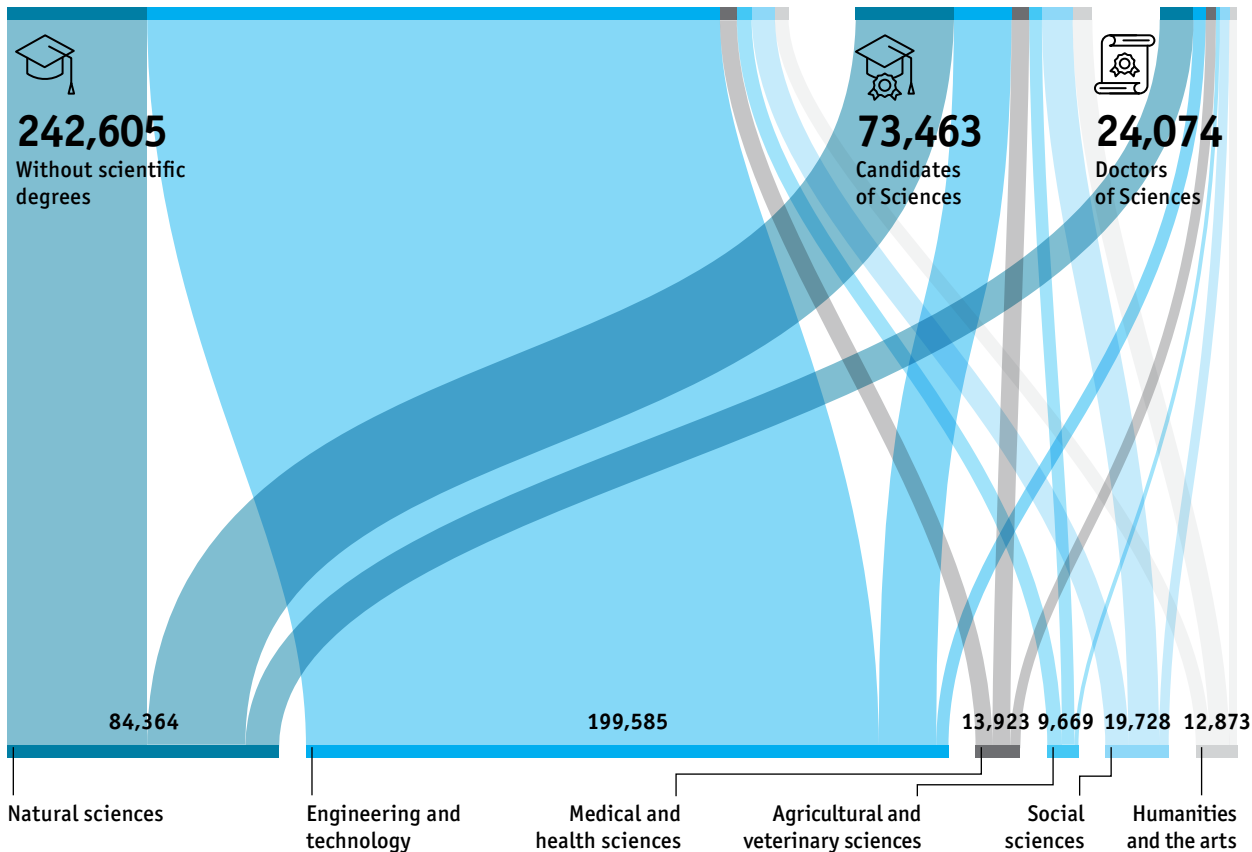
Scientific degree



Doctors of Sciences

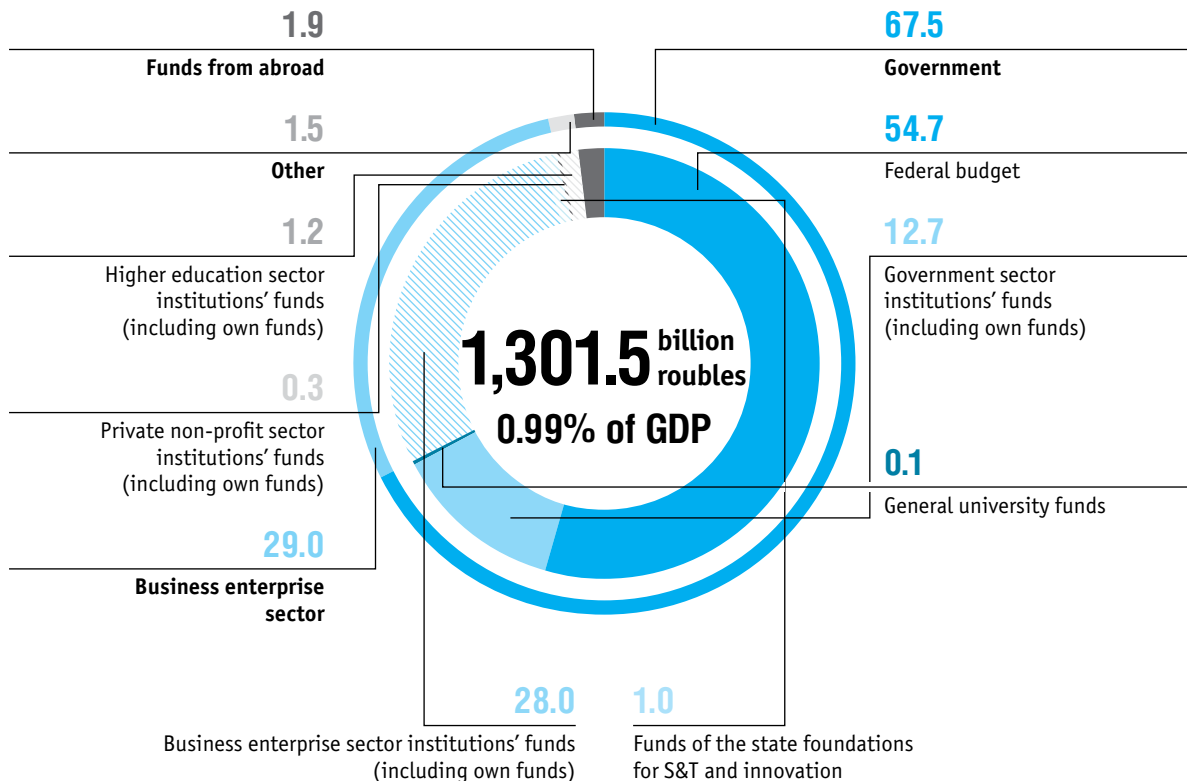
Candidates of Sciences

Without scientific degrees



NUMBER OF RESEARCHERS BY FIELDS OF SCIENCE AND TECHNOLOGY

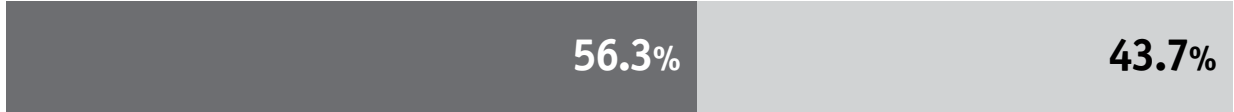
Sources of funds, %



GROSS DOMESTIC EXPENDITURE ON R&D
BY SOURCE OF FUNDS

Postgraduate enrolment – total

90,156



Entrants

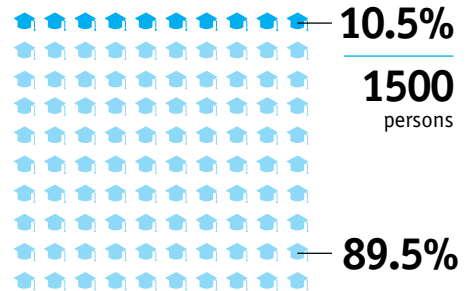
27,992



Male Female

Graduates

14,326



Defended thesis Did not defend thesis

20

R&D OUTPUT

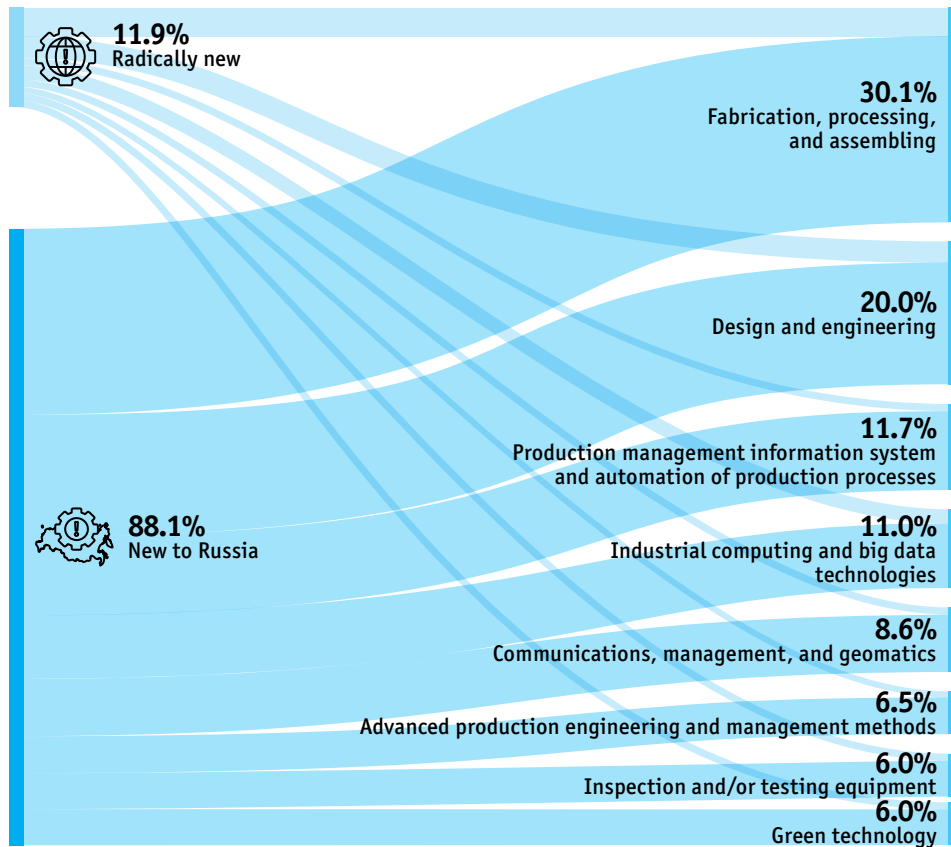
As a percentage of the world total number of publications indexed in Scopus	Number of publications in dexed in Scopus	Rank	Country	Rank	Number of patent applications	As a percentage of the world total number of patent applications
24.3	848,516	1	China	1	1,538,549	44.8
18.4	643,358	2	United States	2	509,853	14.8
6.3	218,590	3	India	9	43,133	1.3
6.0	209,586	4	United Kingdom	7	53,608	1.6
5.4	188,130	5	Germany	5	165,656	4.8
4.0	139,156	6	Italy	10	34,166	1
3.9	135,501	7	Japan	3	412,851	12
3.5	122,551	8	Russia	14	25,881	0.8
3.3	116,772	9	Canada	13	26,504	0.8
3.3	116,113	10	France	6	66,087	1.9
3.2	112,461	11	Spain	20	10,875	0.3
3.2	110,868	12	Australia	19	12,821	0.4
2.8	97,496	13	Republic of Korea	4	267,517	7.8
2.7	94,353	14	Brazil	23	6,900	0.2
2.1	73,469	15	Iran	21	11,550	0.3

● The data are provided for top 15 countries by the number of publications indexed in Scopus in 2021.

● The data for patent applications refer to 2020 (as at November 23, 2022).

Technologies developed

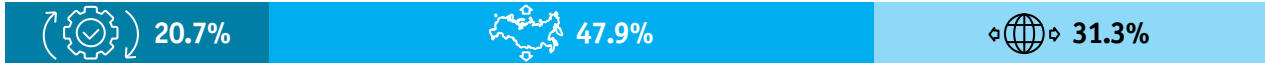
2,186



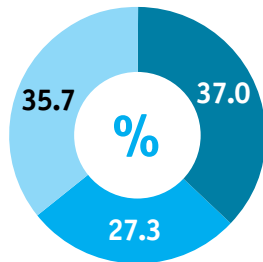
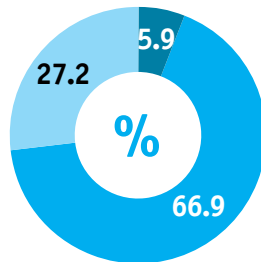
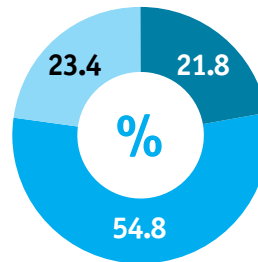
DEVELOPMENT OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE

Technologies in use

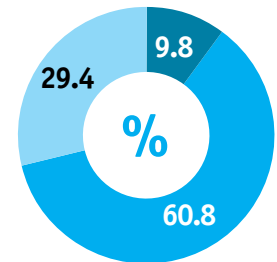

256,582





Types of technologies*

Fabrication, processing,
and assemblingCommunications, management,
and geomatics

Design and engineering

Production management
information system
and automation
of production processes
 Developed by organisations
using their own resources

 Acquired from other Russian
organisations

 Acquired from foreign
suppliers

* The data refer to the most widespread types of technologies.

What do you think is the primary goal of science?

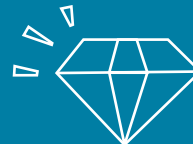
84%

agree that most scientists work on improving people's quality of life



47%

think that they personally benefit from the work of Russian scientists



How the development of science and technologies impacts our life?

68%

think that new technologies help people organise their daily lives



64%

agree that they have become too dependent on new technologies

50%

cannot trust organisations that have only online interaction



25%

follow the emergence of new technologies in areas of their interest



MAIN SCIENCE AND TECHNOLOGY INDICATORS

	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D, <i>million roubles</i> :								
at current prices	523377.2	914669.1	943815.2	1019152.4	1028247.6	1134786.7	1174534.3	1301490.9
at constant 2010 prices*	523377.2	597159.4	599400.0	614650.8	563763.2	602296.4	619055.7	588803.4
Gross domestic expenditure on R&D:								
as a percentage of GDP	1.13	1.10	1.10	1.11	0.99	1.04	1.09	0.99
as a percentage of the previous year at constant 2010 prices	94.3	100.7	100.4	102.5	91.7	106.8	102.8	95.1
Gross domestic expenditure on R&D per R&D institution, <i>thousand roubles</i>	149878.9	219082.4	234081.2	258405.8	260315.9	280125.1	281325.6	311734.4
Gross domestic expenditure on R&D per R&D employee, <i>thousand roubles</i>	710.6	1238.0	1306.7	1439.7	1506.4	1662.8	1729.0	1963.9
Gross domestic expenditure on R&D per researcher, <i>thousand roubles</i>	1418.7	2410.8	2548.2	2832.6	2956.0	3258.8	3389.7	3826.3
Federal budget appropriations on civil S&T, <i>million roubles</i>								
at current prices	237644.0	439392.8	402722.3	377882.2	420472.3	489158.4	549602.1	626574.3
at constant 2010 prices	237644.0	286866.1	255761.7	227900.7	230534.7	259624.4	289675.9	283466.5
Federal budget appropriations on civil S&T as a percentage of GDP	0.51	0.53	0.47	0.41	0.40	0.45	0.51	0.48
R&D personnel, <i>thousand persons</i>	736.5	738.9	722.3	707.9	682.6	682.5	679.3	662.7
As a percentage of the previous year	99.2	100.9	97.8	98.0	96.4	100.0	99.5	97.6
R&D personnel per R&D institution, <i>persons</i>	211	177	179	179	173	168	163	159

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
R&D personnel per 10,000 employment, <i>persons</i>	109	102	100	99	95	96	98	94
Researchers, <i>thousand persons</i>	368.9	379.4	370.4	359.8	347.9	348.2	346.5	340.1
As a percentage of the previous year	99.9	101.5	97.6	97.1	96.7	100.1	99.5	98.2
Researchers per R&D institution, <i>persons</i>	106	91	92	91	88	86	83	81
Researchers per 10,000 employment, <i>persons</i>	55	52	51	50	49	49	50	48
Patent applications filed in the Russian Federation	42500	45517	41587	36454	37957	35511	34984	30977
Patent grants received in the Russian Federation	30322	34706	33536	34254	35774	34008	28788	23662
Number of developed advanced manufacturing technologies	864	1398	1534	1402	1565	1620	1989	2186
Number of advanced manufacturing technologies in use	203330	218018	232388	240054	254927	262645	242931	256582
Total receipts from technology exports, <i>thousand USD</i>	627887.5	1654732.1	1277023.5	1181183.9	1405475.1	3520119.7	4548522.4	4662722.8
Total payments for technology imports, <i>thousand USD</i>	1425983.3	2207406.8	2498677.8	3305202.5	3064747.9	4836809.2	4824951.5	5044265.4

* The data are calculated using GDP deflator as at April 8, 2022.

MAIN INDICATORS OF SCIENCE AND TECHNOLOGY IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION*

	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D, <i>thousand roubles</i> :						
at current prices	4396169.3	3545165.6	4749615.6	4896547.8	5075911.3	6001088.2
at constant 2010 prices*	2791927.7	2138089.1	2604098.7	2598878.9	2675334.1	2714933.1
Gross domestic expenditure on R&D as a percentage of the previous year at constant 2010 prices	–	76.6	121.8	99.8	102.9	101.5
Gross domestic expenditure on R&D per R&D institution, <i>thousand roubles</i>	60221.5	52134.8	64184.0	59714.0	55172.9	66678.8
Gross domestic expenditure on R&D per R&D employee, <i>thousand roubles</i>	1216.1	1172.7	1443.2	1482.9	1531.2	1816.3
Gross domestic expenditure on R&D per researcher, <i>thousand roubles</i>	2395.7	2355.6	2818.8	2911.1	2918.9	3415.5
Number of R&D institutions	73	68	74	82	92	90
R&D personnel, <i>persons</i>	3615	3023	3291	3302	3315	3304
As a percentage of the previous year	–	83.6	108.9	100.3	100.4	99.7
R&D personnel per R&D institution, <i>persons</i>	50	44	44	40	36	37
Researchers, <i>persons</i>	1835	1505	1685	1682	1739	1757
Researchers per R&D institution, <i>persons</i>	25	22	23	21	19	20
Number of institutions implementing postgraduate programmes	18	16	10	10	10	10
Postgraduate enrolment, <i>persons</i>	716	623	643	624	664	674
Postgraduate graduates, <i>persons</i>	174	202	111	81	79	90
Of whom defended their thesis	8	4	4	–	–	8

(continued)

	2016	2017	2018	2019	2020	2021
Number of institutions implementing postdoctoral programmes	3	2	2	...	1	1
Postdoctoral enrolment, <i>persons</i>	3	5	5	4	1	2
Postdoctoral graduates, <i>persons</i>	8	–	3	2	3	1
Of whom defended their thesis	–	–	–	2	1	1
Number of organisations that have used advanced manufacturing technologies	786	479	537	514	566	586
Number of advanced manufacturing technologies in use	10390	7570	7719	8470	8248	8678
Of which acquired abroad	2840	1519	1425	1960	1853	1951

* Including the data on R&D institutions located on the land territories of the Arctic zone of the Russian Federation.

** The data are calculated using GDP deflator as at April 8, 2022.

MAIN INDICATORS OF INNOVATION

	2010	2015	2016	2017	2018	2019	2020	2021
Innovation activity of enterprises, <i>percentage</i>	9.5	9.3	8.4	14.6	12.8	9.1	10.8	11.9
Industrial production	10.8	10.6	10.5	17.8	15.6	15.1	16.2	17.4
Telecommunications; computer programming, consultancy and related activities; IT industry	13.6	10.8	9.3	12.4	9.5	9.8	12.2	12.2
Construction	...	2.0	1.5	9.6	7.6	3.7	3.9	4.5
Agriculture	...	...	4.0	4.6	4.2	4.2	6.6	8.1
Transportation and storage	...	...	...	...	...	2.8	4.0	3.9
Human health and social work activities	...	...	...	...	...	5.3	8.6	11.0
Innovation expenditure, <i>million roubles:</i>								
at current prices	411008.8	1211294.4	1298444.5	1416922.8	1484901.1	1954133.3	2134038.4	2379709.9
at constant 2010 prices*	411008.8	790817.0	824618.6	854546.0	814135.2	1037170.7	1124776.5	1076596.9
Industrial production:								
at current prices	356163.5	741283.8	787232.5	856794.0	893881.3	984315.5	1168528.8	1307322.1
at constant 2010 prices	356163.5	483961.5	499957.1	516732.4	490093.4	522432.7	615890.4	591441.4
Telecommunications; computer programming, consultancy and related activities; IT industry:								
at current prices	40223.1	67749.9	54681.7	55565.9	61734.7	100958.0	104003.4	147312.9
at constant 2010 prices	40223.1	44231.8	34727.4	33511.8	33847.6	53584.2	54816.5	66645.4

* The data are calculated taking into account the GDP deflator as of April 08, 2022.

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
Construction:								
at current prices	...	13.4	7.3	196.4	49.7	10930.5	13520.9	16888.5
at constant 2010 prices	...	8.8	4.6	118.5	27.3	5801.4	7126.4	7640.4
Agriculture:								
at current prices	...	...	15073.6	15942.0	22033.3	49393.2	39692.8	33424.6
at constant 2010 prices	...	...	9573.0	9614.6	12080.3	26215.8	20920.7	15121.5
Transportation and storage:								
at current prices	...	...	...	...	...	228822.7	203748.5	180625.9
at constant 2010 prices	...	...	...	...	...	121449.3	107388.7	81716.4
Human health and social work activities:								
at current prices	...	...	...	...	...	17763.8	34295.5	25607.9
at constant 2010 prices	...	...	...	...	...	9428.3	18076.0	11585.2
Innovation expenditure as a percentage of total sales	1.6	2.7	2.5	2.5	2.2	2.1	2.3	2.0
Industrial production	1.5	1.8	1.8	1.7	1.5	1.6	1.9	1.6
Telecommunications; computer programming, consultancy and related activities; IT industry	3.0	3.4	2.4	2.4	2.6	3.2	2.8	3.3
Construction	...	0.01	0.01	0.2	0.03	0.1	0.3	0.2
Agriculture	...	...	0.9	1.0	1.2	1.6	1.6	1.1
Transportation and storage	...	...	...	...	...	2.6	2.0	1.5
Human health and social work activities	...	...	...	...	...	0.9	1.6	0.9

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
<i>Sales of innovative goods and services, million roubles:</i>								
at current prices	1243712.5	3843428.7	4364321.7	4166998.7	4516276.4	4863381.9	5189046.2	6003342.0
at constant 2010 prices	1243712.5	2509256.8	2771701.8	2513116.6	2476164.5	2581275.9	2734963.5	2715952.8
<i>Industrial production:</i>								
at current prices	1165747.6	3258254.6	3723693.4	3403055.2	3693061.6	3871481.1	3999391.8	4582372.5
at constant 2010 prices	1165747.6	2127214.6	2364850.4	2052382.4	2024815.8	2054817.2	2107938.5	2073096.5
<i>Telecommunications; computer programming, consultancy and related activities; IT industry:</i>								
at current prices	62636.4	86048.9	80955.8	111254.6	138610.7	200311.3	222389.1	370602.1
at constant 2010 prices	62636.4	56178.7	51413.6	67097.7	75996.9	106316.7	117213.5	167662.9
<i>Construction:</i>								
at current prices	...	600.3	2351.0	152.9	48.7	29952.4	30079.9	40351.1
at constant 2010 prices	...	391.9	1493.1	92.2	26.7	15897.4	15854.1	18255.1
<i>Agriculture:</i>								
at current prices	...	...	22222.9	28446.0	33829.1	69559.2	58855.8	67339.6
at constant 2010 prices	...	...	14113.4	17155.8	18547.7	36919.1	31020.8	30464.9
<i>Transportation and storage:</i>								
at current prices	...	...	...	...	...	47469.6	125550.2	82179.5
at constant 2010 prices	...	...	...	...	...	25194.8	66173.1	37178.6
<i>Human health and social work activities:</i>								
at current prices	...	...	...	...	...	13710.9	25249.8	15287.5
at constant 2010 prices	...	...	...	...	...	7277.1	13308.3	6916.2

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
Innovative goods and services as a percentage of total sales	4.8	8.4	8.5	7.2	6.5	5.3	5.7	5.0
Industrial production	4.9	7.9	8.4	6.7	6.0	6.1	6.4	5.5
Telecommunications; computer programming, consultancy and related activities; IT industry	4.7	4.3	3.5	4.8	5.7	6.4	6.0	8.3
Construction	...	0.6	1.7	0.1	0.03	0.4	0.6	0.6
Agriculture	...	...	1.4	1.8	1.9	2.3	2.3	2.3
Transportation and storage	...	...	...	...	...	0.5	1.2	0.7
Human health and social work activities	...	...	...	...	...	0.7	1.2	0.6
Enterprises engaged in technological innovation as a percentage of the total number of enterprises**	7.9	8.3	7.3	20.8	19.8	21.6	23.0	23.0
Industrial production	9.3	9.5	9.2	19.6	18.5	20.0	21.5	20.9
Telecommunications; computer programming, consultancy and related activities; IT industry	10.8	9.4	7.7	15.7	14.3	17.9	18.7	19.1
Construction	...	2.0	1.1	10.5	9.5	8.2	10.9	8.6
Agriculture	...	...	3.4	5.2	5.4	6.5	9.4	9.5

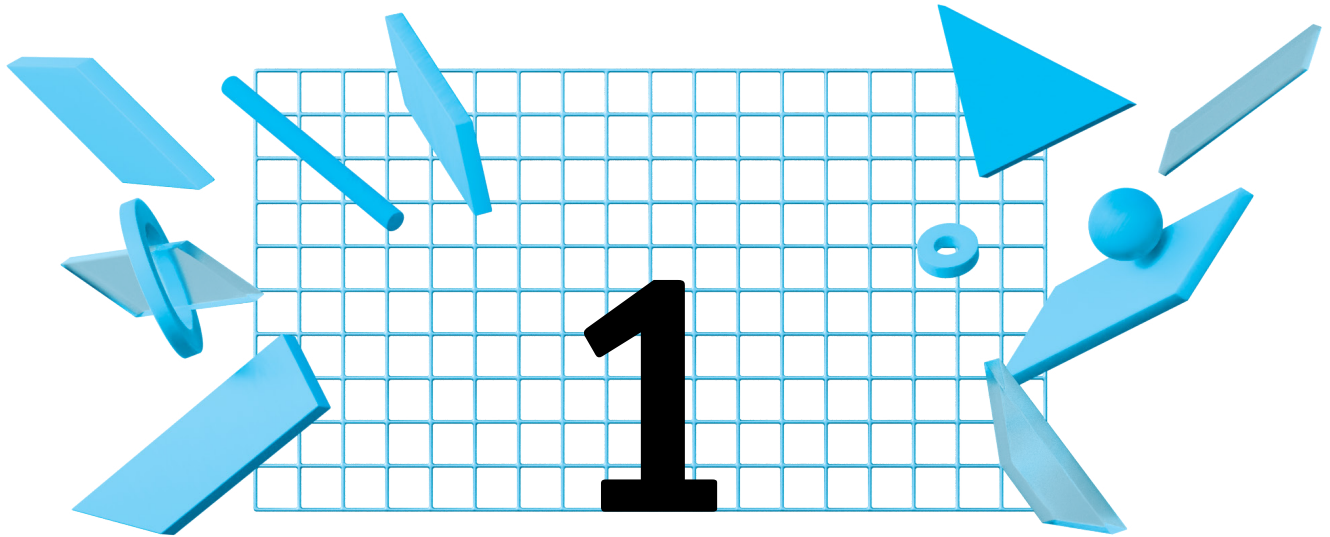
** Since 2018, the indicator is calculated according to the methodology approved by Order no. 788 of Rosstat of December 20, 2019 for the purpose of information support of Clause 1e of Decree no. 204 of the President of the Russian Federation of May 07, 2018 'On the National Goals and Strategic Tasks of the Development of the Russian Federation until 2024'. Any changes in 2017 data are due to the recalculation of indicators according to the specified method.

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
Expenditure on technological innovation as a percentage of total sales	1.6	2.6	2.5	2.4	2.1	1.9	2.1	1.8
Industrial production	1.5	1.8	1.8	1.7	1.4	1.4	1.6	1.4
Telecommunications; computer programming, consultancy and related activities; IT industry	2.9	3.3	2.3	2.3	2.5	2.2	2.1	2.4
Construction	...	0.01	0.01	0.2	0.03	0.1	0.3	0.2
Agriculture	...	...	0.9	1.0	1.2	1.5	1.5	1.1
Innovation activity of small enterprises, <i>percentage</i> ***	...	4.5	...	5.2	...	5.8	...	6.9
Innovation expenditure of small enterprises, <i>million roubles</i> ****:								
at current prices	...	12151.8	...	19220.4	...	27340.2	...	54441.8
at constant 2010 prices	...	7933.6	...	11591.8	...	14511.0	...	24629.8
Innovation expenditure as a percentage of total sales in small enterprises	...	0.6	...	0.8	...	1.0	...	1.3
Sales of innovative goods and services of small enterprises, <i>million roubles</i> :								
at current prices	...	31270.9	...	37523.0	...	67055.9	...	118825.9
at constant 2010 prices	...	20415.8	...	22630.1	...	35590.4	...	53757.6
Innovative goods and services as a percentage of total sales in small enterprises	...	1.6	...	1.6	...	2.4	...	2.8

*** Until 2019, the indicator was calculated based on the data of small enterprises engaged in technological innovations.

**** Until 2019, indicators showing innovation expenditure were calculated based on the data on expenditure on technological innovation.



INSTITUTIONS

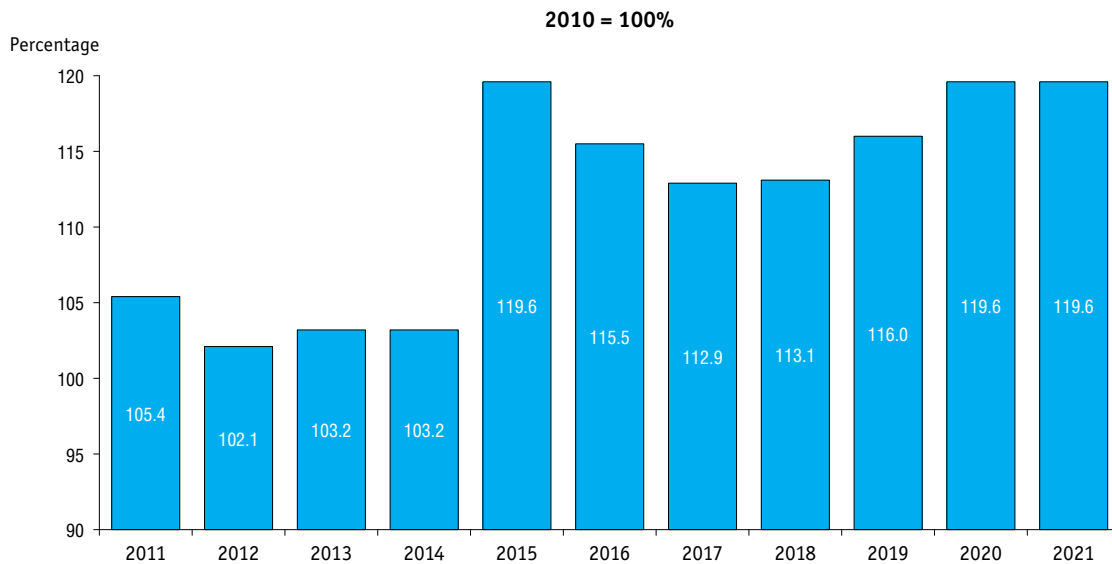
1.1. R&D INSTITUTIONS BY TYPE

	2000	2005*	2010	2015	2016	2017	2018	2019	2020	2021
Total	4099	3566	3492	4175	4032	3944	3950	4051	4175	4175
Research institutes	2686	2115	1840	1708	1673	1577	1574	1618	1633	1627
Design organisations	318	489	362	322	304	273	254	255	239	233
Construction project and exploration organisations	85	61	36	29	26	23	20	11	12	13
Pilot plants	33	30	47	61	62	63	49	44	35	33
Higher education institutions	390	406	517	1040**	979	970	917	951	969	990
Industrial enterprises	284	231	238	371	363	380	419	450	441	446
Others	303	234	452	644	625	658	717	722	846	833

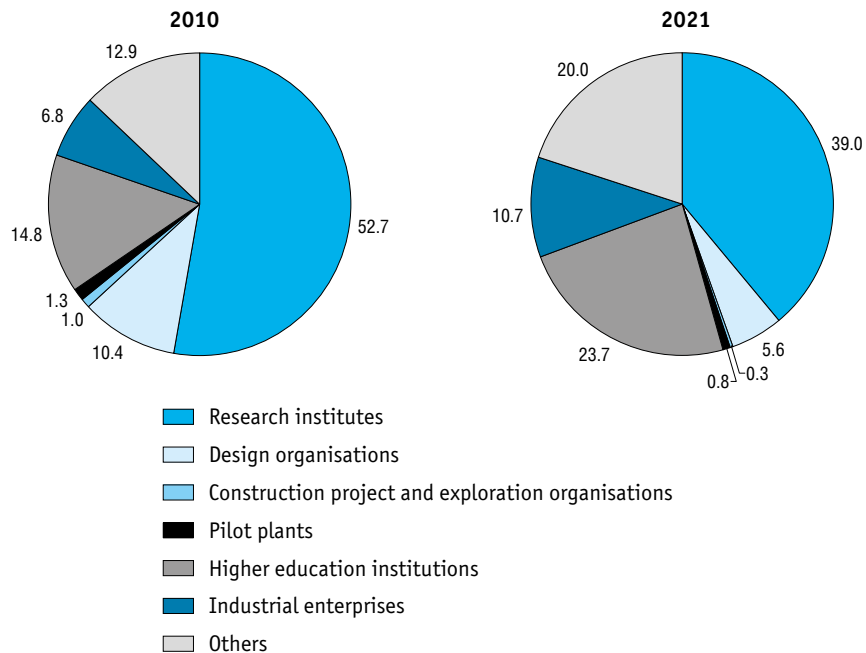
* In 2005, the R&D institutions classification by type was changed due to the abolition of the 'All-Russian Classifier of Economy Branches'.

** Since 2015, the number of R&D institutions includes branches of higher education institutions.

1.2. TRENDS IN THE NUMBER OF R&D INSTITUTIONS



1.3. PERCENTAGE DISTRIBUTION OF R&D INSTITUTIONS BY TYPE



1.4. R&D INSTITUTIONS BY OWNERSHIP

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	4099	3566	3492	4175	4032	3944	3950	4051	4175	4175
Russian ownership	4035	3513	3436	4077	3940	3859	3862	3955	4071	4082
Public ownership	2938*	2632	2610	2684	2592	2520	2510	2555	2591	2580
Federal	2755	2483	2467	2494	2414	2343	2314	2356	2395	2378
Regional	181	149	140	190	178	177	196	199	196	202
Municipal ownership	11	6	14	15	14	14	12	10	11	9
Ownership by voluntary associations	60	27	28	43	44	41	41	39	45	44
Private ownership	388	422	470	881	865	875	880	920	999	1014
Ownership by Russian citizens permanently living abroad	...	...	...	1	1	1	1	–	–	–
Ownership by consumers' cooperatives*	3	4	4	5	6	6	1	–	–	–
Mixed ownership	635	422	304	358	326	296	304	310	304	301
Mixed ownership with a share of public ownership	...	...	268	275	248	221	206	203	193	187
Other mixed ownership	...	...	...	83	78	75	98	107	111	114
Ownership by state corporations	...	...	6	90	92	106	113	121	121	134
Foreign ownership	6	7	16	36	39	43	42	46	51	43
Joint ownership (with both Russian and foreign participation)	58	46	40	62	53	42	46	50	53	50

* The sum of the breakdown may not add to the total because some institutions have shared ownership.

(continued)

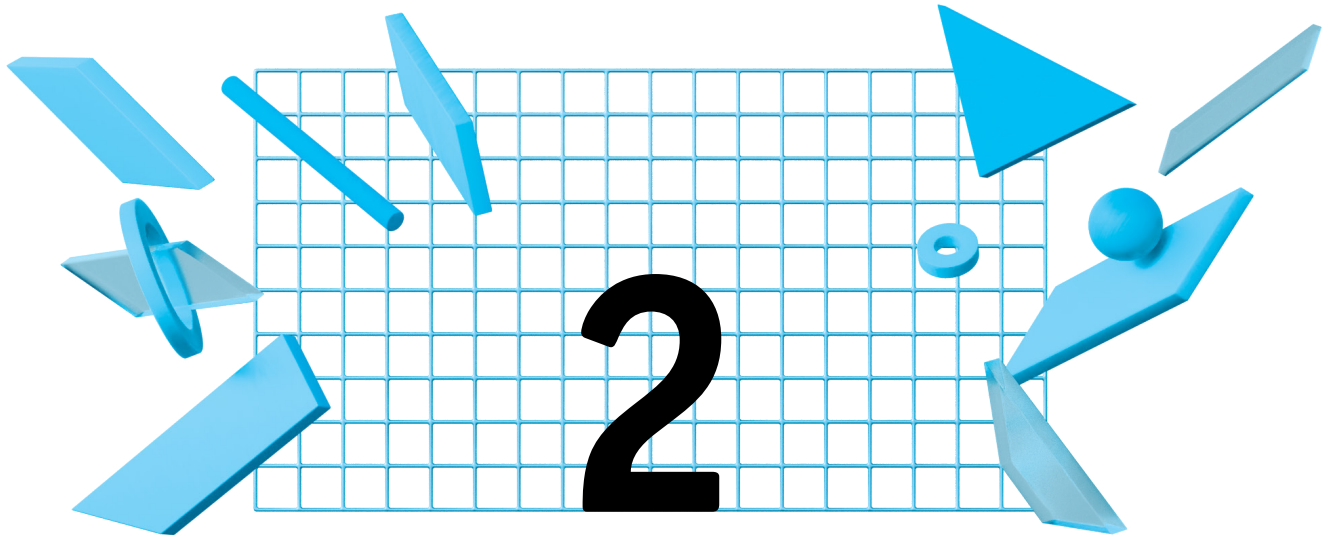
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total, percentage	100	100	100	100	100	100	100	100	100	100
Russian ownership	98.4	98.5	98.4	97.7	97.7	97.8	97.8	97.6	97.5	97.8
Public ownership	71.7	73.8	74.7	64.3	64.3	63.9	63.5	63.1	62.1	61.8
Federal	67.2	69.6	70.6	59.7	59.9	59.4	58.6	58.2	57.4	57.0
Regional	4.4	4.2	4.0	4.6	4.4	4.5	5.0	4.9	4.7	4.8
Municipal ownership	0.3	0.2	0.4	0.4	0.3	0.4	0.3	0.2	0.3	0.2
Ownership by voluntary associations	1.5	0.8	0.8	1.0	1.1	1.0	1.0	1.0	1.1	1.1
Private ownership	9.5	11.8	13.5	21.1	21.5	22.2	22.3	22.7	23.9	24.3
Ownership by Russian citizens permanently living abroad	...	...	...	0.02	0.02	0.03	0.03	–	–	–
Ownership by consumers' cooperatives*	0.07	0.1	0.1	0.1	0.1	0.2	0.03	–	–	–
Mixed ownership	15.5	11.8	8.7	8.6	8.1	7.5	7.7	7.7	7.3	7.2
Mixed ownership with a share of public ownership	...	...	7.7	6.6	6.2	5.6	5.2	5.0	4.6	4.5
Other mixed ownership	...	...	...	2.0	1.9	1.9	2.5	2.6	2.7	2.7
Ownership by state corporations	...	...	0.2	2.2	2.3	2.7	2.9	3.0	2.9	3.2
Foreign ownership	0.1	0.2	0.5	0.9	1.0	1.1	1.1	1.1	1.2	1.0
Joint ownership (with both Russian and foreign participation)	1.4	1.3	1.1	1.5	1.3	1.1	1.2	1.2	1.3	1.2

1.5. PERCENTAGE DISTRIBUTION OF R&D INSTITUTIONS BY SIZE

	2000	2005	2010	2015	2018	2019	2020	2021
Total								
R&D institutions	4099	3566	3492	4175	3950	4051	4175	4175
Number of employees, <i>headcount</i> :								
under 100	2377	2023	2094	2822	2718	2803	2927	2976
101–500	1344	1199	1076	1033	933	950	954	905
501–1000	222	199	194	183	170	171	171	178
1001–5000	145	136	120	131	122	121	118	111
over 5,000	11	9	8	6	7	6	5	5
Percentage								
R&D institutions	100	100	100	100	100	100	100	100
Number of employees, <i>headcount</i> :								
under 100	58.0	56.7	60.0	67.6	68.8	69.2	70.1	71.3
101–500	32.8	33.6	30.8	24.7	23.6	23.5	22.9	21.7
501–1000	5.4	5.6	5.6	4.4	4.3	4.2	4.1	4.3
1001–5000	3.5	3.8	3.4	3.1	3.1	3.0	2.8	2.7
over 5,000	0.3	0.3	0.2	0.1	0.2	0.1	0.1	0.1

1.6. R&D INSTITUTIONS BY TYPE OF ECONOMIC ACTIVITY

	2017	2018	2019	2020	2021
Total	3944	3950	4051	4175	4175
Agriculture, forestry and fishing	32	23	25	25	25
Mining and quarrying	3	5	6	6	5
Manufacturing	453	464	508	530	536
Electricity, gas, steam and air-conditioning supply	5	9	4	2	2
Water supply; sewerage, waste management, and remediation activities	2	4	4	1	1
Construction	3	2	2	1	1
Wholesale and retail trade; repair of motor vehicles and motorcycles	7	12	15	15	16
Transportation and storage	4	4	6	2	4
Accommodation and food service activities	1	1	2	–	1
Information and communication	39	43	49	63	55
Financial and insurance activities	4	1	1	1	2
Real estate activities	11	9	13	13	11
Professional, scientific and technical activities	2164	2178	2172	2211	2202
Of which research and development	2089	2104	2083	2127	2122
Administrative and support service activities	4	4	8	10	6
Public administration and defence; compulsory social security	2	6	4	6	6
Education	1030	991	1029	1072	1089
Of which higher education	986	945	977	1020	1041
Human health and social work activities	38	53	58	65	66
Art, entertainment and recreation	132	127	130	132	131
Other service activities	10	14	15	20	16



R&D PERSONNEL

2.1. R&D PERSONNEL

(headcount)

	2000	2005*	2010	2015	2016	2017	2018	2019	2020	2021
Total	887729	813207	736540	738857	722291	707887	682580	682464	679333	662702
Research institutes	718434	510523	435304	435502	427158	407962	394402	401771	388757	366041
Design organisations	56488	184785	157146	136263	133742	125272	115565	112684	103346	109185
Construction project and exploration organisations	6811	5443	6324	2849	1801	1537	1296	508	1955	2161
Pilot plants	6145	1232	1558	3023	2996	6030	5747	3284	2897	7477
Higher education institutions	31110	33942	46776	60151	59124	56571	58573	59280	61436	63990
Industrial enterprises	54721	43524	51807	53868	50740	59421	52977	57974	63189	64489
Others	14020	33758	37625	47201	46730	51094	54020	46963	57753	49359

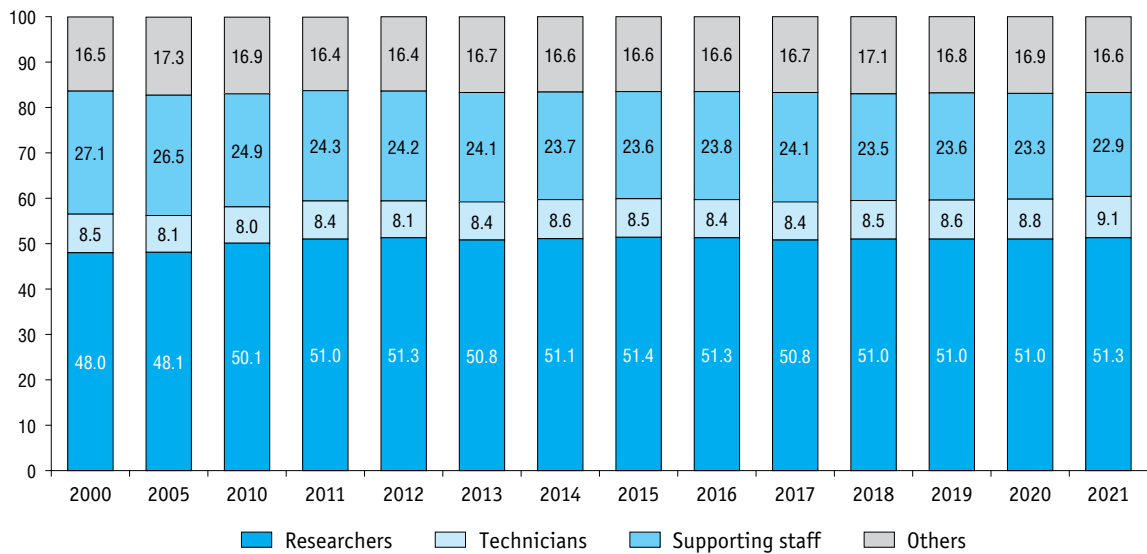
* In 2005, the R&D institutions classification by type was changed due to the abolition of the 'All-Russian Classifier of Economy Branches'.

2.2. R&D PERSONNEL BY OCCUPATION

(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	887729	813207	736540	738857	722291	707887	682580	682464	679333	662702
Researchers	425954	391121	368915	379411	370379	359793	347854	348221	346497	340142
Technicians	75184	65982	59276	62805	60441	59690	57722	58681	59557	60474
Supporting staff	240506	215555	183713	174056	171915	170347	160591	160864	158298	152066
Others	146085	140549	124636	122585	119556	118057	116413	114698	114981	110020

2.3. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL BY OCCUPATION



2.4. R&D PERSONNEL BY OWNERSHIP OF R&D INSTITUTIONS

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
	Headcount									
Total	887729	813207	736540	738857	722291	707887	682580	682464	679333	662702
Russian ownership	866386	797394	726234	729121	714043	699449	673100	672469	669369	654880
Public ownership	673658*	641310	575035	485424	458989	424666	390604	394079	388642	374775
Federal	657696	629207	564238	472548	447382	415705	381171	385549	380214	365480
Regional	15957	12103	10450	12876	11607	8961	9433	8530	8428	9295
Municipal ownership	725	77	170	141	150	142	137	113	116	83
Ownership by voluntary associations	1207	231	512	1010	959	1144	1229	1210	1266	1305
Private ownership	53408	58480	66906	85798	99312	104995	103793	103883	107223	103848
Ownership by Russian citizens permanently living abroad	...	...	...	...**	...**	...**	...**	-	-	-
Ownership by consumers' cooperatives*	16	27	268	20	23	28	...**	-	-	-
Mixed ownership	137372	97269	78464	124661	121142	124785	125224	122635	121429	116335
Mixed ownership with a share of public ownership	...	...	66574	90907	91932	93247	87428	79938	79051	72283
Other mixed ownership	...	...	...	33754	29210	31538	37796	42697	42378	44052
Ownership by state corporations	...	...	4879	32063	33464	43685	52108	50549	50693	58534
Foreign ownership	146	1145	1130	2898	2881	3030	2993	4561	4905	3026
Joint ownership (with both Russian and foreign participation)	21197	14668	9176	6838	5367	5408	6487	5434	5059	4796

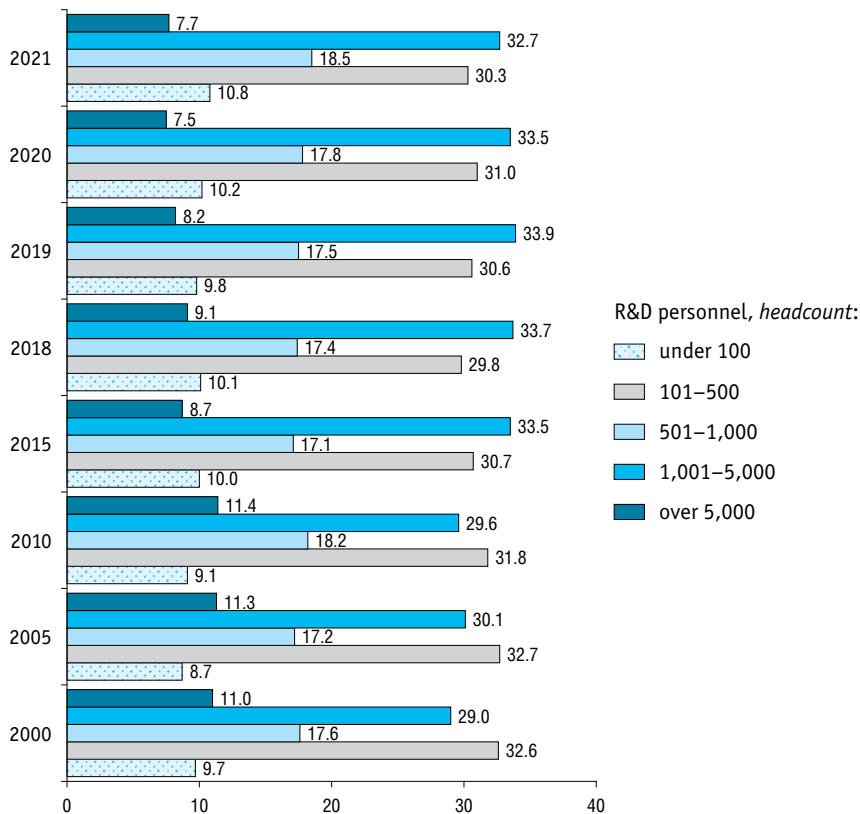
(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Percentage										
Total	100	100	100	100	100	100	100	100	100	100
Russian ownership	97.6	98.1	98.6	98.7	98.9	98.8	98.6	98.5	98.5	98.8
Public ownership	75.9	78.9	78.1	65.7	63.5	60.0	57.2	57.7	57.2	56.6
Federal	74.1	77.4	76.6	64.0	61.9	58.7	55.8	56.5	56.0	55.1
Regional	1.8	1.49	1.4	1.7	1.6	1.3	1.4	1.2	1.2	1.4
Municipal ownership	0.08	0.01	0.02	0.02	0.0	0.0	0.02	0.0	0.0	0.0
Ownership by voluntary associations	0.1	0.03	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
Private ownership	6.0	7.19	9.1	11.6	13.7	14.8	15.2	15.2	15.8	15.7
Ownership by Russian citizens permanently living abroad	...	...	...	...^{**}	...^{**}	...^{**}	...^{**}	–	–	–
Ownership by consumers' cooperatives*	0.0	0.0	0.04	0.0	0.0	0.0	... ^{**}	–	–	–
Mixed ownership	15.5	11.96	10.7	16.9	16.8	17.6	18.3	18.0	17.9	17.6
Mixed ownership with a share of public ownership	...	...	9.0	12.3	12.7	13.2	12.8	11.7	11.6	10.9
Other mixed ownership	...	...	...	4.6	4.0	4.5	5.5	6.3	6.2	6.6
Ownership by state corporations	...	...	0.7	4.3	4.6	6.2	7.6	7.4	7.5	8.8
Foreign ownership	0.02	0.14	0.2	0.4	0.4	0.4	0.4	0.7	0.7	0.5
Joint ownership (with both Russian and foreign participation)	2.4	1.8	1.2	0.9	0.7	0.8	1.0	0.8	0.7	0.7

* The sum of the breakdown may not add to the total because some institutions have shared ownership.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

2.5. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL BY SIZE OF R&D INSTITUTIONS



2.6. R&D PERSONNEL BY TYPE OF ECONOMIC ACTIVITY

(headcount)

	R&D personnel			Researchers		
	2019	2020	2021	2019	2020	2021
Total	682464	679333	662702	348221	346497	340142
Agriculture, forestry and fishing	369	520	469	145	248	209
Mining and quarrying	460	468	116	406	419	103
Manufacturing	86451	93372	90576	44222	48511	46739
Electricity, gas, steam and air-conditioning supply	–	395	409	–	111	109
Water supply; sewerage, waste management, and remediation activities	...*	289	538	...*	137	151
Construction	...*	8	15	...*	8	8
Wholesale and retail trade; repair of motor vehicles and motorcycles	569	275	276	503	158	191
Transportation and storage	2535	413	1482	1191	298	1119
Accommodation and food service activities	...*	–	898	...*	–	667
Information and communication activities	4307	7167	4294	3047	4462	3051
Financial and insurance activities	–	–	5	–	–	4
Real estate activities	866	362	385	378	182	122
Professional, scientific and technical activities	515479	503690	488524	251105	243831	237822
Of which research and development	503107	495670	482399	243926	238200	234207
Administrative and support service activities	305	520	411	237	396	346
Public administration and defence; compulsory social security	850	842	959	308	318	434

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

(continued)

	R&D personnel			Researchers		
	2019	2020	2021	2019	2020	2021
Education	61964	63726	66321	42290	43777	45504
Of which higher education	61095	63098	65769	41653	43194	45061
Human health and social work activities	4065	4188	4366	1858	2122	2003
Art, entertainment and recreation	3066	3009	2595	1666	1484	1533
Other service activities	78	89	63	28	35	27

2.7. R&D PERSONNEL BY EDUCATIONAL ATTAINMENT

(headcount)

	Total	Higher education	Secondary vocational education	Other education
2000	887729	530649	144503	212577
2005	813207	501718	134222	177267
2006	807066	502657	133454	170955
2007	801135	513099	129360	158676
2008	761252	495255	121508	144489
2009	742433	489076	115042	138315
2010	736540	493852	109158	133530
2011	735273	506330	103873	125070
2012	726318	508057	99503	118758
2013	727029	512017	97867	117145
2014	732274	522726	95564	113984
2015	738857	537118	95640	106099
2016	722291	529418	93123	99750
2017	707887	522779	90607	94501
2018	682580	511222	85539	85819
2019	682464	516809	86590	79065
2020	679333	518917	85533	74883
2021	662702	508871	83247	70584

2.8. RESEARCHERS BY AGE

(headcount)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Total	359793	347854	348221	346497	340142	142290	136431	136074	134389	132090
Age, years:										
under 29 inclusive	66376	60634	58537	56607	53459	23988	22134	21687	20682	19375
30–34	51603	51360	52152	51904	49430	19469	19296	19537	19403	18556
35–39	39826	40749	43375	44922	46547	15977	15973	16639	17018	17855
40–44	28679	30045	32376	34918	36604	12276	12443	13196	14156	14736
45–49	22470	22756	23563	25154	26195	10473	10188	10337	10630	11010
50–54	26749	24159	22662	21642	20872	12730	11574	10719	10176	9738
55–59	33144	30673	29342	27198	25243	14869	13754	13161	12089	11206
60–64	57414*	54077*	29559	27480	26789	22548*	21301*	12143	11339	11189
65–69			25350	24236	23271			9285	9074	8706
70 and over	33532	33401	31305	32436	31732	9960	9768	9370	9822	9719
Doctors of Sciences	26076	25288	24844	24473	24074	6816	6729	6747	6742	6824
Age, years:										
under 29 inclusive	32	40	12	39	14	–	3	...**	4	4
30–34	108	95	94	81	88	25	23	24	21	20
35–39	458	423	424	438	428	133	114	111	114	115
40–44	1116	1052	1013	987	939	378	361	350	331	299
45–49	1357	1422	1471	1485	1535	522	552	595	550	552
50–54	1987	1791	1679	1588	1657	731	674	651	640	663
55–59	3173	2972	2639	2488	2315	978	970	913	871	842
60–64	8484*	8145*	3950	3625	3600	2247*	2222*	1186	1102	1143
65–69			4440	4262	4101			1098	1127	1161
70 and over	9361	9348	9122	9480	9397	1802	1810	1817	1982	2025

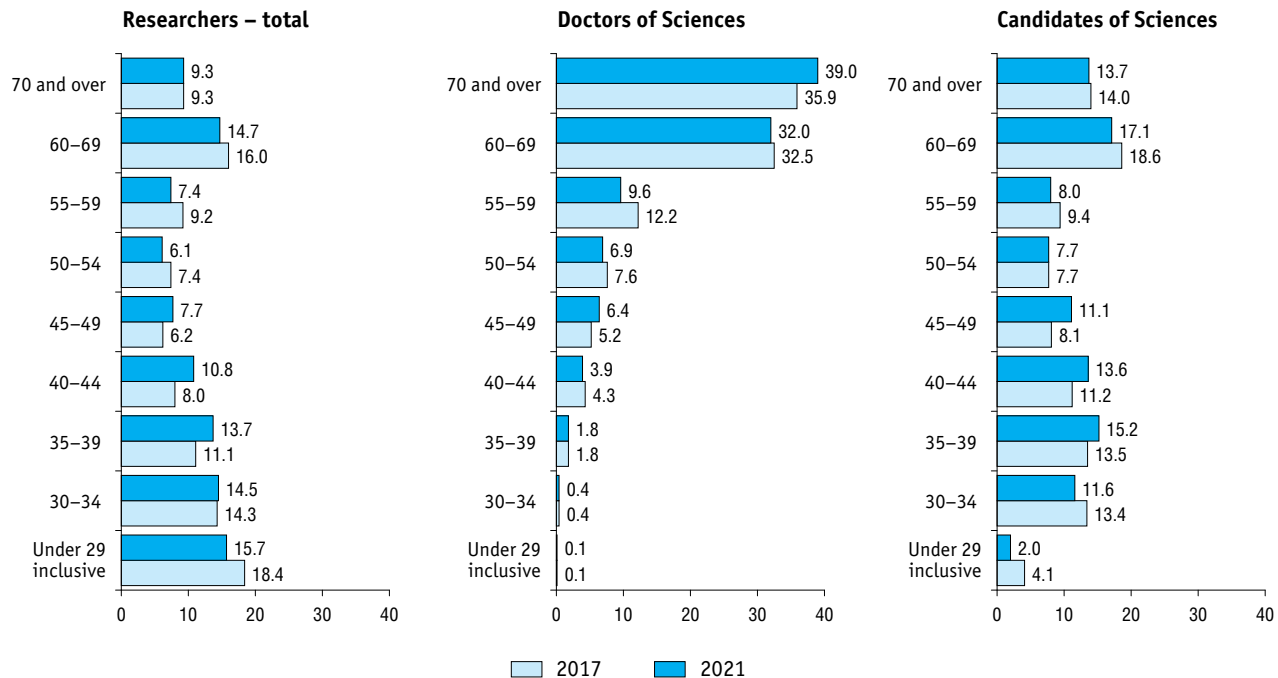
(continued)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Candidates of Sciences	77251	75042	75068	74649	73463	32265	31503	31594	31798	31862
<i>Age, years:</i>										
under 29 inclusive	3153	2507	2129	1746	1462	1223	1008	824	734	611
30–34	10347	9936	9699	9280	8502	4336	4189	4105	3876	3624
35–39	10425	10523	10866	11015	11181	4895	4795	4878	4865	4889
40–44	8665	8868	9355	9765	9994	4331	4409	4581	4762	4903
45–49	6241	6598	7181	7645	8119	3191	3375	3618	3894	4120
50–54	5938	5538	5469	5462	5670	2830	2718	2677	2779	2961
55–59	7300	6772	6524	6205	5859	3002	2859	2791	2683	2629
60–64			7046	6623	6464			2740	2682	2654
65–69	14351*	13693*	6694	6458	6113	5074*	4898*	2212	2252	2221
70 and over	10831	10607	10105	10450	10099	3383	3252	3168	3271	3250

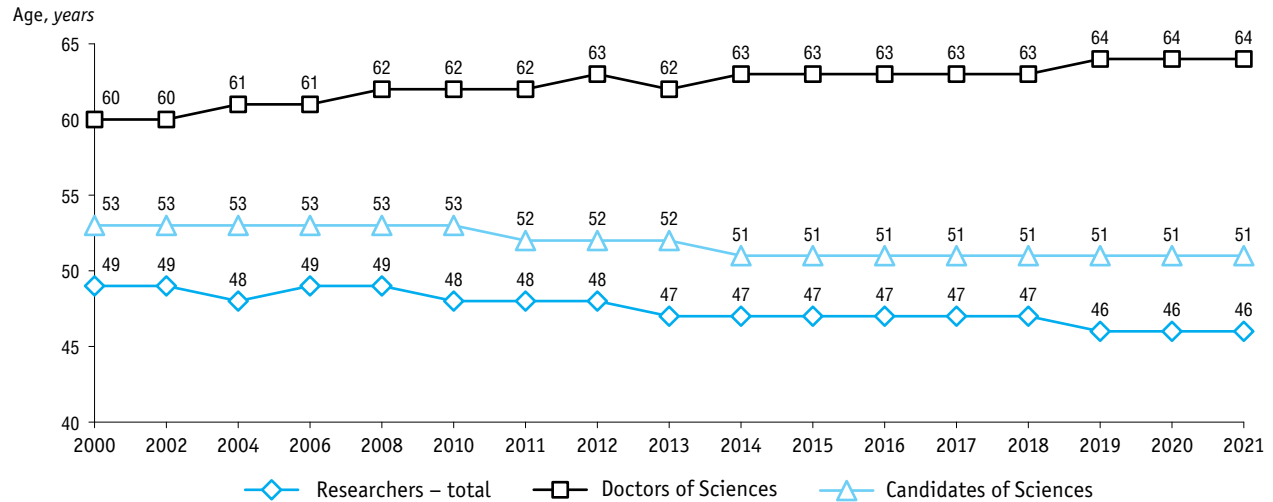
* Until 2019, the data was collected for the 60–69 age group.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

2.9. PERCENTAGE DISTRIBUTION OF RESEARCHERS BY AGE



2.10. AVERAGE AGE OF RESEARCHERS

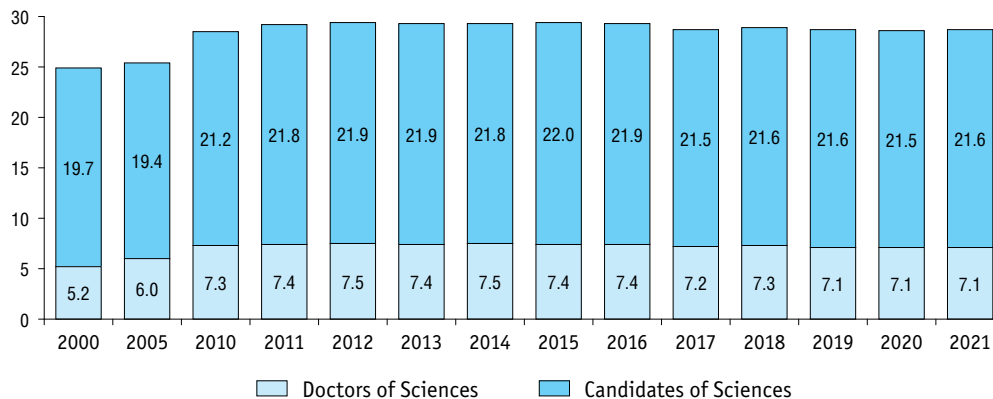


2.11. RESEARCHERS WITH SCIENTIFIC DEGREES

(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Researchers with scientific degrees	105911	99428	105114	111533	108388	103327	100330	99912	99122	97537
Doctors of Sciences	21949	23410	26789	28046	27430	26076	25288	24844	24473	24074
Candidates of Sciences	83962	76018	78325	83487	80958	77251	75042	75068	74649	73463

2.12. RESEARCHERS WITH SCIENTIFIC DEGREES AS A PERCENTAGE OF THE TOTAL NUMBER OF RESEARCHERS

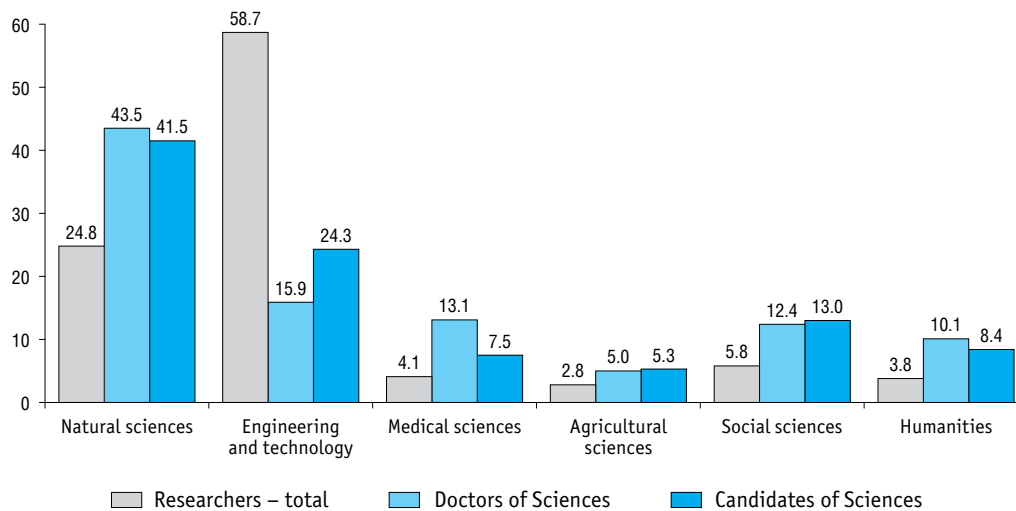


2.13. RESEARCHERS BY FIELD OF SCIENCE AND TECHNOLOGY

(headcount)

	2010			2020			2021		
	Researchers	Of whom		Researchers	Of whom		Researchers	Of whom	
		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences
Total	368915	26789	78325	346497	24473	74649	340142	24074	73463
Natural sciences	89375	12251	33664	80966	10757	30959	84364	10475	30499
Engineering and technology	224641	4620	21260	208994	3974	18760	199585	3825	17852
Medical sciences	16516	4045	7475	14584	3339	5834	13923	3159	5520
Agricultural sciences	12734	1542	5004	9551	1197	3936	9669	1195	3914
Social sciences	14347	2057	5861	20076	2959	9568	19728	2989	9537
Humanities	11302	2274	5061	12326	2247	5592	12873	2431	6141

2.14. PERCENTAGE DISTRIBUTION OF RESEARCHERS BY FIELD OF SCIENCE AND TECHNOLOGY: 2021



2.15. FLOWS OF R&D PERSONNEL: 2020–2021

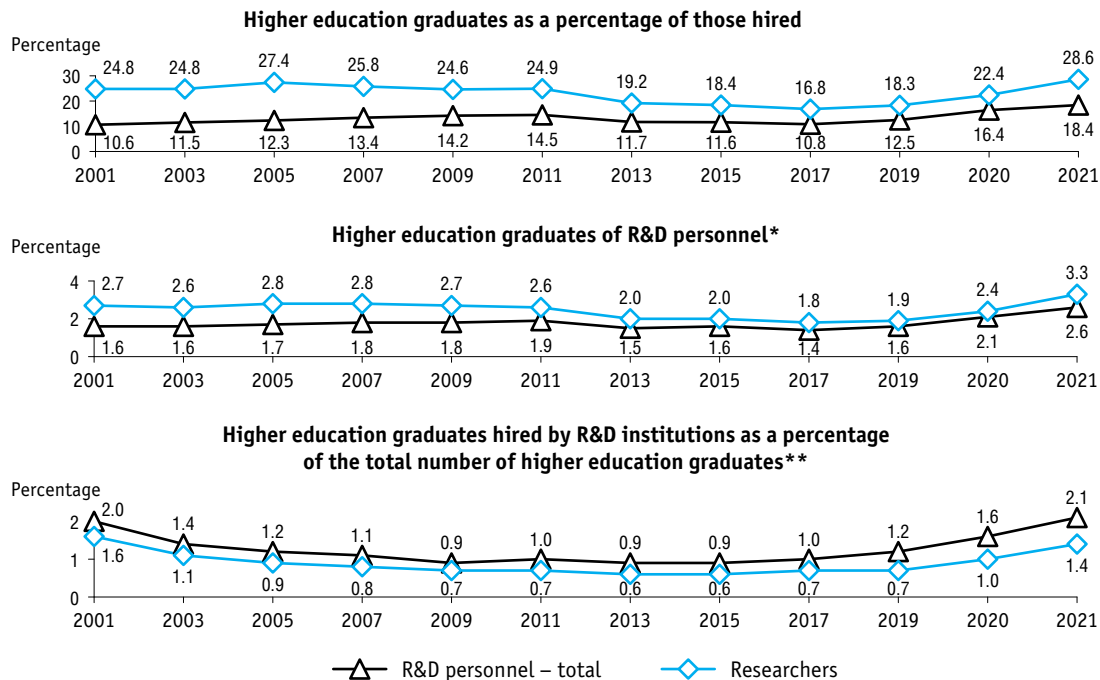
(headcount)

	Number at the beginning of the reporting year	Inflow							Outflow		Number at the end of the reporting year
		total	of whom						total	were made redundant	
			higher education graduates					other research institutes' graduates			
			total	of whom			with a master's degree				
from leading classical university	from federal university	from national research university									
2020											
Total	684868	85544	14015	2471	3047	2756	3344	15750	91079	2796	679333
Researchers	349041	37364	8361	1583	1744	1740	2382	7387	39102	1081	346497
Technicians	59488	11095	1849	175	517	481	373	1850	11034	152	59557
Supporting staff	159023	20000	2595	374	529	456	404	3757	21038	686	158298
Others	117316	17085	1210	339	257	79	185	2756	19905	877	114981
2021											
Total	668307	92653	17005	2643	2753	3533	3848	13430	98258	2105	662702
Researchers	342016	39103	11184	1750	1875	2347	2661	5648	41156	749	340142
Technicians	60105	13743	2175	314	457	581	483	1713	13136	107	60474
Supporting staff	153317	21157	2485	336	275	439	487	3288	23065	467	152066
Others	112869	18650	1161	243	146	166	217	2781	20901	782	110220

2.16. FLOWS OF R&D PERSONNEL (headcount)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of whom			total	of whom			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
2001	890718	132757	14122	21549	97086	137932	93587	3542	40803	885568
2003	867456	120298	13777	20702	85819	129284	89513	5917	33854	858470
2005	826007	109973	13495	15618	80860	122773	81623	6598	34552	813207
2007	814329	105758	14150	19778	71830	118952	80536	4617	33799	801135
2009	745978	93526	13235	13529	66762	97071	58295	5776	33000	742433
2011	741183	94939	13725	11881	69333	100849	62848	2973	35028	735273
2013	725591	94550	11075	13210	70265	93112	59214	2015	31883	727029
2015	737210	100290	11662	14026	74602	98643	58285	4238	36120	738857
2017	714384	92300	9985	12539	69776	98797	57974	4327	36496	707887
2019	682995	89311	11165	11263	66883	89842	54687	2689	32466	682464

2.17. INFLOW OF HIGHER INSTITUTION GRADUATES IN R&D INSTITUTIONS



* The ratio of the higher education graduates hired during the year to the number of employees at the end of the year.

** Including private higher education institutions.

2.18. TRENDS IN INFLOW AND OUTFLOW OF R&D PERSONNEL

	2001	2005	2007	2009	2011	2013	2015	2017	2019	2020	2021
R&D personnel balance by inflow*	0.152	0.138	0.135	0.131	0.135	0.138	0.144	0.142	0.144	0.140	0.155
R&D personnel balance by outflow**	0.158	0.154	0.152	0.136	0.144	0.136	0.142	0.152	0.145	0.149	0.164
Labour force replacement ratio***	0.962	0.896	0.889	0.963	0.941	1.015	1.017	0.934	0.994	0.939	0.943

* The ratio of the R&D personnel inflow during the year to the average employment in the organisation.

** The ratio of the R&D personnel outflow during the year to the average employment in the organisation.

*** The ratio of R&D personnel inflow during the year to the outflow during the same period.

Training of R&D personnel

2.19. MAIN INDICATORS OF POSTGRADUATE STUDIES

	Number of institutions <i>(at the end of the year)</i>	Enrolment, persons <i>(at the end of the year)</i>	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons*
Total					
2000	1362	117714	43100	24828	7503
2005	1473	142899	46896	33561	10650
2006	1493	146111	50462	35530	11893
2007	1490	147719	51633	35747	10970
2008	1529	147674	49638	33670	8831
2009	1547	154470	55540	34235	10770
2010	1568	157437	54558	33763	9611
2011	1570	156279	50582	33082	9635
2012	1575	146754	45556	35162	9195
2013	1557	132002	38971	34733	8979
2014	1519	119868	32981	28273	5189
2015	1446	109936	31647	25826	4651
2016	1359	98352	26421	25992	3730
2017	1284	93523	26081	18069	2320
2018	1223	90823	27008	17729	2198
2019	1187	84265	24912	15453	1629
2020	1189	87751	27710	13957	1245
2021	1174	90156	27992	14326	1500

* Here and below in tables 2.21–2.23, the headcount of those who defended their thesis during their postgraduate studies (i.e., during the period of time specified in the order of admission).

(continued)

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Research institutes					
2000	797	17502	6075	3813	873
2005	833	19986	6577	4806	1009
2006	820	19542	6330	4865	852
2007	799	18346	6072	4847	895
2008	811	17397	5381	4781	715
2009	800	16549	5549	4359	734
2010	809	16936	5655	4335	729
2011	805	15865	4784	4028	693
2012	820	14823	4555	4101	655
2013	818	13593	4166	3943	674
2014	805	12175	3126	3331	397
2015	771	11528	3189	2728	313
2016	733	10581	2949	2954	331
2017	670	10231	3133	2209	247
2018	618	10527	3253	2039	211
2019	599	11055	3385	2142	242
2020	588	11829	3784	2024	189
2021	572	11109	3170	2135	156

(continued)

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Higher education institutions					
2000	565	100212	37025	21015	6630
2005	640	122913	40319	28755	9641
2006	673	126569	44132	30665	11041
2007	691	129373	45561	30900	10075
2008	718	130277	44257	28889	8116
2009	730	137068	49736	29678	9996
2010	748	139908	48748	29268	8854
2011	750	139542	45561	28847	8869
2012	740	131226	40802	30885	8480
2013	724	117790	34643	30639	8257
2014	698	107083	29700	24836	4770
2015	661	97847	28285	22971	4318
2016	611	87180	23281	22917	3379
2017	599	82633	22749	15753	2063
2018	585	79583	23580	15546	1977
2019	567	72476	21335	13198	1376
2020	566	75097	23677	11763	1052
2021	565	78133	24527	12047	1329

(continued)

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Additional professional (vocational) education institutions and other institutions					
2009	17	853	255	198	40
2010	11	593	155	160	28
2011	15	872	237	207	73
2012	15	705	199	176	60
2013	15	619	162	151	48
2014	16	610	155	106	22
2015	14	561	173	127	20
2016	15	591	191	121	20
2017	15	659	199	107	10
2018	20	713	175	144	10
2019	21	734	192	113	11
2020	35	825	249	170	4
2021	37	914	295	144	15

2.20. POSTGRADUATE ENROLMENT, ENTRANTS, AND GRADUATES OF FOREIGN STATES BY TYPE OF R&D INSTITUTIONS

(persons)

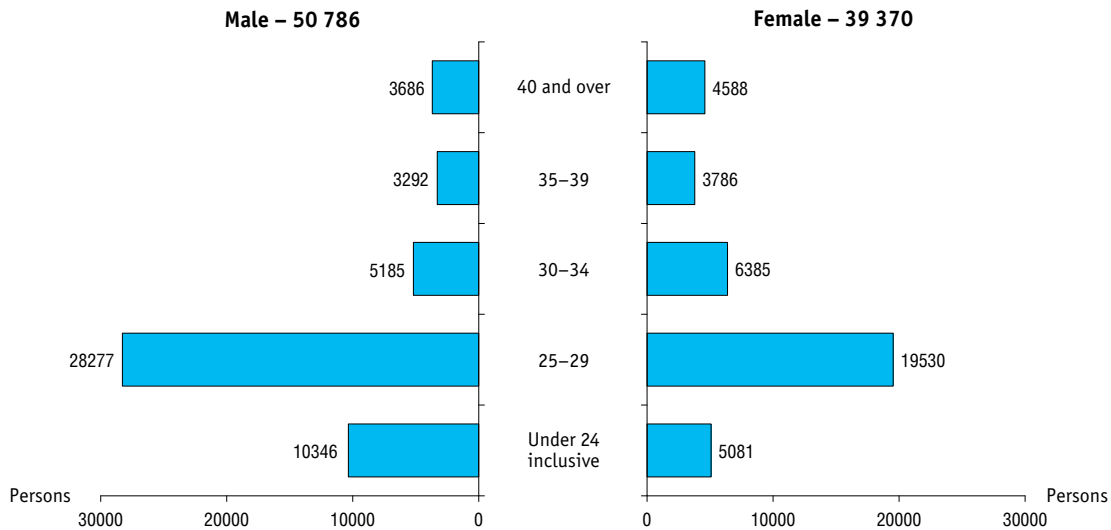
	Enrolment (at the end of the year)	Entrants	Graduates
Total			
2014	5497	1986	824
2015	6081	2344	1019
2016	6690	2341	1020
2017	7341	2436	1036
2018	7906	2647	1493
2019	7871	2697	1311
2020	9464	3517	1506
2021	10569	3872	1673
Research institutes			
2014	151	52	23
2015	149	62	27
2016	167	71	35
2017	185	82	40
2018	215	87	28
2019	273	107	45
2020	281	111	63
2021	172	57	33

(continued)

	Enrolment (at the end of the year)	Entrants	Graduates
Higher education institutions			
2014	5336	1931	800
2015	5923	2278	986
2016	6513	2268	983
2017	7141	2348	996
2018	7673	2552	1461
2019	7581	2587	1265
2020	9164	3401	1439
2021	10385	3812	1633
Additional professional (vocational) education institutions and other institutions			
2014	10	3	1
2015	9	4	6
2016	10	2	2
2017	15	6	–
2018	18	8	4
2019	17	3	1
2020	19	5	4
2021	12	3	7

2.21. POSTGRADUATE ENROLMENT BY GENDER AND AGE: 2021

(at the end of the year)



2.22. POSTGRADUATE ENROLMENT, ENTRANTS, AND GRADUATES BY FIELD OF EDUCATION*

(persons)

	Enrolment		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Total	87751	90156	27710	27992	13957	14326	1245	1500
Engineering mathematics	2418	2438	756	764	301	386	32	57
Computer and information science	331	368	137	157	35	45	3	2
Physics and astronomy	4169	4364	1234	1307	738	739	108	112
Chemistry	2661	2699	747	770	456	504	66	110
Earth sciences	2766	2782	941	924	564	540	27	38
Biological sciences	4567	4857	1377	1473	671	754	56	83
Architecture	413	404	135	117	72	59	–	–
Civil engineering and technology	2000	2002	568	560	211	278	9	20
Computer science and engineering	7216	7510	2135	2166	841	928	98	92
Information security	500	553	172	176	45	38	1	4
Electronics and communications engineering	1817	1778	524	481	274	281	22	25
Photonics, instrumentation engineering, optical and biomedical engineering	978	954	299	300	131	159	24	28
Electrical and thermal power engineering	1938	1921	567	539	252	297	27	41
Nuclear power engineering and technology	297	296	91	82	34	52	–	1
Mechanical engineering	2127	2132	563	583	306	315	19	27
Engineering physics and technology	33	32	11	9	3	6	–	–
Weapons and armaments systems	59	64	20	20	1	7	–	1
Chemical engineering	1159	1209	302	323	202	157	16	16
Industrial ecology and biotechnology	838	885	269	251	106	111	18	29

* In accordance with Federal Law no. 273-FL of December 29, 2012 'On the Education in the Russian Federation', since January 1, 2014, the fields of studies that postgraduates can enrol in are listed in the Order of the Ministry of Science and Higher Education of the Russian Federation no. 1061 of September 12, 2013 'On the Approval of the Lists of Professions and Fields of Studies in Higher Education'.

(continued)

	Enrolment		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Technosphere safety and environmental engineering	413	413	120	122	64	65	6	6
Applied geology, mining and quarrying, oil and gas engineering, geodesy	1148	1233	310	340	167	158	37	24
Materials engineering	1133	1222	309	325	203	195	28	20
Surface transport engineering and technology	876	876	239	245	94	116	14	11
Aircraft and aerospace engineering	952	956	254	242	117	138	9	10
Flight navigation and aircraft and aerospace equipment operation	190	208	63	57	11	23	1	–
Shipbuilding and water-borne transportation engineering and technology	406	429	120	119	47	46	–	5
Engineering systems management	1036	992	295	265	147	159	18	17
Nanotechnologies and nanomaterials	29	35	10	10	8	2	3	–
Light industry technological processes	170	184	60	60	39	32	3	2
Basic medicine	1041	1018	316	312	235	231	22	24
Clinical medicine	6429	6569	2020	2027	1323	1295	119	148
Health sciences and preventive medicine	677	729	211	251	129	133	3	4
Pharmacology and pharmacy	317	317	106	105	63	67	10	20
Agriculture, forestry and fisheries	3057	3125	942	954	538	492	80	82
Veterinary science and animal science	1283	1353	471	477	243	246	66	60
Psychology	1920	2025	645	691	315	257	17	15
Economics and management	7867	7495	2739	2555	1229	1149	60	65
Sociology and social work	1133	1179	389	373	171	169	9	14
Law	5280	5459	1897	1802	757	764	39	44
Political sciences and area studies	1217	1292	427	468	242	218	4	5

(continued)

	Enrolment		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Mass media, library and information science	343	376	116	122	52	46	3	5
Education and educational research	5199	5588	1669	1851	811	877	47	62
Linguistics and literary studies	3188	3272	1029	1092	616	615	56	86
History and archaeology	2447	2570	847	836	422	458	33	32
Philosophy, ethics and religion	1290	1332	418	429	228	234	14	26
Theology	27	24	10	11	3	8	–	–
Physical training and sport	670	682	221	219	144	147	7	9
Art (arts, history of arts, etc.)	1089	1312	395	446	181	219	6	9
Cultural studies and sociocultural projects	637	643	214	184	115	111	5	9

2.23. POSTGRADUATE ENROLMENT, ENTRANTS, AND GRADUATES BY FIELD OF EDUCATION CORRESPONDING TO PRIORITY AREAS OF ECONOMICAL MODERNISATION AND TECHNOLOGICAL DEVELOPMENT*

(persons)

	Enrolment		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Fields of education, by priority areas of economical modernisation and technological development	47609	48932	14270	14588	7397	7776	750	904
Engineering mathematics	2418	2438	756	764	301	386	32	57
Computer and information science	330	368	137	157	35	45	3	2
Physics and astronomy	4169	4364	1234	1307	738	739	108	112
Biological sciences	4565	4857	1376	1473	671	754	56	83
Civil engineering and technology	2000	2002	568	560	211	278	9	20
Computer science and engineering	7194	7510	2126	2166	837	928	97	92
Information security	500	553	172	176	45	38	1	4
Electronics and communications engineering	1817	1778	524	481	274	281	22	25
Photonics, instrumentation engineering, optical and biomedical engineering	978	954	299	300	131	159	24	28
Electrical and thermal power engineering	1938	1921	567	539	252	297	27	41
Nuclear, thermal and renewables power engineering, and related technologies	297	296	91	82	34	52	–	1
Mechanical engineering	2126	2132	562	583	306	315	19	27
Engineering physics and technology	33	32	11	9	3	6	–	–
Weapons and armaments systems	59	64	20	20	1	7	–	1
Chemical engineering	1159	1209	302	323	202	157	16	16
Technosphere safety	413	413	120	122	64	65	6	6
Geology, exploration, and exploitation of minerals	1097	1177	292	321	159	152	34	23

(continued)

	Enrolment		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Materials engineering	1133	1222	309	325	203	195	28	20
Aircraft and aerospace engineering	952	956	254	242	117	138	9	10
Flight navigation and aircraft and aerospace equipment operation	190	208	63	57	11	23	1	–
Shipbuilding and water-borne transportation engineering and technology	406	429	120	119	47	46	–	5
Engineering systems management	1036	992	295	265	147	159	18	17
Nanotechnologies and nanomaterials	29	35	10	10	8	2	3	–
Basic medicine	1041	1018	316	312	235	231	22	24
Clinical medicine	6429	6569	2020	2027	1323	1295	119	148
Medical and preventive care	677	729	211	251	129	133	3	4
Pharmacology and pharmacy	317	317	106	105	63	67	10	20
Technology, mechanisation tools and power equipment for agriculture, forestry and fishing	1092	1117	369	400	230	213	26	32
Linguistics and literary studies	3169	3272	1024	1092	614	615	56	86

2.24. MAIN INDICATORS OF POSTDOCTORAL STUDIES

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons*
Total					
2000	492	4213	1637	1251	486
2005	535	4282	1457	1417	516
2006	548	4189	1499	1383	450
2007	579	4109	1520	1320	429
2008	593	4242	1517	1216	297
2009	598	4294	1569	1302	435
2010	602	4418	1650	1259	336
2011	608	4562	1696	1321	382
2012	597	4554	1632	1371	394
2013	585	4572	1582	1356	323
2014	478	3204	166	1359	231
2015	437	2007	419	1386	181
2016	385	921	397	1346	151
2017	223	1059	439	253	65
2018	213	1048	393	330	82
2019	195	955	386	356	82
2020	183	979	351	339	63
2021	182	932	210	354	87

* Here and below in tables 2.25 and 2.26, the headcount of those who defended their thesis during postdoctoral studies (i.e., during the period of time specified in the order of admission).

(continued)

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Research institutes					
2000	178	505	192	151	63
2005	173	445	147	148	48
2006	178	426	142	139	35
2007	201	358	118	116	33
2008	205	336	111	123	23
2009	204	327	114	107	23
2010	192	299	100	95	20
2011	192	303	106	100	17
2012	183	254	87	99	16
2013	184	262	110	73	9
2014	105	194	23	78	14
2015	91	153	46	67	8
2016	82	96	29	76	8
2017	45	97	26	27	9
2018	45	95	26	25	16
2019	34	75	28	20	7
2020	34	105	27	22	9
2021	34	79	18	27	11

(continued)

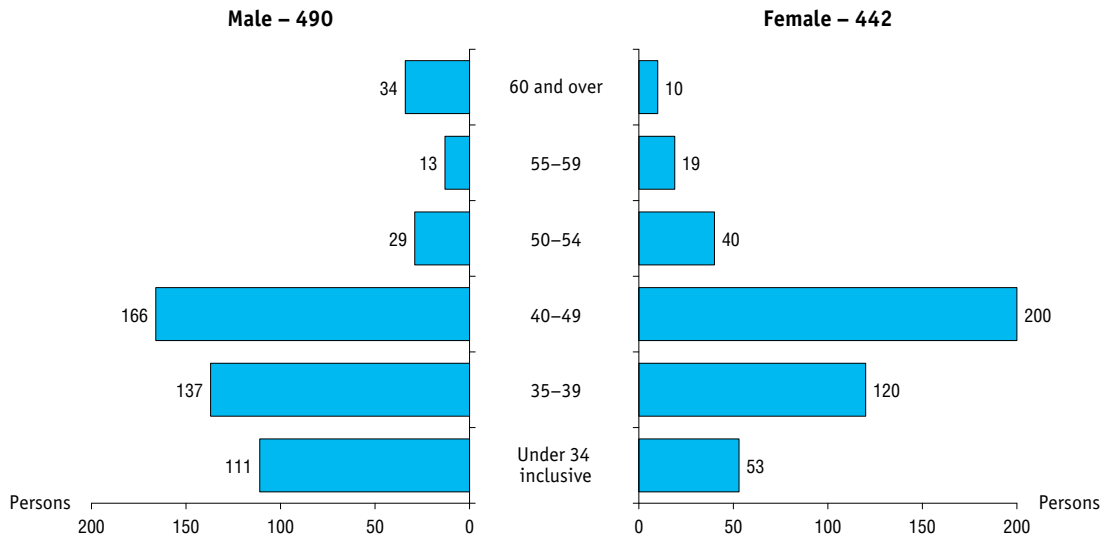
	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Higher education institutions					
2000	314	3708	1445	1100	423
2005	362	3837	1310	1269	468
2006	370	3763	1357	1244	415
2007	378	3751	1402	1204	396
2008	388	3906	1406	1093	274
2009	391	3962	1454	1193	412
2010	407	4116	1548	1162	316
2011	412	4256	1589	1220	365
2012	410	4296	1543	1271	378
2013	398	4307	1471	1281	314
2014	372	3009	143	1281	217
2015	345	1853	373	1319	173
2016	303	825	368	1270	143
2017	178	962	413	226	56
2018	167	951	366	303	66
2019	160	878	358	336	75
2020	148	871	322	315	52
2021	148	853	192	327	76

(continued)

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons
Additional professional (vocational) education institutions and other institutions					
2009	3	5	1	2	–
2010	3	3	2	2	–
2011	4	3	1	1	–
2012	4	4	2	1	–
2013	3	3	1	2	–
2014	1	1	–	–	–
2015	1	1	–	–	–
2016	–	–	–	–	–
2017	–	–	–	–	–
2018	1	2	1	2	–
2019	1	2	–	–	–
2020	1	3	2	2	2
2021	–	–	–	–	–

2.25. POSTDOCTORAL ENROLMENT BY GENDER AND AGE: 2021

(at the end of the year)



2.26. POSTDOCTORAL ENROLMENT, ENTRANTS, AND GRADUATES BY GROUP OF SCIENTIFIC PROFESSIONS

(persons)

	Enrolment, persons (at the end of the year)		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Total	979	932	351	210	339	354	63	87
The total for scientific professions approved by Order no. 1027 of the Ministry of Science and Higher Education of the Russian Federation of October 23, 2017	979	688	351	–	339	354	63	87
Mathematics	–	–	–	–	2	–	–	–
Mechanics	4	2	2	–	1	1	–	–
Physics	56	36	19	–	18	22	3	3
Chemistry	22	18	7	–	8	8	2	2
Physico-chemical biology	8	4	1	–	–	2	–	1
General biology	25	21	13	–	11	3	–	–
Physiology	2	–	1	–	1	–	–	–
Geometric engineering and computer-generated graphics	–	–	–	–	1	–	1	–
Mechanical engineering and engineering science	28	22	15	–	23	6	3	–
Energy, metallurgical and chemical engineering	2	1	–	–	2	1	–	–
Transportation, mining and civil engineering	4	3	2	–	1	2	–	1
Aircraft and aerospace engineering	5	2	1	–	1	2	–	–
Shipbuilding	1	1	1	–	–	–	–	–
Electrical machinery	6	2	2	–	5	2	1	–
Instrumentation engineering, metrology and data measuring instruments and systems	21	16	7	–	7	5	1	–
Radio-frequency engineering and communication	7	10	4	–	3	–	–	–
Computer engineering and control	76	56	27	–	44	31	3	4

(continued)

	Enrolment, <i>persons</i> (<i>at the end of the year</i>)		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Energy sector	8	6	2	–	2	–	–	–
Metallurgy and materials engineering	18	12	5	–	6	5	–	2
Chemical engineering	10	5	3	–	6	3	2	2
Food technology	18	15	7	–	5	8	1	2
Technology of textile materials and light industry products	1	1	–	–	–	1	–	–
Processes and machines in agro-engineering systems	13	6	3	–	3	8	2	2
Technology, machinery and equipment for logging and forestry, wood processing and biomass chemical conversion	2	3	1	–	1	1	1	–
Transportation	19	11	5	–	6	5	2	1
Construction and architecture	36	25	19	–	3	12	–	4
Civil defence	8	8	6	–	1	–	–	–
Electronics	13	13	8	–	1	3	1	–
Agronomy	5	4	1	–	–	3	–	1
Veterinary science and animal science	12	8	5	–	8	9	5	5
Forestry	2	2	–	–	1	3	1	1
Fishing	–	–	–	–	–	–	–	–
History and archaeology	43	33	15	–	9	16	3	4
Economics	157	112	56	–	44	61	7	13
Philosophy	20	7	7	–	7	9	1	2
Literary studies	14	12	8	–	5	4	–	1

(continued)

	Enrolment, <i>persons</i> (<i>at the end of the year</i>)		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Linguistics	16	12	8	–	13	11	3	5
Law	90	50	26	–	22	46	1	13
Pedagogy	51	44	19	–	25	16	4	4
Clinical medicine	43	24	10	–	7	9	5	6
Preventive medicine	4	1	–	–	1	3	1	–
Life sciences	9	3	2	–	7	5	2	2
Pharmacology and pharmacy	1	3	–	–	–	–	–	–
Art (arts, history of arts, etc.)	5	3	3	–	1	2	1	1
Psychology	17	15	2	–	3	2	–	–
Sociology	22	16	8	–	7	4	2	2
Political science	16	8	7	–	6	7	1	1
Culturology	21	21	6	–	5	6	–	1
Earth sciences	18	11	7	–	6	7	3	1
The total for scientific professions approved by Order no. 118 of the Ministry of Science and Higher Education of the Russian Federation of February 24, 2021	–	244	–	210	–	–	–	–
Natural sciences	–	28	–	21	–	–	–	–
Engineering mathematics	–	1	–	1	–	–	–	–
Computer and information sciences	–	7	–	2	–	–	–	–
Physical sciences	–	4	–	3	–	–	–	–
Chemical sciences	–	6	–	6	–	–	–	–
Biological sciences	–	7	–	6	–	–	–	–
Earth and related environmental sciences	–	3	–	3	–	–	–	–

(continued)

	Enrolment, <i>persons</i> (<i>at the end of the year</i>)		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Engineering and technology	-	86	-	74	-	-	-	-
Construction and architecture	-	14	-	14	-	-	-	-
Electronics, photonics, instrumentation engineering and communications engineering	-	12	-	11	-	-	-	-
Telecommunications and IT industry	-	13	-	11	-	-	-	-
Energy and electrical machinery	-	7	-	4	-	-	-	-
Mechanical engineering	-	9	-	9	-	-	-	-
Chemistry, metallurgy and materials engineering	-	18	-	13	-	-	-	-
Biotechnology	-	1	-	1	-	-	-	-
Mineral resources management and mining science	-	4	-	3	-	-	-	-
Transport infrastructure	-	8	-	8	-	-	-	-
Medical sciences	-	10	-	6	-	-	-	-
Clinical medicine	-	9	-	6	-	-	-	-
Preventive medicine	-	-	-	-	-	-	-	-
Life sciences	-	-	-	-	-	-	-	-
Pharmaceutical sciences	-	1	-	-	-	-	-	-
Agricultural sciences	-	15	-	15	-	-	-	-
Agronomy, forestry and water management	-	9	-	9	-	-	-	-
Veterinary science and animal science	-	2	-	2	-	-	-	-
Agroengineering and food technology	-	4	-	4	-	-	-	-

(continued)

	Enrolment, <i>persons</i> (<i>at the end of the year</i>)		Entrants		Graduates		Of whom defended their thesis	
	2020	2021	2020	2021	2020	2021	2020	2021
Social sciences and humanities	–	105	–	94	–	–	–	–
Law	–	15	–	15	–	–	–	–
Economics	–	29	–	21	–	–	–	–
Psychology	–	2	–	2	–	–	–	–
Sociology	–	1	–	1	–	–	–	–
Political science	–	3	–	2	–	–	–	–
Historical sciences	–	13	–	13	–	–	–	–
Philosophy	–	7	–	6	–	–	–	–
Pedagogy	–	15	–	14	–	–	–	–
Philology	–	19	–	19	–	–	–	–
Art history and cultural studies	–	1	–	1	–	–	–	–

Activity of dissertation councils, defence of doctoral and candidate's theses

*(according to the Academic Researchers and Teaching Staff Certification Department
under the Ministry of Science and Higher Education of the Russian Federation)*

2.27. NUMBER OF DIPLOMAS ISSUED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION TO INDIVIDUALS WHO DEFENDED THEIR DOCTORAL THESIS BY FIELD OF SCIENCE AND TECHNOLOGY

(according to reports of dissertation councils)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	2147	2153	1927	1813	1622	1519	1112	1142	924	1003	710	864
Physics and mathematics	233	230	149	172	173	121	112	137	85	122	55	52
Chemical sciences	61	72	71	42	74	46	43	59	39	26	26	37
Biological sciences	144	158	155	149	124	132	84	77	81	65	53	60
Geological and mineralogical sciences	33	29	18	24	15	23	22	21	10	14	4	15
Engineering and technology	363	321	364	259	286	204	190	188	191	188	159	187
Agricultural sciences	42	56	52	42	53	40	37	38	31	36	18	25
Historical sciences	101	91	93	82	66	54	63	44	47	43	27	44
Economics	296	316	224	257	171	122	78	84	60	62	40	74
Philosophy	80	63	74	44	31	42	37	51	33	36	12	15
Philology and linguistics	119	114	68	117	99	89	53	66	29	56	37	44
Geography	14	14	15	11	12	7	9	6	3	3	4	8
Law	65	51	82	37	46	63	39	33	32	35	25	21
Pedagogical sciences	99	119	96	89	62	86	41	41	18	35	30	33
Medical sciences	380	371	310	378	319	380	234	222	215	215	187	205
Pharmaceutical sciences	2	7	9	12	8	9	8	7	8	10	4	6

(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Veterinary sciences	8	25	14	7	7	17	5	5	9	10	5	6
Art (arts, history of arts, etc.)	12	21	12	29	28	17	7	16	5	15	4	9
Architecture	1	–	–	–	–	3	3	–	3	2	–	1
Psychology	32	27	38	22	13	22	15	14	10	7	5	5
Sociology	21	32	36	21	16	17	13	20	6	3	6	7
Political science	31	31	26	12	14	14	13	7	3	6	1	5
Culturology	10	5	21	7	5	11	6	6	6	13	7	5
Theology	–	–	–	–	–	–	–	–	–	1	1	–

2.28. NUMBER OF DIPLOMAS ISSUED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION IN THE REPORTING YEAR FOR INDIVIDUALS WHO DEFENDED THEIR DOCTORAL THESIS BY GROUP OF SCIENTIFIC PROFESSIONS

(according to reports of dissertation councils)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	2147	2153	1927	1813	1622	1519	1112	1142	924	1003	710	864
The total for scientific professions approved by Order no. 1027 of the Ministry of Science and Higher Education of the Russian Federation of October 23, 2017	2147	2153	1927	1813	1622	1519	1112	1142	924	1003	710	848
Mathematics	35	40	30	22	28	15	17	20	11	16	7	13
Mechanics	35	24	18	16	16	17	16	13	14	19	11	7
Astronomy	5	9	6	8	6	6	–	6	–	1	–	2
Physics	141	123	71	110	97	71	62	77	59	77	40	28
Chemical sciences	67	78	74	43	88	50	43	58	36	25	23	37
Physico-chemical biology	39	48	39	40	32	23	26	19	25	18	12	20
General biology	78	77	90	66	51	70	44	50	35	32	26	28
Physiology	31	36	39	36	29	34	17	18	13	8	2	13
Geometric engineering and computer-generated graphics	–	1	1	–	2	–	–	–	–	1	–	1
Mechanical engineering and engineering science	28	21	29	22	20	21	11	9	16	14	10	20
Energy, metallurgical and chemical engineering	8	10	3	6	1	5	3	2	4	1	5	1
Transportation, mining and civil engineering	6	7	4	9	3	6	6	3	2	1	3	5
Aircraft and aerospace engineering	1	6	3	3	3	2	3	3	5	3	2	1
Shipbuilding	2	3	2	4	2	1	4	2	1	–	–	3
Electrical machinery	9	9	11	5	20	11	5	9	5	8	5	2

(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Instrumentation engineering, metrology and data measuring instruments and systems	20	10	17	15	12	15	8	17	10	10	14	10
Radio-frequency engineering and communication	11	11	10	5	14	7	8	4	4	10	4	3
Computer engineering and control	99	92	85	63	68	30	35	54	37	48	34	34
Energy sector	11	6	6	13	19	7	6	6	8	5	7	1
Metallurgy and materials engineering	20	20	26	16	14	8	10	11	10	20	11	9
Chemical engineering	21	19	29	11	18	5	14	12	8	11	8	9
Food technology	27	25	28	18	25	9	14	8	15	4	12	12
Technology of textile materials and light industry products	8	6	11	5	2	2	2	1	4	2	4	2
Processes and machines in agro-engineering systems	22	19	18	20	18	15	12	18	19	16	10	16
Technology, machinery and equipment for logging and forestry, wood processing and biomass chemical conversion	2	5	5	4	1	5	14	3	5	6	4	8
Transportation	8	10	10	8	8	6	3	5	8	7	3	8
Construction and architecture	15	9	22	6	12	16	21	5	8	5	2	15
Documentary information	2	7	5	4	7	3	2	4	1	–	–	0
Civil defence	4	7	11	4	12	1	4	3	9	3	3	7
Electronics	10	7	5	7	3	5	4	5	6	2	3	3

(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Agronomy	25	39	26	20	34	26	16	21	20	30	7	11
Veterinary science and animal science	34	42	47	34	31	44	23	22	26	27	19	27
Forestry	3	4	5	6	8	6	4	6	2	1	5	3
Fishing	–	–	–	2	–	3	–	1	–	–	–	0
Historical sciences and archaeology	100	87	89	80	67	55	62	42	45	43	28	41
Economics and business	295	313	221	257	172	122	77	83	60	62	40	74
Philosophy	71	55	65	39	24	39	32	45	28	36	8	13
Literary studies	48	51	17	53	40	27	19	28	6	22	18	15
Linguistics	72	63	51	64	59	62	35	40	23	34	19	29
Law	65	51	82	37	46	63	39	33	32	35	25	21
Educational research	98	118	94	87	57	85	39	41	18	34	30	33
Clinical medicine	269	255	205	278	212	235	174	165	163	158	147	144
Preventive medicine	43	56	43	40	45	63	28	30	20	28	19	13
Life sciences	60	57	47	56	54	70	36	20	35	34	25	32
Pharmaceutical sciences	1	7	8	13	8	9	7	6	9	8	4	5
Art (arts, history of arts, etc.)	12	20	11	28	27	17	7	16	5	15	3	6
Psychology	33	28	40	26	15	22	15	15	11	7	5	5
Sociology	21	32	35	20	15	16	12	20	6	3	6	7
Political sciences	29	31	26	12	14	14	12	5	3	6	1	5
Culturology	20	14	33	15	14	15	12	13	12	14	13	9
Earth sciences	83	85	74	57	49	60	49	45	22	32	22	37
Theology	–	–	–	–	–	–	–	–	–	1	1	–

2.29. NUMBER OF DIPLOMAS ISSUED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION IN THE REPORTING YEAR TO INDIVIDUALS WHO DEFENDED THEIR CANDIDATE'S THESIS BY FIELD OF SCIENCE AND TECHNOLOGY

(according to reports of dissertation councils)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	16967	15800	14948	14190	11628	10946	9656	8715	6888	7341	4168	5740
Physics and mathematics	1063	1009	711	1097	857	876	796	848	576	591	317	302
Chemical sciences	526	577	567	326	567	349	483	441	261	345	160	229
Biological sciences	1025	926	1104	902	800	707	550	570	430	402	255	346
Geological and mineralogical sciences	161	121	126	120	135	99	83	88	71	71	37	53
Engineering and technology	2655	2485	2785	2707	2569	2086	2073	1863	1583	1687	847	1296
Agricultural sciences	319	347	320	354	279	222	248	255	186	201	113	233
Historical sciences	614	507	602	451	353	320	368	324	251	232	138	145
Economics	2785	2837	2447	2058	1620	1202	875	595	426	453	259	405
Philosophy	370	339	320	297	209	197	202	194	129	104	49	69
Philology and linguistics	1040	879	580	940	646	655	570	625	332	513	245	376
Geography	124	98	110	129	108	90	86	71	51	37	24	33
Law	1012	941	1025	456	519	676	474	365	319	361	230	248
Pedagogical sciences	1321	1348	968	945	685	806	643	421	409	398	286	371
Medical sciences	2622	2103	2021	2272	1461	1797	1468	1388	1382	1416	913	1274
Pharmaceutical sciences	35	70	112	93	52	71	70	54	56	67	42	52
Veterinary sciences	94	102	124	91	83	76	56	66	63	68	53	54
Art (arts, history of arts, etc.)	136	119	120	199	141	96	88	131	81	94	61	64
Architecture	21	20	22	9	29	20	23	21	20	23	12	15

(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Psychology	422	362	292	257	187	240	163	125	86	100	65	61
Sociology	290	258	236	255	142	151	160	120	99	74	26	32
Political science	251	272	257	163	133	164	110	97	41	62	17	23
Culturology	81	80	99	69	53	46	67	53	36	40	18	50
Theology	–	–	–	–	–	–	–	–	–	2	1	9

2.30. NUMBER OF DIPLOMAS ISSUED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION IN THE REPORTING YEAR TO INDIVIDUALS WHO DEFENDED THEIR CANDIDATE'S THESIS BY GROUP OF SCIENTIFIC PROFESSIONS

(according to reports of dissertation councils)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	16967	15800	14948	14190	11628	10946	9656	8715	6888	7341	4168	5740
The total for scientific professions approved by Order no. 1027 of the Ministry of Science and Higher Education of the Russian Federation of October 23, 2017	16967	15800	14948	14190	11628	10946	9656	8715	6888	7341	4168	5632
Mathematics	200	208	104	172	109	168	112	149	75	58	15	38
Mechanics	145	165	95	169	151	120	115	117	73	90	55	51
Astronomy	27	26	12	27	19	24	25	29	22	11	5	15
Physics	504	465	382	592	459	462	463	471	358	373	243	203
Chemical sciences	535	550	536	329	580	361	488	430	244	341	148	226
Physico-chemical biology	252	240	281	307	223	217	192	180	128	134	73	81
General biology	566	504	651	413	418	387	273	245	190	200	115	160
Physiology	230	224	230	194	144	136	98	115	78	51	47	71
Geometric engineering and computer-generated graphics	1	1	3	4	3	–	1	4	2	1	2	2
Mechanical engineering and engineering science	202	173	193	244	166	136	127	116	124	100	47	125
Energy, metallurgical and chemical engineering	39	25	28	29	25	31	45	29	27	27	11	7
Transportation, mining and civil engineering	35	39	42	45	29	38	42	31	30	18	11	21
Aircraft and aerospace engineering	35	36	46	24	23	25	23	38	42	33	34	54
Shipbuilding	22	33	22	27	28	16	17	17	14	18	14	17
Electrical machinery	104	80	61	75	133	75	81	88	68	76	38	41

(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Instrumentation engineering, metrology and data measuring instruments and systems	105	128	108	140	116	111	108	112	108	115	64	58
Radio-frequency engineering and communication	88	93	94	115	90	104	75	99	75	83	37	57
Computer engineering and control	776	765	687	752	676	517	432	435	348	377	179	228
Energy sector	84	55	46	102	115	79	73	64	47	67	16	33
Metallurgy and materials engineering	126	107	144	125	139	118	118	138	117	104	54	74
Chemical engineering	143	172	203	126	168	83	151	121	83	103	28	55
Food technology	160	189	188	155	170	114	99	71	60	76	27	69
Technology of textile materials and light industry products	52	40	57	44	30	12	24	21	9	5	11	17
Processes and machines in agro-engineering systems	137	108	153	147	116	98	116	94	81	91	46	65
Technology, machinery and equipment for logging and forestry, wood processing and biomass chemical conversion	43	38	30	57	46	43	42	33	39	44	18	31
Transportation	112	102	128	70	69	88	67	67	57	48	43	67
Construction and architecture	181	169	251	148	210	186	201	117	104	104	61	114
Documentary information	38	29	31	33	26	33	21	14	12	9	2	13
Civil defence	42	41	64	61	44	35	39	39	37	38	20	21
Electronics	44	42	29	46	53	32	42	63	35	57	20	25
Agronomy	192	215	197	219	192	157	160	173	113	110	75	124
Veterinary science and animal science	271	246	274	275	199	171	154	183	179	161	108	166
Forestry	29	32	40	60	36	28	36	22	15	33	18	38







(continued)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fishing	–	–	6	5	2	4	4	3	10	3	–	2
Historical sciences and archaeology	594	503	581	435	341	309	358	316	242	233	133	134
Economics and business	2780	2826	2436	2055	1620	1199	875	595	426	453	259	405
Philosophy	315	305	269	255	174	183	185	171	120	98	45	58
Literary studies	328	266	173	297	230	226	209	243	103	147	78	84
Linguistics	715	614	411	643	415	425	361	390	225	365	167	289
Law	1012	941	1025	456	519	676	474	365	319	361	230	248
Educational research	1304	1337	956	931	672	794	638	411	408	394	288	366
Clinical medicine	1973	1541	1392	1725	1107	1377	1204	1156	1156	1186	752	1051
Preventive medicine	239	240	245	157	112	135	63	79	54	80	34	50
Life sciences	371	284	323	321	239	242	173	167	174	173	129	112
Pharmaceutical sciences	33	71	111	93	56	68	70	50	51	54	36	52
Art (arts, history of arts, etc.)	145	128	127	205	142	95	89	125	80	95	57	59
Psychology	436	375	303	258	199	246	172	128	91	105	65	61
Sociology	288	255	234	254	137	149	157	120	99	74	26	32
Political sciences	244	262	248	156	127	162	106	87	41	62	17	22
Culturology	154	123	170	131	109	71	94	91	57	52	30	63
Earth sciences	516	389	528	487	422	380	364	292	238	248	136	168
Theology	–	–	–	–	–	–	–	1	–	2	1	9

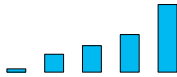




2.31. DISTRIBUTION OF DOCTORAL THESIS DEFENCES IN DISSERTATION COUNCILS ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION BY FIELD OF SCIENCE AND TECHNOLOGY

	2016	2017	2018	2019	2020	2021	2016–2021
Total	1449	1353	1293	1204	838	1011	
Natural sciences	374	333	297	250	165	247	
Engineering and technology	231	218	232	210	152	201	
Medical sciences	282	278	287	305	219	214	
Agricultural sciences	62	62	81	60	45	43	
Social sciences and humanities	500	462	396	379	257	306	

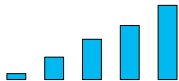

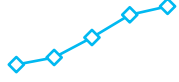



**2.3.2. DISTRIBUTION OF CANDIDATE'S THESIS DEFENCES IN DISSERTATION COUNCILS
ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
BY FIELD OF SCIENCE AND TECHNOLOGY**

	2016	2017	2018	2019	2020	2021	2016–2021
Total	10497	9572	8703	7738	5115	6104	
Natural sciences	2376	2045	1772	1541	987	1195	
Engineering and technology	2056	1914	1767	1534	960	1258	
Medical sciences	1676	1648	1721	1602	1173	1364	
Agricultural sciences	427	436	400	338	302	331	
Social sciences and humanities	3962	3529	3043	2723	1693	1956	

2.33. DISTRIBUTION OF DOCTORAL THESIS DEFENCES IN DISSERTATION COUNCILS ESTABLISHED BY INSTITUTIONS INDEPENDENTLY BY FIELD OF SCIENCE AND TECHNOLOGY

	2017	2018	2019	2020	2021	2017–2021
Total	13	71	105	149	268	
Natural sciences	5	36	49	51	93	
Engineering and technology	–	4	11	21	25	
Medical sciences	–	–	2	23	47	
Agricultural sciences	–	–	–	–	–	
Social sciences and humanities	8	31	43	54	103	

2.34. DISTRIBUTION OF CANDIDATE'S THESIS DEFENCES IN DISSERTATION COUNCILS ESTABLISHED INDEPENDENTLY BY INSTITUTIONS BY FIELD OF SCIENCE AND TECHNOLOGY

	2017	2018	2019	2020	2021	2017–2021
Total	157	593	1065	1429	1962	
Natural sciences	87	242	437	452	618	
Engineering and technology	1	48	180	330	386	
Medical sciences	–	–	14	116	232	
Agricultural sciences	–	3	5	1	4	
Social sciences and humanities	69	300	429	530	722	

**2.35. NUMBER OF DOCTORAL AND CANDIDATE'S THESIS DEFENCES IN DISSERTATION COUNCILS ESTABLISHED
THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION AND DISSERTATION COUNCILS
ESTABLISHED INDEPENDENTLY BY INSTITUTIONS BY FIELD OF SCIENCE AND TECHNOLOGY: 2021**

	Thesis defences in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation				Thesis defences in dissertation councils established by institutions independently			
	Doctoral		Candidate's		Doctoral		Candidate's	
	total	of which successful	total	of which successful	total	of which successful	total	of which successful
Total	1021	1011	6118	6104	270	268	1964	1962
Physics and mathematics	85	85	357	355	59	59	310	310
Chemical sciences	39	39	238	238	10	10	125	125
Biological sciences	80	80	372	372	14	14	97	97
Geological and mineralogical sciences	14	14	68	68	6	6	34	34
Engineering and technology	232	228	1404	1401	28	27	408	408
Agricultural sciences	22	21	213	212	–	–	–	–
Historical sciences	39	39	177	175	4	4	78	78
Economics	87	87	368	368	23	23	180	178
Philosophy	14	14	64	64	7	7	48	48
Philology and linguistics	55	55	394	393	20	20	130	130
Geography	7	7	45	45	2	2	18	18
Law	30	30	247	247	24	24	104	104
Pedagogical sciences	42	40	415	412	2	2	43	43
Medical sciences	217	216	1343	1341	44	43	231	231
Pharmaceutical sciences	7	7	49	49	4	4	17	17
Veterinary sciences	10	10	76	76	–	–	2	2

(continued)

	Thesis defences in dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation				Thesis defences in dissertation councils established by institutions independently			
	Doctoral		Candidate's		Doctoral		Candidate's	
	total	of which successful	total	of which successful	total	of which successful	total	of which successful
Art (arts, history of arts, etc.)	12	11	74	74	1	1	5	5
Architecture	–	–	17	17	–	–	–	–
Psychology	10	9	67	67	8	8	25	25
Sociology	5	5	34	34	3	3	34	34
Political science	5	5	28	28	9	9	68	68
Culturology	9	9	59	59	2	2	7	7
Theology	–	–	9	9	–	–	–	–

2.36. DISTRIBUTION OF DOCTORAL AND CANDIDATE'S THESIS DEFENCES IN COUNCILS ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION AND COUNCILS ESTABLISHED INDEPENDENTLY BY INSTITUTIONS BY CRITICAL TECHNOLOGY

(according to attestation cases data)

	Dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation				Dissertation councils established by institutions independently			
	Doctoral		Candidate's		Doctoral		Candidate's	
	2020	2021	2020	2021	2020	2021	2020	2021
Correspondence of the thesis to the critical technology is not indicated	457	554	2932	3474	83	162	875	1119
Correspondence of the thesis to the critical technology is indicated	381	457	2183	2630	66	106	554	843
Of which:								
basic and critical military and industrial technologies for creating advanced types of weapons, military and special equipment	5	8	32	39	–	–	6	6
basic technologies of power electrical engineering	–	1	10	8	–	1	9	9
biocatalytic, biosynthetic, and biosensor technologies	2	9	22	20	1	3	16	15
biomedical and veterinary technologies	117	115	647	744	17	37	116	193
genomic, proteomic, and postgenomic technologies	5	10	46	53	1	1	9	9
cellular technologies	2	5	26	25	–	1	4	6
computational modelling of nanomaterials, nanodevices and nanotechnologies	2	12	18	30	3	4	11	11
nano-, bio-, information, and cognitive technologies	11	23	96	109	9	7	43	64

(continued)

	Dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation				Dissertation councils established by institutions independently			
	Doctoral		Candidate's		Doctoral		Candidate's	
	2020	2021	2020	2021	2020	2021	2020	2021
nuclear energy, nuclear fuel cycle, safe radioactive waste and spent nuclear fuel management technologies	4	3	21	24	2	1	11	15
bioengineering technologies	7	4	28	48	1	1	6	18
nanomaterials and nanodevices diagnostics technologies	3	11	20	32	4	3	11	15
access technologies for broadband multimedia services	1	2	13	3	–		8	3
technologies and software for distributed and high-performance computing systems	7	9	50	47	1	3	18	27
technologies for information, control, and navigation systems	27	31	158	233	4	5	31	84
environmental monitoring and forecasting, pollution prevention and remediation technologies	39	36	156	203	6	5	34	72
nanodevices and microsystem engineering technologies	6	6	30	27	2	4	9	27
new and renewable energy technologies, including hydrogen energy	5	7	22	39	1	2	15	24
mineral exploration, mining, and extraction technologies	19	24	97	133	4	2	41	47

(continued)

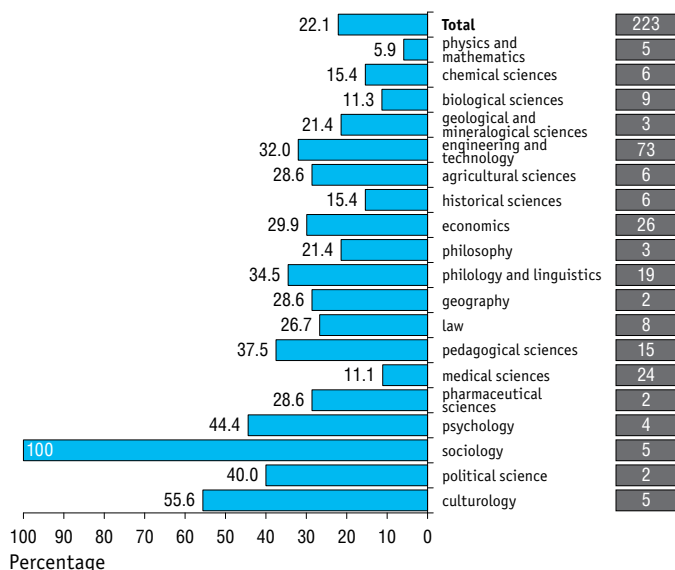
	Dissertation councils established by the Ministry of Science and Higher Education of the Russian Federation				Dissertation councils established by institutions independently			
	Doctoral		Candidate's		Doctoral		Candidate's	
	2020	2021	2020	2021	2020	2021	2020	2021
technologies for obtaining and processing engineering nanomaterials	6	7	34	49	2	3	17	15
technologies for obtaining and processing functional nanomaterials	17	24	94	92	2	2	32	51
technologies for the prevention and elimination of natural and man-made emergencies	9	14	52	73	2	1	17	16
technologies for reducing losses from socially significant diseases	54	51	297	307	2	10	31	44
technologies for creating high-speed vehicles and intelligent control systems for new modes of transport	2	5	21	26	–	–	3	–
technologies for creating a new generation of rocket, space, and transport equipment	7	8	91	112	–	–	12	16
technologies for creating an electronic component base and energy-efficient light devices	1	4	22	28	1	–	11	8
technologies for creating energy-saving systems for energy transportation, distribution, and use	15	17	53	77	–	4	21	30
technologies for efficient production and conversion of energy using organic fuel	8	11	27	49	1	6	12	18

2.37. AVERAGE NUMBER OF PUBLICATIONS PER DOCTOR OF SCIENCES AND CANDIDATE OF SCIENCES CANDIDATE WHO DEFENDED THEIR THESIS IN DISSERTATION COUNCILS ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION AND DISSERTATION COUNCILS INDEPENDENTLY ESTABLISHED BY INSTITUTIONS

	Dissertation councils established by the Ministry of Science and Higher Education of Russian Federation				Dissertation councils established independently by institutions			
	Doctors of Sciences		Candidates of Sciences		Doctors of Sciences		Candidates of Sciences	
	2020	2021	2020	2021	2020	2021	2020	2021
Number of publications per Doctor of Sciences and Candidate of Sciences candidate who defended their thesis during the reporting period	79.1	87.0	16.8	17.8	63.5	71.4	12.7	14.0
On the same topic as the thesis	56.6	56.3	14.0	14.0	43.2	42.1	10.7	10.8
Recommended by the State Commission for Academic Degrees and Titles	22.5	23.2	5.1	5.2	16.8	18.0	4.0	4.1
In journals indexed in international databases	4.5	5.5	1.3	1.5	12.9	13.1	3.1	3.2

2.38. DOCTOR OF SCIENCES CANDIDATES WHO HAVE COMPLETED POSTDOCTORAL STUDIES AND DEFENDED THEIR THESIS IN 2021 IN DISSERTATION COUNCILS ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION BY FIELD OF SCIENCE AND TECHNOLOGY

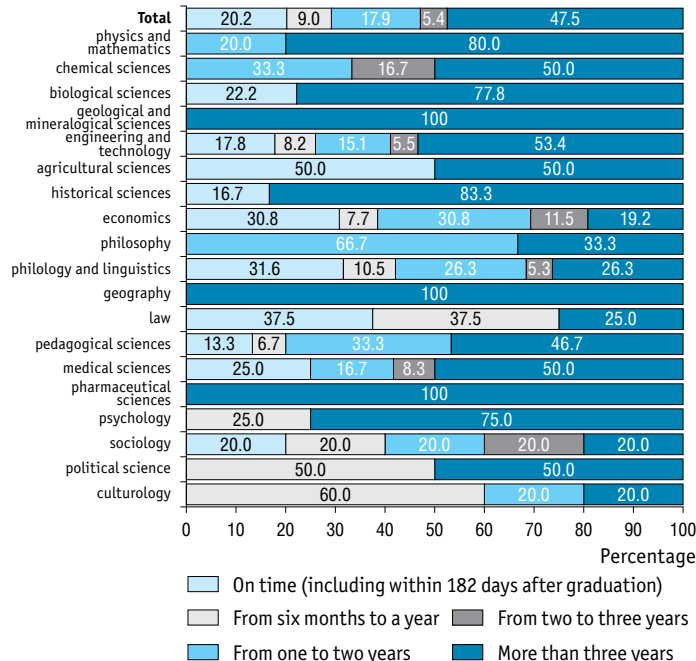
Individuals who have completed postdoctoral studies as a percentage of the total number of Doctor of Sciences candidates



Number of individuals who have completed postdoctoral studies and defended their thesis

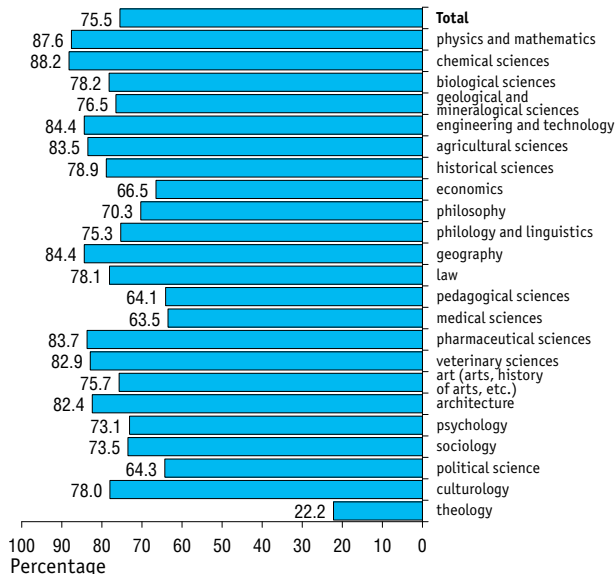
Total	223
physics and mathematics	5
chemical sciences	6
biological sciences	9
geological and mineralogical sciences	3
engineering and technology	73
agricultural sciences	6
historical sciences	6
economics	26
philosophy	3
philology and linguistics	19
geography	2
law	8
pedagogical sciences	15
medical sciences	24
pharmaceutical sciences	2
psychology	4
sociology	5
political science	2
culturology	5

Percentage distribution of Doctor of Sciences candidates by field of science and technology and defence term



2.39. CANDIDATE OF SCIENCES CANDIDATES WHO HAVE COMPLETED POSTGRADUATE STUDIES AND DEFENDED THEIR THESIS IN 2021 IN DISSERTATION COUNCILS ESTABLISHED BY THE MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION BY FIELD OF SCIENCE AND TECHNOLOGY

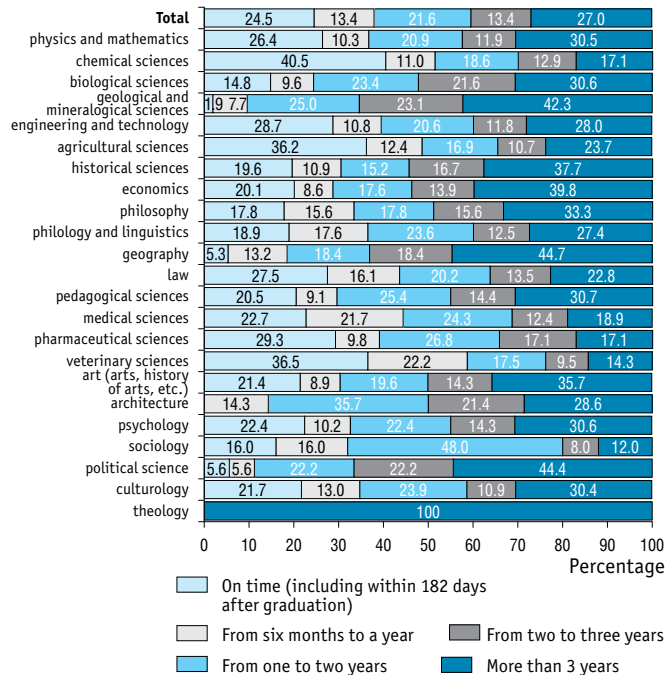
Individuals who have completed postgraduate studies as a percentage of the total number of Candidate of Sciences candidates



Number of individuals who have completed postgraduate studies and defended their thesis

Total	4608
physics and mathematics	311
chemical sciences	210
biological sciences	291
geological and mineralogical sciences	52
engineering and technology	1183
agricultural sciences	177
historical sciences	138
economics	244
philosophy	45
philology and linguistics	296
geography	38
law	193
pedagogical sciences	264
medical sciences	852
pharmaceutical sciences	41
veterinary sciences	63
art (arts, history of arts, etc.)	56
architecture	14
psychology	49
sociology	25
political science	18
culturology	46
theology	2

Percentage distribution of Candidate of Sciences candidates by field of science and technology and defence term



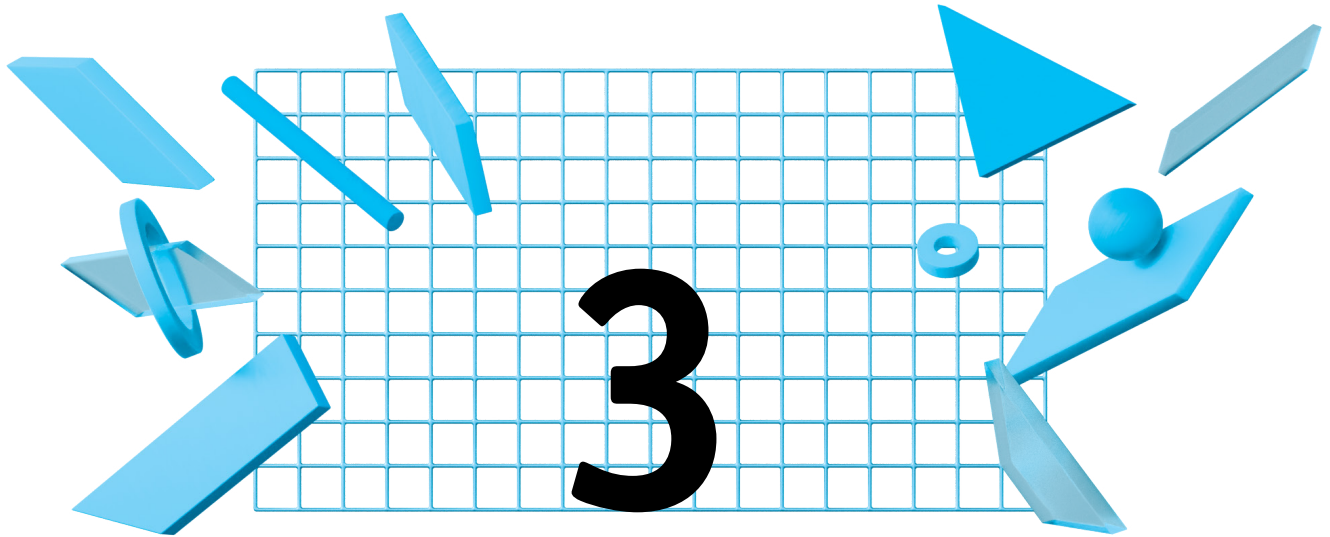
2.40. CANDIDATE OF SCIENCES CANDIDATES WHO HAVE COMPLETED POSTGRADUATE STUDIES AND DEFENDED THEIR THESIS IN 2021 IN DISSERTATION COUNCILS ESTABLISHED INDEPENDENTLY BY INSTITUTIONS BY FIELD OF SCIENCE AND TECHNOLOGY

(persons)

	Candidate of Sciences candidates											
	total		of whom individuals who have completed postgraduate studies		of whom within the defence term							
					on time (including within 182 days after graduation)		from six months to a year		from one to two years		from two to three years	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Total	1429	1962	1143	1561	430	521	111	230	279	338	119	166
Physics and mathematics	241	310	197	246	87	105	23	23	38	44	13	23
Chemical sciences	67	125	61	118	21	53	7	19	17	26	7	7
Biological sciences	70	97	65	90	17	27	3	8	19	22	11	10
Geological and mineralogical sciences	16	34	15	24	6	5	1	3	2	5	2	3
Engineering and technology	365	408	297	339	168	174	23	44	52	40	19	34
Historical sciences	56	78	35	65	11	11	–	12	13	18	5	8
Economics	100	178	64	133	9	12	8	33	14	40	12	15
Philosophy	24	48	19	46	4	19	5	5	5	13	2	1
Philology and linguistics	100	130	89	106	31	27	14	19	26	27	8	10
Geography	6	18	6	14	2	2	–	1	1	6	–	2
Law	95	104	67	78	16	13	5	6	13	21	9	12
Pedagogical sciences	34	43	26	35	6	9	3	7	8	10	6	3
Medical sciences	120	231	94	148	28	42	2	22	33	37	13	20
Pharmaceutical sciences	16	17	15	10	4	4	2	3	1	1	2	2

(continued)

	Candidate of Sciences candidates											
	total		of whom individuals who have completed postgraduate studies		of whom within the defence term							
					on time (including within 182 days after graduation)		from six months to a year		from one to two years		from two to three years	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Veterinary sciences	–	2	–	1	–	–	–	–	–	1	–	–
Art (arts, history of arts, etc.)	5	5	3	5	–	–	–	3	–	1	1	–
Psychology	28	25	20	19	5	–	1	2	10	6	1	3
Sociology	26	34	19	29	4	8	2	6	9	6	1	4
Political science	56	68	47	50	11	8	11	13	16	14	6	7
Culturology	4	7	4	5	–	2	1	1	2	–	1	2



R&D FUNDING

3.1. GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF R&D INSTITUTION

(thousand roubles)

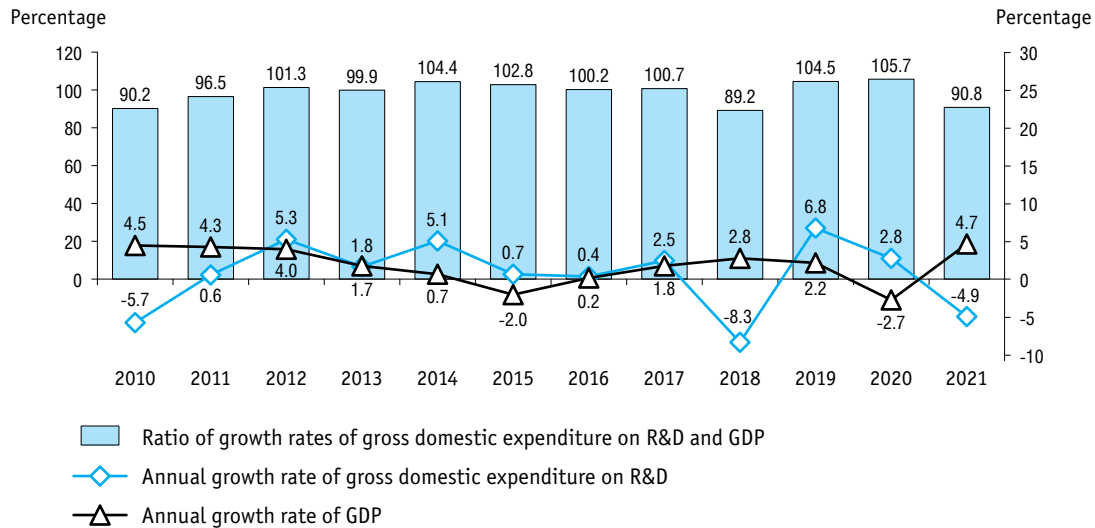
	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	230785150.3	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
Research institutes	136699352.5	290022807.7	508671690.7	529229803.8	557552584.0	578340931.1	643561481.3	655228361.3	695552859.1
Design organisations	56385016.8	120926725.8	175200033.2	176836173.1	177912174.8	176896332.7	210473879.2	189083713.9	217938590.9
Construction project and exploration organisations	1626464.3	4215166.6	2764868.3	2558012.5	2305287.2	2058281.8	1035878.8	3851886.7	6230508.4
Pilot plants	171135.5	564476.6	3228916.7	3204025.6	11337208.7	11974006.1	5709961.2	3853357.5	15345835.4
Higher education institutions	10963094.5	38787366.4	82972415.2	80424185.9	86842669.4	91741379.8	100255580.8	108343554.5	121331834.0
Industrial enterprises	12633435.9	32838780.9	74693899.2	75747420.1	90217091.0	79760617.2	92576631.2	112060937.0	135840342.3
Others	12306650.8	36021909.9	67137233.9	75815598.6	92985422.0	87476096.1	81173252.1	102112486.4	109250974.4

3.2. GROSS DOMESTIC EXPENDITURE ON R&D

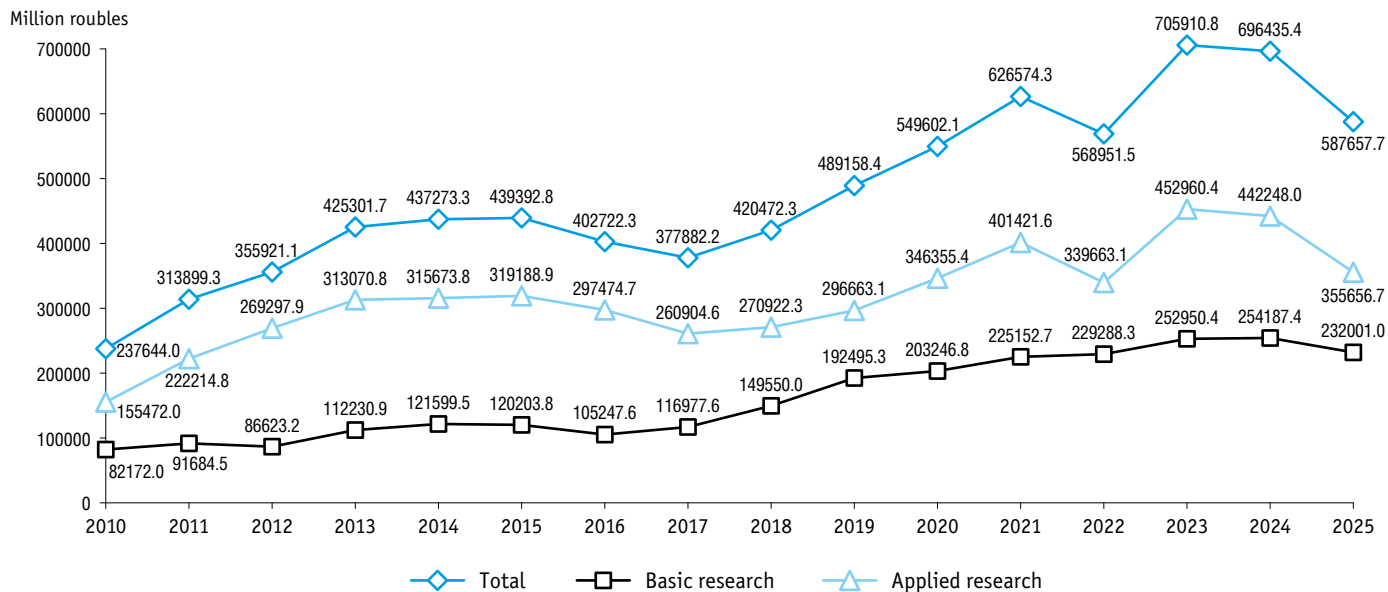
	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D, thousand roubles:								
at current prices	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
at constant 2010 prices*	523377233.9	597159402.8	599399987.0	614650767.2	563763169.5	602296409.2	619055656.6	588803358.9
Gross domestic expenditure on R&D as a percentage of GDP	1.13	1.10	1.10	1.11	0.99	1.04	1.09	0.99

* Here and below in this section, the data are calculated using GDP deflator as of April 08, 2022.

3.3. GROWTH RATES OF GROSS DOMESTIC EXPENDITURE ON R&D AND GDP

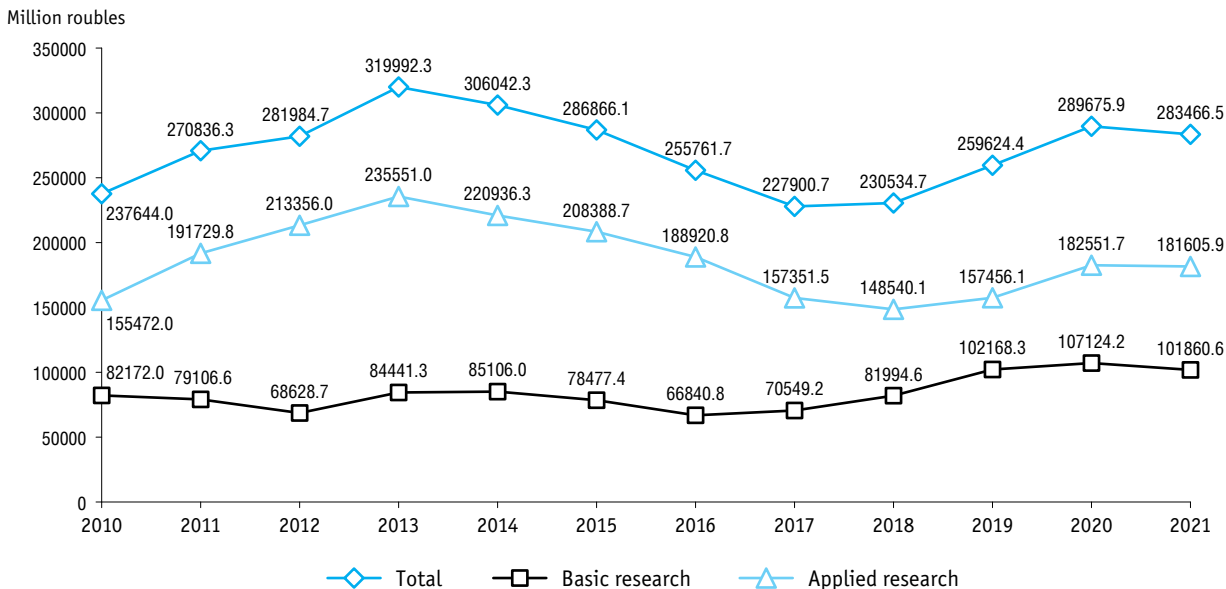


3.4. FEDERAL BUDGET APPROPRIATIONS ON CIVIL S&T AT CURRENT PRICES



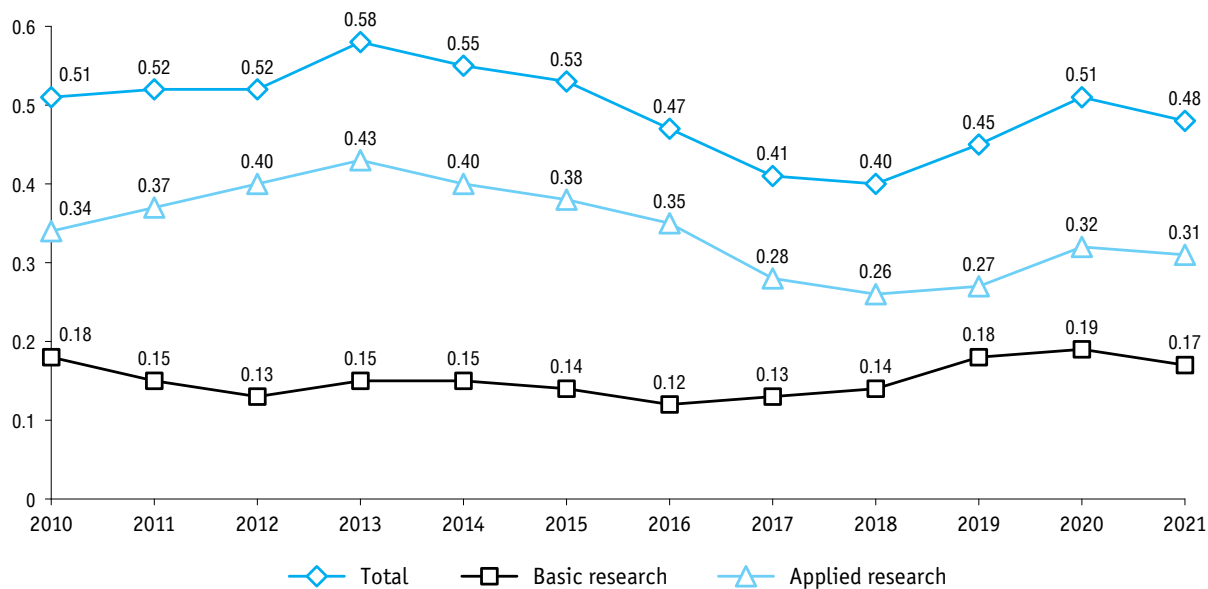
Source: for 2010–2021, annual reports on the implementation of the consolidated budget of the Russian Federation and the budgets of state extra-budgetary funds (according to the Federal Treasury); for 2022, in accordance with Federal Law No. 390-FL of December 6, 2021 'On the 2022 Federal Budget and the 2023–2024 Budget Plan'; 2023–2025, in accordance with Federal Law No. 466-FL of December 5, 2022 'On the 2023 Federal Budget and the 2024–2025 Budget Plan'.

3.5. FEDERAL BUDGET APPROPRIATIONS ON CIVIL S&T AT CONSTANT 2010 PRICES



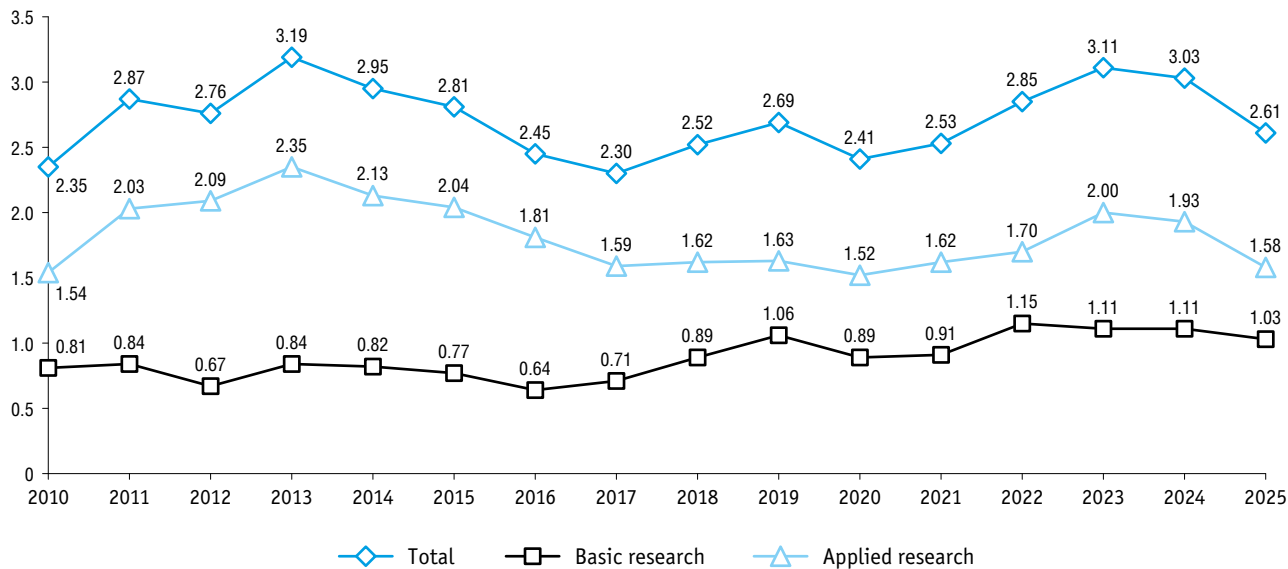
Sources: annual reports on the implementation of the consolidated budget of the Russian Federation and the budgets of state extra-budgetary funds (according to the Russian Federal Treasury).

3.6. FEDERAL BUDGET APPROPRIATIONS ON CIVIL S&T AS A PERCENTAGE OF GDP



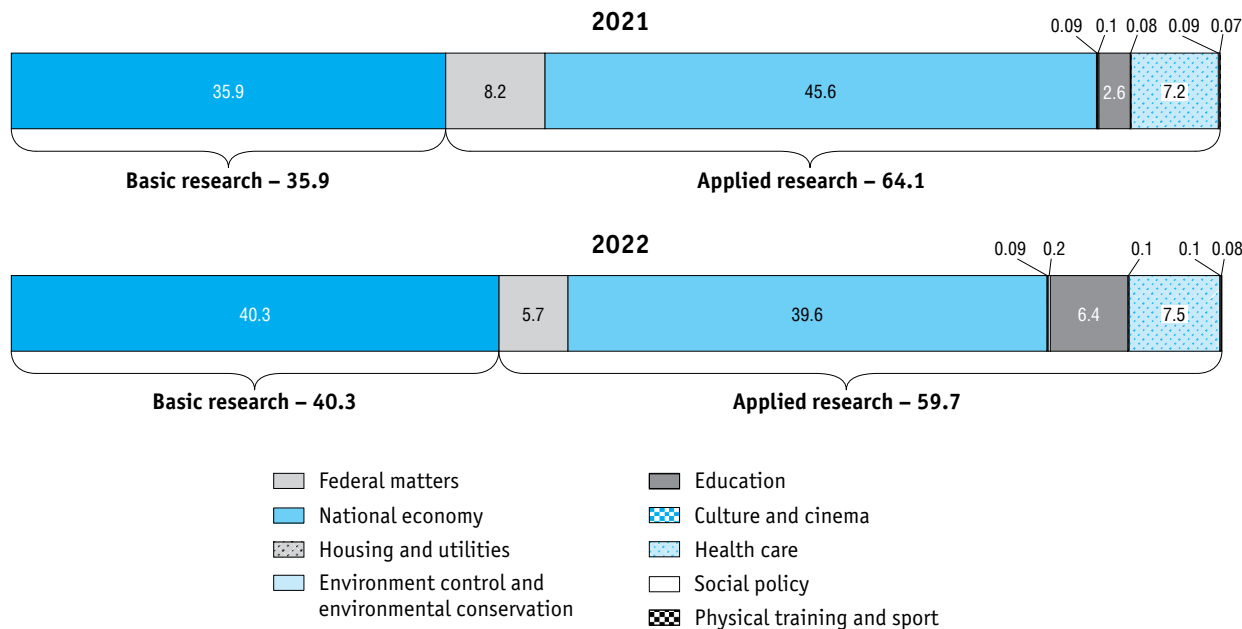
Sources: annual reports on the implementation of the consolidated budget of the Russian Federation and the budgets of state extra-budgetary funds (according to the Russian Federal Treasury).

3.7. FEDERAL BUDGET APPROPRIATIONS ON CIVIL S&T AS A PERCENTAGE OF FEDERAL BUDGET EXPENDITURE



Source: for 2010–2021, annual reports on the implementation of the consolidated budget of the Russian Federation and the budgets of state extra-budgetary funds (according to the Federal Treasury); for 2022, in accordance with Federal Law No. 390-FL of December 6, 2021 'On the 2022 Federal Budget and the 2023–2024 Budget Plan'; 2023–2025, in accordance with Federal Law No. 466-FL of December 5, 2022 'On the 2023 Federal Budget and the 2024–2025 Budget Plan'.

3.8. PERCENTAGE DISTRIBUTION OF FEDERAL BUDGET APPROPRIATIONS ON CIVIL S&T BY SUBSECTION OF THE BUDGET EXPENDITURE CLASSIFICATION AND TYPE OF R&D



Source: for 2021, an annual report on the implementation of the consolidated budget of the Russian Federation and the budgets of state extra-budgetary funds (according to the Federal Treasury); for 2022, in accordance with Federal Law No. 390-FL of December 6, 2021 'On the 2022 Federal Budget and the 2023–2024 Budget Plan'.

3.9. GROSS DOMESTIC EXPENDITURE ON R&D BY SOURCE OF FUNDS

	Gross domestic expenditure on R&D	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
<i>At current prices, thousand roubles</i>						
2010	523377233.9	368191779.8	133498976.0	2436564.1	682378.0	18567536.0
2011	610426680.6	409449448.8	168957596.6	4664465.3	1209661.5	26145508.4
2012	699869784.8	474789779.0	190545904.2	5905489.1	877937.6	27750674.9
2013	749797638.8	507197614.5	211135955.9	7820677.9	896366.0	22747024.5
2014	847526992.9	586658713.4	229444656.4	9069176.1	1372014.1	20982432.9
2015	914669057.2	635859865.4	242155382.4	10875090.0	1566750.2	24211969.2
2016	943815219.6	643401009.6	265277238.1	8210528.3	1537132.8	25389310.8
2017	1019152437.1	674344339.3	307459020.2	7901322.1	2645187.7	26802567.8
2018	1028247644.8	689270557.4	303219233.8	8841468.3	2761098.4	24155286.9
2019	1134786664.6	752260999.0	342832982.1	9010684.2	3462827.9	27219171.4
2020	1174534297.3	796369857.5	343277964.2	10876282.2	3327080.1	20683113.3
2021	1301490944.5	878778557.6	378025987.0	15733105.5	3829258.9	25124035.5

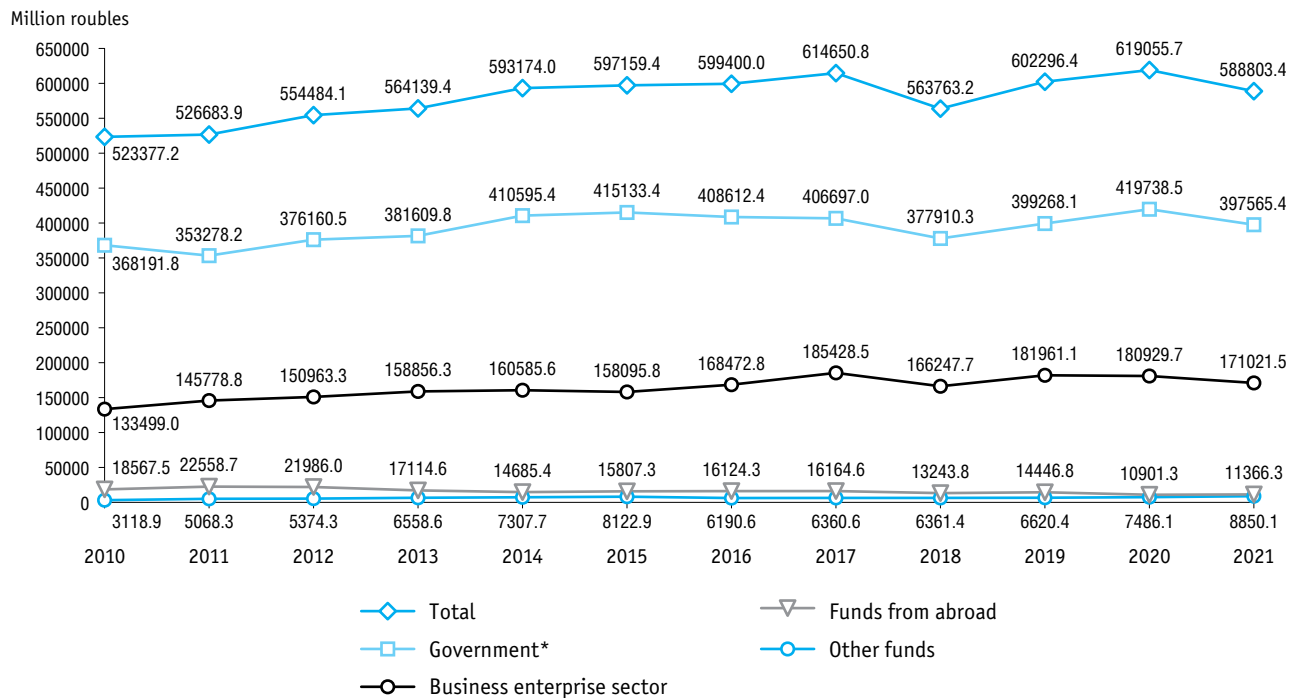
* Including budget funds, budget appropriations for higher education institutions, and government sector institutions' funds (including own funds).

(continued)

	Gross domestic expenditure on R&D	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
	Percentage					
2010	100	70.3	25.5	0.5	0.1	3.5
2011	100	67.1	27.7	0.8	0.2	4.3
2012	100	67.8	27.2	0.8	0.1	4.0
2013	100	67.6	28.2	1.0	0.1	3.0
2014	100	69.2	27.1	1.1	0.2	2.5
2015	100	69.5	26.5	1.2	0.2	2.6
2016	100	68.2	28.1	0.9	0.2	2.7
2017	100	66.2	30.2	0.8	0.2	2.6
2018	100	67.0	29.5	0.9	0.3	2.3
2019	100	66.3	30.2	0.8	0.3	2.4
2020	100	67.8	29.2	0.9	0.3	1.8
2021	100	67.5	29.0	1.2	0.3	1.9

3.10. TRENDS IN GROSS DOMESTIC EXPENDITURE ON R&D BY SOURCE OF FUNDS

(at constant 2010 prices)



* Including budget funds, general university funds, and government sector institutions' funds (including own funds).

3.11. SUBSIDIES, GRANTS AND OTHER COMPETITIVE R&D FUNDING: 2021

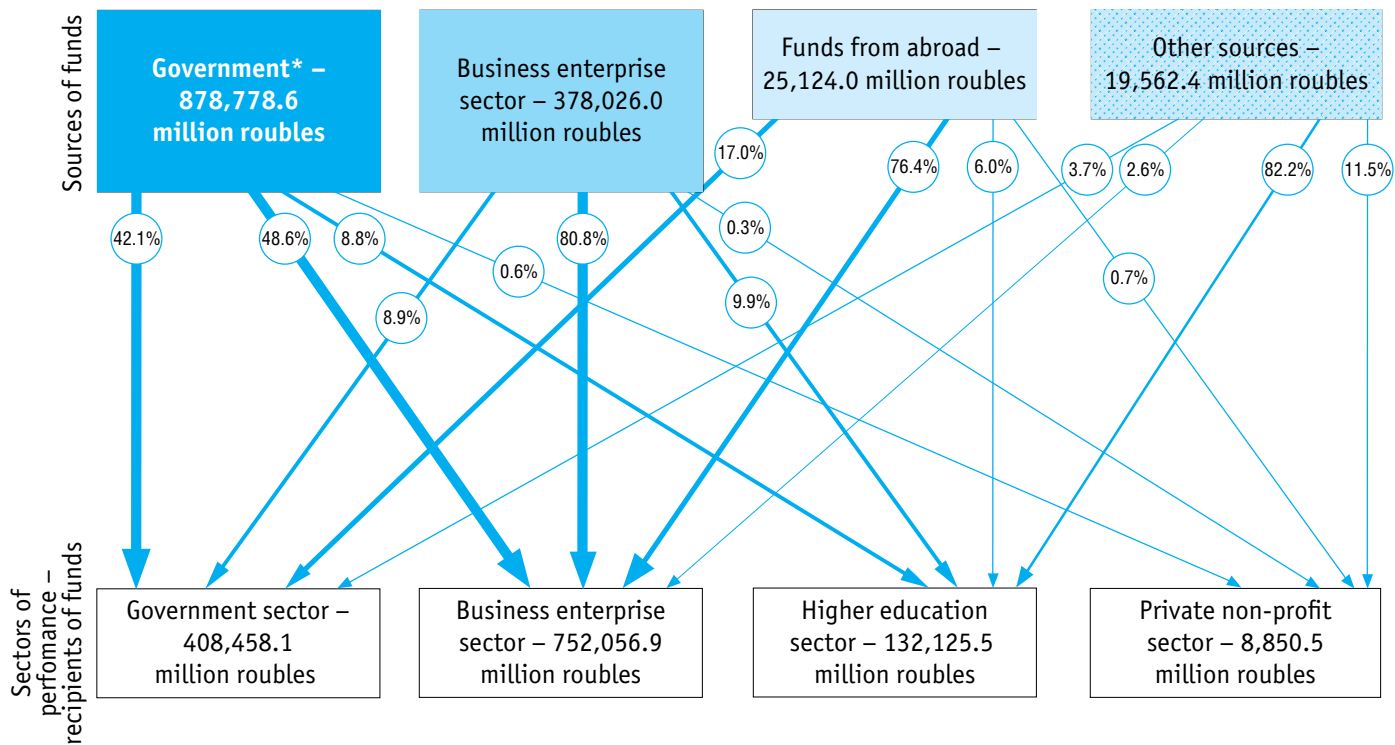
(thousand roubles)

	Total	Of which	
		funds from budgets of all levels	of which federal budget appropriations
Gross domestic expenditure on R&D	1301490944.5	712520139.7	688707890.8
Of which:			
budget subsidies for institutional R&D funding	216297666.5	216297666.5	207230612.7
budget subsidies for performing R&D	72488430.7	72488430.7	71599523.6
grants from foundations for S&T and innovation	42747145.3	34174780.3	31247960.5
other types of competitive financing	76324697.3	57413651.4	56688146.4

3.12. GROSS DOMESTIC EXPENDITURE ON R&D FUNDED FROM ABROAD

	2019		2020		2021	
	Thousand roubles	Percentage	Thousand roubles	Percentage	Thousand roubles	Percentage
Gross domestic expenditure on R&D funded from abroad	27219171.4	100	20683113.3	100	25124035.5	100
Including:						
international organisations	1808325.3	6.6	1635387.3	7.9	3190903.3	12.7
government organisations of foreign countries	7828845.7	28.8	6327459.6	30.6	9571582.3	38.1
business enterprise sector institutions of foreign countries	13464450.2	49.5	11125022.3	53.8	9477380.6	37.7
other foreign institutions (educational institutions, funds, non-profit organisations)	4117550.2	15.1	1595244.1	7.7	2884169.3	11.5

3.13. R&D FUNDING BY SECTOR OF PERFORMANCE: 2021



* Including budget funds, general university funds, and government sector institutions' funds (including own funds).

3.14. GROSS DOMESTIC EXPENDITURE ON R&D BY OWNERSHIP OF R&D INSTITUTIONS

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
<i>At current prices, thousand roubles</i>										
Total	76697100.5	230785150.3	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
Russian ownership	74254897.9	226582085.6	514058161.4	897702466.4	930156714.4	1002767874.7	1008118341.7	1111947490.2	1149948559.7	1280107912.5
Public ownership	56254567.1	171855852.1	394615118.0	570759794.5	569769183.6	553896563.1	559124268.0	620343354.1	640973841.0	687617092.8
Federal	55150426.2	168986692.6	389105256.8	559987658.5	555862200.4	543888734.1	547008790.1	609189006.6	630058680.1	675405726.0
Regional	1099762.3	2869159.5	5396479.0	10772136.0	13906983.2	10007829.0	12115477.9	11154347.5	10915160.9	12211366.8
Municipal ownership	50381.9	17253.5	50304.2	93960.3	90712.5	113977.1	114978.0	118299.5	77234.5	67810.2
Ownership by voluntary associations	209229.3	339129.1	525085.2	2010818.4	2083134.9	2478750.5	2112286.5	2248707.3	3352538.1	3491281.4
Private ownership	4948266.7	20957744.5	60263592.5	116626956.5	149005447.9	181015620.9	166351736.8	200324614.4	208887803.1	239769182.5
Ownership by Russian citizens permanently living abroad	...	...	...	...*	...*	...*	...*	-	-	-
Ownership by consumers' cooperatives*	1095.2	4354.5	36590.0	20664.7	22065.5	21885.2	...*	-	-	-
Mixed ownership	12791357.7	33407751.9	55954325.1	168031713.1	168078029.2	204497889.4	207408687.4	215210138.5	208281223.5	240576158.1
Mixed ownership with a share of public ownership	...	...	49557690.9	129154411.8	138670373.3	170078332.1	160105661.3	143889355.7	141003162.4	147537019.8
Other mixed ownership	...	...	...	38877301.3	29407655.9	34419557.3	47303026.1	71320782.8	67278061.1	93039138.3
Ownership by state corporations	...	...	2613146.4	40134256.9	41085157.5	60722748.5	73003244.8	73702376.4	88375919.5	108586387.5
Foreign ownership	117265.0	697993.4	1390905.3	5684831.2	7007423.6	8754129.1	7698848.2	11529265.4	15872183.7	13378250.5
Joint ownership (with both Russian and foreign participation)	2324937.6	3505071.3	7928167.2	11281759.6	6651081.6	7630433.3	12430454.9	11309909.0	8713553.9	8004781.5

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
	Percentage									
Total	100	100	100	100	100	100	100	100	100	100
Russian ownership	96.8	98.2	98.2	98.1	98.6	98.4	98.0	98.0	97.9	98.4
Public ownership	73.3	74.5	75.4	62.4	60.4	54.3	54.4	54.7	54.6	52.8
Federal	71.9	73.2	74.3	61.2	58.9	53.4	53.2	53.7	53.6	51.9
Regional	1.4	1.2	1.0	1.2	1.5	1.0	1.2	1.0	0.9	0.9
Municipal ownership	0.07	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ownership by voluntary associations	0.3	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3
Private ownership	6.5	9.1	11.5	12.8	15.8	17.8	16.2	17.7	17.8	18.4
Ownership by Russian citizens permanently living abroad	...	...	...	...*	...*	...*	...*	-	-	-
Ownership by consumers' cooperatives*	0.0	0.0	0.0	0.0	0.0	0.0	...*	-	-	-
Mixed ownership	16.7	14.5	10.7	18.4	17.8	20.1	20.2	19.0	17.7	18.5
Mixed ownership with a share of public ownership	...	...	9.5	14.1	14.7	16.7	15.6	12.7	12.0	11.3
Other mixed ownership	...	...	...	4.3	3.1	3.4	4.6	6.3	5.7	7.1
Ownership by state corporations	...	...	0.5	4.4	4.4	6.0	7.1	6.5	7.5	8.3
Foreign ownership	0.2	0.3	0.3	0.6	0.7	0.9	0.7	1.0	1.4	1.0
Joint ownership (with both Russian and foreign participation)	3.0	1.5	1.5	1.2	0.7	0.7	1.2	1.0	0.7	0.6

3.15. GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF ECONOMIC ACTIVITY*

(thousand roubles)

	2019	2020	2021
Total	1134786664.6	1174534297.3	1301490944.5
Agriculture, forestry and fishing	319096.7	638026.0	473387.2
Mining and quarrying	1216424.5	1277086.8	191670.1
Manufacturing	117349554.3	154043732.9	165925184.7
Electricity, gas, steam and air-conditioning supply	...*	...*	...*
Water supply; sewerage, waste management, and remediation activities	339566.8	...*	...*
Construction	...*	...*	...*
Wholesale and retail trade; repair of motor vehicles and motorcycles	1252412.4	394996.5	332999.2
Transportation and storage	6589850.1	...*	11235621.8
Accommodation and food service activities	...*	—	...*
Information and communication	6689401.5	13003553.9	10443789.6
Financial and insurance activities	...*	...*	...*
Real estate activities	956536.2	370716.0	676623.9
Professional, scientific and technical activities	883435221.9	879950167.7	968925283.4
Of which research and development	857161323.1	866750256.7	959600068.0
Administrative and support service activities	172662.7	1287622.6	860981.1
Public administration and defence; compulsory social security	789008.2	825394.3	884535.1
Education	105784524.3	110301775.2	126136944.3
Of which higher education	103463029.7	109718087.5	125310051.2
Human health and social work activities	5065840.6	6415605.5	5967163.0
Art, entertainment and recreation	2701884.3	3474783.3	4046519.2
Other service activities	245287.9	168925.2	477095.4

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

3.16. GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF EXPENDITURE

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
<i>At current prices, thousand roubles</i>										
Gross domestic expenditure on R&D	76697100.5	230785150.3	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
Current expenditure	73873345.0	221119537.6	489450798.7	854288043.8	873778705.8	950256965.4	960689437.2	1060589716.7	1091333468.1	1193578508.5
Salaries	27762734.2	94274453.3	241472234.1	398143690.1	402793518.7	437788837.4	457267132.6	502089955.8	514955125.5	563908143.6
Of which for R&D personnel*	24452200.6	83218561.7	211660690.5	346425420.7	349060524.6	381564501.7	390093269.5	423392763.7	443059727.6	486719058.1
Social security payments**	10419152.6	22597417.5	47904606.9	104167630.5	105441328.0	114318768.6	119930831.0	130616630.6	135641735.8	148770673.7
Equipment	3433380.7	9936177.7	18067655.4	28480160.0	24412188.2	21750617.6	19610481.8	34199569.2	35234257.8	37991455.4
Other material costs	17470855.0	51304357.4	89279048.7	157810431.8	174467767.8	186670110.7	175201149.9	195666200.1	208186164.0	236619193.1
Other current expenditure	14787222.5	43007131.7	92727253.6	165686131.4	166663903.1	189728631.1	188679841.9	198017361.0	197316185.0	206289042.7
Capital expenditure	2823755.5	9665612.7	33926435.2	60381013.4	70036513.8	68895471.7	67558207.6	74196947.9	83200829.2	107912436.0
Land and buildings	496202.4	1647639.4	8077521.7	10029243.3	12419641.1	15624626.2	11008455.8	13895402.1	12817985.2	17379807.6
Including:										
land	...	...	...	...	...	3340264.1	120680.1	678250.5	123451.3	1612879.1
buildings	...	...	...	...	...	12284362.1	10887775.7	13217151.6	12694533.9	15766928.5
Equipment	1448665.0	5818068.7	19887596.3	33807469.6	37427491.3	36339715.7	37177474.3	37219955.3	49326387.3	63643291.3
Intellectual property items and results of intellectual activity	...	...	...	...	...	3499599.3	6352075.5	7893945.3	7026190.8	12078196.4
Other capital expenditure	878888.1	2199904.6	5961317.2	16544300.5	20189381.4	13431530.5	13020202.0	15187645.2	14030265.9	14811140.7

(continued)

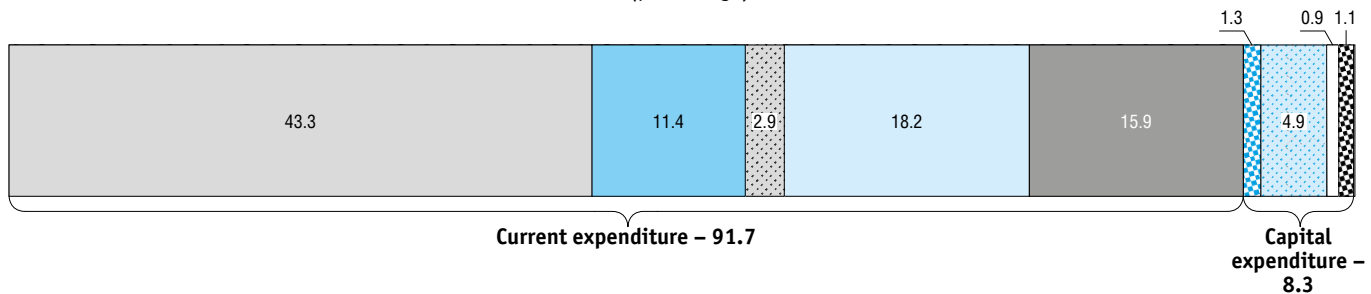
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Percentage										
Gross domestic expenditure on R&D	100	100	100	100	100	100	100	100	100	100
Current expenditure	96.3	95.8	93.5	93.4	92.6	93.2	93.4	93.5	92.9	91.7
Salaries	36.2	40.8	46.1	43.5	42.7	43.0	44.5	44.2	43.8	43.3
Of which for R&D personnel*	31.9	36.1	40.4	37.9	37.0	37.4	37.9	37.3	37.7	37.4
Social security payments**	13.6	9.8	9.2	11.4	11.2	11.2	11.7	11.5	11.5	11.4
Equipment	4.5	4.3	3.5	3.1	2.6	2.1	1.9	3.0	3.0	2.9
Other material costs	22.8	22.2	17.1	17.3	18.5	18.3	17.0	17.2	17.7	18.2
Other current expenditure	19.3	18.6	17.7	18.1	17.7	18.6	18.3	17.4	16.8	15.9
Capital expenditure	3.7	4.2	6.5	6.6	7.4	6.8	6.6	6.5	7.1	8.3
Land and buildings	0.6	0.7	1.5	1.1	1.3	1.5	1.1	1.2	1.1	1.3
Including:										
land	...	...	...	...	...	0.3	0.01	0.06	0.01	0.1
buildings	...	...	...	...	...	1.2	1.1	1.2	1.1	1.2
Equipment	1.9	2.5	3.8	3.7	4.0	3.6	3.6	3.3	4.2	4.9
Intellectual property and results of intellectual activity	...	...	...	...	...	0.3	0.6	0.7	0.6	0.9
Other capital expenditure	1.1	1.0	1.1	1.8	2.1	1.3	1.3	1.3	1.2	1.1

* Excluding external multiple jobholders and independent contractors.






** National pension insurance, national health insurance, national social insurance.

3.17. GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE: 2021





(percentage)



Current expenditure:

-  salaries
-  social security payments
-  equipment
-  other material costs
-  other current expenditure

Capital expenditure:

-  land and buildings
-  equipment
-  intellectual property items and results of intellectual activity
-  other capital expenditure

3.18. GROSS DOMESTIC EXPENDITURE ON R&D BY PRIORITY S&T AREA AND SOURCE OF FUNDS: 2021

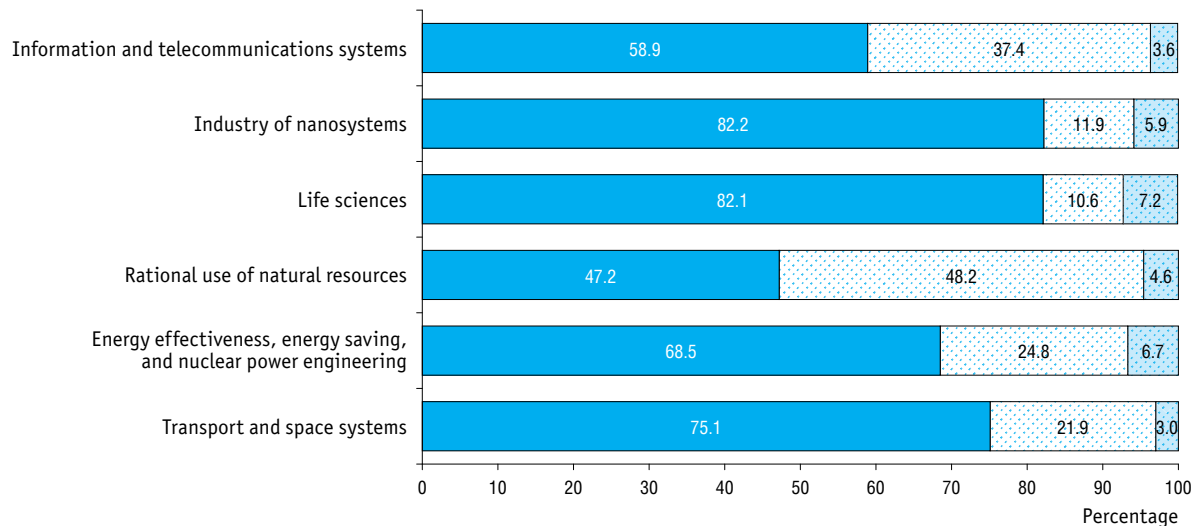
(thousand roubles)

	Total	Information and telecommunication systems	Industry of nanosystems	Life sciences	Rational use of natural resources	Energy effectiveness, energy saving, nuclear power engineering	Transport and space systems
Gross domestic expenditure on R&D by priority S&T areas	905910253.6	99672990.0	30705476.3	102632444.2	61291804.7	131427271.9	268070469.6
Sources of funds:							
government*	633787580.2	58742439.7	25226154.7	84305666.8	28954982.9	90022781.4	201407755.3
of which federal budget appropriations	504400050.3	46541232.9	17390320.7	73903325.2	23109669.6	66420831.2	169945677.0
business enterprise sector**	232537784.1	37300112.6	3662959.8	10910845.2	29518439.2	32587159.7	58668746.0
other	39584889.3	3630437.7	1816361.8	7415932.2	2818382.6	8817330.8	7993968.3

* Including budget funds and government sector institutions' funds (including own funds).

** Business enterprise sector institutions' funds (including own funds).

3.19. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY PRIORITY S&T AREA AND SOURCE OF FUNDS: 2021



Sources of funds:

- government*
- business enterprise sector**
- other

* Including budget funds and government sector institutions' funds (including own funds).

** Business enterprise sector institutions' funds (including own funds).

3.20. GROSS DOMESTIC EXPENDITURE ON R&D BY SOCIO-ECONOMIC OBJECTIVE

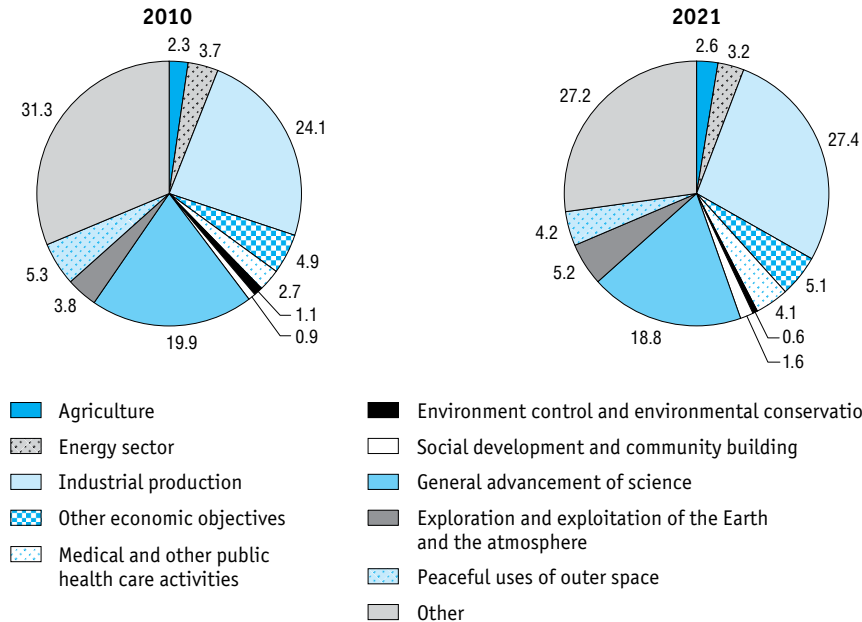
(thousand roubles)

	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
Economic development	183113782.3	335508245.3	356656937.7	405957250.5	408881985.5	441468455.2	447604583.4	498341858.5
Agriculture, forestry and fishing	12090814.9	20507885.2	19839916.9	22158788.8	24651341.9	26468230.8	30140836.9	33358613.4
Production, distribution, and rational use of energy	19174764.6	28233810.5	27986109.3	29764264.2	26099381.3	31245591.2	32888603.0	41249552.0
Industrial production	126029410.7	247190324.1	267198733.4	310831962.7	309387473.2	329916726.9	329248221.6	356911309.4
Increasing economic efficiency and technological level of production	14916168.9	27970190.2	32603056.9	35330996.0	33663416.2	30443593.1	35935421.9	41789275.4
Extraction and processing of non-energy minerals	1279265.4	2979762.1	3515879.2	3088792.3	3146341.5	2834830.9	3048351.5	2708357.1
Manufacture of chemicals and chemical products	5839135.5	18046159.1	16726672.0	22666897.6	21569350.6	21126049.9	16567265.4	18373210.6
Manufacture of motor vehicles and other vehicles	21495410.4	38496344.6	47336591.0	52963468.8	52907681.8	61226054.2	56119132.1	70230335.1
Electronics industry, manufacture of radio, television and communication equipment, office equipment	13389386.0	34152557.2	28696420.2	38512032.2	33269372.0	34143780.9	38534852.9	39746412.2
Software development	6740442.6	10935776.1	13858343.1	16942170.0	17048206.3	14844011.6	14573469.8	19691164.3
Manufacture of electrical machinery and appliances	2879253.1	6855694.7	9068432.3	11649795.4	7562423.8	8705877.5	7064250.4	7382878.8
Manufacture of instruments	13466912.8	24545740.1	30199136.8	29594205.1	30799561.6	35409482.2	33665243.0	37086849.7
Manufacture of other machinery and equipment	13654259.2	19618563.5	23208998.1	35130556.7	33230211.9	36812073.5	39417740.0	47109323.0
Manufacture of wearing apparel, textiles, and leather goods	97483.3	152999.3	112320.3	331649.1	1832109.0	559830.4	342944.0	309301.9
Production of food and beverages	565348.2	883049.0	815777.0	924618.2	1061783.6	865902.9	655273.3	1325166.9

(continued)

	2010	2015	2016	2017	2018	2019	2020	2021
Other sectors of manufacturing industry	31706345.3	62553488.2	61057106.5	63696781.3	73297014.9	82945239.8	83324277.3	71159034.4
Construction	5513681.4	4100727.2	4527423.8	4492617.8	4630356.3	4973429.0	5372364.1	10831978.9
Transport	12686004.3	28936996.8	28935628.1	29024172.8	32376301.6	37073727.5	38409951.6	41119905.6
Communication	6704734.7	5137035.8	6753395.9	8343946.4	9142616.9	9873975.4	8706499.8	13285731.0
Infrastructure and general planning of urban and rural settlements	354546.0	720423.3	750011.5	594804.6	1485742.9	1126947.6	889463.0	754477.3
Services sector	559825.7	681042.4	665718.8	746693.2	1108771.4	789826.8	1948643.4	830290.9
Social objectives	24966176.4	47512609.4	53126847.1	51110186.9	54264887.5	59966499.6	70988426.0	82781984.3
Environment control and environmental conservation	5950018.6	7698790.1	6978201.4	6241376.7	7599352.2	7448488.1	6949527.8	8011822.1
Medical and other public health care activities	14373675.7	27779185.8	33577707.1	30526694.5	32012099.3	38041662.5	45063635.1	53471951.1
Social development and community building	4642482.1	12034633.5	12570938.6	14342115.7	14653436.0	14476349.0	18975263.5	21298211.1
Of which:								
Development of education	...	4981852.5	5267846.5	5569999.6	6127429.4	7036074.3	6860972.8	8425737.0
Development of culture, entertainment, mass media	...	1583936.6	1738974.2	3538810.3	1573426.9	1418837.1	1410975.0	2420954.2
General advancement of science	104294714.1	145154435.8	139556056.0	139964844.3	169868470.5	195163836.5	223783022.8	244459695.2
Exploration and exploitation of the Earth and the atmosphere	19821817.2	43206894.0	35280752.7	40987614.3	40888641.4	42964967.8	44365802.6	67457945.6
Peaceful uses of outer space	27503697.9	57441295.9	46367115.9	41270828.6	43631330.1	60031472.7	48882620.6	54776976.3
Other	163677046.0	285845576.8	312827510.2	339861712.5	310712329.8	335191432.8	338909841.9	353672484.6

3.21. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SOCIO-ECONOMIC OBJECTIVE



3.22. CURRENT EXPENDITURE ON R&D BY TYPE OF R&D ACTIVITY AND FIELD OF SCIENCE AND TECHNOLOGY

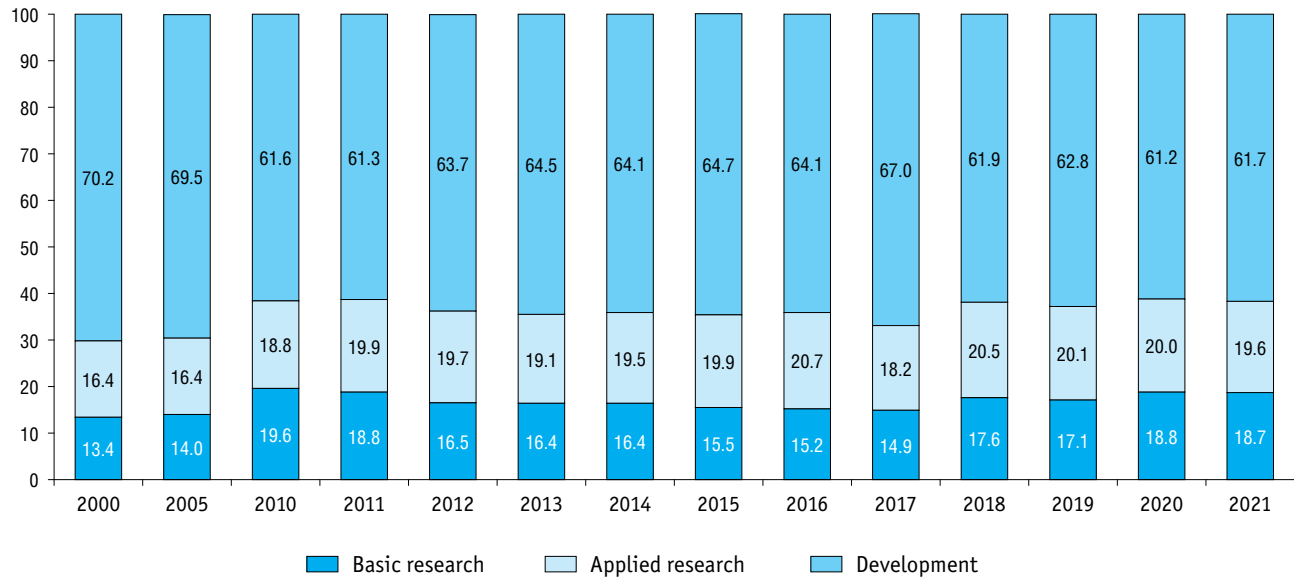
(thousand roubles)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2005							
Current expenditure on R&D	221119537.6	34579040.8	171109626.3	4571313.8	4159368.3	4628535.6	2071652.8
Basic research	31022855.8	19345182.8	4579039.5	1865239.8	1947227.1	1723405.3	1562761.3
Applied research	36360266.9	8860755.5	21725918.2	2051910.3	1409317.9	1957292.2	355072.8
Development	153736414.9	6373102.5	144804668.6	654163.7	802823.3	947838.1	153818.7
2010							
Current expenditure on R&D	489450798.7	96010015.2	348621966.4	15462300.4	8887624.5	13752461.7	6716430.5
Basic research	95881364.3	50550000.6	22866475.2	6378644.4	4766037.6	6074153.0	5246053.5
Applied research	92010677.2	27202686.8	46841680.2	7900476.3	2582521.1	6199410.7	1283902.1
Development	301558757.2	18257327.8	278913811.0	1183179.7	1539065.8	1478898.0	186474.9
2015							
Current expenditure on R&D	854288043.8	148980051.6	624144576.7	29945902.1	13664068.9	23961543.0	13591901.5
Basic research	132064934.3	75057491.5	20557380.6	9996433.7	8047617.4	9160226.3	9245784.8
Applied research	169654641.2	43503918.7	90396242.3	16630952.5	3699011.9	12207246.2	3217269.6
Development	552568468.3	30418641.4	513190953.8	3318515.9	1917439.6	2594070.5	1128847.1
2018							
Current expenditure on R&D	960689437.2	173022401.1	684924043.2	39639658.0	16692222.2	30698357.3	15712755.4
Basic research	169174956.7	96339608.1	26082030.5	12875130.6	9714906.8	12681749.4	11481531.3
Applied research	197209324.5	43416306.3	105317837.9	23622352.9	5316803.0	15872396.2	3663628.2
Development	594305156.0	33266486.7	553524174.8	3142174.5	1660512.4	2144211.7	567595.9

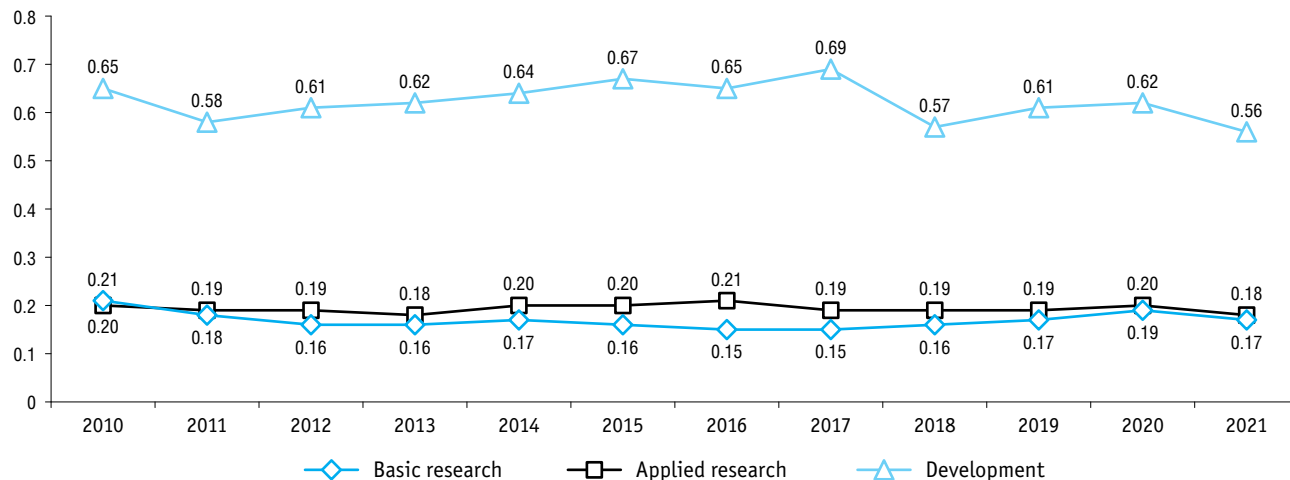
(continued)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2019							
Current expenditure on R&D	1060589716.7	188396592.2	764035947.0	43218695.4	18247519.2	30069137.0	16621825.9
Basic research	181371877.9	100997875.3	31630052.6	12503059.0	11083735.8	12441761.5	12715393.7
Applied research	213363276.3	50223371.0	111193075.2	26920256.9	5429795.7	16176551.6	3420225.9
Development	665854562.5	37175345.9	621212819.2	3795379.5	1733987.7	1450823.9	486206.3
2020							
Current expenditure on R&D	1091333468.1	211497369.9	756168047.3	50254524.4	21197446.6	33867614.5	18348465.4
Basic research	205227856.2	109944433.4	41446415.9	12934144.0	13423193.1	13448217.6	14031452.2
Applied research	218491534.4	55837579.2	103554206.3	30832295.9	6033906.9	18373868.6	3859677.5
Development	667614077.5	45715357.3	611167425.1	6488084.5	1740346.6	2045528.3	457335.7
2021							
Current expenditure on R&D	1193578508.5	219571570.5	834160639.1	58081604.0	23986289.0	36744103.4	21034302.5
Basic research	223093559.3	118117756.5	43448641.6	16065980.4	14758223.2	14099460.8	16603496.8
Applied research	233457720.2	57194172.8	110019275.5	35716247.7	7292100.2	19281030.5	3954893.5
Development	737027229.0	44259641.2	680692722.0	6299375.9	1935965.6	3363612.1	475912.2

3.23. PERCENTAGE DISTRIBUTION OF CURRENT EXPENDITURE ON R&D BY TYPE OF R&D ACTIVITY



3.24. GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP BY TYPE OF R&D ACTIVITY



3.25. AVERAGE MONTHLY SALARY OF R&D PERSONNEL

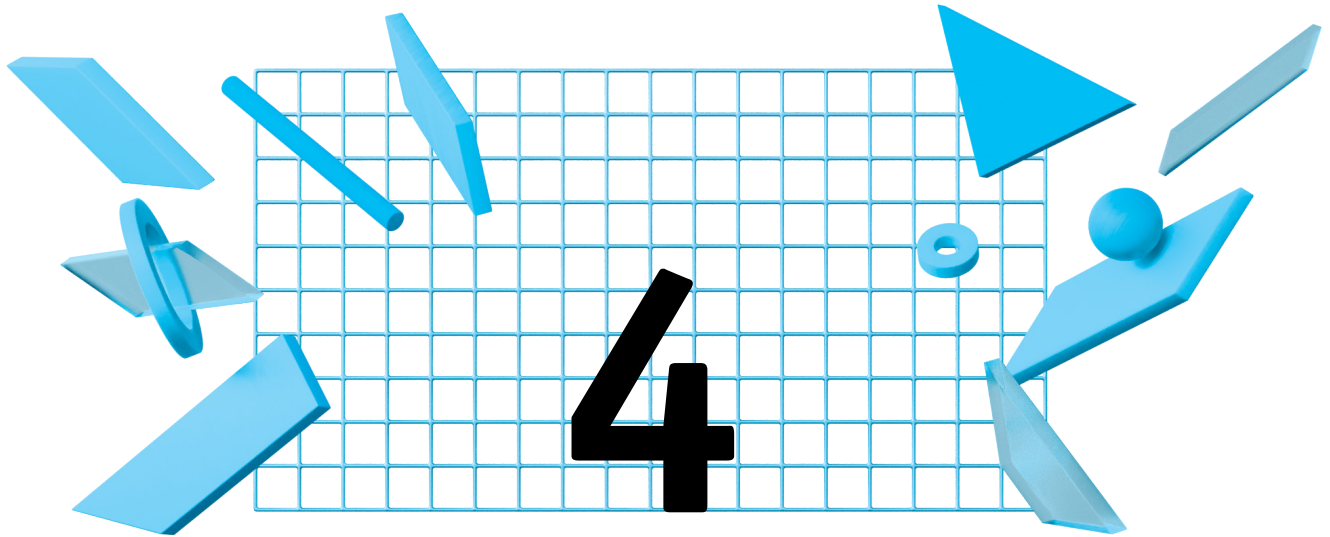
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Average monthly salary, roubles	2322.9	8672.0	25043.5	41511.8	43539.5	48833.6	53272.0	57012.6	60247.3	67685.0
As a percentage of the salary:										
in the national economy (=100%)	104.5	101.4	119.5	122.0	118.6	124.7	121.8	119.1	117.3	118.2
in manufacturing (=100%)	98.2	103.0	131.3	130.1	125.9	126.8	130.8	130.0	129.5	129.1
in construction (=100%)	88.0	95.9	118.3	138.6	134.7	145.0	138.3	133.7	134.7	130.3

3.26. TAX INCENTIVES ON R&D BY TYPE

(million roubles)

	2015	2016	2017	2018	2019	2020	2021
Tax expenditure on R&D – total	122800.1	139890.2	143133.1	144926.4	176871.7	186468.6	199921.6
VAT exemption	111953.9	128150.0	128925.2	128188.3	161831.2	169735.4	178401.5
R&D funded from budget and special foundations	82718.1	96199.2	95200.5	86585.6	104606.8	96736.9	112260.6
Sales of exclusive rights on R&D results and of which – to computer software	21976.3	24882.9	27767.7	34651.3	50369.4	65856.1	54388.6
R&D aimed at development/improvement of new technologies and products (for selected types of economic activity)	–	–	–	–	–	–	51560.4
Income tax reduction	7259.6	7067.9	5956.9	6951.4	6855.1	7142.4	11752.4
Accelerated depreciation of fixed assets for S&T activity	8790.2	9552.2	12005.1	14158.8	13016.1	15091.4	19714.6
Accelerated R&D expenditure write-off	41.0	37.2	36.6	35.4	23.5	21.8	21.8
Property tax exemption	8749.2	9514.2	11968.5	14123.4	12992.6	15069.6	19692.8
State Research Centres	2056.0	2188.9	2202.9	2579.3	2024.3	1641.8	1805.5
State Research Centres	2056.0	2188.9	2202.9	2579.3	2024.3	1641.8	1805.5

Sources: national statistical surveys on the structure of VAT calculation, on the tax base and the structure of income tax calculation for organisations, on the tax base and the structure of property tax calculation for organisations.



R&D FIXED ASSETS

4.1. R&D FIXED ASSETS

	2010	2015	2016	2017	2018	2019	2020	2021
At current prices								
Fixed assets – total, million roubles	741512.1	1498990.8	1696171.4	1966209.0	2092417.2	2725667.6	2210443.5	2423645.6
Per employee, thousand roubles	1006.8	2028.8	2348.3	2777.6	3065.5	3993.9	3253.8	3657.2
Per researcher, thousand roubles	2010.0	3950.8	4579.6	5464.8	6015.2	7827.4	6379.4	7125.4
Machinery and equipment, million roubles	300165.9	676194.6	753104.4	827473.9	1002702.6	1182278.1	1099478.6	1246305.5
Per employee, thousand roubles	407.5	915.2	1042.7	1168.9	1469.0	1732.4	1618.5	1880.6
Per researcher, thousand roubles	813.6	1782.2	2033.3	2299.9	2882.5	3395.2	3173.1	3664.1
Machinery and equipment under 5 years, million roubles	...	320676.7	352080.8	347976.6	405001.4	419297.2	429051.9	462366.1
As a percentage of the total value of machinery and equipment	...	47.4	46.8	42.1	40.4	35.5	39.0	37.1
At constant 2010 prices*								
Fixed assets – total, million roubles	741512.1	970848.9	1016889.3	1144475.5	1153482.5	1420358.3	1091577.0	1135728.9
per employee, thousand roubles	1006.8	1314.0	1407.9	1616.7	1689.9	2081.2	1606.8	1713.8
per researcher, thousand roubles	2010.0	2558.8	2745.5	3180.9	3316.0	4078.9	3150.3	3339.0
Machinery and equipment, million roubles	300165.9	437949.9	451501.5	481649.5	552757.8	616090.7	542952.4	584023.2
Per employee, thousand roubles	407.5	592.7	625.1	680.4	809.8	902.7	799.2	881.3
Per researcher, thousand roubles	813.6	1154.3	1219.0	1338.7	1589.1	1769.3	1567.0	1717.0
Machinery and equipment under 5 years, million roubles	...	207692.2	211079.6	202547.5	223264.3	218497.7	211877.5	216666.4

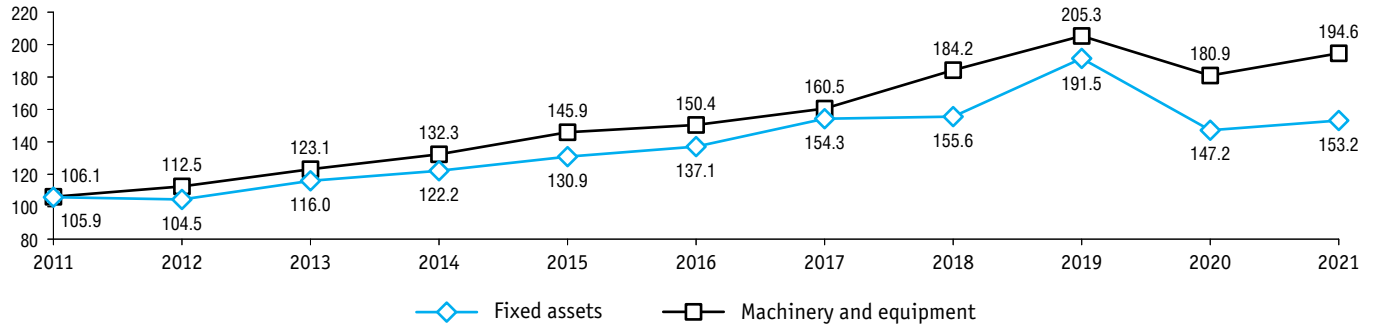
* The data are calculated taking into account the GDP deflator as at April 08, 2022.

4.2. TRENDS IN R&D FIXED ASSETS VALUE*

(at constant 2010 prices)

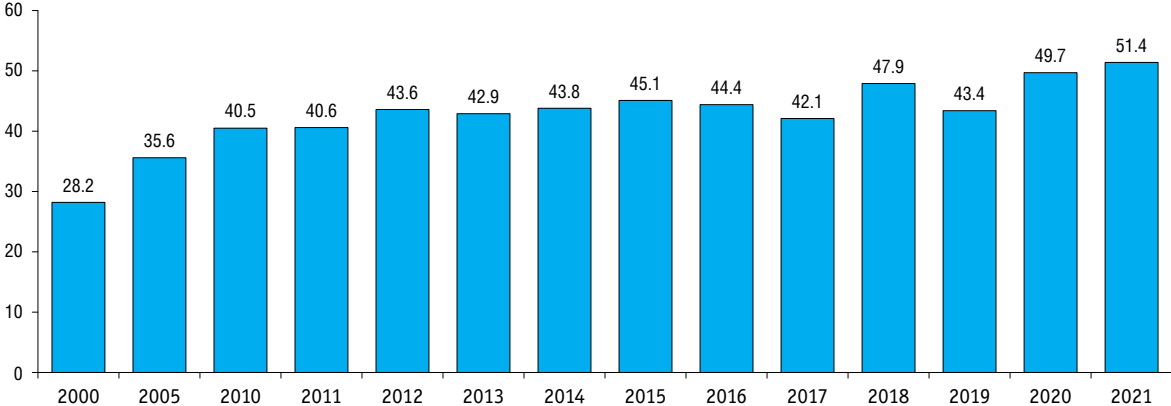
2010 = 100%

Percentage



* The data are calculated taking into account the GDP deflator as at April 08, 2022.

4.3. MACHINERY AND EQUIPMENT AS A PERCENTAGE OF THE TOTAL R&D FIXED ASSETS VALUE



4.4. R&D FIXED ASSETS BY OWNERSHIP OF R&D INSTITUTIONS

(million roubles)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Fixed assets										
Total	237564.4	399515.9	741512.1	1498990.8	1696171.4	1966209.0	2092417.2	2725667.6	2210443.5	2423645.6
Russian ownership	232793.0	393181.0	725165.1	1469213.6	1671745.0	1940826.9	2033060.1	2664373.2	2171378.6	2379939.0
Public ownership	194659.0*	344693.4	635491.6	1126242.5	1225443.7	1326141.4	1413339.4	1979598.6	1392776.3	1509069.0
Federal	191972.3	336223.9	617118.2	1090290.3	1188742.5	1291470.8	1376810.5	1942860.4	1344435.6	1475236.3
Regional	2686.3	8469.5	18110.1	35952.3	36701.2	34670.7	36528.9	36738.2	48340.7	33832.7
Municipal ownership	541.7	28.2	35.9	104.4	113.7	115.0	122.3	135.2	100.7	7.3
Ownership by voluntary associations	221.8	38.9	82.1	832.5	898.4	1221.7	1000.7	999.2	1305.2	1463.0
Private ownership	10499.1	17478.8	43615.5	107275.4	154400.3	173735.1	217269.3	217594.2	240920.8	238187.0
Ownership by Russian citizens permanently living abroad	...	...	...	...*	...*	...*	...*	-	-	-
Ownership by consumers' cooperatives	0.09	0.9	1.7	28.9	29.9	28.6	...*	-	-	-
Mixed ownership	26871.3	30940.7	42862.9	157314.6	194653.9	294699.8	253602.1	319339.6	370520.8	393050.9
Mixed ownership with a share of public ownership	...	...	38571.0	117386.6	155829.6	238539.2	178219.6	187595.4	196860.6	221607.8
Other mixed ownership	...	...	...	39928.0	38824.3	56160.6	75382.5	131744.1	173660.2	171443.1
Ownership by state corporations	...	...	3075.4	77404.6	96193.8	144874.1	147713.2	146706.4	165754.9	238161.7
Foreign ownership	49.0	114.9	1131.5	6198.6	7957.3	9896.2	4901.1	14268.5	20039.7	22087.6
Joint ownership (with both Russian and foreign participation)	4722.4	6220.1	15215.5	23578.6	16469.1	15485.9	54456.0	47026.0	19025.2	21619.0

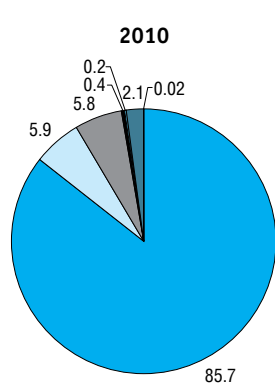
(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Machinery and equipment										
Total	66938.3	142154.7	300165.9	676194.6	753104.4	827473.9	1002702.6	1182278.1	1099478.6	1246305.5
Russian ownership	65631.5	140294.5	290440.4	659628.5	737057.5	810671.5	966639.8	1147002.3	1075544.0	1217910.4
Public ownership	53434.4*	121662.2	256172.4	503877.8	538303.6	569891.9	668862.3	798611.7	699149.1	788859.3
Federal	52750.5	117529.4	248766.8	487747.4	523789.9	552906.2	653949.1	783826.9	677428.6	773269.4
Regional	683.5	4132.8	7284.9	16130.4	14513.7	16985.7	14913.2	14784.8	21720.4	15589.9
Municipal ownership	176.0	4.7	6.2	26.0	25.3	26.7	29.4	14.7	14.5	2.1
Ownership by voluntary associations	41.6	20.4	49.5	209.1	225.2	370.1	298.3	346.4	502.2	499.4
Private ownership	4235.7	8094.0	17150.5	50474.8	70650.8	76991.6	113624.8	112020.0	115158.1	125980.8
Ownership by Russian citizens permanently living abroad	...	...	...	... **	... **	... **	... **	-	-	-
Ownership by consumers' cooperatives	0.09	0.2	1.0	7.0	7.0	7.0	... **	-	-	-
Mixed ownership	7743.7	10513.1	15944.0	70093.0	89889.1	107805.3	121003.1	161719.0	179995.2	171188.0
Mixed ownership with a share of public ownership	...	...	13870.9	52907.6	68716.0	75338.9	77292.4	93953.3	103038.1	104156.8
Other mixed ownership	...	...	...	17185.5	21173.2	32466.4	43710.8	67765.7	76957.1	67031.2
Ownership by state corporations	...	...	1116.7	34931.1	37946.0	55567.9	62809.1	74290.6	80724.9	131380.8
Foreign ownership	48.2	61.0	630.0	2958.5	5835.9	7104.1	3389.1	8890.5	11833.1	13740.8
Joint ownership (with both Russian and foreign participation)	1258.6	1799.2	9095.5	13607.6	10211.0	9698.2	32673.6	26385.3	12101.6	14654.3

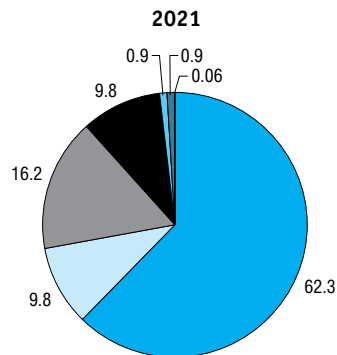
* The sum of the breakdown may not add to the total because some institutions have shared ownership.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

4.5. PERCENTAGE DISTRIBUTION OF R&D FIXED ASSETS BY OWNERSHIP OF R&D INSTITUTIONS



Fixed assets



Ownership:

public

private

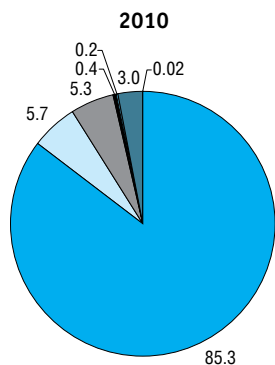
mixed

by state corporations

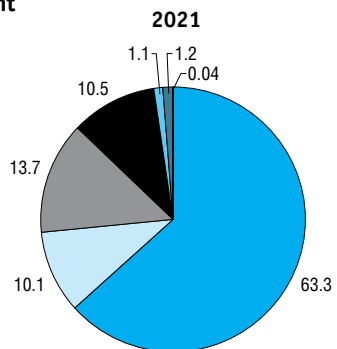
foreign ownership

joint ownership (with both Russian and foreign participation)

other ownership



Machinery and equipment

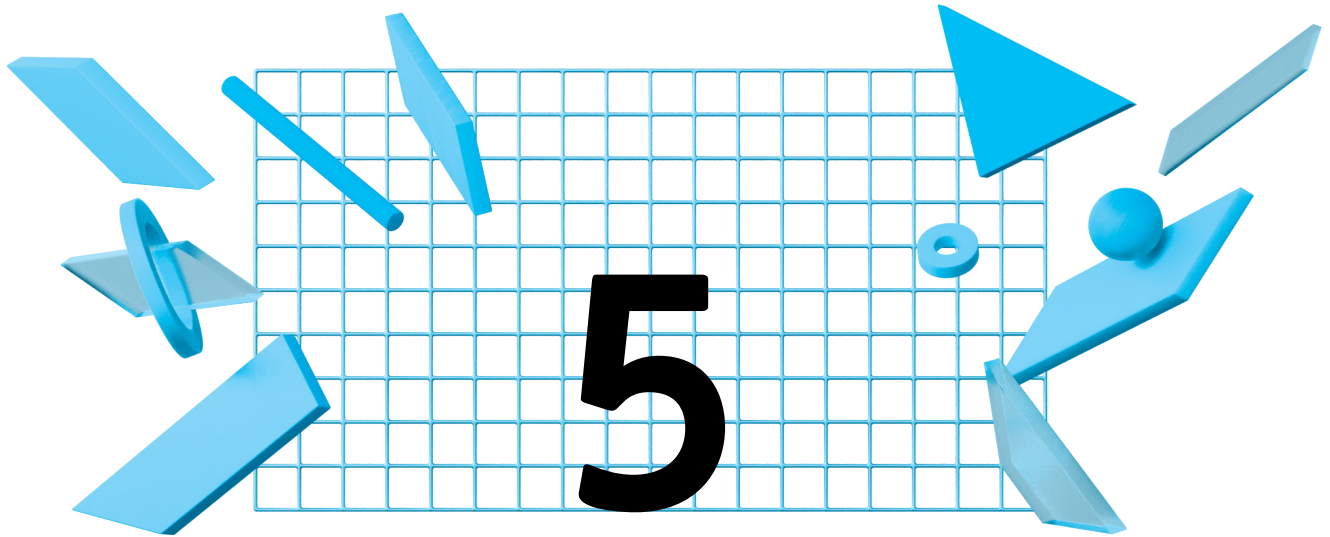


4.6. R&D FIXED ASSETS BY TYPE OF ECONOMIC ACTIVITY

(million roubles)

	Fixed assets			Machinery and equipment		
	2019	2020	2021	2019	2020	2021
Total	2725667.6	2210443.5	2423645.6	1182278.1	1099478.6	1246305.5
Agriculture, forestry and fishing	2970.3	2777.7	2520.0	379.2	479.4	376.9
Mining and quarrying	...*	...*	...*	...*	...*	...*
Manufacturing	366781.7	380164.8	386754.4	207444.0	201400.3	201426.1
Electricity, gas, steam and air-conditioning supply	–	...*	...*	–	...*	...*
Water supply; sewerage, waste management, and remediation activities	105807.4	...*	...*	...*	...*	...*
Construction	...*	...*	...*	...*	...*	...*
Wholesale and retail trade; repair of motor vehicles and motorcycles	5175.5	228.6	3826.1	2725.2	173.6	2183.8
Transportation and storage	8963.0	...*	21796.3	4889.7	...*	10287.9
Accommodation and food service activities	...*	–	...*	...*	–	...*
Information and communication	11349.8	12537.5	13487.8	8301.5	5599.0	5002.4
Financial and insurance activities	–	–	–	–	–	–
Real estate activities	2809.0	3524.6	860.9	1371.7	592.8	329.6
Professional, scientific and technical activities	1806543.8	1429823.2	1625390.8	800487.5	721324.8	841151.6
Of which research and development	1786433.3	1413894.5	1610309.6	788016.1	713087.0	830568.0
Administrative and support service activities	2731.8	2885.8	2368.0	1943.4	2225.3	2066.6
Public administration and defence; compulsory social security	1121.3	1028.1	1308.9	493.4	484.4	372.6
Education	376252.0	317421.9	314972.9	135269.7	140948.9	161347.0
Of which higher education	375335.4	316926.2	314772.3	134623.8	140801.0	161240.3
Human health and social work activities	25337.9	31401.5	21812.5	12522.0	18234.1	15793.1
Art, entertainment and recreation	5909.2	4498.4	3866.8	1356.4	1018.9	960.5
Other service activities	83.1	87.1	9.2	76.7	30.0	6.6

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).



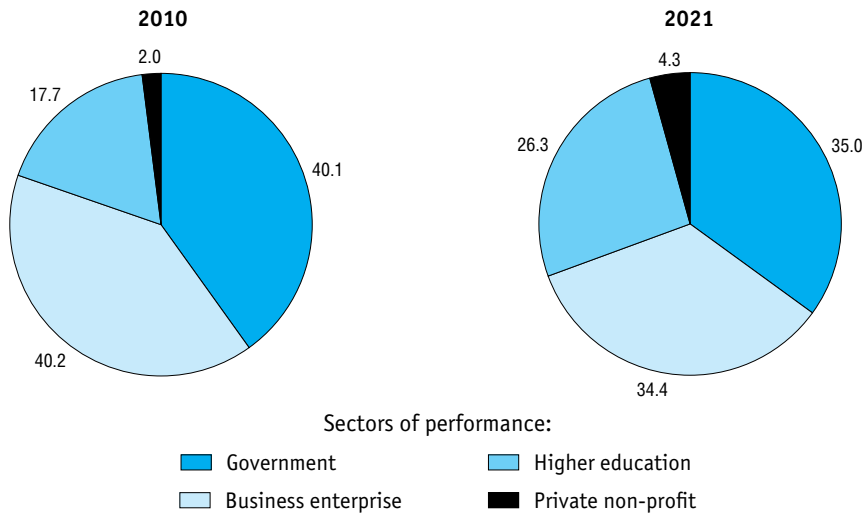
SECTORS OF R&D PERFORMANCE

5.1. Composite indices

5.1.1. R&D INSTITUTIONS BY SECTOR OF PERFORMANCE

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
2000	4099	1247	2278	526	48
2005	3566	1282	1703	539	42
2006	3622	1341	1682	540	59
2007	3957	1483	1742	616	116
2008	3666	1429	1540	603	94
2009	3536	1406	1446	603	81
2010	3492	1400	1405	617	70
2011	3682	1457	1450	696	79
2012	3566	1465	1362	662	77
2013	3605	1495	1269	762	79
2014	3604	1491	1265	777	71
2015	4175	1560	1400	1124	91
2016	4032	1546	1326	1064	96
2017	3944	1493	1292	1038	121
2018	3950	1511	1304	998	137
2019	4051	1479	1374	1057	141
2020	4175	1501	1426	1080	168
2021	4175	1462	1437	1096	180

5.1.2. PERCENTAGE DISTRIBUTION OF R&D INSTITUTIONS BY SECTOR OF PERFORMANCE



5.1.3. R&D PERSONNEL BY SECTOR OF PERFORMANCE AND OCCUPATION

(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	887729	813207	736540	738857	722291	707887	682580	682464	679333	662702
Researchers	425954	391121	368915	379411	370379	359793	347854	348221	346497	340142
Technicians	75184	65982	59276	62805	60441	59690	57722	58681	59557	60474
Supporting staff	240506	215555	183713	174056	171915	170347	160591	160864	158298	152066
Others	146085	140549	124636	122585	119556	118057	116413	114698	114981	110020
Government sector	255850	272718	259007	265429	269056	268080	270357	227480	248680	234973
Researchers	129725	139378	131734	134794	134225	130081	131366	113555	120649	115208
Technicians	25085	25462	24009	27090	26075	26040	24923	21468	24966	23396
Supporting staff	59706	61448	56530	56552	61140	62961	63570	48065	54714	50771
Others	41334	46430	46734	46993	47616	48998	50498	44392	48351	45598
Business enterprise sector	590646	496706	423112	408802	388385	377150	347080	379442	359280	352581
Researchers	267640	221445	197785	198123	190378	186347	171205	185358	178481	175178
Technicians	46535	36837	30063	29850	27519	26788	26012	29105	26784	27720
Supporting staff	175261	147980	120485	108230	101219	98139	88124	101175	92888	90371
Others	101210	90444	74779	72599	69269	65876	61739	63804	61127	59312
Higher education sector	40787	43500	53290	63870	63046	59729	64073	74215	68860	72353
Researchers	28325	30111	38640	45967	44994	42113	44489	48429	45837	48087
Technicians	3509	3658	5095	5836	6789	6584	6736	8036	7478	8987
Supporting staff	5463	6098	6564	9217	8929	8391	8838	11489	10491	10648
Others	3490	3633	2991	2850	2334	2641	4010	6261	5054	4631
Private non-profit sector	446	283	1131	756	1804	2928	1070	1327	2513	2795
Researchers	264	187	756	527	782	1252	794	879	1530	1669
Technicians	55	25	109	29	58	278	51	72	329	371
Supporting staff	76	29	134	57	627	856	59	135	205	276
Others	51	42	132	143	337	542	166	241	449	479

5.1.4. R&D PERSONNEL BY SECTOR OF PERFORMANCE AND EDUCATIONAL ATTAINMENT

(headcount)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
R&D personnel					
2005	813207	272718	496706	43500	283
2010	736540	259007	423112	53290	1131
2015	738857	265429	408802	63870	756
2018	682580	270357	347080	64073	1070
2019	682464	227480	379442	74215	1327
2020	679333	248680	359280	68860	2513
2021	662702	234973	352581	72353	2795
Higher education					
2005	501718	177676	288649	35159	234
2010	493852	178026	268821	46112	893
2015	537118	194608	283664	58144	702
2018	511222	198459	253804	57980	979
2019	516809	170945	278640	66024	1200
2020	518917	186809	267786	62040	2282
2021	508871	178097	262329	65973	2472
Secondary vocational education					
2005	134222	40495	89265	4430	32
2010	109158	36091	69552	3394	121
2015	95640	33163	60370	2071	36
2018	85539	34300	48957	2224	58
2019	86590	28537	55205	2767	81
2020	85533	32528	50849	2050	106
2021	83247	30108	50850	2147	142

(continued)

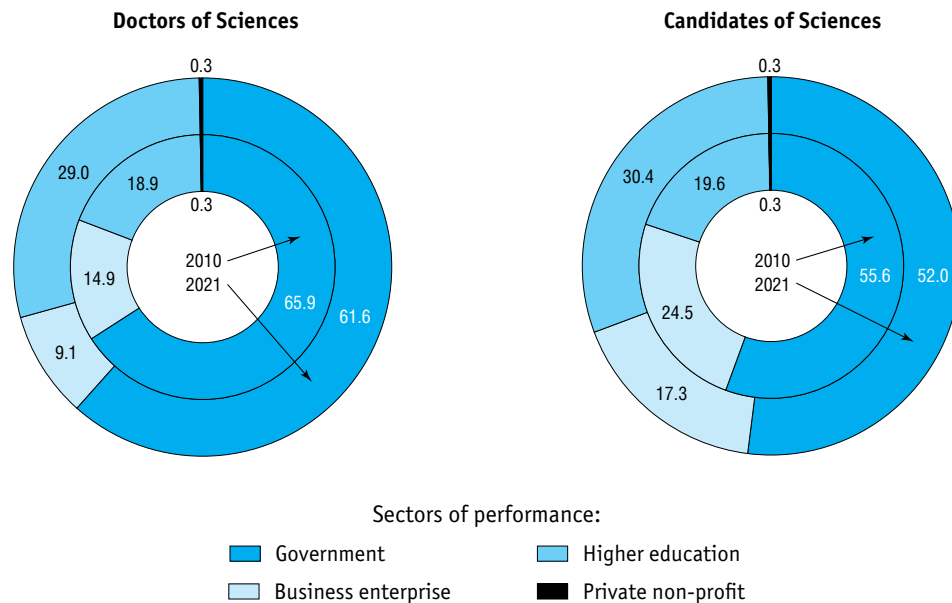
	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Other education					
2005	177267	54547	118792	3911	17
2010	133530	44890	84739	3784	117
2015	106099	37658	64768	3655	18
2018	85819	37598	44319	3869	33
2019	79065	27998	45597	5424	46
2020	74883	29343	40645	4770	125
2021	70584	26768	39402	4233	181

5.1.5. RESEARCHERS WITH SCIENTIFIC DEGREES BY SECTOR OF PERFORMANCE

(persons)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Researchers with scientific degrees	105911	99428	105114	111533	108388	103327	100330	99912	99122	97537
Doctors of Sciences	21949	23410	26789	28046	27430	26076	25288	24844	24473	24074
Candidates of Sciences	83962	76018	78325	83487	80958	77251	75042	75068	74649	73463
Government sector	58901	60066	61194	63906	62285	59138	56387	53505	55109	53019
Doctors of Sciences	14987	16511	17646	18264	17781	16948	15934	15074	15373	14838
Candidates of Sciences	43914	43555	43548	45642	44504	42190	40453	38431	39736	38181
Business enterprise sector	34775	26661	23169	20270	18833	18107	16575	17493	15695	14881
Doctors of Sciences	4806	4222	3987	3413	3071	2873	2591	2754	2349	2187
Candidates of Sciences	29969	22439	19182	16857	15762	15234	13984	14739	13346	12694
Higher education sector	12113	12618	20423	27184	27109	25812	27132	28572	28041	29319
Doctors of Sciences	2120	2654	5068	6318	6532	6185	6692	6914	6687	6978
Candidates of Sciences	9993	9964	15355	20866	20577	19627	20440	21658	21354	22341
Private non-profit sector	122	83	328	173	161	270	236	342	277	318
Doctors of Sciences	36	23	88	51	46	70	71	102	64	71
Candidates of Sciences	86	60	240	122	115	200	165	240	213	247

5.1.6. PERCENTAGE DISTRIBUTION OF RESEARCHERS WITH SCIENTIFIC DEGREES BY SECTOR OF PERFORMANCE



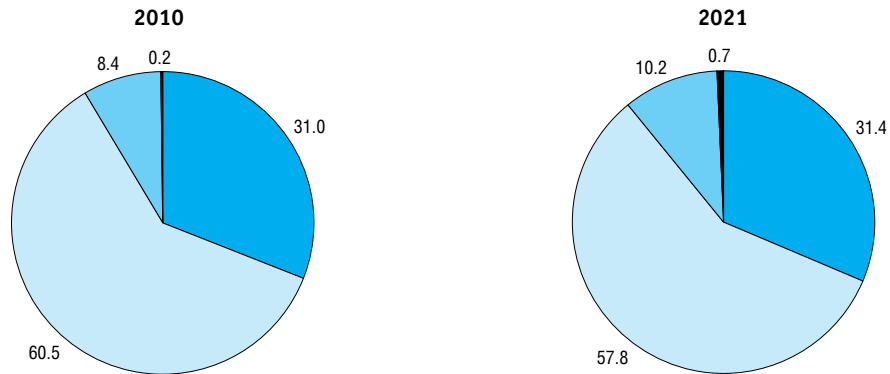
5.1.7. GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE

(thousand roubles)

	2010	2015	2016	2017	2018	2019	2020	2021
At current prices								
Gross domestic expenditure on R&D	523377233.9	914669057.2	943815219.6	1019152437.1	1028247644.8	1134786664.6	1174534297.3	1301490944.5
Government	161988411.4	284154288.3	301775305.3	310029734.6	354037790.2	320991529.3	385550663.3	408458070.8
Business enterprise	316701679.9	541533094.3	554093599.1	612960678.4	571633146.1	688349498.9	664773104.2	752056929.7
Higher education	43714007.3	87730781.4	85932983.0	91934601.3	99497983.2	120583819.3	115667831.6	132125467.4
Private non-profit	973135.3	1250893.2	2013332.2	4227422.8	3078725.3	4861817.1	8542698.2	8850476.6
At constant 2010 prices*								
Gross domestic expenditure on R&D	523377233.9	597159402.8	599399987.0	614650767.2	563763169.5	602296409.2	619055656.6	588803358.9
Government	161988411.4	185515628.6	191652042.0	186978912.4	194110307.7	170368626.6	203210174.1	184789210.5
Business enterprise	316701679.9	353550365.1	351894829.9	369676544.5	313412547.9	365346584.0	350378487.4	340235672.1
Higher education	43714007.3	57276739.2	54574484.3	55445751.9	54552323.7	64000753.3	60964439.8	59774460.5
Private non-profit	973135.3	816669.8	1278630.9	2549558.4	1687990.2	2580445.4	4502555.3	4004015.8

* Here and below in this section, the data are calculated using GDP deflator as of April 08, 2022.

5.1.8. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE



Sectors of performance:

- Government
- Higher education
- Business enterprise
- Private non-profit

5.1.9. GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP BY SECTOR OF PERFORMANCE

	Total	Government sector	Business enterprise sector	Higher education sector
2000	1.05	0.26	0.74	0.05
2005	1.07	0.28	0.73	0.06
2006	1.07	0.29	0.72	0.07
2007	1.12	0.32	0.72	0.07
2008	1.04	0.31	0.66	0.07
2009	1.25	0.38	0.78	0.09
2010	1.13	0.35	0.68	0.09
2011	1.02	0.30	0.62	0.09
2012	1.03	0.33	0.60	0.10
2013	1.03	0.31	0.62	0.09
2014	1.07	0.33	0.64	0.11
2015	1.10	0.34	0.65	0.11
2016	1.10	0.35	0.65	0.10
2017	1.11	0.34	0.67	0.10
2018	0.99	0.34	0.55	0.10
2019	1.04	0.29	0.63	0.11
2020	1.09	0.36	0.62	0.11
2021	0.99	0.31	0.57	0.10

5.1.10. GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE AND SOURCE OF FUNDS

(thousand roubles)

	Total	Government*	Business enterprise	Higher education	Private non-profit	Funds from abroad
2015						
Gross domestic expenditure on R&D	914669057.2	635859865.4	242155382.4	10875090.0	1566750.2	24211969.2
Sectors of R&D performance:						
government	284154288.3	240265758.8	32877099.7	321525.4	163335.5	10526568.9
business enterprise	541533094.3	343396867.3	185037359.3	561703.2	421868.8	12115295.7
higher education	87730781.4	51570251.1	24028351.9	9979551.2	671465.0	1481162.2
private non-profit	1250893.2	626988.2	212571.5	12310.2	310080.9	88942.4
2018						
Gross domestic expenditure on R&D	1028247644.8	689270557.4	303219233.8	8841468.3	2761098.4	24155286.9
Sectors of R&D performance:						
government	354037790.2	306902140.4	34001536.7	263610.1	450830.9	12419672.1
business enterprise	571633146.1	321302048.6	239608783.5	140133.6	137267.2	10444913.2
higher education	99497983.2	60269300.1	28911169.3	8436774.6	638991.1	1241748.1
private non-profit	3078725.3	797068.3	697744.3	950.0	1534009.2	48953.5
2019						
Gross domestic expenditure on R&D	1134786664.6	752260999.0	342832982.1	9010684.2	3462827.9	27219171.4
Sectors of R&D performance:						
government	320991529.3	285936853.1	30095122.4	270058.5	301188.9	4388306.4
business enterprise	688349498.9	394109751.2	272796973.4	223218.5	137358.7	21082197.1
higher education	120583819.3	70926425.7	38811041.2	8516807.2	668979.4	1660565.8
private non-profit	4861817.1	1287969.0	1129845.1	600.0	2355300.9	88102.1

(continued)

	Total	Government*	Business enterprise	Higher education	Private non-profit	Funds from abroad
2020						
Gross domestic expenditure on R&D	1174534297.3	796369857.5	343277964.2	10876282.2	3327080.1	20683113.3
Sectors of R&D performance:						
government	385550663.3	347367596.8	34200252.1	397856.0	198513.8	3386444.6
business enterprise	664773104.2	374706775.4	273751774.6	243993.5	465468.0	15605092.7
higher education	115667831.6	68550845.1	34306561.0	10212551.5	1003087.0	1594787.0
private non-profit	8542698.2	5744640.2	1019376.5	21881.2	1660011.3	96789.0
2021						
Gross domestic expenditure on R&D	1301490944.5	878778557.6	378025987.0	15733105.5	3829258.9	25124035.5
Sectors of R&D performance:						
government	408458070.8	369871621.7	33605446.0	487836.9	234061.4	4259104.8
business enterprise	752056929.7	426727754.2	305629816.1	271097.6	244622.7	19183639.1
higher education	132125467.4	76977653.9	37556241.5	14954576.7	1123152.2	1513843.1
private non-profit	8850476.6	5201527.8	1234483.4	... **	2227422.6	167448.5

* Including budget funds, general university funds, and government sector institutions' funds (including own funds).

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.1.11. SUBSIDIES, GRANTS, AND OTHER COMPETITIVE R&D FUNDING BY SECTOR OF PERFORMANCE: 2021

(thousand roubles)

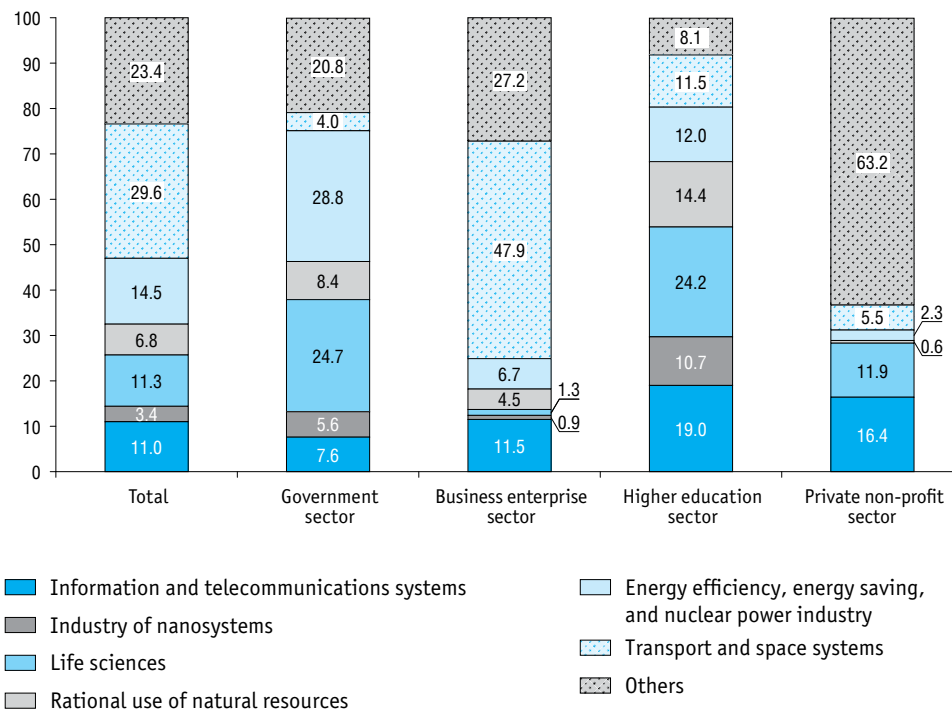
	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Budget subsidies for institutional R&D funding	216297666.5	160541840.8	27626876.7	27273854.2	855094.8
Of which federal	207230612.7	154851304.8	26294002.7	25385881.4	699423.8
Budget subsidies for performing R&D	72488430.7	16772668.2	43369524.2	12123560.0	222678.3
Of which federal	71599523.6	16625186.8	43257443.7	11496964.8	219928.3
Grants from foundations for S&T and innovation	42747145.3	20043488.5	1755990.6	20466691.0	480975.2
Funds from budgets of all levels	34174780.3	17125150.8	184762.5	16412093.2	452773.8
Of which federal	31247960.5	14966123.1	168635.0	15731228.6	381973.8
Other types of competitive financing	76324697.3	20320168.0	44581979.8	10990393.5	432156.0
Funds from budgets of all levels	57413651.4	16091520.7	36254457.6	4647143.1	420530.0
Of which federal	56688146.4	15843041.4	36239178.4	4186890.6	419036.0

5.1.12. GROSS DOMESTIC EXPENDITURE ON R&D BY PRIORITY S&T AREA AND SECTOR OF PERFORMANCE: 2021

(thousand roubles)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Gross domestic expenditure on R&D by priority S&T areas	905910253.6	299532405.4	512361473.1	88480043.8	5536331.3
Of which:					
information and telecommunications systems	99672990.0	22906296.1	59029478.9	16827857.4	909357.6
industry of nanosystems	30705476.3	16666995.3	4534286.7	9504194.3	–
life sciences	102632444.2	74072437.3	6460305.3	21441829.4	657872.2
rational use of natural resources	61291804.7	25242117.2	23265181.8	12750689.4	33816.3
energy effectiveness, energy saving, and nuclear power engineering	131427271.9	86373624.8	34342859.2	10582854.4	127933.5
transport and space systems	268070469.6	12092949.9	245483823.7	10187527.0	306169.0

5.1.13. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D
BY PRIORITY S&T AREA AND SECTOR OF PERFORMANCE: 2021



**5.1.14. SOURCES OF FUNDS FOR GROSS DOMESTIC EXPENDITURE ON R&D
BY PRIORITY S&T AREA AND SECTOR OF PERFORMANCE: 2021**

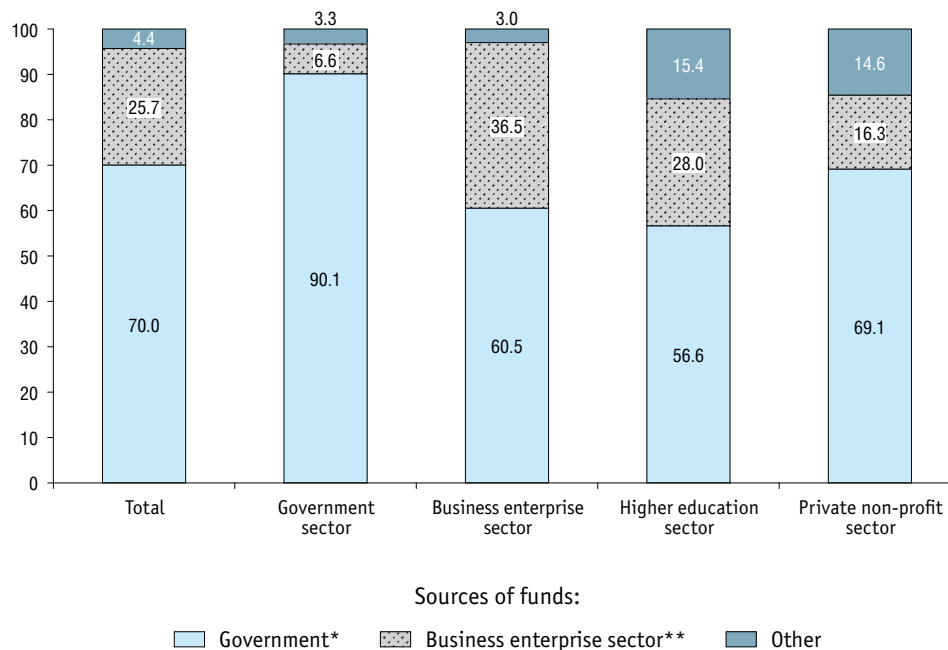
(thousand roubles)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Gross domestic expenditure on R&D by priority S&T areas	905910253.6	299532405.4	512361473.1	88480043.8	5536331.3
Including by sources of funds:					
government*	633787580.2	269812555.2	310083770.5	50065721.7	3825532.8
of which federal budget appropriations	504400050.3	209265354.6	247642206.4	43961657.1	3530832.2
business enterprise sector**	232537784.1	19855893.8	187033428.2	24748486.3	899975.8
other	39584889.3	9863956.4	15244274.4	13665835.8	810822.7

* Including budget funds and government sector institutions' funds (including own funds).

** Business enterprise sector institutions' funds (including own funds).

5.1.15. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY PRIORITY S&T AREA, SECTOR OF PERFORMANCE, AND SOURCE OF FUNDS: 2021



* Including budget funds and government sector institutions' funds (including own funds).

** Business enterprise sector institutions' funds (including own funds).

5.1.16. GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE AND SOCIO-ECONOMIC OBJECTIVE

(thousand roubles)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
2015					
Gross domestic expenditure on R&D	914669057.2	284154288.3	541533094.3	87730781.4	1250893.2
Economic development	335508245.3	66498291.0	229892147.1	38839549.5	278257.7
Social objectives	47512609.4	26204488.0	3635210.6	17511474.7	161436.1
General advancement of science	145154435.8	84086241.6	37477260.5	23092224.3	498709.4
Exploration and exploitation of the Earth and the atmosphere	43206894.0	18496276.7	22445320.5	2221571.2	43725.6
Peaceful uses of outer space	57441295.9	10919478.4	45009580.3	1437968.4	74268.8
Other	285845576.8	77949512.6	203073575.3	4627993.3	194495.6
2018					
Gross domestic expenditure on R&D	1028247644.8	354037790.2	571633146.1	99497983.2	3078725.3
Economic development	408881985.5	87448534.4	276559143.7	43910298.2	964009.2
Social objectives	54264887.5	31469966.4	2171080.2	20318937.0	304903.9
General advancement of science	169868470.5	107649755.5	34995204.0	26310367.5	913143.5
Exploration and exploitation of the Earth and the atmosphere	40888641.4	17546248.8	20805154.5	2496650.9	40587.2
Peaceful uses of outer space	43631330.1	11858878.8	30876915.6	880112.3	15423.4
Other	310712329.8	98064406.3	206225648.1	5581617.3	840658.1

(continued)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
2019					
Gross domestic expenditure on R&D	1134786664.6	320991529.3	688349498.9	120583819.3	4861817.1
Economic development	441468455.2	55117264.3	340801643.4	44980166.5	569381.0
Social objectives	59966499.6	33976791.9	3948546.3	21675725.5	365435.9
General advancement of science	195163836.5	105269654.3	50089846.8	38248978.5	1553356.9
Exploration and exploitation of the Earth and the atmosphere	42964967.8	18951110.9	20386543.8	3353956.9	273356.2
Peaceful uses of outer space	60031472.7	8592604.4	50305406.4	1119240.9	...*
Other	335191432.8	99084103.5	222817512.2	11205751.0	2084066.1
2020					
Gross domestic expenditure on R&D	1174534297.3	385550663.3	664773104.2	115667831.6	8542698.2
Economic development	447604583.4	73907670.5	328835860.5	42949991.0	1911061.4
Social objectives	70988426.0	42901043.2	2744995.5	23116614.2	2225773.1
General advancement of science	223783022.8	129615428.7	54920023.7	37979104.9	1268465.5
Exploration and exploitation of the Earth and the atmosphere	44365802.6	22977126.7	17882965.6	3442359.4	63350.9
Peaceful uses of outer space	48882620.6	14101812.4	33714742.0	1066004.5	...*
Other	338909841.9	102047581.8	226674516.9	7113757.6	3073985.6

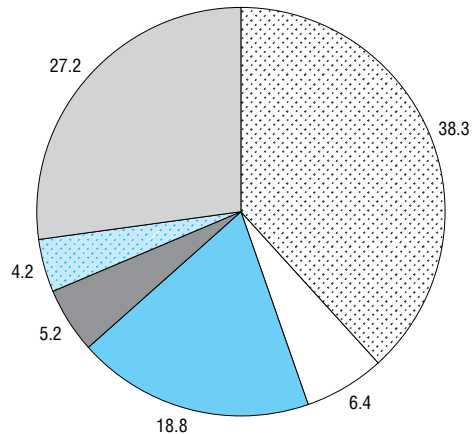
(continued)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
2021					
Gross domestic expenditure on R&D	1301490944.5	408458070.8	752056929.7	132125467.4	8850476.6
Economic development	498341858.5	72500849.3	374778598.0	49177270.9	1885140.3
Social objectives	82781984.3	47001857.9	5634559.0	27891160.9	2254406.5
General advancement of science	244459695.2	141248085.2	59458903.7	41955658.4	1797047.9
Exploration and exploitation of the Earth and the atmosphere	67457945.6	45995190.5	17805434.3	3629755.8	27565.0
Peaceful uses of outer space	54776976.3	9183725.7	4437281.5	1215969.1	–
Other	353672484.6	92528362.2	250002153.2	8255652.3	2886316.9

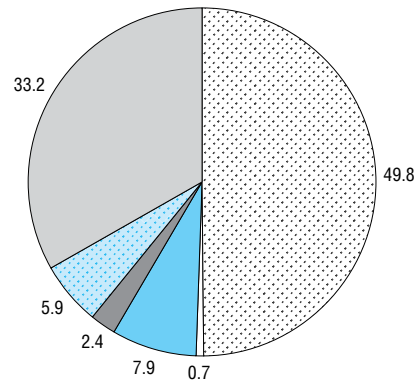
* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).




5.1.17. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE AND SOCIO-ECONOMIC OBJECTIVE: 2021




**Total –
1,301,490.9 million roubles**



**Business enterprise sector –
752,056.9 million roubles**

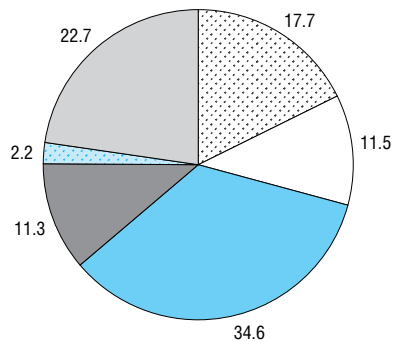


 Economic development
 Social objectives
 General advancement of science

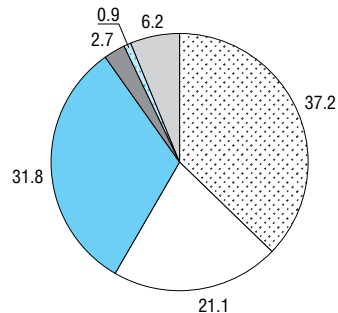
 Exploration and exploitation of the Earth and the atmosphere
 Peaceful uses of outer space
 Other

(continued)

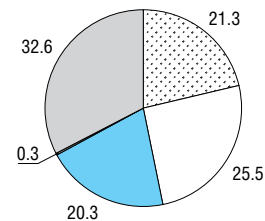
**Government sector –
408,458.1 million roubles**









**Higher education
sector –
132,125.5 million roubles**



**Private non-profit
sector –
8,850.5 million roubles**



-  Economic development
-  Social objectives
-  General advancement of science
-  Exploration and exploitation of the Earth and the atmosphere
-  Peaceful uses of outer space
-  Other

5.1.18. CURRENT EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE AND TYPE OF R&D ACTIVITY

(thousand roubles)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Current expenditure on R&D					
2005	221119537.6	56342327.7	151228693.6	13144292.5	404223.8
2010	489450798.7	151825126.6	294103827.7	42552245.4	969599.0
2015	854288043.8	265478556.9	503088818.5	84495233.0	1225435.4
2018	960689437.2	325114767.7	535192496.3	97311000.9	3071172.3
2019	1060589716.7	296305449.9	642575965.9	117214181.6	4494119.3
2020	1091333468.1	347925035.2	624366170.3	111405695.7	7636566.9
2021	1193578508.5	364192738.6	696291982.6	125753005.7	7340781.6
Basic research					
2005	31022855.8	24586195.8	2591506.7	3841327.6	3825.7
2010	95881364.3	65041375.9	16935403.4	13647906.8	256678.2
2015	132064934.3	99987000.6	7122577.4	24839057.2	116299.1
2018	169174956.7	121640034.7	15069244.8	31730954.7	734722.5
2019	181371877.9	122335848.1	18106435.2	38605748.7	2323845.9
2020	205227856.2	135877581.6	21611519.0	44018871.9	3719883.7
2021	223093559.3	146113040.7	24706807.3	48710911.9	3562799.4
Applied research					
2005	36360266.9	10603039.3	20026408.8	5405410.3	325408.5
2010	92010677.2	30948555.6	42872394.0	17804762.0	384965.6
2015	169654641.2	66248286.3	61520451.3	41098469.1	787434.5
2018	197209324.5	82114839.9	65737130.8	48963848.7	393505.1
2019	213363276.3	74856671.5	81431333.0	55931371.7	1143900.1
2020	218491534.4	100594445.3	63310313.2	52638722.2	1948053.7
2021	233457720.2	101723069.8	69149094.7	60773033.0	1812522.7

(continued)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Development					
2005	153736414.9	21153092.6	128610778.1	3897554.6	74989.6
2010	301558757.2	55835195.1	234296030.3	11099576.6	327955.2
2015	552568468.3	99243270.0	434445789.8	18557706.7	321701.8
2018	594305156.0	121359893.1	454386120.7	16616197.5	1942944.7
2019	665854562.5	99112930.3	543038197.7	22677061.2	1026373.3
2020	667614077.5	111453008.3	539444338.1	14748101.6	1968629.5
2021	737027229.0	116356628.1	602436080.6	16269060.8	1965459.5

5.1.19. AVERAGE MONTHLY SALARY OF R&D PERSONNEL BY SECTOR OF PERFORMANCE

(roubles)

	Total	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
2000	2322.9	2015.6	2519.9	1400.3	1836.1
2005	8672.0	7220.9	9599.6	7042.0	5767.4
2006	10840.9	9678.8	11744.8	8348.7	9409.1
2007	14683.4	14208.3	15203.6	12233.1	13237.3
2008	19263.3	19561.0	19345.3	16812.7	21161.2
2009	22104.3	22979.7	21674.1	21191.5	24253.8
2010	25043.5	24792.1	25359.7	23716.4	24438.5
2011	28387.5	27869.4	29174.9	24963.9	25956.5
2012	32539.9	31990.2	33165.2	30915.1	25983.7
2013	35618.8	34532.8	36540.8	34101.0	27979.8
2014	39549.3	38715.6	39855.8	41258.6	37197.0
2015	41511.8	40513.5	42102.7	41850.5	41898.6
2016	43539.5	42125.9	44611.1	43370.8	26588.1
2017	48833.6	44614.8	51648.5	49437.9	54279.4
2018	53272.0	54193.9	51766.7	57848.0	94276.2
2019	57012.6	60209.5	54405.3	60266.4	114840.3
2020	60247.3	64643.2	55538.9	69840.8	112868.6
2021	67685.0	71944.1	63695.3	74302.3	95401.5

5.2. Government sector

5.2.1. R&D INSTITUTIONS IN THE GOVERNMENT SECTOR BY TYPE

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	1282	1400	1560	1546	1493	1511	1479	1501	1462
Research institutes	1145	1124	1173	1167	1117	1098	1100	1128	1110
Design organisations, design-and-engineering organisations	62	61	55	55	43	44	33	32	21
Construction project and exploration organisations	6	5	8	5	5	3	2	–	–
Pilot plants	14	30	48	47	45	35	27	22	15
Others	55	180	276	272	283	331	317	319	316

5.2.2. R&D PERSONNEL IN THE GOVERNMENT SECTOR BY TYPE OF R&D INSTITUTIONS

(headcount)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	272718	259007	265429	269056	268080	270357	227480	248680	234973
Research institutes	248214	222613	230893	232100	228743	218296	203275	217214	212963
Design organisations, design-and-engineering organisations	21499	26473	19459	23544	24404	30128	9514	15640	6622
Construction project and exploration organisations	159	1419	1220	52	50	43	...*	–	–
Pilot plants	367	631	1519	1365	1372	2040	860	800	690
Others	2479	7871	12338	11995	13511	19850	13753	15026	14698

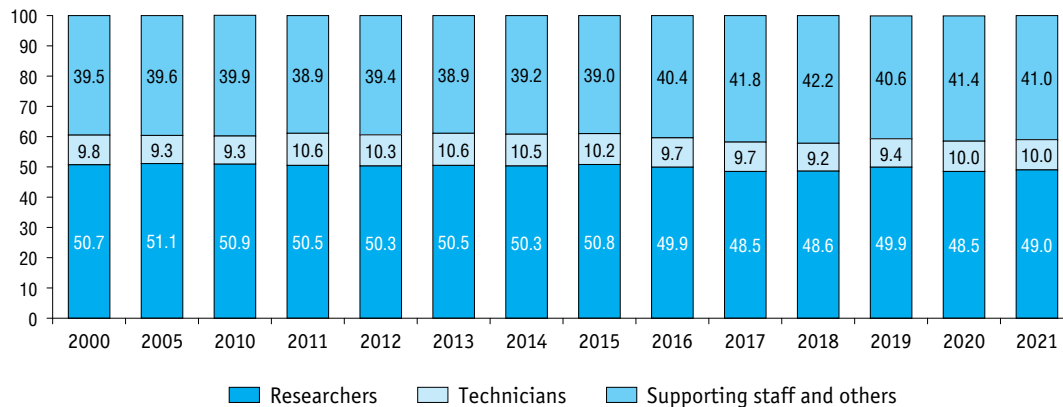
* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.2.3. R&D PERSONNEL IN THE GOVERNMENT SECTOR BY OCCUPATION

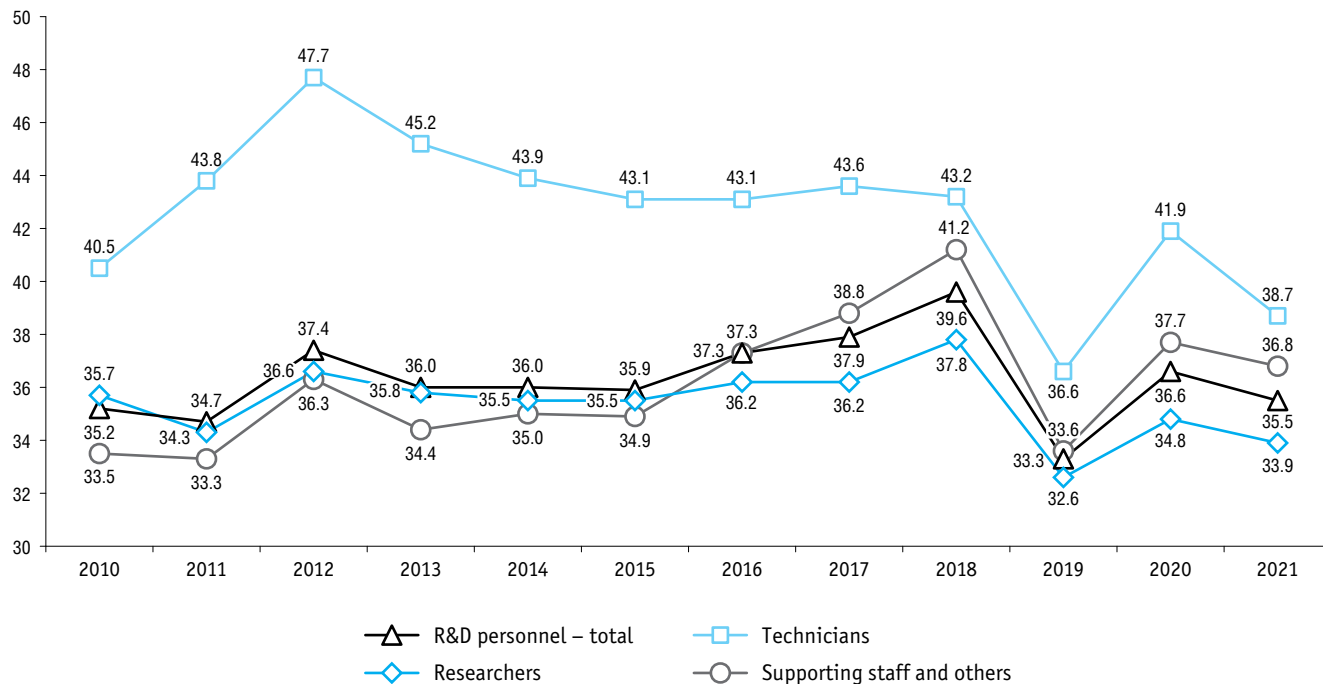
(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	255850	272718	259007	265429	269056	268080	270357	227480	248680	234973
Researchers	129725	139378	131734	134794	134225	130081	131366	113555	120649	115208
Technicians	25085	25462	24009	27090	26075	26040	24923	21468	24966	23396
Supporting staff	59706	61448	56530	56552	61140	62961	63570	48065	54714	50771
Others	41334	46430	46734	46993	47616	48998	50498	44392	48351	45598

5.2.4. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL IN THE GOVERNMENT SECTOR BY OCCUPATION



5.2.5. R&D PERSONNEL IN THE GOVERNMENT SECTOR AS A PERCENTAGE OF THE TOTAL NUMBER OF R&D PERSONNEL BY OCCUPATION



5.2.6. R&D PERSONNEL IN THE GOVERNMENT SECTOR BY OCCUPATION AND EDUCATIONAL ATTAINMENT

(headcount)

	Total	Higher education	Secondary vocational education	Other education
R&D personnel				
2005	272718	177676	40495	54547
2010	259007	178026	36091	44890
2015	265429	194608	33163	37658
2018	270357	198459	34300	37598
2019	227480	170945	28537	27998
2020	248680	186809	32528	29343
2021	234973	178097	30108	26768
Researchers				
2005	139378	139378	–	–
2010	131734	131734	–	–
2015	134794	134794	–	–
2018	131366	131366	–	–
2019	113555	113555	–	–
2020	120649	120649	–	–
2021	115208	115208	–	–
Technicians				
2005	25462	7802	12177	5483
2010	24009	9110	10155	4744
2015	27090	13761	8609	4720
2018	24923	12851	7888	4184
2019	21468	12726	5638	3104
2020	24966	14594	6315	4057
2021	23396	13650	5722	4024

(continued)

	Total	Higher education	Secondary vocational education	Other education
Supporting staff				
2005	61448	19119	15834	26495
2010	56530	21762	14287	20481
2015	56552	26144	13119	17289
2018	63570	30949	14079	18542
2019	48065	24791	11488	11786
2020	54714	28565	13822	12327
2021	50771	27312	12391	11068
Others				
2005	46430	11377	12484	22569
2010	46734	15420	11649	19665
2015	46993	19909	11435	15649
2018	50498	23293	12333	14872
2019	44392	19873	11411	13108
2020	48351	23001	12391	12959
2021	45598	21927	11995	11676

5.2.7. RESEARCHERS IN THE GOVERNMENT SECTOR BY AGE

(headcount)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Total	130081	131366	113555	120649	115208	56141	56159	49992	52543	50513
Age, years:										
under 29 inclusive	18393	18702	15131	15825	14593	7725	7880	6906	7073	6523
30–34	16785	17438	14794	15544	14041	7074	7341	6419	6712	6192
35–39	14155	14845	13479	14597	14548	6266	6415	5867	6474	6453
40–44	10657	11184	10584	11721	12025	5009	5172	4950	5438	5493
45–49	8462	8933	8101	9022	9287	4262	4384	4039	4430	4506
50–54	9892	9514	7776	7812	7415	4966	4719	4005	4017	3801
55–59	12587	12058	9935	9873	8902	5988	5766	4788	4628	4250
60–64	23209*	22608*	10602	10505	9979	9643*	9336*	4648	4626	4442
65–69			9199	9892	9136			3751	3986	3756
70 and over	15941	16084	13954	15858	15282	5208	5146	4619	5159	5097
Doctors of Sciences	16948	15934	15074	15373	14838	4637	4399	4384	4411	4325
Age, years:										
under 29 inclusive	3	19	7	5	4	–	3	...**	3	1
30–34	53	55	53	37	43	12	14	15	11	9
35–39	243	230	218	214	222	74	63	58	59	58
40–44	694	588	535	517	478	242	213	204	182	159
45–49	832	830	829	900	871	317	332	342	345	316
50–54	1232	1056	951	931	898	454	394	389	374	374
55–59	2047	1815	1559	1474	1352	658	617	575	536	498
60–64	5609*	5295*	2535	2292	2247	1576*	1511*	811	734	730
65–69			2662	2697	2579			735	772	782
70 and over	6235	6046	5725	6306	6144	1304	1252	1253	1395	1398

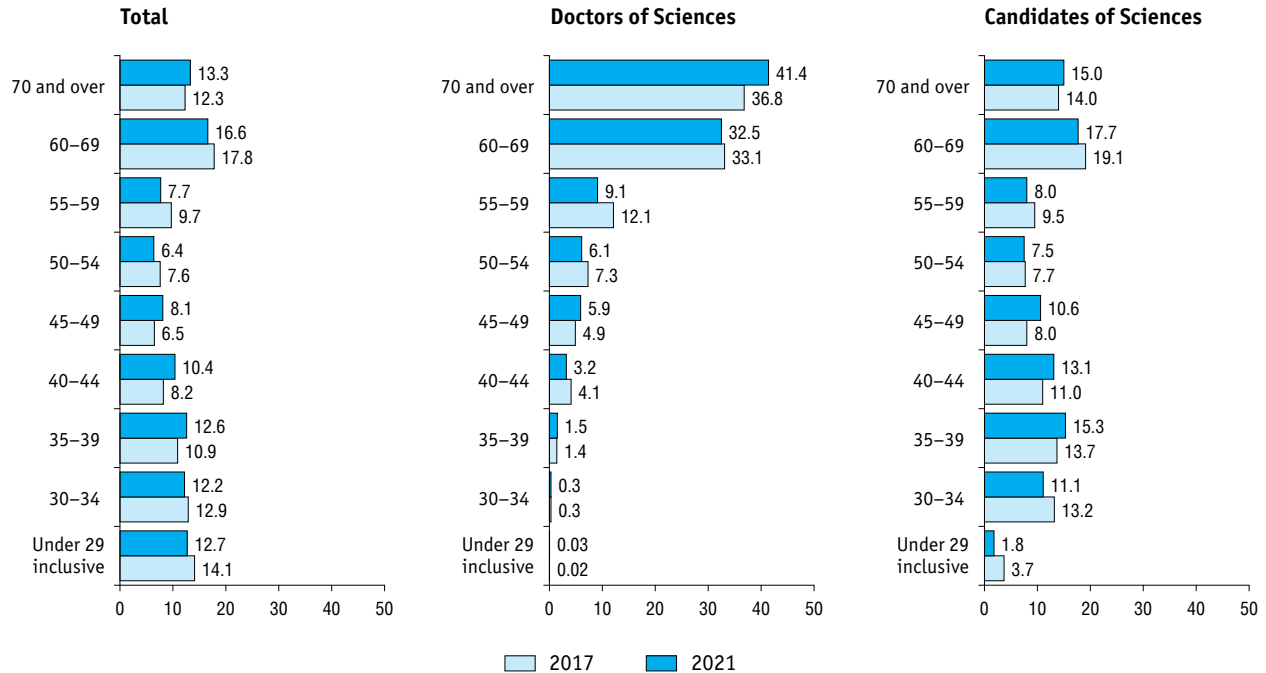
(continued)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Candidates of Sciences	42190	40453	38431	39736	38181	19308	18471	17933	18378	17799
Age, years:										
under 29 inclusive	1558	1251	1034	831	682	661	537	433	379	290
30–34	5581	5272	4757	4632	4224	2521	2450	2251	2151	1975
35–39	5801	5785	5683	5914	5840	2844	2793	2732	2807	2744
40–44	4650	4629	4655	4979	5009	2426	2412	2426	2551	2564
45–49	3355	3446	3531	3908	4030	1804	1856	1915	2052	2087
50–54	3259	2995	2800	2837	2850	1651	1556	1468	1529	1570
55–59	4025	3680	3462	3369	3036	1850	1700	1608	1581	1440
60–64			3687	3649	3464			1651	1641	1570
65–69	8069*	7565*	3446	3617	3305	3328*	3042*	1389	1451	1376
70 and over	5892	5830	5376	6000	5741	2223	2125	2060	2236	2183

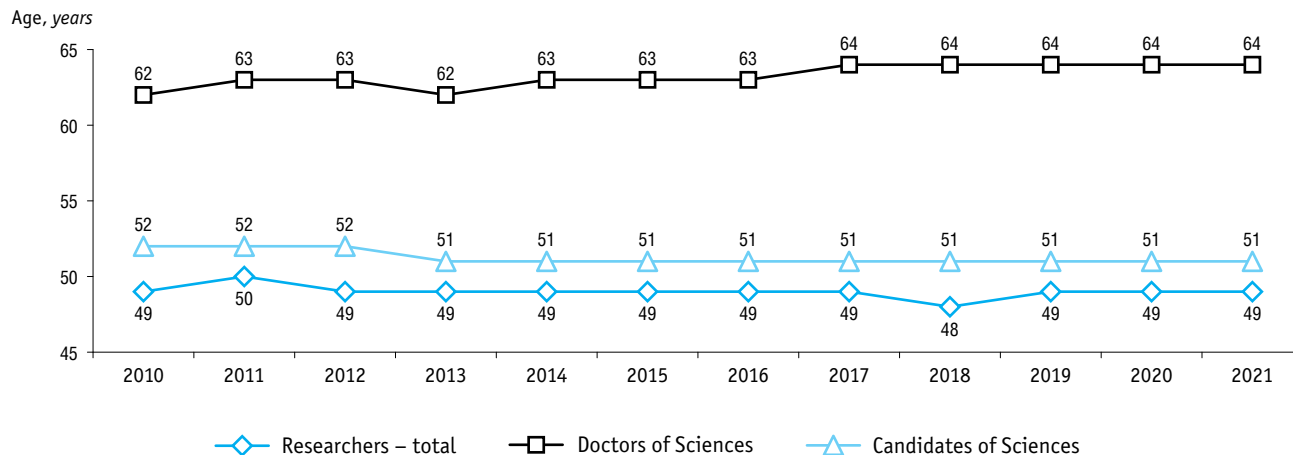
* Until 2019, the data was collected for the 60–69 age group.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.2.8. PERCENTAGE DISTRIBUTION OF RESEARCHERS IN THE GOVERNMENT SECTOR BY AGE



5.2.9. AVERAGE AGE OF RESEARCHERS IN THE GOVERNMENT SECTOR

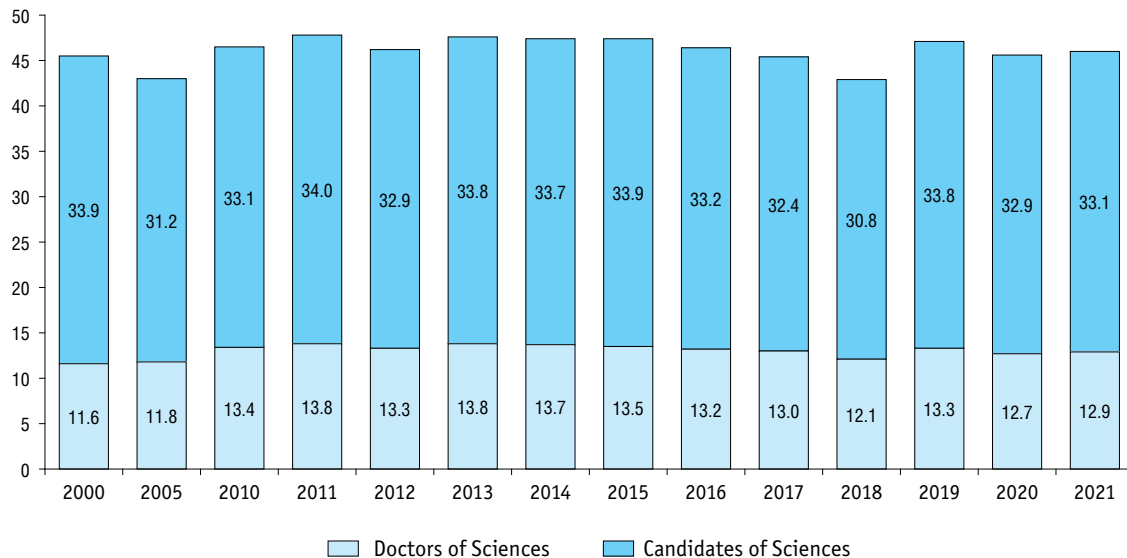


5.2.10. RESEARCHERS WITH SCIENTIFIC DEGREES IN THE GOVERNMENT SECTOR

(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Researchers with scientific degrees	58901	60066	61194	63906	62285	59138	56387	53505	55109	53019
Doctors of Sciences	14987	16511	17646	18264	17781	16948	15934	15074	15373	14838
Candidates of Sciences	43914	43555	43548	45642	44504	42190	40453	38431	39736	38181

5.2.11. RESEARCHERS WITH SCIENTIFIC DEGREES AS A PERCENTAGE OF THE TOTAL NUMBER OF RESEARCHERS IN THE GOVERNMENT SECTOR



5.2.12. RESEARCHERS IN THE GOVERNMENT SECTOR BY FIELD OF SCIENCE AND TECHNOLOGY

(headcount)

	2010			2019			2020			2021		
	Researchers	Of whom		Researchers	Of whom		Researchers	Of whom		Researchers	Of whom	
		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences
Total	131734	17646	43548	113555	15074	38431	120649	15373	39736	115208	14838	38181
Natural sciences	53265	8683	22210	49151	7625	20709	52802	7869	21631	52575	7651	21262
Engineering and technology	42472	1692	5802	34856	1443	4900	37051	1521	5133	33512	1513	4729
Medical sciences	13131	3454	6086	10505	2723	4382	11367	2813	4666	10718	2651	4376
Agricultural sciences	10147	1265	3988	7627	930	3137	7351	845	2888	6929	829	2730
Social sciences	5937	1044	2571	5499	1077	2522	6039	1107	2679	5733	994	2436
Humanities	6782	1508	2891	5917	1276	2781	6039	1218	2739	5741	1200	2648

5.2.13. R&D PERSONNEL TURNOVER IN THE GOVERNMENT SECTOR BY OCCUPATION: 2020-2021

(headcount)

	Number at the beginning of the reporting year	Inflow							Outflow		Number at the end of the reporting year
		total	of whom						total	were made redundant	
			higher education graduates					other research institutes' graduates			
			total	of whom:			with a master's degree				
from leading classical university	from federal university	from national research university									
2020											
Total	248966	29930	4677	818	1196	890	1315	6516	30216	846	248680
Researchers	121278	10256	2506	540	600	452	915	2581	10814	305	120649
Technicians	24674	4377	898	85	284	223	203	827	4010	65	24966
Supporting staff	54054	7434	842	105	187	187	137	1843	6869	149	54714
Others	48960	7863	431	88	125	28	60	1265	8523	327	48351
2021											
Total	236803	31107	4511	900	884	571	1196	5055	32937	418	234973
Researchers	117183	9755	2536	487	487	369	850	1696	11697	134	115208
Technicians	23604	5236	715	103	215	148	170	754	5402	35	23396
Supporting staff	50478	7890	804	170	95	40	124	1467	7668	69	50771
Others	45538	8226	456	140	87	14	52	1138	8170	180	45598

5.2.14. R&D PERSONNEL TURNOVER IN THE GOVERNMENT SECTOR BY OCCUPATION

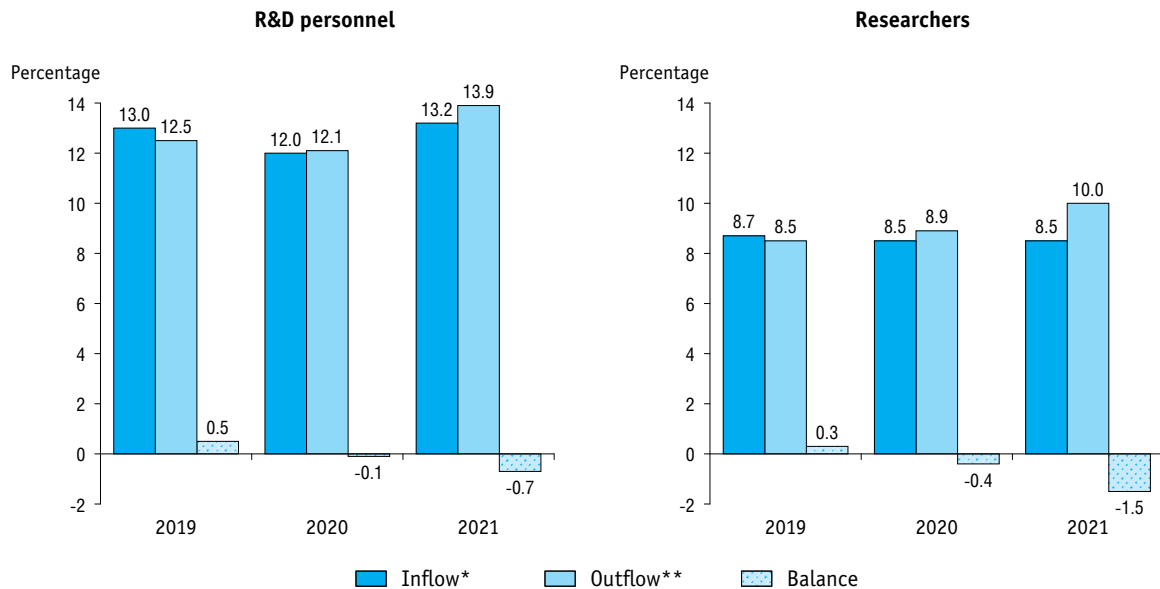
(headcount)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of whom			total	of whom			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Total										
2005	275249	32634	3990	5456	23188	35165	24924	851	9390	272718
2013	264121	28184	2650	3461	22073	30436	20179	642	9615	261869
2015	268080	33169	3182	4136	25851	35820	20622	1319	13879	265429
2017	271650	29850	2815	4564	22471	33420	21146	999	11275	268080
2019	226144	29557	2970	3392	23195	28221	18561	678	8982	227480
Researchers										
2005	139746	11715	3127	3121	5467	12087	8871	358	2858	139378
2013	133682	10035	1894	2211	5930	11819	8172	277	3370	132117
2015	136237	11127	2147	2347	6633	12169	7725	505	3939	134794
2017	132188	10287	1811	2622	5854	12118	7685	330	4103	130081
2019	113145	9929	1833	2118	5978	9585	6591	181	2813	113555
Technicians										
2005	25569	4128	336	630	3162	4227	2892	83	1252	25462
2013	28152	4034	349	292	3393	4371	2696	55	1620	27777
2015	28250	4634	463	439	3732	5846	2689	138	3019	27090
2017	26083	3852	447	424	2981	4079	2560	78	1441	26040
2019	21302	3938	443	306	3189	3770	2206	61	1503	21468

(continued)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of whom			total	of whom			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Supporting staff and others										
2005	109934	16791	527	1705	14555	18851	13161	410	5280	107878
2013	102287	14115	407	958	12750	14246	9311	310	4625	101975
2015	103593	17408	572	1350	15486	17805	10208	676	6921	103545
2017	113379	15711	557	1518	13636	17223	10901	591	5731	111959
2019	91697	15690	694	968	14028	14866	9764	436	4666	92457

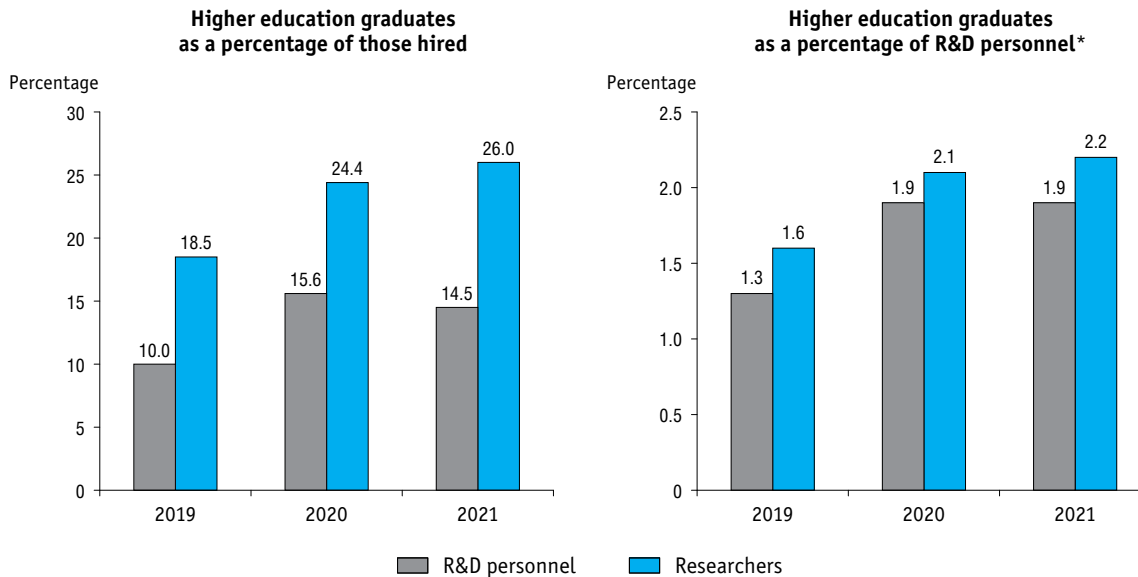
5.2.15. INFLOW AND OUTFLOW OF R&D PERSONNEL IN THE GOVERNMENT SECTOR



* The ratio of those hired during the year to the total employment at the end of the year.

** The ratio of those who left during the year to the total employment at the beginning of the year.

5.2.16. INFLOW OF HIGHER EDUCATION GRADUATES INTO GOVERNMENT SECTOR INSTITUTIONS



* The ratio of the higher education graduates hired during the year to the number of employees at the end of the year.

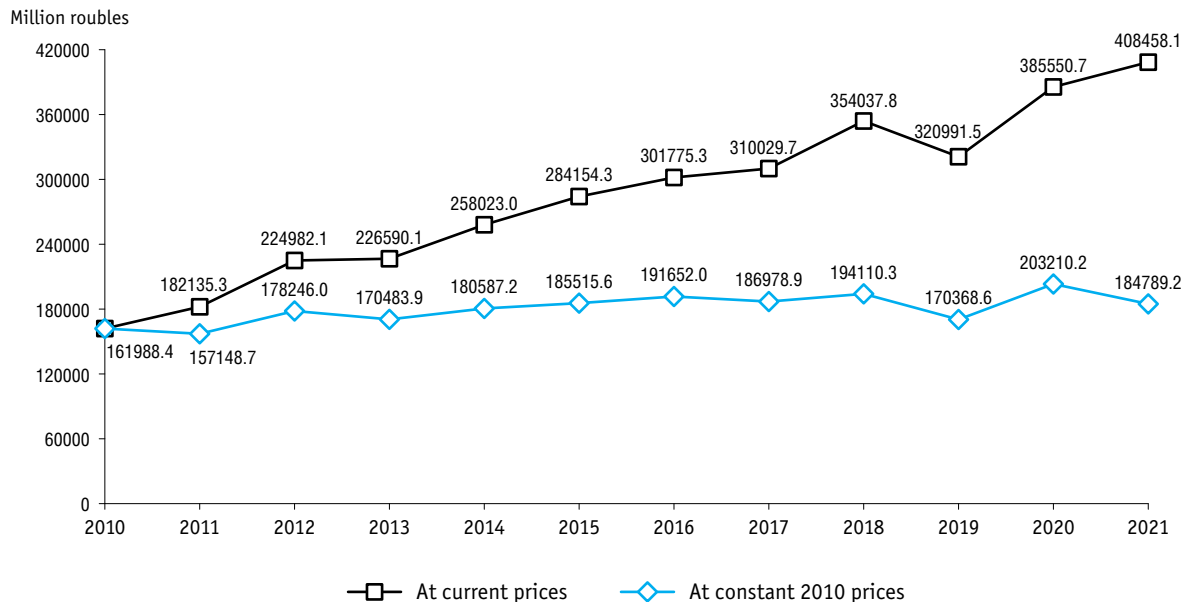
5.2.17. GROSS DOMESTIC EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR BY TYPE OF R&D INSTITUTIONS

(thousand roubles)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	60158166.6	161988411.4	284154288.3	301775305.3	310029734.6	354037790.2	320991529.3	385550663.3	408458070.8
Research institutes	55762222.6	136870186.3	241159555.3	254408906.6	260728834.1	286050599.4	294667475.8	342618072.6	379179143.2
Design organisations, design-and-engineering organisations	4007361.7	20163653.6	31243788.5	35387725.2	34575060.4	41726660.0	9924168.8	24375425.6	9278571.0
Construction project and exploration organisations	21993.6	524208.6	384269.6	27093.9	29684.9	31895.0	...*	–	–
Pilot plants	20300.0	139733.5	998142.5	1093828.8	2877813.2	3559682.4	1172596.3	912894.8	1342150.2
Others	346288.7	4290629.4	10368532.4	10857750.8	11818342.0	22668953.4	15004311.3	17644270.3	18658206.4

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.2.18. GROSS DOMESTIC EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR



5.2.19. GROSS DOMESTIC EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR BY SOURCE OF FUNDS

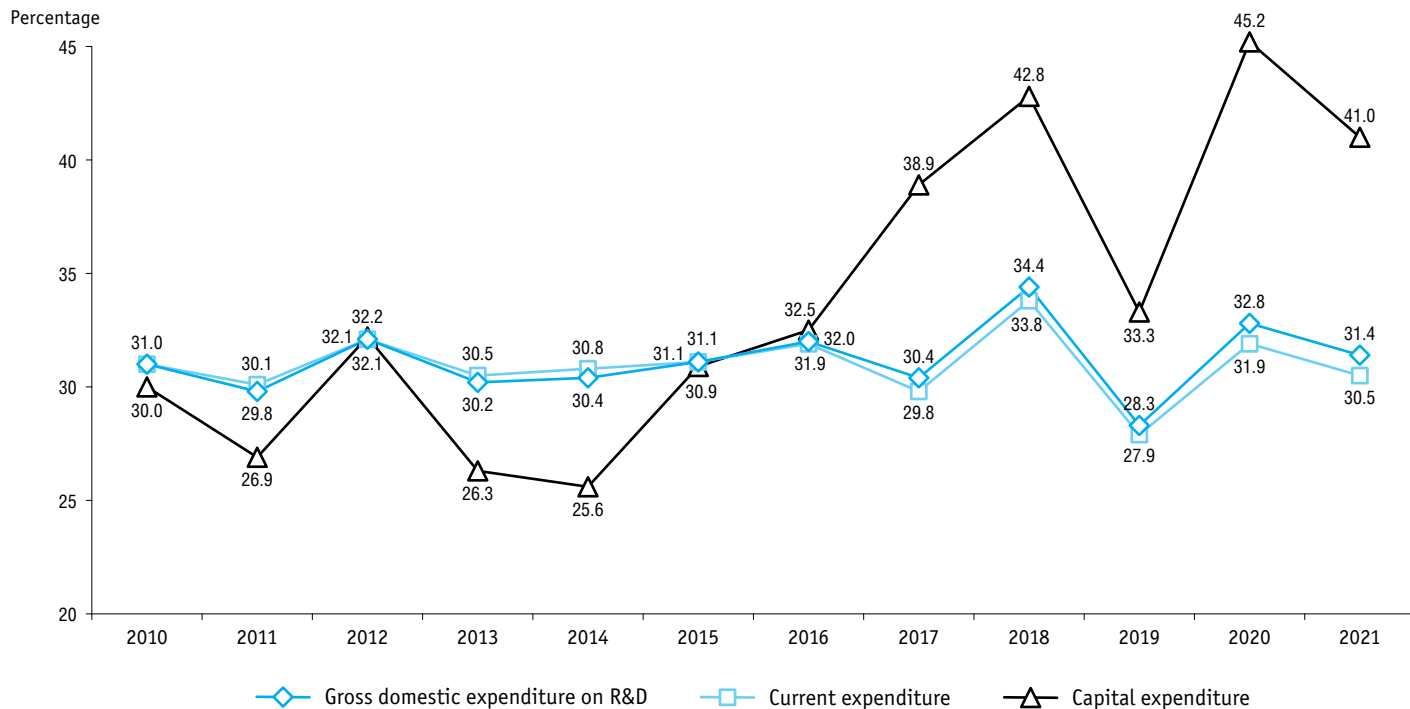
	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
<i>At current prices, thousand roubles</i>						
2000	18748588.2	15060439.1	2028296.2	11323.4	3898.5	1644631.0
2005	60158166.6	50589802.5	6845507.2	46912.8	21976.9	2653967.2
2006	77950634.9	65449102.1	9136754.4	111817.6	52071.9	3200888.9
2007	107984917.2	85896140.4	14355790.2	80481.6	12412.3	7640092.7
2008	129871228.3	108231726.8	16119227.3	183124.2	120667.0	5216483.0
2009	147023165.7	124027349.4	16292839.6	90578.1	38990.4	6573408.2
2010	161988411.4	134275595.6	20873979.0	205154.5	73117.4	6560564.9
2011	182135309.9	153529403.4	21528707.1	244802.6	61568.4	6770828.4
2012	224982089.2	186513895.7	29459319.3	197336.7	75635.7	8735901.8
2013	226590120.7	186895055.8	31300159.7	211201.3	105228.8	8078475.1
2014	258023009.1	219020381.4	29660844.5	357181.2	100284.6	8884317.4
2015	284154288.3	240265758.8	32877099.7	321525.4	163335.5	10526568.9
2016	301775305.3	263326940.4	27544205.3	363329.0	253809.8	10287020.8
2017	310029734.6	268775672.5	29924193.6	210118.7	608620.0	10511129.8
2018	354037790.2	306902140.4	34001536.7	263610.1	450830.9	12419672.1
2019	320991529.3	285936853.1	30095122.4	270058.5	301188.9	4388306.4
2020	385550663.3	347367596.8	34200252.1	397856.0	198513.8	3386444.6
2021	408458070.8	369871621.7	33605446.0	487836.9	234061.4	4259104.8

* Including budget funds, own funds, and government sector institutions' funds.

(continued)

	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
	Percentage					
2000	100	80.3	10.8	0.06	0.02	8.8
2005	100	84.1	11.4	0.08	0.04	4.4
2006	100	84.0	11.7	0.14	0.07	4.1
2007	100	79.5	13.3	0.07	0.01	7.1
2008	100	83.3	12.4	0.14	0.09	4.0
2009	100	84.4	11.1	0.06	0.03	4.5
2010	100	82.9	12.9	0.13	0.05	4.1
2011	100	84.3	11.8	0.13	0.03	3.7
2012	100	82.9	13.1	0.09	0.03	3.9
2013	100	82.5	13.8	0.08	0.05	3.6
2014	100	84.9	11.5	0.14	0.04	3.4
2015	100	84.6	11.6	0.11	0.06	3.7
2016	100	87.3	9.1	0.12	0.08	3.4
2017	100	86.7	9.7	0.07	0.20	3.4
2018	100	86.7	9.6	0.07	0.13	3.5
2019	100	89.1	9.4	0.08	0.09	1.4
2020	100	90.1	8.9	0.10	0.05	0.9
2021	100	90.6	8.2	0.12	0.06	1.0

5.2.20. GOVERNMENT SECTOR AS A PERCENTAGE OF GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF EXPENDITURE



5.2.21. GROSS DOMESTIC EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR BY TYPE

(thousand roubles)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D	60158166.6	161988411.4	284154288.3	301775305.3	310029734.6	354037790.2	320991529.3	385550663.3	408458070.8
Current expenditure	56342327.7	151825126.6	265478556.9	279027077.7	283231733.5	325114767.7	296305449.9	347925035.2	364192738.6
Salaries	25406848.5	80849201.5	134412102.1	139090202.7	144850814.7	175612670.0	164389281.6	192411572.7	201721873.0
Of which for R&D personnel*	23066423.6	73752076.2	121375793.9	125987971.1	131753641.2	155235548.2	147630614.4	169758532.2	179570048.3
Social security payments**	6257309.9	16436614.4	36154760.9	37718124.5	39027533.6	47184795.5	43137331.8	51973655.7	54496399.5
Equipment	3086873.3	5458681.5	7442689.6	5766984.9	6071286.9	5151450.8	7486466.5	14371648.4	14847495.2
Other material costs	9781232.9	22464861.8	42451174.6	53280149.8	44970239.0	49198458.4	42730161.6	47807605.8	52522899.7
Other current expenditure	11810063.1	26615767.4	45017829.7	43171615.8	48311859.3	47967393.0	38562208.4	41360552.6	40604071.2
Capital expenditure	3815838.9	10163284.8	18675731.4	22748227.6	26798001.1	28923022.5	24686079.4	37625628.1	44265332.2
Land and buildings	399698.5	3113137.6	3903611.8	5480973.9	8823840.7	7111357.9	5829906.2	7284592.6	9807212.9
Including:									
land	...	...	...	...	2917843.6	10637.9	366110.5	21295.7	189905.3
buildings	...	...	...	...	5905997.1	7100720.0	5463795.7	7263296.9	9617307.6

(continued)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Equipment	2485274.0	4647644.5	10358881.1	14661765.0	14481293.8	17172755.7	14615466.2	23308857.0	27517907.4
Intellectual property items and results of intellectual activity	...	...	...	...	782015.5	818388.8	548154.1	949826.7	1310285.0
Other capital expenditure	930866.4	2402502.7	4413238.5	2605488.7	2710851.1	3820520.1	3692552.9	6082351.8	5629926.9

* Excluding external multiple jobholders and independent contractors.

** National pension insurance, national health insurance, national social insurance.

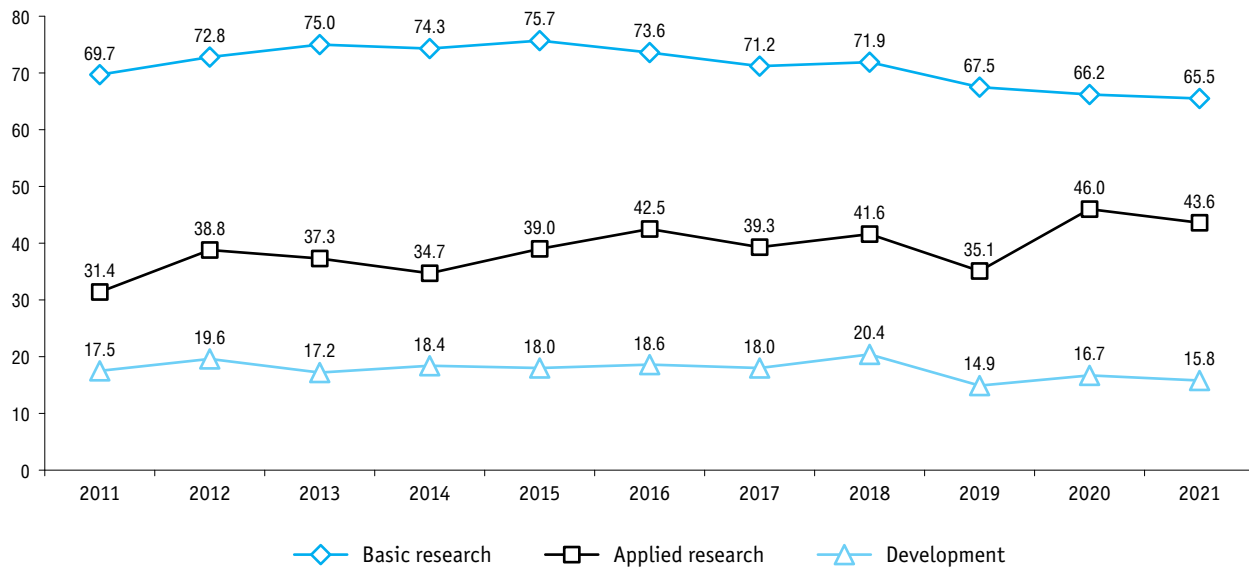
5.2.22. CURRENT EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR BY TYPE OF R&D ACTIVITY AND FIELD OF SCIENCE AND TECHNOLOGY

(thousand roubles)

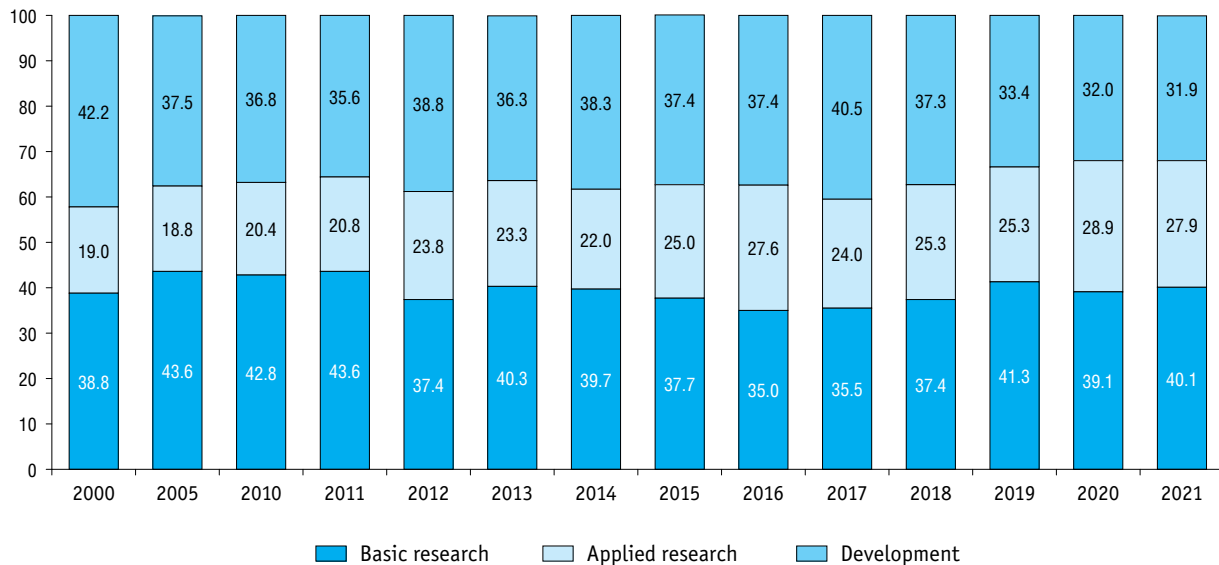
	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2005							
Current expenditure on R&D	56342327.7	20577533.0	25509704.3	3738833.2	2939051.4	1951167.1	1626038.7
Basic research	24586195.8	15976354.8	2622298.0	1662238.3	1678543.7	1333808.2	1312952.8
Applied research	10603039.3	2644812.7	4734050.4	1703960.2	840824.2	475142.3	204249.5
Development	21153092.6	1956365.5	18153355.9	372634.7	419683.5	142216.6	108836.4
2010							
Current expenditure on R&D	151825126.6	56889173.8	65431955.8	12635358.1	6868458.0	4815854.6	5184326.3
Basic research	65041375.9	38927125.1	8471457.1	5340161.8	4177771.0	3645798.9	4479062.0
Applied research	30948555.6	13265692.5	7766540.0	6615628.6	1773878.6	936306.6	590509.3
Development	55835195.1	4696356.2	49193958.7	679567.7	916808.4	233749.1	114755.0
2015							
Current expenditure on R&D	265478556.9	98742002.1	117329719.0	22341866.9	11448932.5	7440718.3	8175318.1
Basic research	99987000.6	58183429.9	14273618.3	7951401.7	7804653.1	4972403.3	6801494.3
Applied research	66248286.3	24349761.4	23686724.2	13081555.6	2396404.2	1982310.8	751530.1
Development	99243270.0	16208810.8	79369376.5	1308909.6	1247875.2	486004.2	622293.7
2018							
Current expenditure on R&D	325114767.7	114732306.6	147072618.3	29827734.8	13470698.3	10316052.8	9695356.9
Basic research	121640034.7	75089158.3	13151656.4	10726414.0	8855848.4	5497294.9	8319662.7
Applied research	82114839.9	25855563.3	30593986.8	17428968.1	3467772.2	3545807.9	1222741.6
Development	121359893.1	13787585.0	103326975.1	1672352.7	1147077.7	1272950.0	152952.6

(continued)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2019							
Current expenditure on R&D	296305449.9	113965795.9	117810821.2	29642755.3	14012449.8	10289776.5	10583851.2
Basic research	122335848.1	75460837.5	13068133.7	9517367.0	9500123.4	5672742.0	9116644.5
Applied research	74856671.5	24940895.2	23235714.2	18094458.6	3381858.7	3877840.9	1325903.9
Development	99112930.3	13564063.2	81506973.3	2030929.7	1130467.7	739193.6	141302.8
2020							
Current expenditure on R&D	347925035.2	139954997.3	133158669.8	36219624.3	15295558.5	11751235	11544950.3
Basic research	135877581.6	84894512.7	13351419.2	10125483.5	10827599.0	6549895.0	10128672.2
Applied research	100594445.3	37675541.0	32634827.5	21274139.0	3472327.4	4255860.3	1281750.1
Development	111453008.3	17384943.6	87172423.1	4820001.8	995632.1	945479.7	134528.0
2021							
Current expenditure on R&D	364192738.6	148436470.5	133358678.9	40255964.8	17276443.8	12666036.3	12199144.3
Basic research	146113040.7	90051236.2	13781085.9	12427050.0	11566923.2	6968910.2	11317835.2
Applied research	101723069.8	36704200.6	31868683.1	23578692.4	4690904.2	4128430.9	752158.6
Development	116356628.1	21681033.7	87708909.9	4250222.4	1018616.4	1568695.2	129150.5

5.2.23. CURRENT EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR AS A PERCENTAGE OF THE TOTAL CURRENT EXPENDITURE ON R&D BY TYPE OF R&D ACTIVITY

5.2.24. PERCENTAGE DISTRIBUTION OF CURRENT EXPENDITURE ON R&D IN THE GOVERNMENT SECTOR BY TYPE OF R&D ACTIVITY



5.2.25. AVERAGE MONTHLY SALARY OF R&D PERSONNEL IN THE GOVERNMENT SECTOR

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Average monthly salary, roubles	2015.6	7220.9	24792.1	40513.5	42125.9	44614.8	54193.9	60209.5	64643.2	71944.1
As a percentage of the salary:										
in the national economy (=100%)	90.7	84.4	118.3	119.1	114.8	113.9	123.9	125.8	125.9	125.7
in manufacturing (=100%)	85.2	85.7	130.0	127.0	121.8	115.9	133.1	137.3	139.0	137.3
in construction (=100%)	76.4	79.9	117.1	135.2	130.3	132.5	140.7	141.2	144.5	138.5

5.3. Business enterprise sector

5.3.1. R&D INSTITUTIONS IN THE BUSINESS ENTERPRISE SECTOR BY TYPE

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	2278	1703	1405	1400	1326	1292	1304	1374	1426	1437
Research institutes	1062	855	634	482	454	419	410	422	410	411
Design organisations, design-and-engineering organisations	564	410	290	260	244	229	209	220	203	206
Construction project and exploration organisations	94	55	31	21	21	18	17	9	12	13
Industrial enterprises	276	231	238	371	363	380	419	450	441	446
Pilot plants	32	16	16	11	14	18	14	16	13	17
Others	250	136	196	255	230	228	235	257	347	344

5.3.2. R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR BY TYPE OF R&D INSTITUTIONS

(headcount)

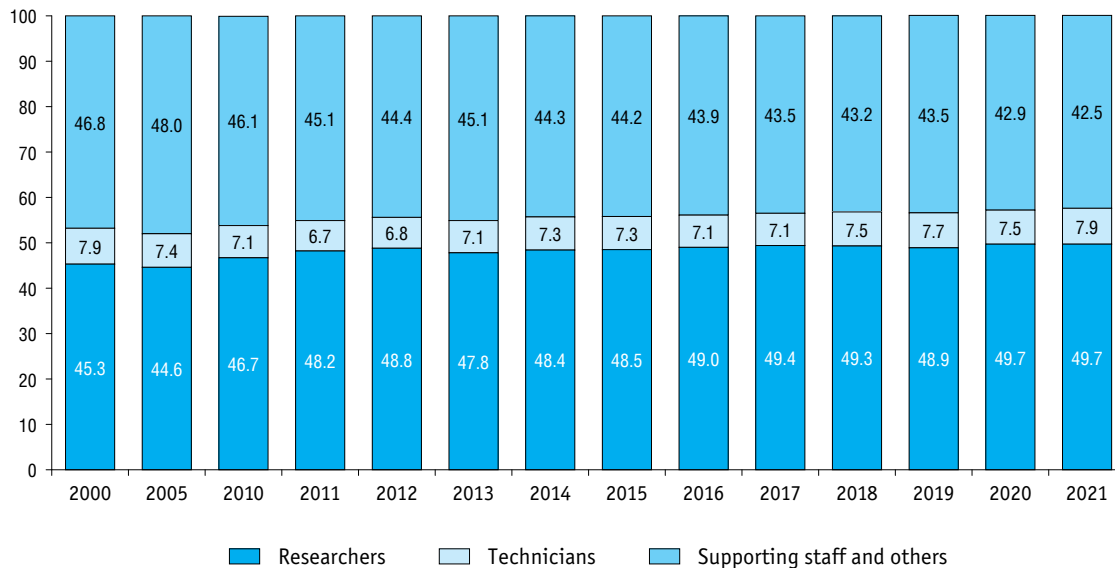
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	590646	496706	423112	408802	388385	377150	347080	379442	359280	352581
Research institutes	349242	255233	207166	202431	192150	176736	172614	186327	165262	145280
Design organisations, design-and-engineering organisations	151705	161295	129281	115683	109359	100443	84579	102151	87434	102072
Construction project and exploration organisations	8177	5284	4905	1629	1749	1487	1253	430	1955	2161
Industrial enterprises	52598	43524	51807	53868	50740	59421	52977	57974	63189	64489
Pilot plants	3945	865	925	1499	1630	4658	3707	2423	2097	6779
Others	24979	30505	29028	33692	32757	34405	31950	30137	39343	31800

5.3.3. R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR BY OCCUPATION

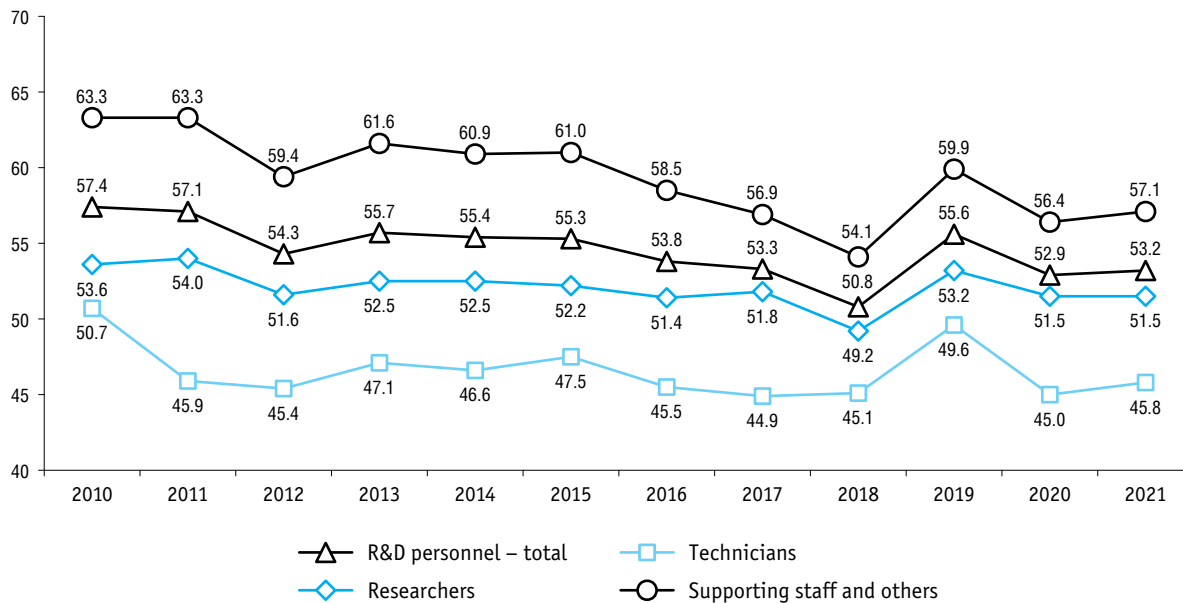
(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	590646	496706	423112	408802	388385	377150	347080	379442	359280	352581
Researchers	267640	221445	197785	198123	190378	186347	171205	185358	178481	175178
Technicians	46535	38837	30063	29850	27519	26788	26012	29105	26784	27720
Supporting staff	175261	147980	120485	108230	101219	98139	88124	101175	92888	90371
Others	101210	90444	74779	72599	69269	65876	61739	63804	61127	59312

5.3.4. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR BY OCCUPATION



5.3.5. R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR AS A PERCENTAGE OF THE TOTAL NUMBER OF R&D PERSONNEL BY OCCUPATION



5.3.6. R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR BY OCCUPATION AND EDUCATIONAL ATTAINMENT

(headcount)

	Total	Higher education	Secondary vocational education	Other education
R&D personnel				
2005	496706	288649	89265	118792
2010	423112	268821	69552	84739
2015	408802	283664	60370	64768
2018	347080	253804	48957	44319
2019	379442	278640	55205	45597
2020	359280	267786	50849	40645
2021	352581	262329	50850	39402
Researchers				
2005	221445	221445	–	–
2010	197785	197785	–	–
2015	198123	198123	–	–
2018	171205	171205	–	–
2019	185358	185358	–	–
2020	178481	178481	–	–
2021	175178	175178	–	–
Technicians				
2005	36837	6274	21435	9130
2010	30063	7842	15051	7170
2015	29850	11656	11794	6400
2018	26012	10757	9705	5550
2019	29105	12418	10740	5947
2020	26784	11670	10020	5094
2021	27720	12024	10206	5490

(continued)

	Total	Higher education	Secondary vocational education	Other education
Supporting staff				
2005	147980	37101	42099	68780
2010	120485	38988	33362	48135
2015	108230	42934	30297	34999
2018	88124	41035	24454	22635
2019	101175	47778	29065	24332
2020	92888	45594	26037	21257
2021	90371	43967	25993	20411
Others				
2005	90444	23829	25733	40882
2010	74779	24206	21139	29434
2015	72599	30951	18279	23369
2018	61739	30807	14798	16134
2019	63804	33086	15400	15318
2020	61127	32041	14792	14294
2021	59312	31160	14651	13501

5.3.7. RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR BY AGE

(headcount)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Total	186347	171205	185358	178481	175178	66085	59321	63895	59912	58372
Age, years:										
under 29 inclusive	40804	34872	35737	33403	31152	13260	11227	11452	10399	9510
30–34	29030	27990	30601	29874	28909	9799	9375	10193	9806	9528
35–39	20628	20665	24023	24772	25862	7144	6950	7955	7888	8560
40–44	13645	14109	16596	18055	19232	4878	4756	5596	5993	6373
45–49	10535	9914	11156	11535	12115	4267	3713	4031	3805	3873
50–54	13510	11269	11266	10488	9818	6035	5040	4891	4356	3908
55–59	16924	14846	15484	13797	12605	7157	6170	6517	5720	5130
60–64	27884*	24884*	15098	13453	13097	10251*	9064*	5769	5062	5020
65–69			12776	11143	10844			4258	3774	3561
70 and over	13387	12656	12621	11961	11544	3294	3026	3233	3109	2909
Doctors of Sciences	2873	2591	2754	2349	2187	215	194	272	212	194
Age, years:										
under 29 inclusive	21	20	... **	4	7	–	–	–	–	2
30–34	3	5	5	8	7	1	1	–	–	–
35–39	40	22	32	27	19	4	5	8	6	5
40–44	62	53	77	74	69	10	4	14	11	7
45–49	65	76	92	72	91	3	14	15	9	10
50–54	105	99	111	85	97	9	9	20	20	11
55–59	308	252	248	206	160	30	24	40	17	20
60–64			374	325	307			38	34	35
65–69	913*	807*	573	431	367	75*	70*	49	39	25
70 and over	1356	1257	1241	1117	1063	83	67	88	76	79

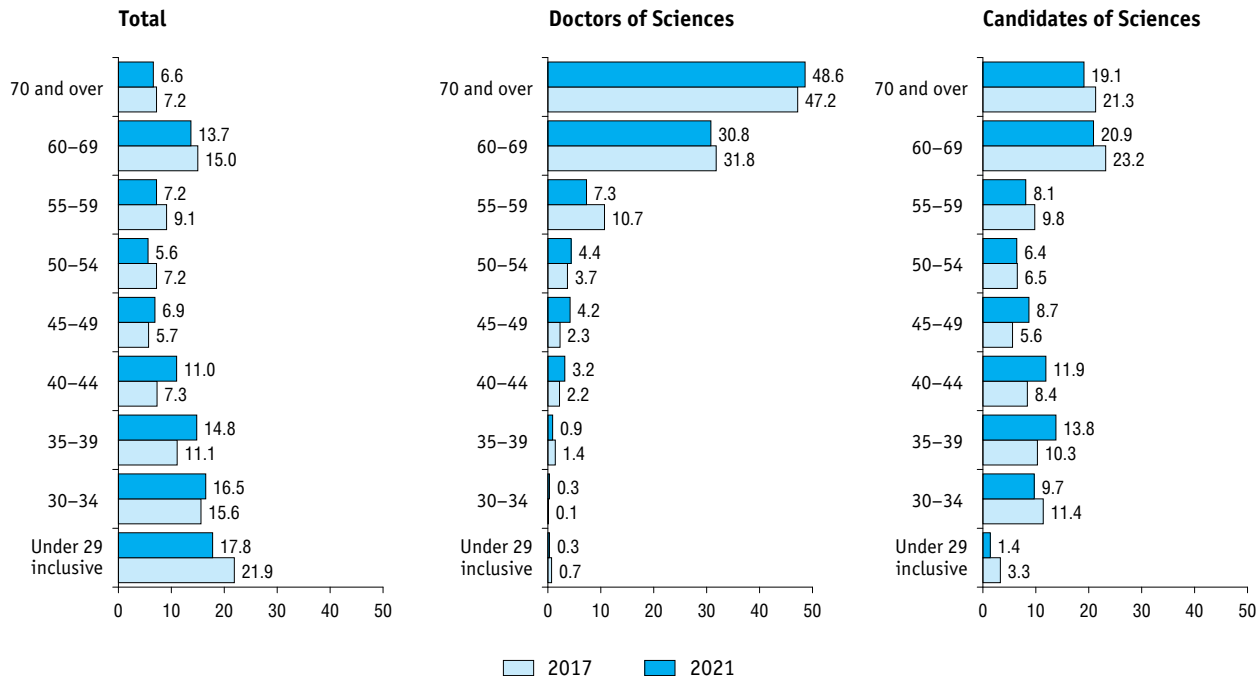
(continued)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Candidates of Sciences	15234	13984	14739	13346	12694	2830	2605	2904	2510	2437
Age, years:										
under 29 inclusive	508	354	292	212	175	118	90	64	49	42
30–34	1737	1588	1649	1464	1225	425	416	426	360	321
35–39	1567	1591	1762	1758	1756	377	376	432	392	423
40–44	1285	1293	1484	1494	1514	321	326	389	373	365
45–49	859	896	1102	1052	1103	202	211	288	251	267
50–54	995	842	875	803	812	198	177	214	190	192
55–59	1499	1259	1268	1111	1028	230	197	231	177	181
60–64	3535*	3186*	1560	1358	1272	503*	454*	220	198	194
65–69			1842	1470	1379			254	203	182
70 and over	3249	2975	2905	2624	2430	456	358	386	317	270

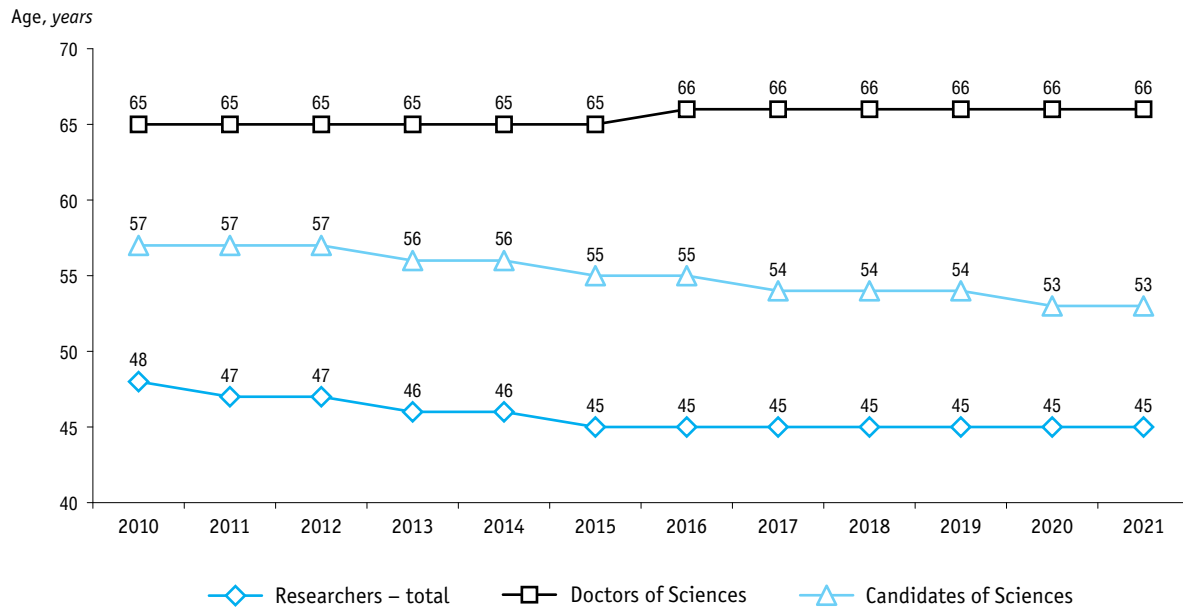
* Until 2019, the data was collected for the 60–69 age group.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.3.8. PERCENTAGE DISTRIBUTION OF RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR BY AGE



5.3.9. AVERAGE AGE OF RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR

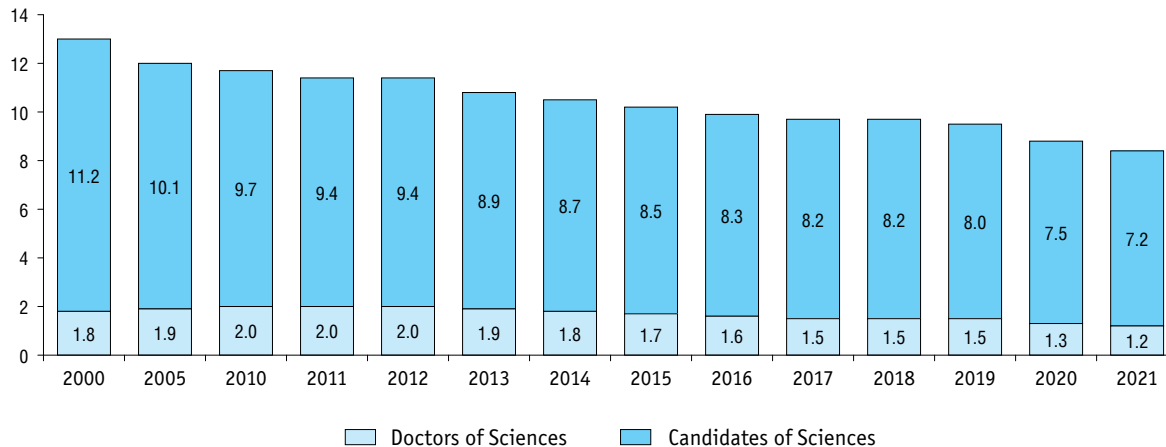


5.3.10. RESEARCHERS WITH SCIENTIFIC DEGREES IN THE BUSINESS ENTERPRISE SECTOR

(headcount)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Researchers with scientific degrees	34775	26661	23169	20270	18833	18107	16575	17493	15695	14881
Doctors of Sciences	4806	4222	3987	3413	3071	2873	2591	2754	2349	2187
Candidates of Sciences	29969	22439	19182	16857	15762	15234	13984	14739	13346	12694

5.3.11. RESEARCHERS WITH SCIENTIFIC DEGREES AS A PERCENTAGE OF THE TOTAL NUMBER OF RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR



5.3.12. RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR BY FIELD OF SCIENCE AND TECHNOLOGY

(headcount)

	2010			2019			2020			2021		
	Researchers	Of whom		Researchers	Of whom		Researchers	Of whom		Researchers	Of whom	
		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences
Total	197785	3987	19182	185358	2754	14739	178481	2349	13346	175178	2187	12694
Natural sciences	22188	1244	4915	15086	730	2973	14281	492	2422	16739	453	2133
Engineering and technology	169887	2342	12793	166270	1774	10916	160462	1614	10135	154978	1508	9750
Medical sciences	1100	115	335	1644	156	427	964	74	232	853	46	177
Agricultural sciences	1692	155	596	351	37	145	650	71	242	1009	94	335
Social sciences	2639	112	484	1857	53	261	1904	75	259	1278	51	212
Humanities	279	19	59	150	...*	17	220	23	56	321	35	87

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.3.13. R&D PERSONNEL TURNOVER IN THE BUSINESS ENTERPRISE SECTOR BY OCCUPATION: 2020–2021

(headcount)

	Number at the beginning of the reporting year	Inflow							Outflow		Number at the end of the reporting year
		total	of whom						total	were made redundant	
			higher education graduates					other research institutes' graduates			
			total	of whom			with a master's degree				
from leading classical university	from federal university	from national research university									
2020											
Total	366056	38706	6424	1302	1251	1140	1393	7354	45482	1765	359280
Researchers	181905	17698	4271	908	819	904	1050	3609	20253	635	178481
Technicians	27043	3639	417	61	96	91	74	790	4074	75	26784
Supporting staff	94279	9251	1129	193	234	97	162	1623	10880	517	92888
Others	62829	8118	607	140	102	48	107	1332	10275	538	61127
2021											
Total	358448	44445	7884	1540	1163	1596	1850	7072	50312	1569	352581
Researchers	176861	19849	5250	1163	885	1144	1244	3208	21976	546	175178
Technicians	27750	4937	768	170	116	144	175	727	4704	64	27720
Supporting staff	92169	10223	1228	113	120	171	277	1580	12174	392	90371
Others	61668	9436	638	94	42	137	154	1557	11458	567	59312

5.3.14. R&D PERSONNEL TURNOVER IN THE BUSINESS ENTERPRISE SECTOR BY OCCUPATION

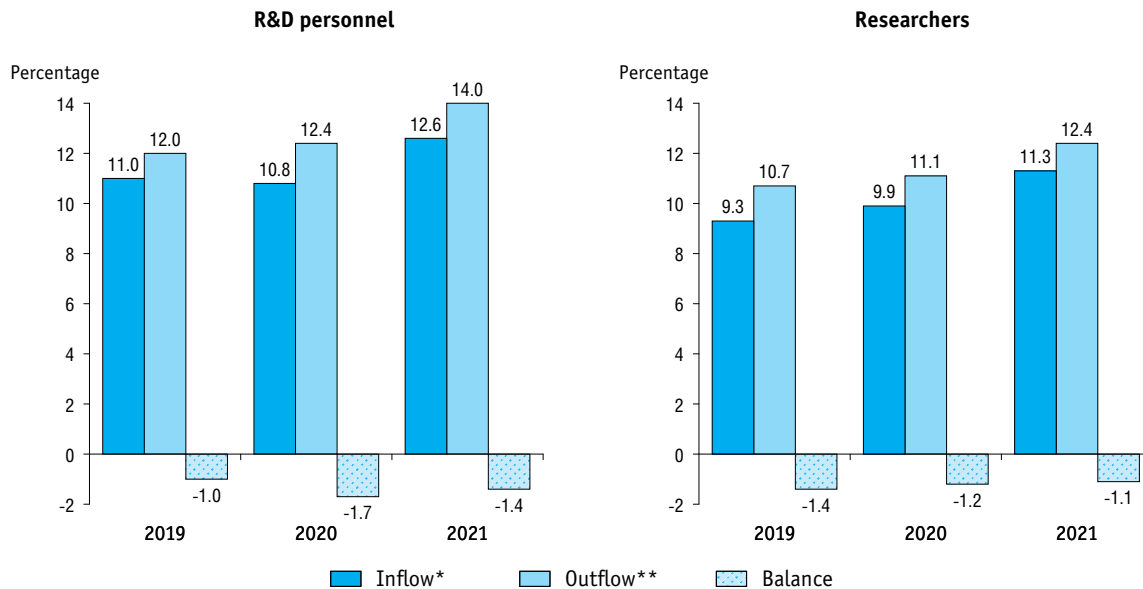
(headcount)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of whom			total	of whom			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Total										
2005	508840	68528	8027	8756	51745	80662	52534	5722	22406	496706
2013	401809	52700	6758	7632	38310	49241	32584	1159	15498	405268
2015	405181	52033	6175	7075	38783	48412	30324	2568	15520	408802
2017	378521	47497	5116	5962	36419	48868	29951	2958	15959	377150
2019	383797	41582	5619	4093	31870	45937	28345	1866	15726	379442
Researchers										
2005	227397	22807	6529	5028	11250	28822	19496	2053	7273	221445
2013	192306	21908	4703	4471	12734	20499	13769	380	6350	193736
2015	197658	21426	4225	3730	13471	20954	13382	831	6741	198123
2017	187881	20491	3610	3716	13165	21620	13324	1117	7179	186347
2019	187267	17189	3710	2626	10853	19969	12797	749	6423	185358
Technicians										
2005	38078	5739	301	729	4709	6965	4347	388	2230	36837
2013	28318	5409	506	665	4238	4779	2829	75	1875	28920
2015	30047	4897	546	574	3777	4977	2973	304	1700	29850
2017	26933	4654	505	417	3732	4911	2850	200	1861	26788
2019	29852	4302	538	261	3503	4755	2827	96	1832	29105

(continued)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of whom			total	of whom			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Supporting staff and others										
2005	243365	39982	1197	2999	35786	44875	28691	3281	12903	238424
2013	181185	25383	1549	2496	21338	23963	15986	704	7273	182612
2015	177476	25710	1404	2771	21535	22481	13969	1433	7079	180829
2017	163707	22352	1001	1829	19522	22337	13777	1641	6919	164015
2019	166678	20091	1371	1206	17514	21213	12721	1021	7471	164979

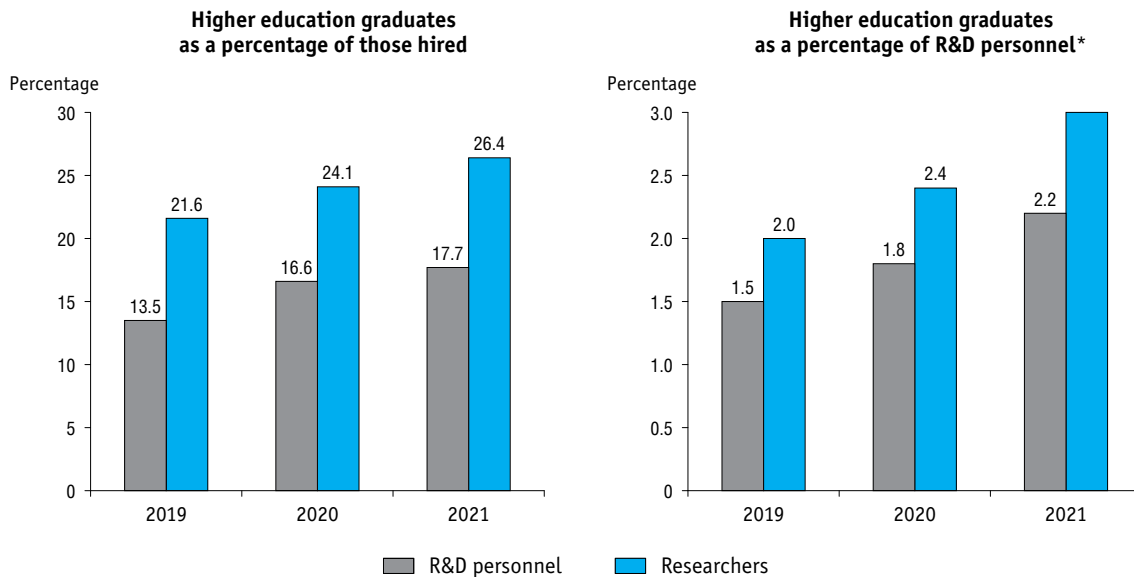
5.3.15. INFLOW AND OUTFLOW OF RESEARCHERS IN THE BUSINESS ENTERPRISE SECTOR



* The ratio of those hired during the year to the total employment at the end of the year.

** The ratio of those who left during the year to the total employment at the beginning of the year.

5.3.16. INFLOW OF HIGHER EDUCATION GRADUATES INTO BUSINESS ENTERPRISE SECTOR INSTITUTIONS



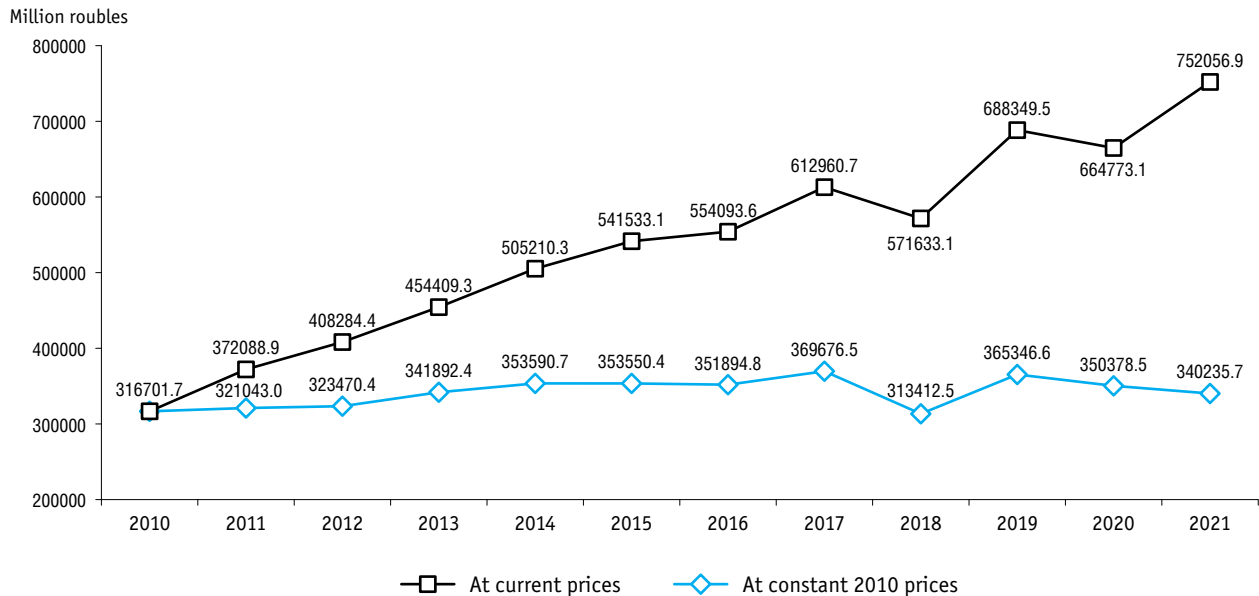
* The ratio of the higher education graduates hired during the year to the number of employees at the end of the year.

5.3.17. GROSS DOMESTIC EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR BY TYPE OF R&D INSTITUTIONS

(thousand roubles)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	54288781.4	156880029.0	316701679.9	541533094.3	554093599.1	612960678.4	571633146.1	688349498.9	664773104.2	752056929.7
Research institutes	31145022.1	79303185.8	149370680.2	264045184.4	271903397.6	294509447.1	287124067.4	332452198.8	305971973.6	304350775.1
Design organisations, design-and- engineering organisations	13115444.7	51857668.0	99778643.7	142841408.8	139631208.0	141773583.4	133684496.7	198556240.9	164617392.2	208160205.1
Construction project and exploration organisations	539721.1	1604470.7	3690958.0	2380598.7	2530918.6	2275602.3	2026386.8	812901.7	3851886.7	6230508.4
Industrial enterprises	4726082.4	12633435.9	32838780.9	74693899.2	75747420.1	90217091.0	79760617.2	92576631.2	112060937.0	135840342.3
Pilot plants	294581.2	150835.5	398159.1	2223362.2	2105223.8	8459395.5	8414323.7	4534395.9	2940462.7	14001855.2
Others	4467929.9	11330433.1	30624458.0	55348641.0	62175431.0	75725559.1	60623254.3	59417130.4	75330452.0	83473243.6

5.3.18. GROSS DOMESTIC EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR



5.3.19. GROSS DOMESTIC EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR BY SOURCE OF FUNDS

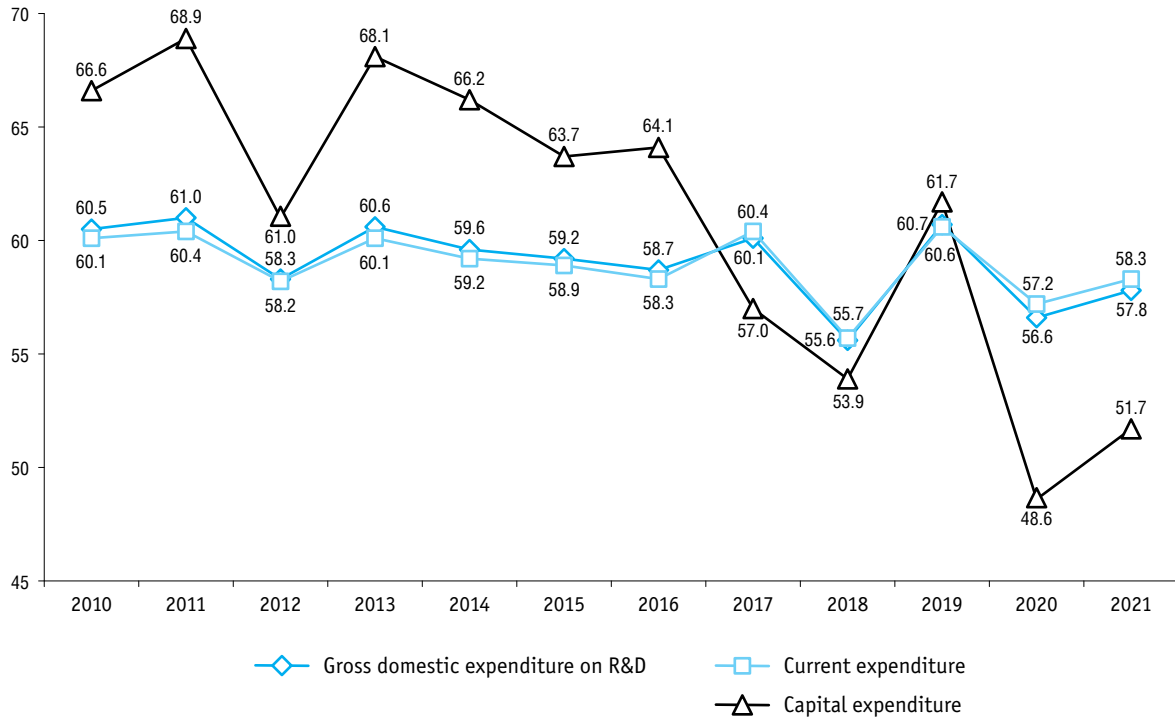
	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
<i>At current prices, thousand roubles</i>						
2000	54288781.4	24674880.5	22199361.6	23662.7	18968.0	7371908.6
2005	156880029.0	84032725.4	58460580.8	46809.5	14570.8	14325342.5
2006	192484851.0	100122872.7	68769254.4	34681.0	160678.6	23397364.3
2007	238386207.4	131768069.7	87352197.2	616853.5	163906.9	18485180.1
2008	271206280.5	151975682.0	99123835.8	43931.1	468252.7	19594578.9
2009	303051131.5	173872629.4	104955691.5	60958.8	238908.1	23922943.7
2010	316701679.9	203267110.6	101760706.5	75409.3	427247.1	11171206.4
2011	372088873.4	218291814.8	134043614.4	376915.9	806970.4	18569557.9
2012	408284378.5	246761318.2	143181603.7	240986.2	152505.3	17947965.1
2013	454409251.0	279358934.6	161100909.7	515567.0	88727.4	13345112.3
2014	505210341.3	316622608.3	177116134.2	442911.7	359214.0	10669473.1
2015	541533094.3	343396867.3	185037359.3	561703.2	421868.8	12115295.7
2016	554093599.1	326710613.8	213215672.3	153457.6	149519.8	13864335.6
2017	612960678.4	346858742.5	250875477.9	161779.1	125995.6	14938683.3
2018	571633146.1	321302048.6	239608783.5	140133.6	137267.2	10444913.2
2019	688349498.9	394109751.2	272796973.4	223218.5	137358.7	21082197.1
2020	664773104.2	374706775.4	273751774.6	243993.5	465468.0	15605092.7
2021	752056929.7	426727754.2	305629816.1	271097.6	244622.7	19183639.1

(continued)

	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
	Percentage					
2000	100	45.5	40.9	0.04	0.03	13.6
2005	100	53.6	37.3	0.03	0.01	9.1
2006	100	52.0	35.7	0.02	0.08	12.2
2007	100	55.3	36.6	0.26	0.07	7.8
2008	100	56.0	36.5	0.02	0.17	7.2
2009	100	57.4	34.6	0.02	0.08	7.9
2010	100	64.2	32.1	0.02	0.13	3.5
2011	100	58.7	36.0	0.10	0.22	5.0
2012	100	60.4	35.1	0.06	0.04	4.4
2013	100	61.5	35.5	0.11	0.02	2.9
2014	100	62.7	35.1	0.09	0.07	2.1
2015	100	63.4	34.2	0.10	0.08	2.2
2016	100	59.0	38.5	0.03	0.03	2.5
2017	100	56.6	40.9	0.03	0.02	2.4
2018	100	56.2	41.9	0.02	0.02	1.8
2019	100	57.3	39.6	0.03	0.02	3.1
2020	100	56.4	41.2	0.04	0.07	2.3
2021	100	56.7	40.6	0.04	0.03	2.6

* Including budget funds, own funds, and government sector institutions' funds.

5.3.20. BUSINESS ENTERPRISE SECTOR AS A PERCENTAGE OF GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF EXPENDITURE



5.3.21. GROSS DOMESTIC EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR BY TYPE

(thousand roubles)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D	156880029.0	316701679.9	541533094.3	554093599.1	612960678.4	571633146.1	688349498.9	664773104.2	752056929.7
Current expenditure	151228693.6	294103827.7	503088818.5	509168604.8	573687801.6	535192496.3	642575965.9	624366170.3	696291982.6
Salaries	61762384.5	134771346.7	214055655.0	214443342.3	238808979.2	221491162.7	263914633.0	251222465.5	283017304.6
Of which for R&D personnel*	56579998.4	123576290.3	196822214.9	195079681.0	218756866.9	199279063.4	229412909.2	225411879.1	254312177.6
Social security payments**	14652167.0	26089246.1	55348833.5	55160883.4	61108594.2	57398180.0	68826975.3	66217575.8	74163891.0
Equipment	5919453.8	9955224.5	17319573.0	14429765.7	11511255.6	10677342.4	22318381.7	15088069.5	15869248.4
Other material costs	39963918.4	63367540.7	109075443.3	114649833.7	135209931.5	119871383.4	146347932.4	152149389.1	174787801.2
Other current expenditure	28930769.9	59920469.7	107289313.7	110484779.7	127049041.1	125754427.8	141168043.5	139688670.4	148453737.4
Capital expenditure	5651335.4	22597852.2	38444275.8	44924994.3	39272876.8	36440649.8	45773533.0	40406933.9	55764947.1
Land and buildings	1208092.5	4950198.0	5984058.2	6774304.9	6405412.6	3749751.1	7817903.0	5041246.1	6671306.9
Including:									
land	...	...	...	...	421752.0	103778.2	285062.5	86855.3	1417411.8
buildings	...	...	...	...	5983660.6	3645972.9	7532840.5	4954390.8	5253895.1

* Excluding part-timers and independent contractors.

** National pension insurance, national health insurance, national social insurance.

(continued)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Equipment	3228403.1	14167838.2	21054397.0	20877238.1	19887421.2	18181174.7	19764025.4	22124613.7	30550551.4
Intellectual property items and results of intellectual activity	...	...	...	...	2525053.5	5391019.6	7161193.5	5600690.2	9972119.8
Other capital expenditure	1214839.8	3479816.0	11405820.6	17273451.3	10454989.5	9118704.4	11030411.1	7640383.9	8570969.0

5.3.22. CURRENT EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR BY TYPE OF R&D ACTIVITY AND FIELD OF SCIENCE AND TECHNOLOGY

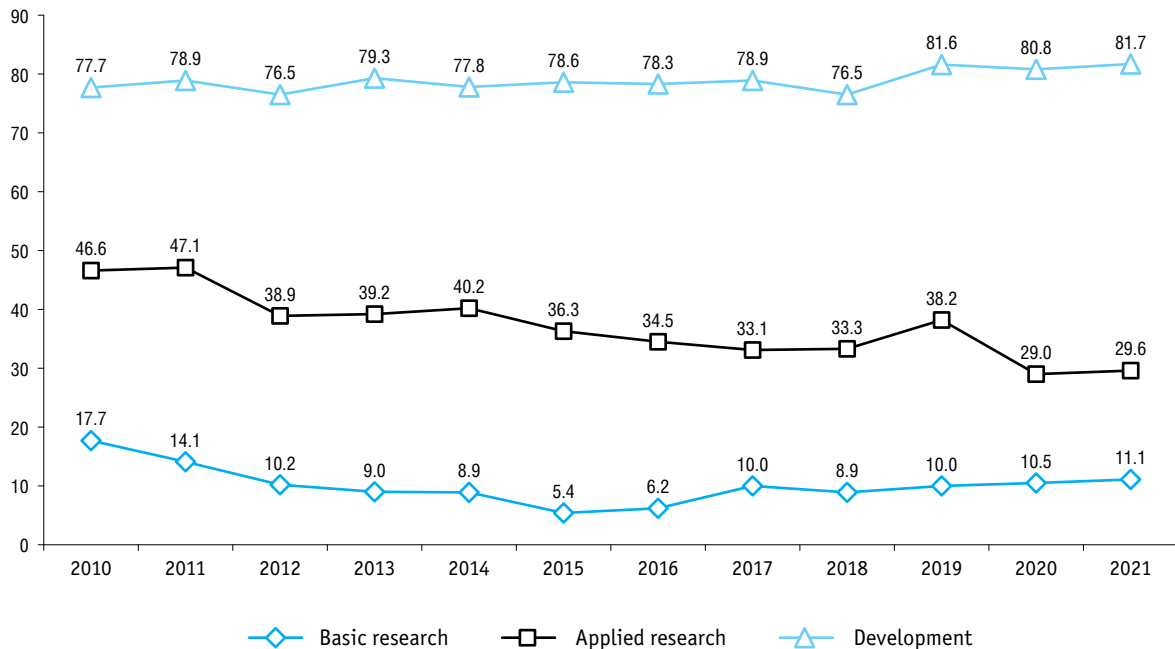
(thousand roubles)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2005							
Current expenditure on R&D	151228693.6	10041430.0	138455122.3	450558.6	1020195.6	1212995.6	48391.5
Basic research	2591506.7	1025517.8	1205156.9	53282.5	236864.8	47440.2	23244.5
Applied research	20026408.8	5053993.0	13842212.4	184566.8	446665.3	489579.6	9391.7
Development	128610778.1	3961919.2	123407753.0	212709.3	336665.5	675975.8	15755.3
2010							
Current expenditure on R&D	294103827.7	26739368.2	261926531.0	1507276.1	1288239.2	2550402.8	92010.4
Basic research	16935403.4	3875649.0	11521941.3	565100.5	441953.0	467877.0	62882.6
Applied research	42872394.0	10638493.8	29871209.5	595697.1	321868.8	1436993.9	8130.9
Development	234296030.3	12225225.4	220533380.2	346478.5	524417.4	645531.9	20996.9
2015							
Current expenditure on R&D	503088818.5	25579412.6	470180938.1	3064111.9	695241.7	3421527.3	147586.9
Basic research	7122577.4	3196716.9	2633478.4	696593.3	47856.6	494091.3	53840.9
Applied research	61520451.3	10793921.5	47539713.2	949480.0	127789.3	2074879.6	34667.7
Development	434445789.8	11588774.2	420007746.5	1418038.6	519595.8	852556.4	59078.3
2018							
Current expenditure on R&D	535192496.3	31320704.7	496301042.0	4187167.4	565072.9	2656308.4	162200.9
Basic research	15069244.8	4454237.6	7857156.1	975478.5	203832.3	1482344.8	96195.5
Applied research	65737130.8	9900869.5	52506409.8	2110448.4	96928.9	1075093.1	47381.1
Development	454386120.7	16965597.6	435937476.1	1101240.5	264311.7	98870.5	18624.3

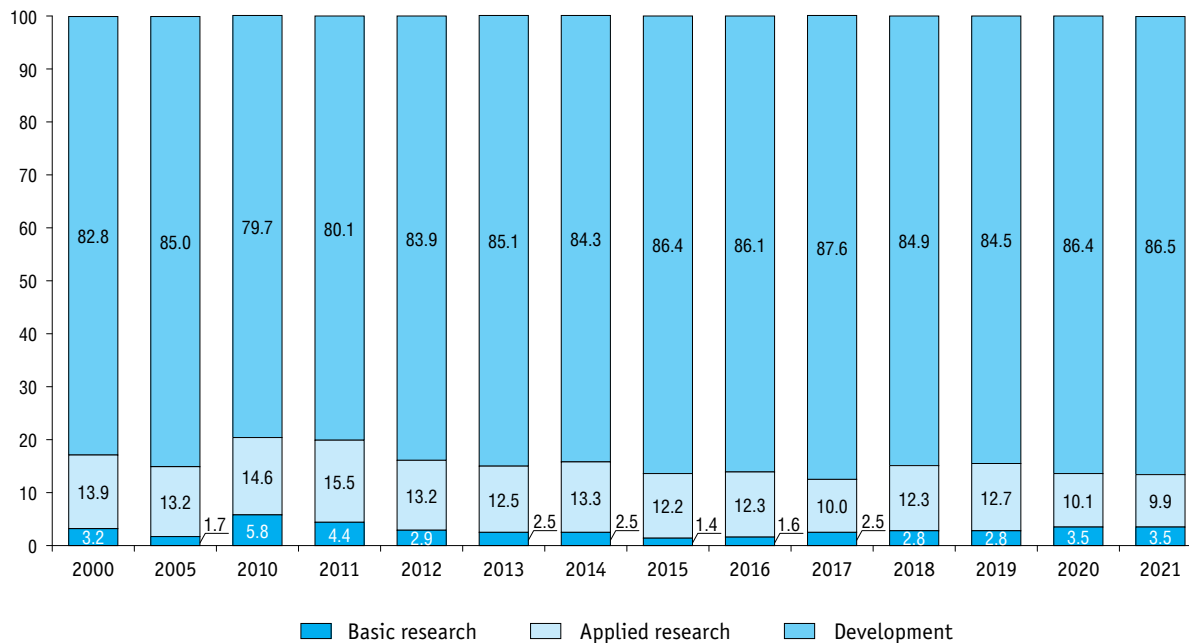
(continued)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2019							
Current expenditure on R&D	642575965.9	38672011.7	594894372.8	6417347.9	660595.4	1875101.9	56536.2
Basic research	18106435.2	2728231.1	13046621.0	1662110.2	281310.2	377473.2	10689.5
Applied research	81431333.0	15010843.3	61344527.2	3629582.0	36138.8	1402391.0	7850.7
Development	543038197.7	20932937.3	520503224.6	1125655.7	343146.4	95237.7	37996.0
2020							
Current expenditure on R&D	624366170.3	37981680.0	578251241.6	4887838.9	1575241.3	1457244.9	212923.6
Basic research	21611519.0	1781985.4	17685221.0	1136787.6	533228.4	309504.4	164792.2
Applied research	63310313.2	10235888.6	48785306.0	2743061.1	566852.9	974144.9	5059.7
Development	539444338.1	25963806.0	511780714.6	1007990.2	475160.0	173595.6	43071.7
2021							
Current expenditure on R&D	696291982.6	33772792.2	651037072.2	6704166.6	2053915.6	2404059.2	319976.8
Basic research	24706807.3	1877830.6	19611727.8	1783832.7	1090061.8	85376.0	257978.4
Applied research	69149094.7	11703822.4	52226169.4	3200286.6	577210.0	1431196.9	10409.4
Development	602436080.6	20191139.2	579199175	1720047.3	386643.8	887486.3	51589.0

5.3.23. CURRENT EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR AS A PERCENTAGE OF THE TOTAL CURRENT EXPENDITURE ON R&D BY TYPE OF R&D ACTIVITY



5.3.24. PERCENTAGE DISTRIBUTION OF CURRENT EXPENDITURE ON R&D IN THE BUSINESS ENTERPRISE SECTOR BY TYPE OF R&D ACTIVITY



5.3.25. AVERAGE MONTHLY SALARY OF R&D PERSONNEL IN THE BUSINESS ENTERPRISE SECTOR

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Average monthly salary, roubles	2519.9	9599.6	25359.7	42102.7	44611.1	51648.5	51766.7	54405.3	55538.9	63695.3
As a percentage of the salary:										
in the national economy (=100%)	113.3	112.2	121.0	123.7	121.5	131.9	118.4	113.7	108.2	111.3
in manufacturing (=100%)	106.5	114.0	132.9	131.9	129.0	134.1	127.1	124.1	119.4	121.5
in construction (=100%)	95.5	106.2	119.8	140.5	138.0	153.4	134.4	127.6	124.1	122.6

5.4. Higher education sector

5.4.1. R&D INSTITUTIONS IN THE HIGHER EDUCATION SECTOR BY TYPE

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	526	539	617	1124	1064	1038	998	1057	1080	1096
Higher education institutions	390	406	517	1040	979	970	917	951	969	990
Research institutes (centres)	107	109	71	43	40	25	41	72	69	74
Design organisations, design-and-engineering organisations	19	17	11	7	5	1	1	2	4	6
Pilot plants	2	–	1	2	1	–	–	1	–	1
Others	8	7	17	32	39	42	39	31	38	25

5.4.2. R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR BY TYPE OF R&D INSTITUTIONS

(persons)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	40787	43500	53290	63870	63046	59729	64073	74215	68860	72353
Higher education institutions	31110	33942	46776	60151	59124	56571	58573	59280	61436	63990
Research institutes (centres)	7254	7021	4796	2092	1722	1128	3210	11642	6105	6859
Design organisations, design-and-engineering organisations	2198	1991	1392	1121	839	...*	...*	...*	272	491
Pilot plants	4	–	2	...*	...*	–	–	...*	–	8
Others	221	546	324	506	1360	1605	1432	2273	1047	1005

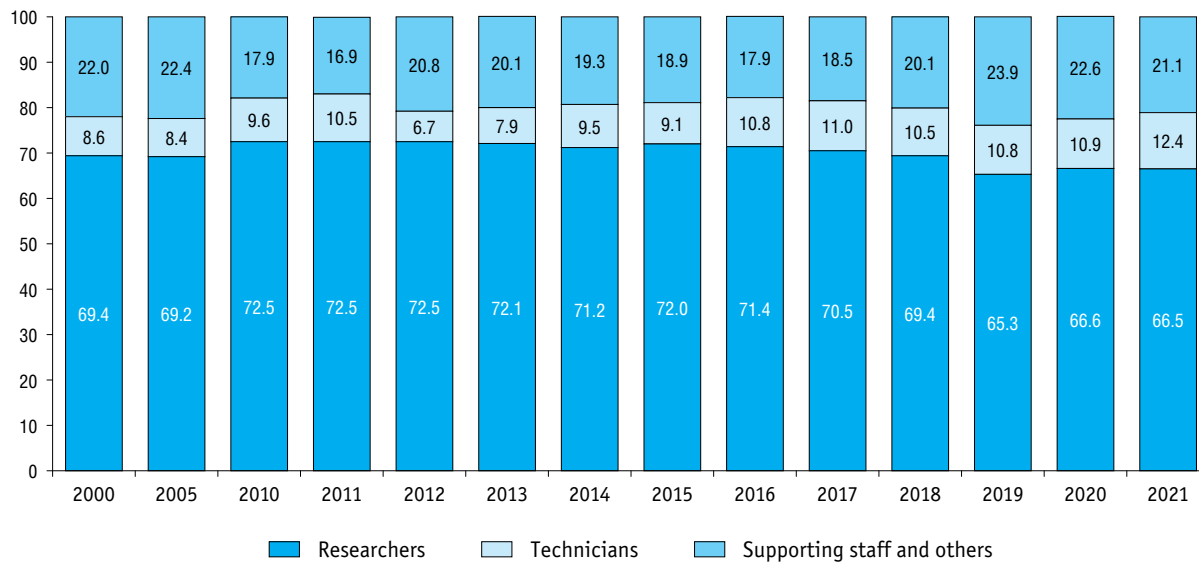
* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.4.3. R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR BY OCCUPATION

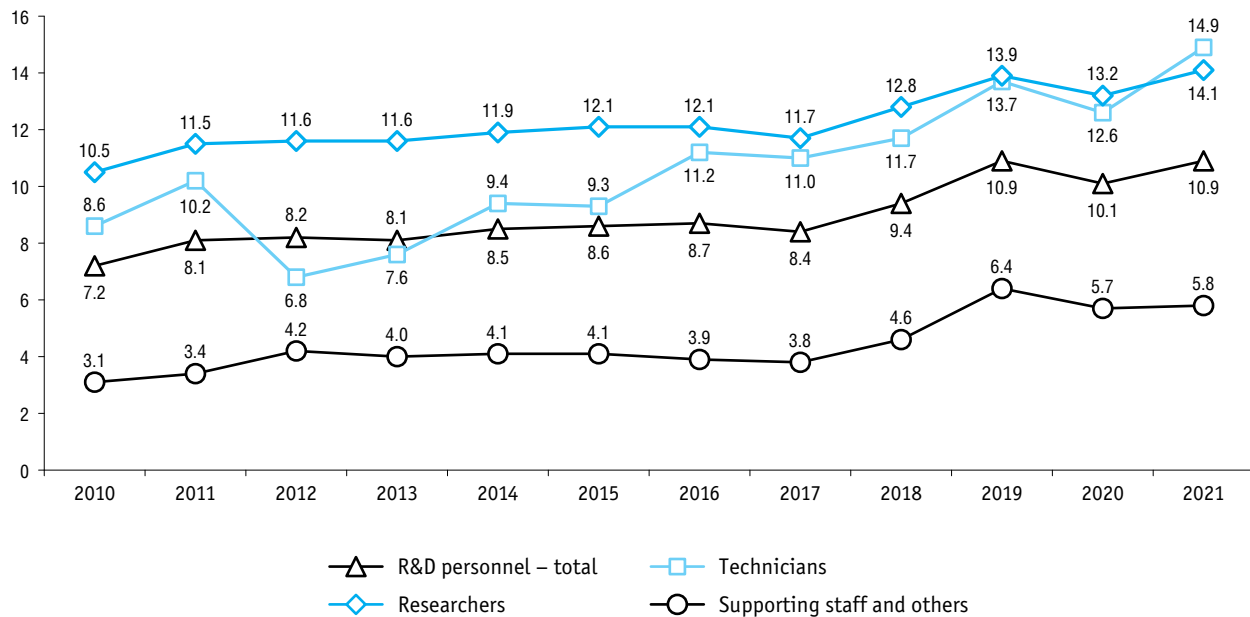
(persons)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	40787	43500	53290	63870	63046	59729	64073	74215	68860	72353
Researchers	28325	30111	38640	45967	44994	42113	44489	48429	45837	48087
Technicians	3509	3658	5095	5836	6789	6584	6736	8036	7478	8987
Supporting staff	5463	6098	6564	9217	8929	8391	8838	11489	10491	10648
Others	3490	3633	2991	2850	2334	2641	4010	6261	5054	4631

5.4.4. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR BY OCCUPATION



5.4.5. R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR AS A PERCENTAGE OF THE TOTAL NUMBER OF R&D PERSONNEL BY OCCUPATION



5.4.6. R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR BY OCCUPATION AND EDUCATIONAL ATTAINMENT

(persons)

	Total	Higher education	Secondary vocational education	Other education
R&D personnel				
2005	43500	35159	4430	3911
2010	53290	46112	3394	3784
2015	63870	58144	2071	3655
2017	59729	54664	1866	3199
2018	64073	57980	2224	3869
2019	74215	66024	2767	5424
2020	68860	62040	2050	4770
2021	72353	65973	2147	4233
Researchers				
2005	30111	30111	–	–
2010	38640	38640	–	–
2015	45967	45967	–	–
2017	42113	42113	–	–
2018	44489	44489	–	–
2019	48429	48429	–	–
2020	45837	45837	–	–
2021	48087	48087	–	–
Technicians				
2005	3658	1079	2082	497
2010	5095	2460	1526	1109
2015	5836	4120	742	974
2017	6584	4651	752	1181
2018	6736	4600	746	1390

(continued)

	Total	Higher education	Secondary vocational education	Other education
2019	8036	5488	737	1811
2020	7478	5291	618	1569
2021	8987	6554	746	1687
Supporting staff				
2005	6098	2758	1465	1875
2010	6564	3695	1190	1679
2015	9217	6068	898	2251
2017	8391	5994	762	1635
2018	8838	6109	915	1814
2019	11489	8093	978	2418
2020	10491	7659	764	2068
2021	10648	8198	781	1669
Others				
2005	3633	1211	883	1539
2010	2991	1317	678	996
2015	2850	1989	431	430
2017	2641	1906	352	383
2018	4010	2782	563	665
2019	6261	4014	1052	1195
2020	5054	3253	668	1133
2021	4631	3134	620	877

5.4.7. RESEARCHERS IN THE HIGHER EDUCATION SECTOR BY AGE

(persons)

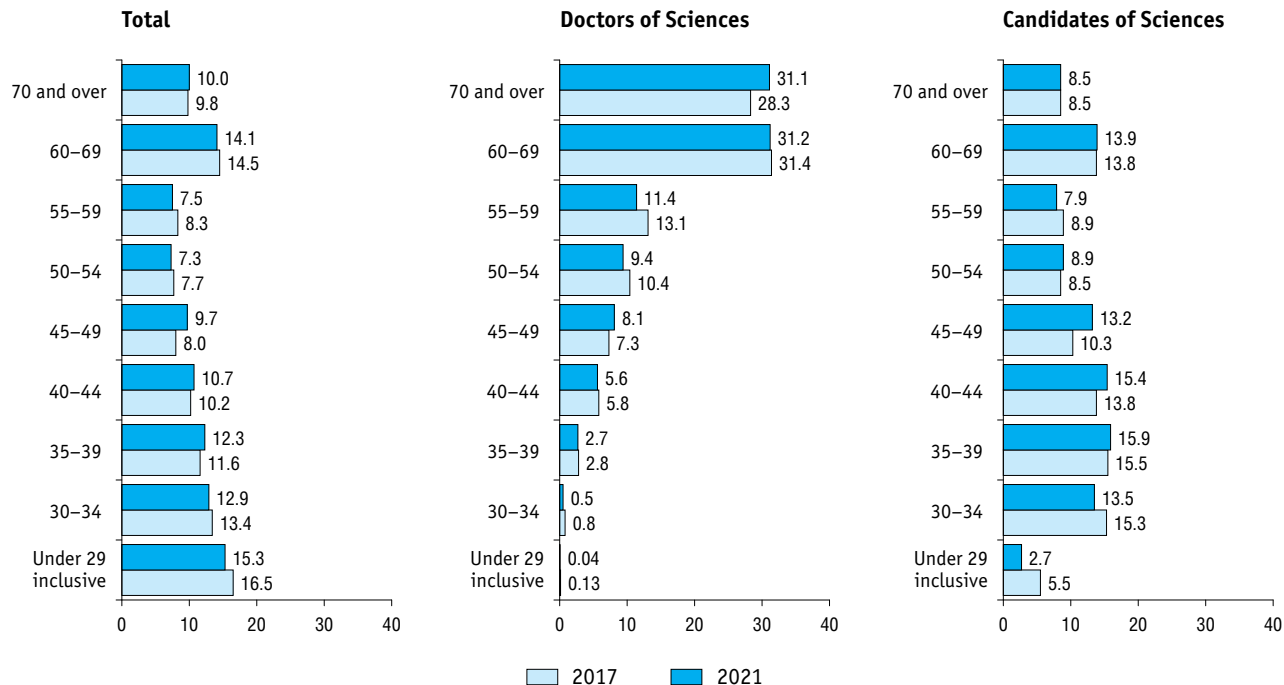
	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Total	42113	44489	48429	45837	48087	19516	20537	21725	21279	22504
Age, years:										
under 29 inclusive	6964	6954	7558	7007	7345	2909	2973	3265	3041	3165
30–34	5632	5833	6647	6246	6223	2537	2529	2869	2779	2727
35–39	4871	5118	5781	5354	5927	2484	2540	2763	2562	2745
40–44	4276	4666	5106	4999	5159	2331	2463	2603	2654	2782
45–49	3348	3803	4257	4490	4667	1862	2017	2240	2353	2581
50–54	3249	3322	3555	3226	3506	1684	1789	1784	1753	1971
55–59	3511	3706	3799	3425	3628	1674	1787	1783	1697	1790
60–64			3788	3408	3592			1690	1609	1686
65–69	6124*	6477*	3318	3129	3211	2588*	2858*	1248	1292	1361
70 and over	4138	4610	4620	4553	4829	1447	1581	1480	1539	1696
Doctors of Sciences	6185	6692	6914	6687	6978	1949	2120	2069	2105	2291
Age, years:										
under 29 inclusive	8	1	4	30	3	–	–	–	1	1
30–34	51	34	35	35	38	12	8	9	9	11
35–39	175	171	174	196	186	55	46	45	49	52
40–44	356	405	398	391	388	125	143	132	135	132
45–49	451	509	547	507	564	199	205	236	193	222
50–54	643	631	609	565	653	268	270	240	245	276
55–59	809	893	825	803	795	286	324	296	316	324
60–64			1027	999	1036			332	334	375
65–69	1941*	2021*	1188	1124	1142	590*	636*	309	315	352
70 and over	1751	2027	2107	2037	2173	414	488	470	508	546

(continued)

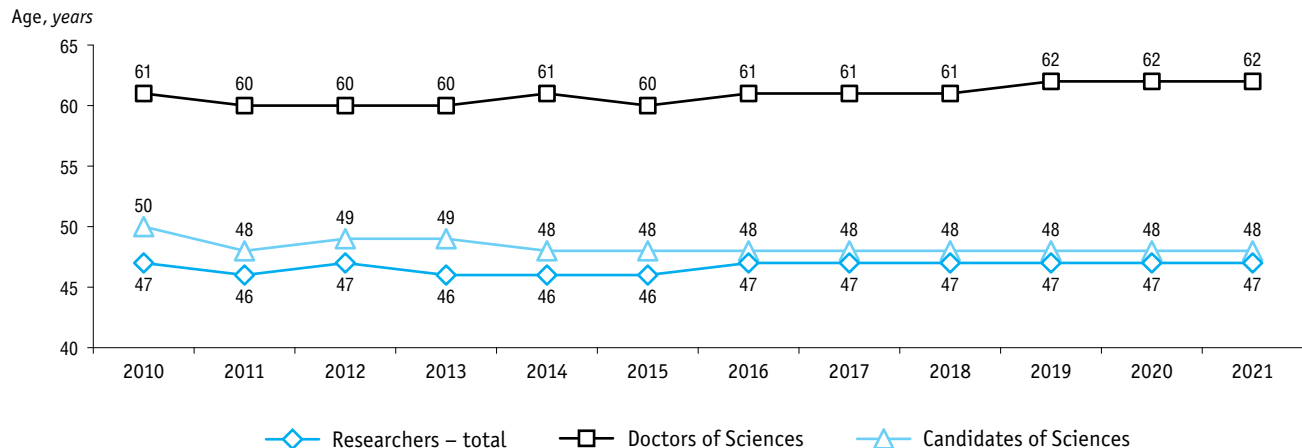
	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Candidates of Sciences	19627	20440	21658	21354	22341	10065	10358	10652	10829	11531
<i>Age, years:</i>										
under 29 inclusive	1082	893	799	700	600	440	378	325	305	277
30–34	3008	3060	3265	3166	3025	1386	1317	1416	1359	1317
35–39	3033	3128	3394	3311	3554	1666	1619	1703	1648	1705
40–44	2706	2920	3183	3260	3436	1570	1661	1751	1827	1959
45–49	2014	2241	2526	2661	2960	1182	1298	1404	1582	1754
50–54	1665	1689	1777	1802	1982	976	979	985	1050	1187
55–59	1747	1814	1777	1705	1774	910	955	948	920	1002
60–64	2708*	2908*	1772	1587	1696	1235*	1388*	861	830	879
65–69			1384	1353	1408			558	593	658
70 and over	1664	1787	1781	1809	1906	700	763	701	715	793

* Until 2019, the data was collected for the 60–69 age group.

5.4.8. PERCENTAGE DISTRIBUTION OF RESEARCHERS IN THE HIGHER EDUCATION SECTOR BY AGE



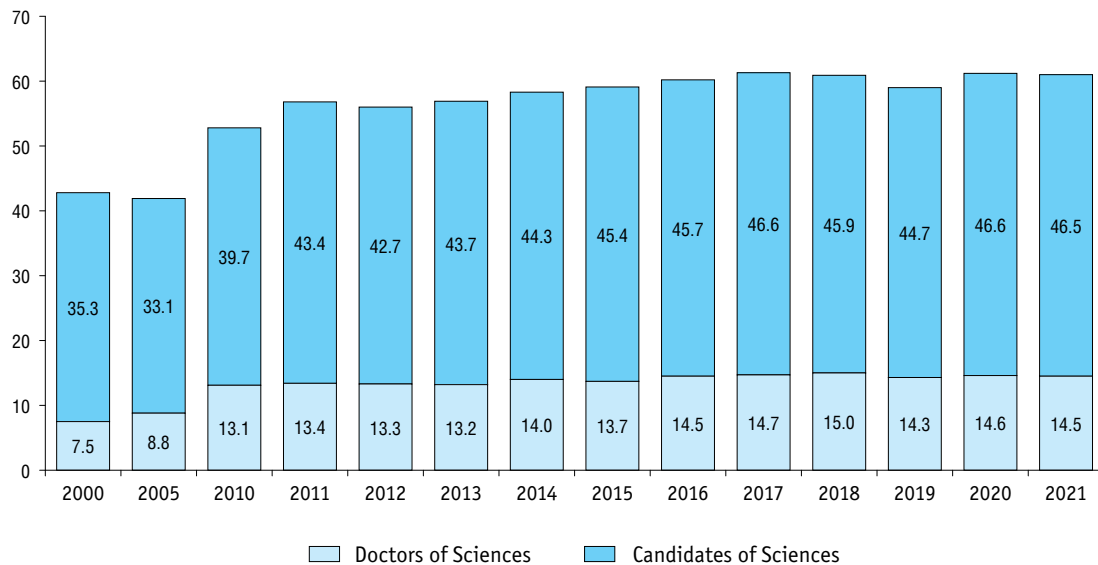
5.4.9. AVERAGE AGE OF RESEARCHERS IN THE HIGHER EDUCATION SECTOR



5.4.10. RESEARCHERS WITH SCIENTIFIC DEGREES IN THE HIGHER EDUCATION SECTOR

(persons)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Researchers with scientific degrees	12113	12618	20423	27184	27109	25812	27132	28572	28041	29319
Doctors of Sciences	2120	2654	5068	6318	6532	6185	6692	6914	6687	6978
Candidates of Sciences	9993	9964	15355	20866	20577	19627	20440	21658	21354	22341

5.4.11. RESEARCHERS WITH SCIENTIFIC DEGREES AS A PERCENTAGE OF THE TOTAL NUMBER OF RESEARCHERS IN THE HIGHER EDUCATION SECTOR

5.4.12. RESEARCHERS IN THE HIGHER EDUCATION SECTOR BY FIELD OF SCIENCE AND TECHNOLOGY

(persons)

	2010			2019			2020			2021		
	Researchers	Of whom		Researchers	Of whom		Researchers	Of whom		Researchers	Of whom	
		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences		Doctors of Sciences	Candidates of Sciences
Total	38640	5068	15355	48429	6914	21658	45837	6687	21354	48087	6978	22341
Natural sciences	13652	2283	6424	14861	2622	7135	13745	2390	6879	14866	2361	7066
Engineering and technology	11938	554	2574	12624	871	3594	10797	819	3417	10370	782	3301
Medical sciences	2263	466	1047	2197	435	1026	2169	445	933	2254	448	947
Agricultural sciences	894	122	420	1357	237	602	1495	272	790	1722	271	845
Social sciences	5664	896	2783	11846	1784	6618	11601	1757	6550	12165	1926	6790
Humanities	4229	747	2107	5544	965	2683	6030	1004	2785	6710	1190	3392

5.4.13. R&D PERSONNEL TURNOVER IN THE HIGHER EDUCATION SECTOR BY OCCUPATION: 2020-2021

(persons)

	Number at the beginning of the reporting year	Inflow							Outflow		Number at the end of the reporting year
		total	of whom						total	were made redundant	
			higher education graduates					other research institutes' graduates			
			total	of whom			with a master's degree				
from leading classical university	from federal university	from national research university									
2020											
Total	67550	16200	2700	224	588	704	581	1860	14890	165	68860
Researchers	44399	8986	1501	124	313	365	377	1183	7686	129	45837
Technicians	7458	3024	524	27	137	164	95	230	2907	10	7478
Supporting staff	10513	3242	616	69	108	172	100	290	3247	15	10491
Others	5180	948	59	4	30	3	9	157	1050	11	5054
2021											
Total	70335	16563	4513	174	690	1338	775	1140	14545	118	72353
Researchers	46288	9194	3325	73	492	816	547	708	7161	69	48087
Technicians	8423	3502	679	41	123	279	131	191	3004	8	8987
Supporting staff	10441	2962	445	53	59	228	86	197	3188	6	10648
Others	5183	905	64	7	16	15	11	44	1192	35	4631

5.4.14. R&D PERSONNEL TURNOVER IN THE HIGHER EDUCATION SECTOR BY OCCUPATION

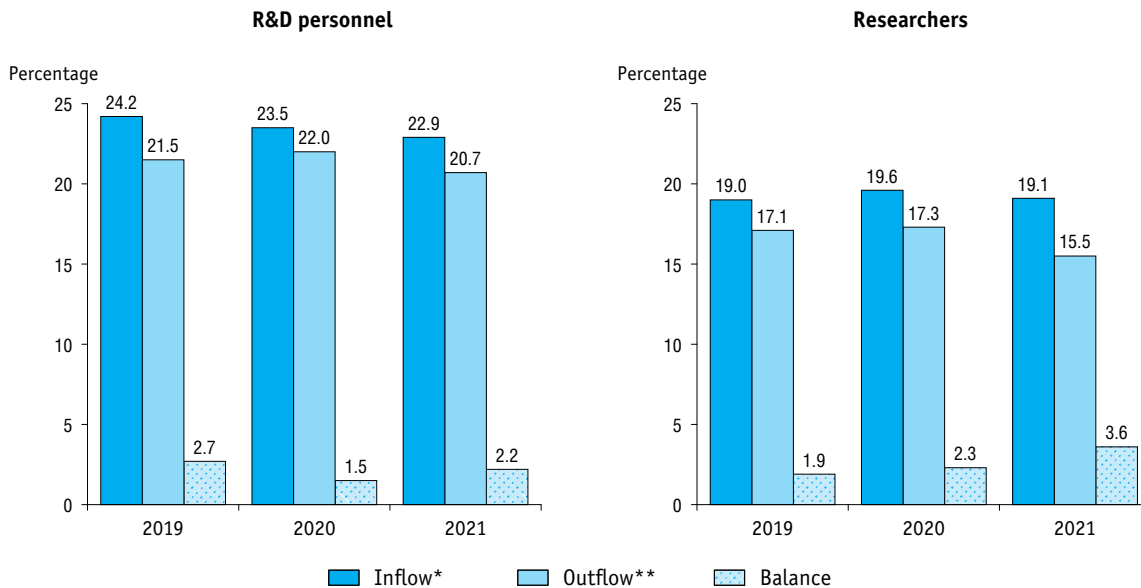
(persons)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of which			total	of which			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Total										
2005	41601	8770	1475	1388	5907	6871	4096	25	2750	43500
2013	59043	13561	1648	2104	9809	13357	6381	212	6764	59247
2015	63192	14971	2293	2788	9890	14293	7256	350	6687	63870
2017	61561	14322	2019	1975	10328	16154	6692	357	9105	59729
2019	71697	17968	2550	3747	11671	15450	7617	131	7702	74215
Researchers										
2005	28951	5219	1229	1058	2932	4062	2470	16	1576	30111
2013	42229	7140	903	1604	4633	6663	3584	134	2945	42692
2015	45677	8141	1102	1934	5105	7854	4158	226	3470	45967
2017	44017	7685	1056	1306	5323	9587	3723	238	5626	42113
2019	47311	9201	1093	2661	5447	8093	3757	85	4251	48429
Technicians										
2005	3451	1030	114	115	801	820	467	1	352	3658
2013	4490	2260	277	187	1796	2081	870	37	1174	4670
2015	5443	2701	606	186	1909	2276	1318	28	930	5836
2017	6453	2770	470	417	1883	2671	1220	18	1433	6584
2019	7416	3269	678	310	2281	2642	1285	11	1346	8036

(continued)

	Number at the beginning of the reporting year	Inflow				Outflow				Number at the end of the reporting year
		total	of which			total	of which			
			higher education graduates	other research institutes' graduates	other		resigned	were made redundant	left due to other reasons	
Supporting staff and others										
2005	9199	2521	132	215	2174	1989	1159	8	822	9731
2013	12324	4161	468	313	3380	4613	1927	41	2645	11885
2015	12072	4129	585	668	2876	4163	1780	96	2287	12067
2017	11091	3867	493	252	3122	3896	1749	101	2046	11032
2019	16970	5498	779	776	3943	4715	2575	35	2105	17750

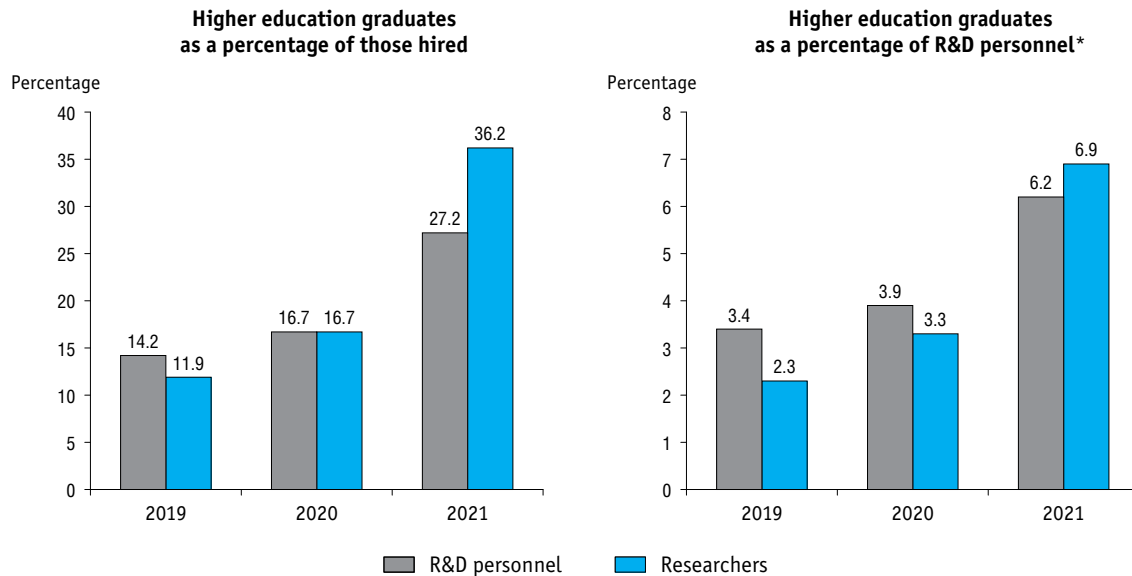
5.4.15. INFLOW AND OUTFLOW OF R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR



* The ratio of those hired during the year to the total employment at the end of the year.

** The ratio of those who left during the year to the total employment at the beginning of the year.

5.4.16. INFLOW OF HIGHER EDUCATION GRADUATES INTO HIGHER EDUCATION SECTOR INSTITUTIONS



* The ratio of the higher education graduates hired during the year to the total employment at the end of the year.

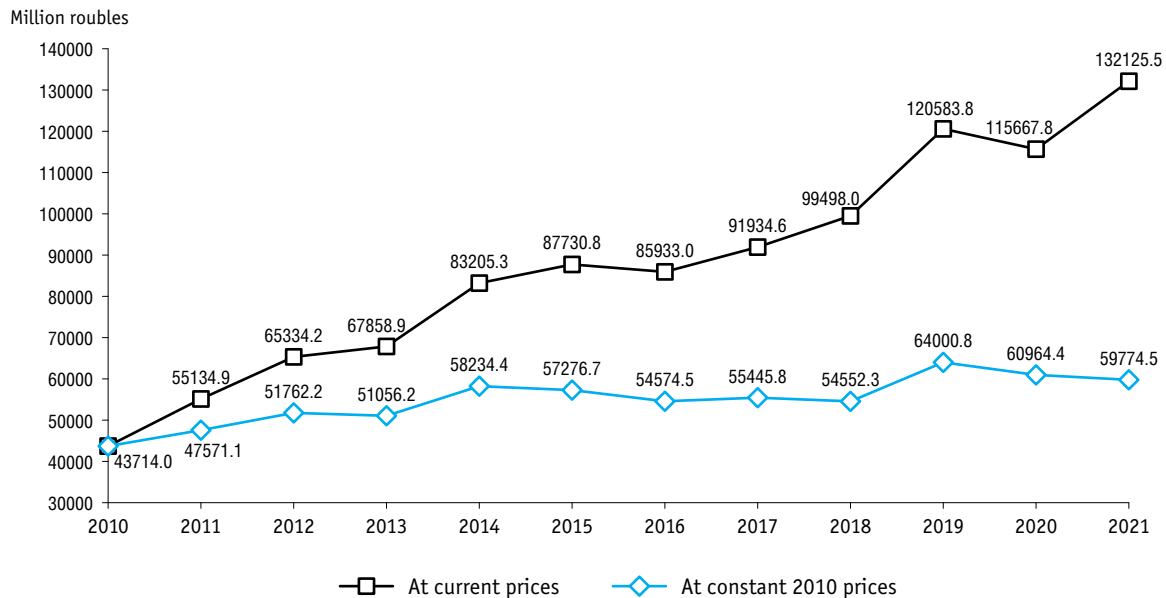
5.4.17. GROSS DOMESTIC EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR BY TYPE OF R&D INSTITUTIONS

(thousand roubles)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	3489342.2	13337987.1	43714007.3	87730781.4	85932983.0	91934601.3	99497983.2	120583819.3	115667831.6	132125467.4
Higher education institutions	2777397.1	10963094.5	38787366.4	82972415.2	80424185.9	86842669.4	91741379.8	100255580.8	108343554.5	121331834.0
Research institutes (centres)	528449.7	1596818.1	3429235.6	3382500.2	2306867.9	2010103.7	4944445.9	15702975.5	6307867.8	9185835.2
Design organisations, design-and-engineering organisations	157818.5	519987.1	984428.5	1114835.9	1817239.9	...*	...*	...*	90896.1	499814.8
Pilot plants	78.5	–	26584.0	...*	...*	–	–	...*	–	...*
Others	25598.4	258087.4	486392.8	253618.1	1379716.3	1518297.2	1326981.5	2628824.5	925513.2	1106153.4

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

5.4.18. GROSS DOMESTIC EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR



5.4.19. GROSS DOMESTIC EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR BY SOURCE OF FUNDS

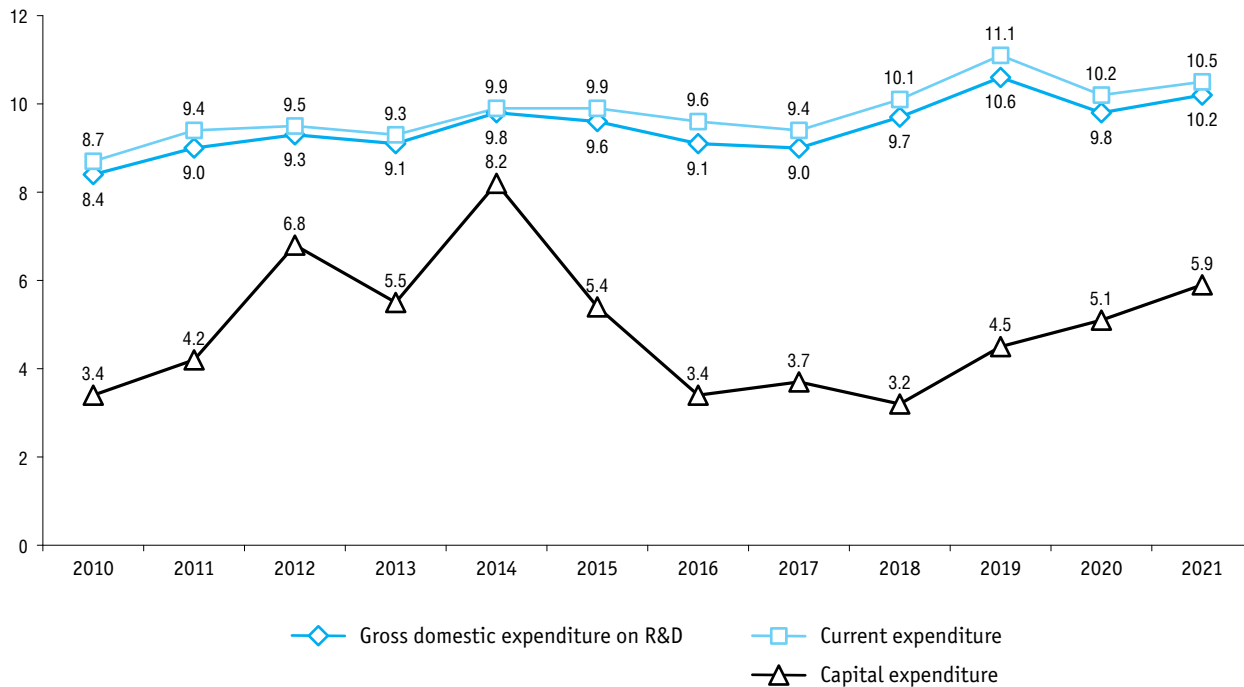
	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
<i>At current prices, thousand roubles</i>						
2000	3489342.2	2220574.3	951898.2	178004.2	6651.5	132214.0
2005	13337987.1	7982229.6	3911201.8	889069.7	20503.0	534983.0
2006	17639173.8	10350996.7	5169607.6	1505274.5	26181.7	587113.3
2007	23471870.9	13931491.1	7267861.9	1573278.8	64898.0	634341.1
2008	28868566.7	18003735.9	8244450.2	1758509.8	84419.2	777451.6
2009	34642216.7	24181368.4	7769897.9	1741764.5	95595.8	853590.1
2010	43714007.3	30017817.7	10724045.9	2154774.3	55055.8	762313.6
2011	55134893.9	37047554.1	13224580.6	4030900.0	93584.3	738274.9
2012	65334232.1	40803297.5	17709405.2	5441235.5	371292.2	1009001.7
2013	67858855.1	40378679.8	18663427.9	7080091.0	448892.7	1287763.7
2014	83205260.1	50496387.8	22607546.6	8215233.9	506189.0	1379902.8
2015	87730781.4	51570251.1	24028351.9	9979551.2	671465.0	1481162.2
2016	85932983.0	52444188.9	23832576.7	7658742.4	832874.6	1164600.4
2017	91934601.3	56486622.7	25896640.8	7528724.3	717720.7	1304892.8
2018	99497983.2	60269300.1	28911169.3	8436774.6	638991.1	1241748.1
2019	120583819.3	70926425.7	38811041.2	8516807.2	668979.4	1660565.8
2020	115667831.6	68550845.1	34306561.0	10212551.5	1003087.0	1594787.0
2021	132125467.4	76977653.9	37556241.5	14954576.7	1123152.2	1513843.1

* Including budget appropriations, general university funds and government sector institutions' funds.

(continued)

	Total	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Funds from abroad
	Percentage					
2000	100	63.6	27.3	5.1	0.2	3.8
2005	100	59.8	29.3	6.7	0.2	4.0
2006	100	58.7	29.3	8.5	0.1	3.3
2007	100	59.4	31.0	6.7	0.3	2.7
2008	100	62.4	28.6	6.1	0.3	2.7
2009	100	69.8	22.4	5.0	0.3	2.5
2010	100	68.7	24.5	4.9	0.1	1.7
2011	100	67.2	24.0	7.3	0.2	1.3
2012	100	62.5	27.1	8.3	0.6	1.5
2013	100	59.5	27.5	10.4	0.7	1.9
2014	100	60.7	27.2	9.9	0.6	1.7
2015	100	58.8	27.4	11.4	0.8	1.7
2016	100	61.0	27.7	8.9	1.0	1.4
2017	100	61.4	28.2	8.2	0.8	1.4
2018	100	60.6	29.1	8.5	0.6	1.2
2019	100	58.8	32.2	7.1	0.6	1.4
2020	100	59.3	29.7	8.8	0.9	1.4
2021	100	58.3	28.4	11.3	0.9	1.1

5.4.20. HIGHER EDUCATION SECTOR AS A PERCENTAGE OF GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF EXPENDITURE



5.4.21. GROSS DOMESTIC EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR BY TYPE

(thousand roubles)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D	13337987.1	43714007.3	87730781.4	85932983.0	91934601.3	99497983.2	120583819.3	115667831.6	132125467.4
Current expenditure	13144292.5	42552245.4	84495233.0	83579171.0	89400111.3	97311000.9	117214181.6	111405695.7	125753005.7
Salaries	6952057.5	25267352.4	48945642.1	48193431.8	51793629.5	58599453.3	71130943.5	67209381.9	74711661.7
Of which for R&D personnel*	3552276.8	14033490.5	27878480.3	27441222.3	29270588.6	34622697.5	44895361.5	44886423.6	49891100.5
Social security payments**	1654258.7	5260709.4	12471272.2	12307550.0	13626193.1	14985942.8	17931547.5	16475500.1	19102091.6
Equipment	917350.6	2639343.7	3708006.7	4202312.8	4151400.5	3335083.5	4341320.0	5666814.6	7209688.6
Other material costs	1501392.4	3344896.4	6193042.0	6139669.1	6005843.5	5977078.2	6245165.6	6951084.4	8297592.6
Other current expenditure	2119233.3	6039943.5	13177270.0	12736207.3	13823044.7	14413443.1	17565205.0	15102914.7	16431971.2
Capital expenditure	193694.6	1161761.9	3235548.4	2353812.0	2534490.0	2186982.3	3369637.7	4262135.9	6372461.7
Land and buildings	39711.4	14186.1	141573.3	164362.3	326991.9	144274.2	113312.8	...***	...***
Including:									
land	...	...	...	...	668.5	6264.0	27077.5	...***	...***
buildings	...	...	...	...	326323.4	138010.2	86235.3	39818.2	85709.0
Equipment	104359.6	1068873.2	2375951.4	1884027.0	1830733.7	1820455.1	2720235.9	3718178.4	5213197.7

(continued)

	2005	2010	2015	2016	2017	2018	2019	2020	2021
Intellectual property items and results of intellectual activity	...	...	...	...	120854.4	142077.1	182630.7	192135.1	495563.6
Other capital expenditure	49623.6	78702.6	718023.7	305422.7	255910.0	80175.9	353458.3	307517.2	577591.4

* Excluding external multiple jobholders and independent contractors.

** National pension insurance, national health insurance, national social insurance.

*** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

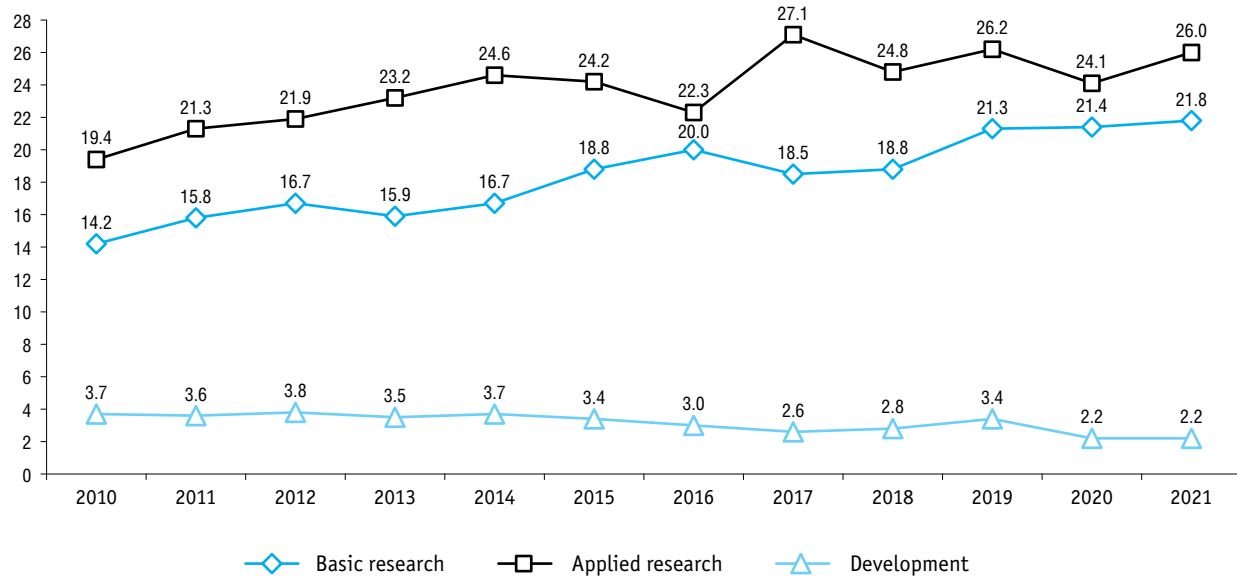
5.4.22. CURRENT EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR BY TYPE OF R&D ACTIVITY AND FIELD OF SCIENCE AND TECHNOLOGY

(thousand roubles)

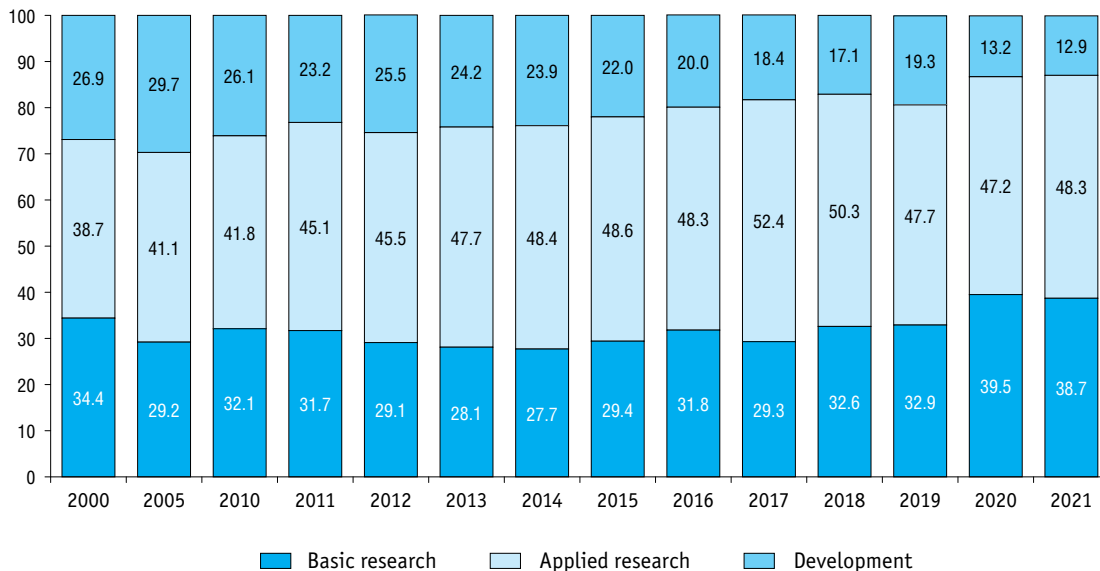
	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2005							
Current expenditure on R&D	13144292.5	3896908.4	6853399.7	378448.2	200121.3	1419552.8	395862.1
Basic research	3841327.6	2342791.4	751584.6	147772.6	31818.6	342156.9	225203.5
Applied research	5405410.3	1112036.2	2918946.4	161855.9	121828.4	949311.8	141431.6
Development	3897554.6	442080.8	3182868.7	68819.7	46474.3	128084.1	29227.0
2010							
Current expenditure on R&D	42552245.4	12076614.1	20864675.6	1309942.7	730315.2	6137791.2	1432906.6
Basic research	13647906.8	7585787.8	2819934.7	472436.1	145701.5	1919937.8	704108.9
Applied research	17804762.0	3177035.8	9056919.5	680400.6	486773.7	3723764.3	679868.1
Development	11099576.6	1313790.5	8987821.4	157106.0	97840.0	494089.1	48929.6
2015							
Current expenditure on R&D	84495233.0	24471293.5	36048768.8	4478205.2	1515246.7	12800336.7	5181382.1
Basic research	24839057.2	13659393.9	3644828.6	1348438.7	193512.2	3664822.7	2328061.1
Applied research	41098469.1	8214107.1	18786848.4	2576517.7	1171765.9	7925797.8	2423432.2
Development	18557706.7	2597792.5	13617091.8	553248.8	149968.6	1209716.2	429888.8
2018							
Current expenditure on R&D	97311000.9	26187293.0	40110145.3	5472907.2	2548942.6	17318509.0	5673203.8
Basic research	31730954.7	16471681.5	4984294.3	1069214.5	635154.9	5585547.4	2985062.1
Applied research	48963848.7	7554228.3	22204622.1	4069279.9	1719281.0	11038872.1	2377565.3
Development	16616197.5	2161383.2	12921228.9	334412.8	194506.7	694089.5	310576.4

(continued)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
2019							
Current expenditure on R&D	117214181.6	33390848.1	50570195.0	6755390.7	3346233.0	17304948.8	5846566.0
Basic research	38605748.7	21022942.4	5322874.9	1234469.4	1268202.2	6249318.0	3507941.8
Applied research	55931371.7	10129850.4	26471857.9	4887937.2	1867066.0	10520821.1	2053839.1
Development	22677061.2	2238055.3	18775462.2	632984.1	210964.8	534809.7	284785.1
2020							
Current expenditure on R&D	111405695.7	32588602.0	40392028.8	8879941.2	4126528.8	18946314.3	6472280.6
Basic research	44018871.9	22825489.6	7771503.1	1594005.9	1888369.8	6262147.0	3677356.5
Applied research	52638722.2	7810529.6	21825629.9	6647631.8	1994726.6	11831667.4	2528536.9
Development	14748101.6	1952582.8	10794895.8	638303.5	243432.4	852499.9	266387.2
2021							
Current expenditure on R&D	125753005.7	36351775.7	46148233.6	10469887.6	4511966.4	20246472.3	8024670.1
Basic research	48710911.9	25596445.8	8019178.0	1773537.9	1981078.8	6762423.1	4578248.3
Applied research	60773033.0	8684257.7	25753126.9	8378719.8	2015814.6	12789246.9	3151867.1
Development	16269060.8	2071072.2	12375928.7	317629.9	515073.0	694802.3	294554.7

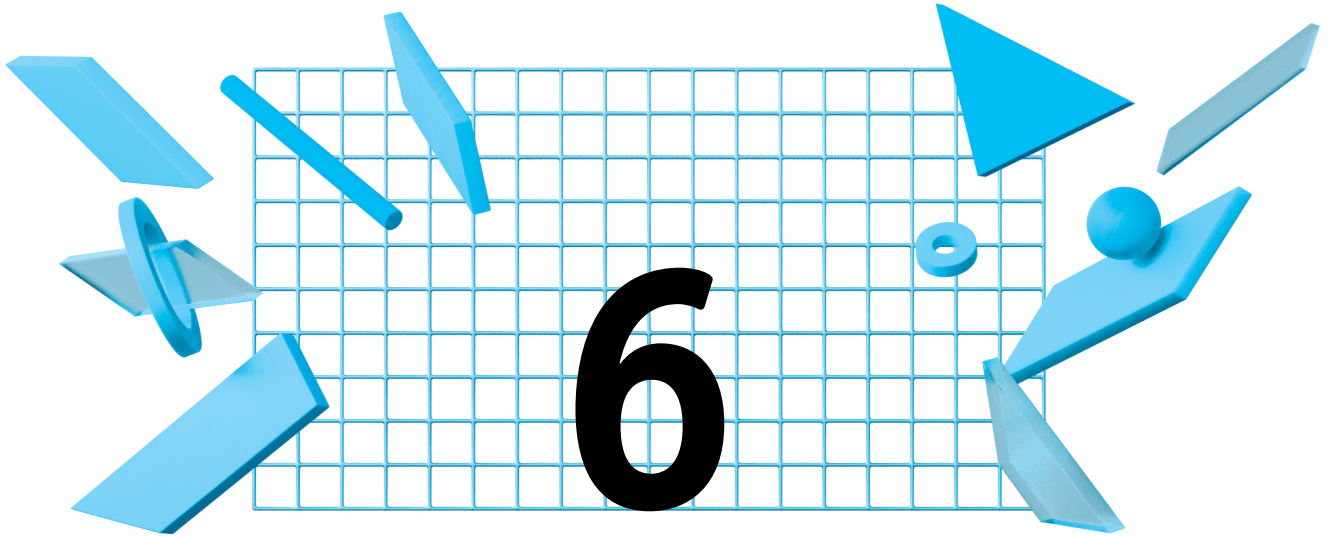
5.4.23. CURRENT EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR AS A PERCENTAGE OF THE TOTAL CURRENT EXPENDITURE ON R&D BY TYPE OF R&D ACTIVITY

5.4.24. PERCENTAGE DISTRIBUTION OF CURRENT EXPENDITURE ON R&D IN THE HIGHER EDUCATION SECTOR BY TYPE OF R&D ACTIVITY



5.4.25. AVERAGE MONTHLY SALARY OF R&D PERSONNEL IN THE HIGHER EDUCATION SECTOR

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Average monthly salary, roubles	1400.3	7042.0	23716.4	41850.5	43370.8	49437.9	57848.0	60266.4	69840.8	74302.3
As a percentage of the salary:										
in the national economy (=100%)	63.0	82.3	113.2	123.0	118.1	126.2	132.3	125.9	136.0	129.8
in manufacturing (=100%)	59.2	83.6	124.3	131.2	125.4	128.4	142.1	137.4	150.2	141.8
in construction (=100%)	53.0	77.9	112.0	139.7	134.1	146.8	150.2	141.4	156.1	143.0



R&D OUTPUT

Publication activity

6.1. PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY TYPE*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
World total number of publications**										
Publications – total	1216054	1678574	2144178	2549939	2638400	2710046	2868398	3065767	3231373	3492016
Articles	998735	1111642	1519507	1969616	2001705	2034368	2143059	2285506	2498546	2728537
Conference papers	146228	384464	493560	429887	465036	492843	537212	589398	508683	504595
Reviews	71091	182468	131111	150436	171659	182835	188127	190863	224144	258884
Number of publications by Russian authors										
Publications – total	34556	39636	39647	67392	81329	89521	103677	115988	123641	122551
Articles	30872	29755	32064	52572	59075	62283	69057	75933	79588	84060
Conference papers	2924	8499	6634	12613	18899	22895	29822	35643	38825	32605
Reviews	760	1382	949	2207	3355	4343	4798	4412	5228	5886
Russia's share in the world total number of publications										
Publications – total	2.84	2.36	1.85	2.64	3.08	3.30	3.61	3.78	3.83	3.51
Articles	3.09	2.68	2.11	2.67	2.95	3.06	3.22	3.32	3.19	3.08
Conference papers	2.00	2.21	1.34	2.93	4.06	4.65	5.55	6.05	7.63	6.46
Reviews	1.07	0.76	0.72	1.47	1.95	2.38	2.55	2.31	2.33	2.27

* Here and below, publications, unless indicated otherwise, mean three types of documents indexed in Scopus or Web of Science: articles, papers and reviews.

** Here and below in table 6.3 and 6.7 and figure 6.5 and 6.11, HSE ISSEK estimates are based on the Scopus data as at November 12, 2022.

6.2. PUBLICATIONS BY RUSSIAN AUTHORS IN SCIENTIFIC JOURNALS INDEXED IN WEB OF SCIENCE BY TYPE*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
World total number of publications										
Publications – total	973121	1256754	1758376	2289978	2404804	2497736	2557037	2768624	2821536	2764974
Articles	797568	1025936	1414735	1816351	1892338	1969704	2032871	2254463	2394724	...
Conference papers	239332	306268	324177	405036	435400	437307	415910	374658	225813	...
Reviews	33643	48513	70828	99869	110932	121496	137096	157921	191932	...
Number of publications by Russian authors										
Publications – total	31337	30325	38170	58152	68895	77079	84358	89919	86325	71617
Articles	27029	26250	34109	46050	50107	55154	60044	64266	66817	...
Conference papers	7279	6444	4515	11967	18637	21830	23379	24247	16456	...
Reviews	642	710	863	1241	1456	1641	2014	2410	3026	...
Russia's share in the world total number of publications										
Publications – total	3.22	2.41	2.17	2.54	2.86	3.09	3.30	3.25	3.06	2.59
Articles	3.39	2.56	2.41	2.54	2.65	2.80	2.95	2.85	2.79	...
Conference papers	3.04	2.10	1.39	2.95	4.28	4.99	5.62	6.47	7.29	...
Reviews	1.91	1.46	1.22	1.24	1.31	1.35	1.47	1.53	1.58	...

* The total number of publications, HSE ISSEK estimates are based on the data from InCites Clarivate Analytics (Web of Science as at March 12, 2022). The number of articles, papers and reviews, HSE ISSEK estimates are based on the Web of Science data as at October 19, 2021. Due to the use of different data sources, the sum of publications by type is not equal to the total number of publications.

6.3. PUBLICATIONS IN THE SELECTED RESEARCH FIELDS AS A PERCENTAGE OF THE TOTAL NUMBER OF PUBLICATIONS IN SCIENTIFIC JOURNALS INDEXED IN SCOPUS*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia										
Natural sciences and exact sciences	86.9	82.9	87.8	78.1	76.6	76.7	77.9	77.9	77.5	74.0
Engineering and technology	41.0	40.7	34.5	35.2	35.8	33.7	36.4	33.5	35.0	30.2
Medical sciences	13.2	8.9	9.3	12.4	14.7	14.9	14.8	15.0	16.5	18.5
Agricultural sciences	2.9	2.2	3.2	3.6	3.1	3.3	3.0	3.1	3.2	3.7
Social sciences	1.7	2.3	3.2	9.8	10.8	10.8	10.7	11.2	10.6	10.6
Humanities	0.4	0.6	1.2	5.1	3.5	4.4	4.9	5.3	5.0	6.1
World										
Natural sciences and exact sciences	57.5	55.4	59.4	59.7	60.3	61.4	62.8	63.4	62.3	61.4
Engineering and technology	28.6	32.9	30.0	31.0	31.2	32.0	32.9	33.9	32.1	30.7
Medical sciences	37.8	32.9	31.6	31.7	31.2	30.4	29.8	29.1	31.2	32.8
Agricultural sciences	5.6	5.2	5.9	6.3	6.2	6.3	6.2	5.9	6.3	6.2
Social sciences	10.0	9.8	11.8	12.2	12.6	12.8	13.1	13.5	13.9	13.9
Humanities	2.6	3.4	3.7	4.2	4.1	4.2	4.2	4.2	4.2	4.2

* Here and below in tables 6.4, 6.7 and 6.8; figures 6.5 and 6.6, the sciences are grouped in accordance with the OECD Fields of Science Classification. Here and below in table 6.4, the sum in the column does not add up to 100%, because one publication may belong to two and more fields of science.

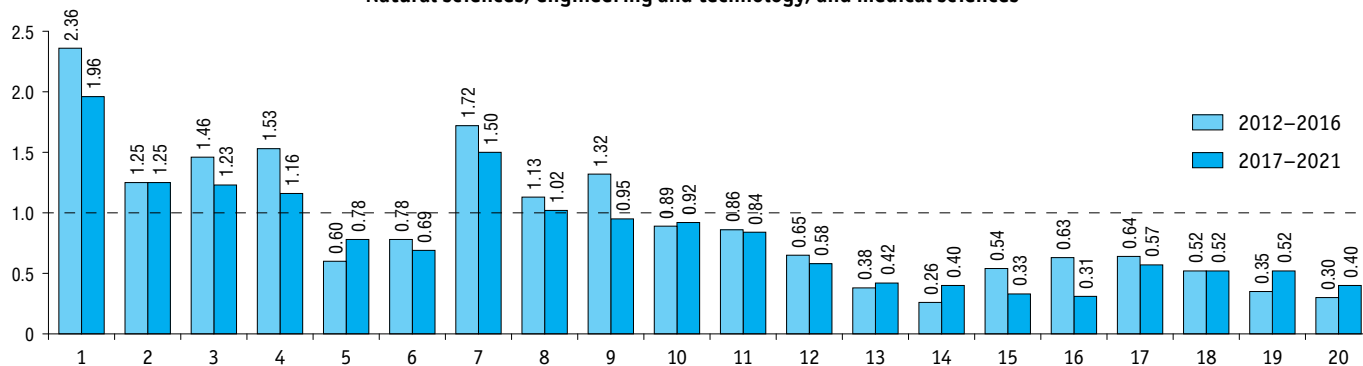
6.4. PUBLICATIONS IN THE SELECTED RESEARCH FIELDS AS A PERCENTAGE OF THE TOTAL NUMBER OF PUBLICATIONS IN SCIENTIFIC JOURNALS INDEXED IN WEB OF SCIENCE*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia										
Natural sciences	79.9	77.3	71.2	62.9	60.3	58.3	59.0	57.9	59.1	57.3
Engineering and technology	28.7	29.6	24.4	31.0	33.1	33.0	33.2	32.3	31.9	29.5
Medical sciences	6.5	7.1	8.2	7.1	7.1	6.9	7.0	7.5	9.0	10.6
Agricultural sciences	1.1	1.2	1.0	1.0	1.2	1.0	1.3	1.7	4.8	2.9
Social sciences	2.2	3.2	6.3	9.4	10.2	12.3	12.6	13.5	12.2	9.6
Humanities	0.5	1.1	2.4	5.4	5.6	7.1	6.6	7.5	8.0	8.0
World										
Natural sciences	51.3	50.4	45.7	44.4	44.2	44.0	44.7	44.9	44.6	44.6
Engineering and technology	27.0	27.5	28.1	30.2	30.9	31.4	31.6	31.1	29.7	28.7
Medical sciences	29.1	26.8	27.2	26.6	26.2	26.1	26.1	26.7	29.3	31.2
Agricultural sciences	4.7	4.2	4.4	3.9	3.8	3.9	3.9	4.1	4.4	4.4
Social sciences	8.1	10.4	13.4	13.7	13.8	14.4	13.7	14.0	13.3	12.3
Humanities	4.1	4.3	5.0	5.3	5.4	5.5	5.0	5.0	4.5	3.5

* Here and below in figure 6.6 and 6.12, table 6.8 and 6.10, HSE ISSEK estimates are based on the data from InCites Clarivate Analytics (Web of Science as at March 12, 2022).

6.5. RUSSIA'S SCIENTIFIC SPECIALISATION INDICES BY PUBLICATIONS INDEXED IN SCOPUS BY FIELD OF SCIENCE AND TECHNOLOGY

Natural sciences, engineering and technology, and medical sciences



Natural sciences:

- 1 – Physical sciences
- 2 – Earth and related environmental sciences
- 3 – Mathematics
- 4 – Chemical sciences
- 5 – Computer and information science
- 6 – Biological sciences

Engineering and technology:

- 7 – Materials engineering
- 8 – Chemical engineering
- 9 – Nanotechnology
- 10 – Mechanical engineering

- 11 – Electrical engineering, electronic engineering, and information technology

- 12 – Medical technologies

- 13 – Energy sector and rational use of natural resources

- 14 – Construction and architecture

- 15 – Environmental biotechnology

- 16 – Industrial biotechnology

Medical sciences:

- 17 – Medical biotechnologies

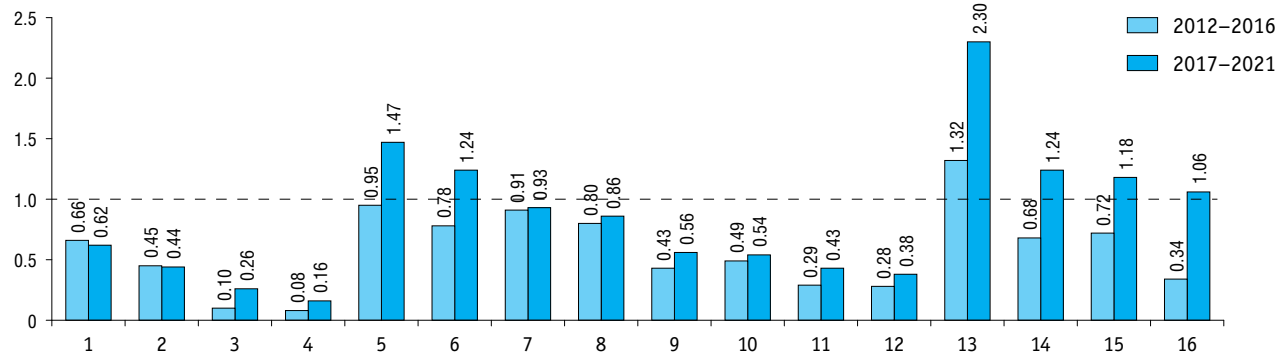
- 18 – Basic medicine

- 19 – Clinical medicine

- 20 – Health sciences

(continued)

Agricultural sciences, social sciences, and humanities



Agricultural sciences:

- 1 – Agriculture, forestry and fisheries
- 2 – Animal and dairy farming
- 3 – Agricultural biotechnologies
- 4 – Veterinary science

Social sciences:

- 5 – Political sciences
- 6 – Sociology
- 7 – Economics and business
- 8 – Educational sciences

9 – Law

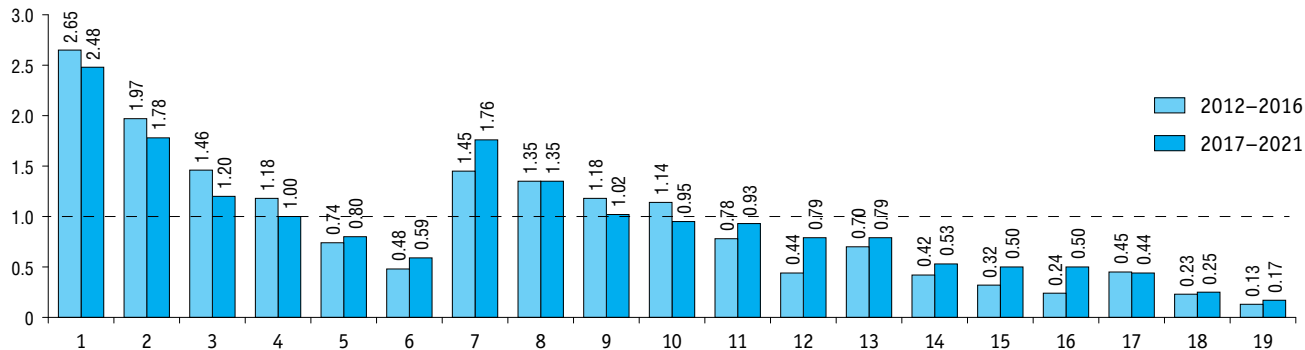
- 10 – Social and economic geography
- 11 – Psychology
- 12 – Media and communications

Humanities:

- 13 – History and archaeology
- 14 – Philosophy, ethics, religion
- 15 – Languages and literature
- 16 – Art (arts, history of arts, etc.)

6.6. RUSSIA'S SCIENTIFIC SPECIALISATION INDICES BY PUBLICATIONS INDEXED IN WEB OF SCIENCE BY FIELD OF SCIENCE AND TECHNOLOGY

Natural sciences, engineering and technology, and medical sciences



Natural sciences:

- 1 – Physical sciences
- 2 – Mathematics
- 3 – Chemical sciences
- 4 – Earth and related environmental sciences
- 5 – Biological sciences
- 6 – Computer and information science

Engineering and technology:

- 7 – Mechanical engineering
- 8 – Materials engineering
- 9 – Nanotechnology

10 – Chemical engineering

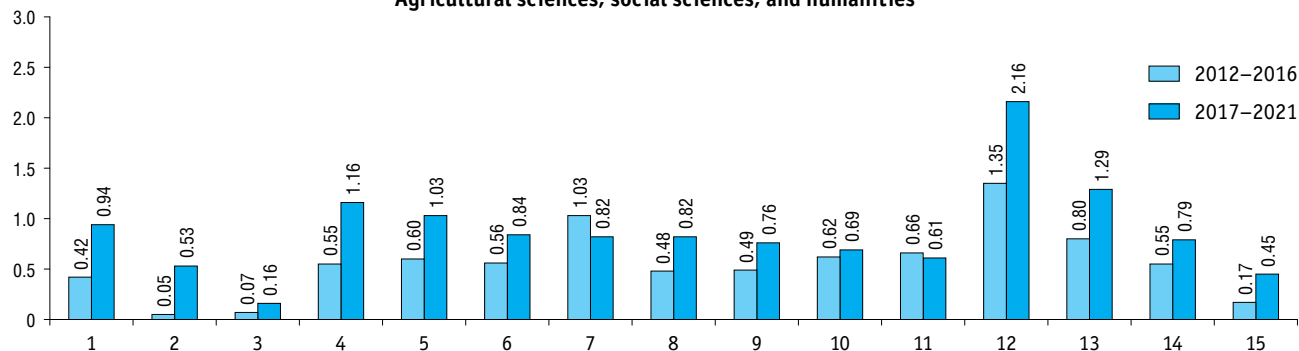
- 11 – Energy sector and rational use of natural resources
- 12 – Construction and architecture
- 13 – Electrical engineering, electronic engineering, and information technology
- 14 – Environmental biotechnology
- 15 – Industrial biotechnology
- 16 – Medical technologies

Medical sciences:

- 17 – Basic medicine
- 18 – Clinical medicine
- 19 – Health sciences

(continued)

Agricultural sciences, social sciences, and humanities



Agricultural sciences:

- 1 – Agriculture, forestry and fisheries
- 2 – Animal and dairy farming
- 3 – Veterinary science

Social sciences:

- 4 – Educational sciences
- 5 – Economics and business
- 6 – Political sciences
- 7 – Law

- 8 – Social and economic geography

- 9 – Media and communications

- 10 – Psychology

- 11 – Sociology

Humanities:

- 12 – History and archaeology

- 13 – Languages and literature

- 14 – Philosophy, ethics, religion

- 15 – Art (arts, history of arts, etc.)

6.7. MAIN INDICATORS OF RUSSIAN AUTHORS' CONTRIBUTION TO THE WORLD TOTAL NUMBER OF PUBLICATIONS INDEXED IN SCOPUS BY FIELD OF SCIENCE AND TECHNOLOGY: 2021

	Number of publications by Russian authors	Russia's share in the world total number of publications	Russia's rank by number of publications
Natural sciences			
Physical sciences	34161	6.81	4
Earth and related environmental sciences	23252	4.60	6
Chemical sciences	16554	3.91	8
Biological sciences	14807	2.50	14
Computer and information science	14700	2.80	10
Mathematics	12010	4.10	6
Interdisciplinary research	964	1.37	26
Engineering and technology			
Materials engineering	18755	4.71	5
Chemical engineering	8839	3.84	6
Mechanical engineering	7675	3.60	7
Electrical engineering, electronic engineering, and information technology	6955	2.77	8
Construction and architecture	1528	1.86	16
Energy sector and rational use of natural resources	1518	1.44	23
Medical technologies	921	1.86	16
Nanotechnology	523	2.69	9
Environmental biotechnology	277	1.11	26-27
Industrial biotechnology	107	1.13	23
Medical sciences			
Clinical medicine	17289	2.07	18
Basic medicine	6876	1.93	17
Health sciences	3286	1.48	19
Medical biotechnologies	793	2.01	15

(continued)

	Number of publications by Russian authors	Russia's share in the world total number of publications	Russia's rank by number of publications
Agricultural sciences			
Agriculture, forestry and fisheries	2939	2.44	14
Animal and dairy farming	1500	1.68	21
Veterinary science	200	0.68	42
Agricultural biotechnologies	30	1.79	14-16
Social sciences			
Sociology	4566	4.71	3
Economics and business	3340	2.50	12
Educational sciences	2193	2.85	10
Psychology	1789	1.75	14
Social and economic geography	1530	2.41	14
Political sciences	1486	5.46	3
Law	630	2.30	13
Media and communications	314	1.70	13
Humanities			
History and archaeology	4355	10.55	2
Languages and literature	2558	5.08	5
Philosophy, ethics, religion	1478	4.32	5
Art (arts, history of arts, etc.)	762	4.43	5

6.8. MAIN INDICATORS OF RUSSIAN AUTHORS' CONTRIBUTION TO THE WORLD TOTAL NUMBER OF PUBLICATIONS INDEXED IN WEB OF SCIENCE BY RESEARCH FIELD: 2021

	Number of publications by Russian authors	Russia's share in the world total number of publications
Natural sciences		
Physical sciences	13882	5.74
Chemical sciences	12011	3.49
Biological sciences	8320	2.40
Earth and related environmental sciences	5267	2.29
Mathematics	4921	4.75
Computer and information science	1852	1.17
Interdisciplinary research	303	4.06
Engineering and technology		
Materials engineering	7732	3.54
Electrical engineering, electronic engineering, and information technology	3590	1.91
Energy sector and rational use of natural resources	3314	2.12
Mechanical engineering	3292	4.11
Nanotechnology	1479	2.62
Chemical engineering	1429	2.72
Environmental biotechnology	423	1.21
Construction and architecture	354	0.71
Medical technologies	333	1.22
Industrial biotechnology	135	1.20
Medical sciences		
Clinical medicine	3675	0.73
Basic medicine	3216	1.31
Health sciences	1163	0.57

(continued)

	Number of publications by Russian authors	Russia's share in the world total number of publications
Agricultural sciences		
Agriculture, forestry and fisheries	1167	2.27
Veterinary science	123	0.54
Animal and dairy farming	109	0.79
Social sciences		
Economics and business	1444	1.55
Educational Sciences	1100	2.19
Psychology	1046	1.66
Social and economic geography	932	1.67
Sociology	653	1.73
Political sciences	632	2.95
Law	442	2.49
Media and communications	427	2.39
Humanities		
History and archaeology	2560	10.20
Languages and literature	1219	4.27
Philosophy, ethics, religion	699	2.91
Art (arts, history of arts, etc.)	127	1.14

6.9. MAIN CITATION INDICATORS OF PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Ratio of average citation level of publications by Russian authors to the world citation average, <i>times</i> **	0.38	0.47	0.52	0.55	0.55	0.54	0.51	0.50	0.53	0.53
Citations of publications by Russian authors as a percentage in the world citation total	1.06	1.10	0.95	1.44	1.69	1.78	1.86	1.90	2.03	1.84
Number of highly cited publications by Russian authors***	72	113	144	263	367	362	383	481	546	667
Publications by Russian authors as a percentage of the world total number of highly cited publications	0.59	0.67	0.67	1.03	1.38	1.32	1.32	1.57	1.65	1.80
Publications in Q1 journals as a percentage of the total number of publications by Russian authors****	23.6	24.6	21.1	21.4	18.6	18.7	18.5	17.6	18.7	21.6
Publications in Q1 journals as a percentage of the world total number of publications	51.9	48.0	44.8	44.7	45.6	46.0	46.0	45.6	46.5	48.1

* HSE ISSEK estimates, based on the data from the Scopus SciVal web-based analytics solutions (Scopus as at June 01, 2022).

** Average citation level of publications is calculated as a ratio of the number of citations a publication has received in the specific year between the point in time when it was indexed in the Scopus base and the time of the analysis to the total number of publications of that year indexed in Scopus.

*** Highly cited publications are the top 1% of the most cited publications during the year they were published.

**** Q1 journals have a highest CiteScore (an integral publication citation indicator for scientific publications indexed in Scopus) in the top 25% of journals for one of its classified subdisciplines. The indicator is calculated for publications in scientific journals rated by CiteScore.

6.10. MAIN CITATION INDICATORS OF PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN WEB OF SCIENCE

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Ratio of average citation level of publications by Russian authors to the world citation average, <i>times</i> *	0.36	0.48	0.46	0.55	0.55	0.54	0.51	0.51	0.59	0.66
Citations of publications by Russian authors as a percentage in the world citation total	1.17	1.15	1.01	1.41	1.59	1.66	1.67	1.67	1.81	1.71
Number of highly cited publications by Russian authors**	...	...	...	191	239	264	253	332	364	423
Publications by Russian authors as a percentage of the world total number of highly cited publications	...	...	...	1.24	1.49	1.59	1.45	1.69	1.68	1.92
Publications in Q1 journals as a percentage of the total number of publications by Russian authors***	20.7	21.9	18.5	23.7	23.7	24.2	24.7	25.1	28.2	...
Publications in Q1 journals as a percentage of the world total number of publications	42.5	43.7	43.0	43.3	43.2	42.9	42.0	41.6	42.1	...

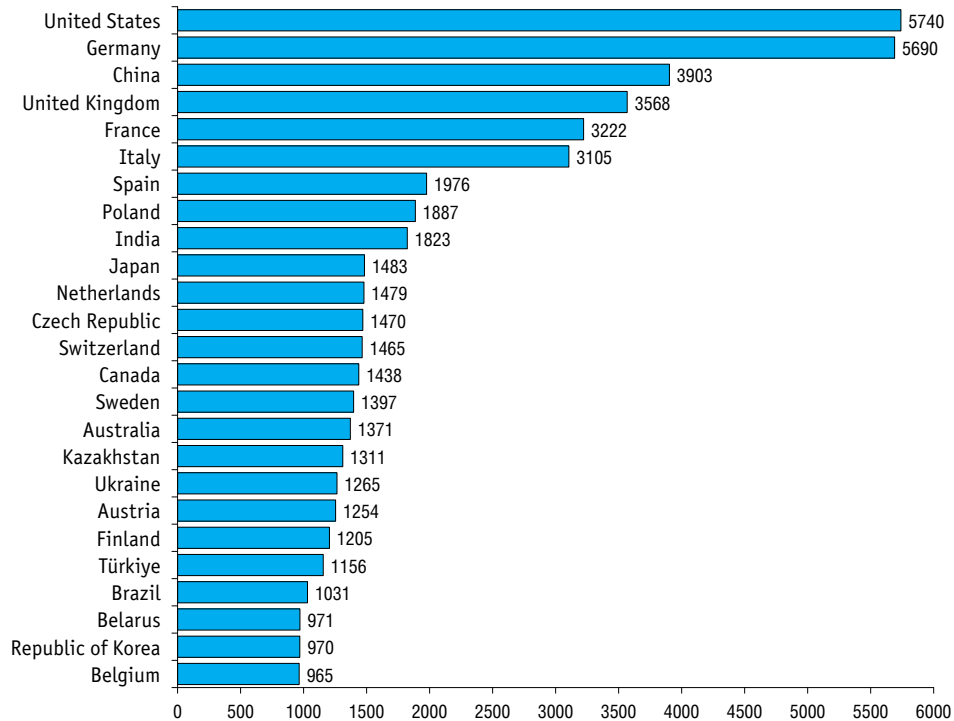
* Average citation level of publications is calculated as a ratio of the number of citations the publications have received in the specific year between the point in time when they were indexed in the Web of Science base and the time of the analysis to the total number of publications of that year indexed in Web of Science.

** Highly cited publications are the top 1% of the most cited publications during the year they were published. Indicator includes articles and reviews in scientific journals listed in Science Citation Index-Expanded (SCIE) and Social Sciences Citation Index (SSCI) sub-databases.

*** Q1 journals are included in the SCIE and SSCI sub-bases and make the top 25% of the rating by Journal Impact Factor at least in one of its classified subdisciplines. The indicator is calculated for publications in scientific journals rated by impact factor.

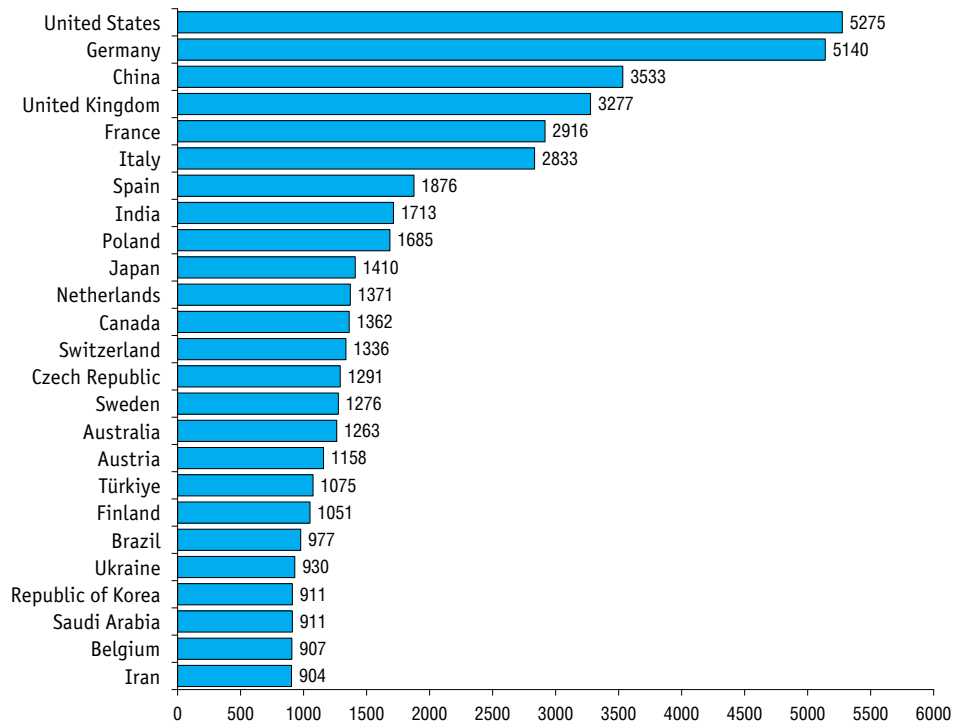
6.11. NUMBER OF INTERNATIONALLY-COLLABORATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN SCOPUS BY PARTNER COUNTRY: 2021

Total number of internationally-collaborated publications by Russian authors: 28,508



6.12. NUMBER OF INTERNATIONALLY-COLLABORATED PUBLICATIONS BY RUSSIAN AUTHORS INDEXED IN WEB OF SCIENCE BY PARTNER COUNTRY: 2021

Total number of internationally-collaborated publications by Russian authors: 23,424



**6.13. NUMBER OF RUSSIAN SCIENTIFIC JOURNALS
INDEXED IN VARIOUS DATABASES***

	2020	2021	2022
Russian journals indexed in Scopus	619	683	721
Russian journals indexed in Web of Science	385	415	414
Russian journals indexed in the Web of Science Russian Science Citation Index (RSCI)	803	887	944

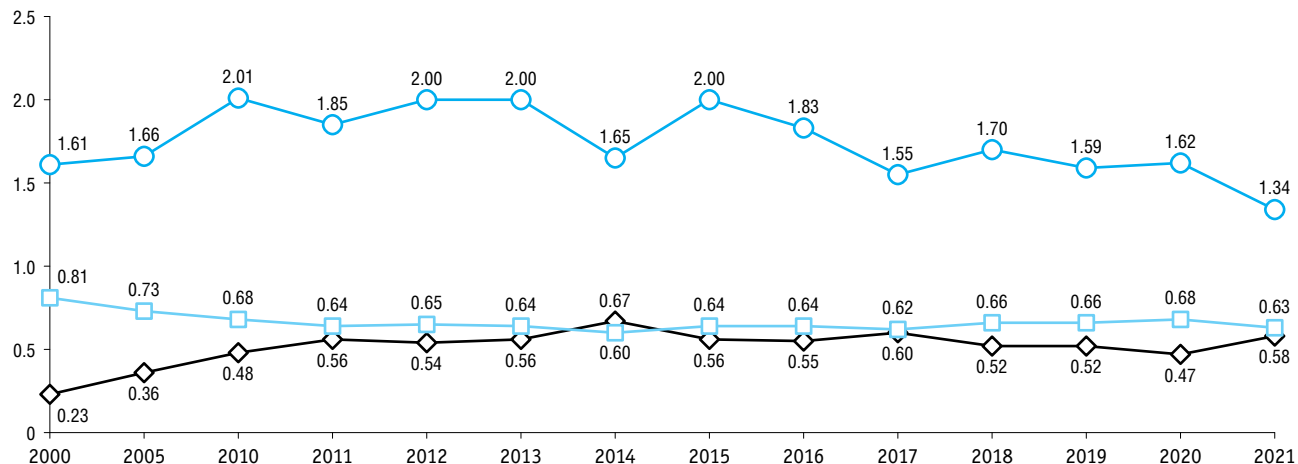
* HSE ISSEK estimates based on the portal data of elibrary.ru, Elsevier Russia, and Journal Citation Reports.

Patent activity

6.14. PATENT APPLICATIONS AND GRANTS

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Patent applications filed in the Russian Federation	28688	32254	42500	45517	41587	36454	37957	35511	34984	30977
By Russian residents	23377	23644	28722	29269	26795	22777	24926	23337	23759	19569
By non-residents	5311	8610	13778	16248	14792	13677	13031	12174	11225	11408
Patent grants received in the Russian Federation	17592	23390	30322	34706	33536	34254	35774	34008	28788	23662
By Russian residents	14444	19447	21627	22560	21020	21037	20526	20113	17181	15012
By non-residents	3148	3943	8695	12146	12516	13217	15248	13895	11607	8650
Patents in force in the Russian Federation	144325	123089	181904	218974	230870	244321	256419	263688	266189	264587

6.15. PATENT ACTIVITY INDICATORS



- Inventiveness ratio – number of patent applications filed in the Russian Federation by Russian residents per 10,000 population
- Self-sufficiency ratio – number of patent applications filed in the Russian Federation by Russian residents to the total number of patent applications filed in the Russian Federation
- ◇ Technological dependency ratio – number of patent applications filed in the Russian Federation by non-residents to the number of patent applications filed in the Russian Federation by Russian residents

6.16. PATENT APPLICATIONS FILED IN THE RUSSIAN FEDERATION BY TECHNOLOGICAL AREA*

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total**	20492	43256	38829	41303	37995	43259	38210	38465	33250	30217
1 Electrical equipment	851	1426	1515	1760	1501	1610	1494	1493	1212	848
2 Audio-visual technologies	193	505	422	568	435	511	535	486	319	251
3 Telecommunications	319	743	621	574	477	543	498	506	445	319
4 Technologies and equipment for digital communications	113	448	747	758	671	812	865	759	934	822
5 Equipment for conventional telephone communication	173	289	260	280	222	232	205	264	256	115
6 Computer technologies	223	708	855	1236	1080	1502	1282	1112	919	689
7 Information technologies for management	14	97	125	182	181	185	206	238	248	153
8 Semiconductors	245	218	248	294	255	288	295	273	185	177
9 Optics	267	329	329	444	388	439	439	390	303	287
10 Measuring technologies	1341	2998	2189	2798	2236	2660	2568	2572	2125	1621
11 Biomaterials analysis	322	667	492	759	594	757	639	697	526	423
12 Measuring and control devices	306	599	570	661	562	809	705	660	571	552
13 Medical technologies	1678	3207	2745	3065	2537	3230	2807	3200	3062	2247
14 Fine and organic chemicals	771	1488	1366	1164	981	1149	1062	1046	856	760
15 Biotechnology	306	1807	743	936	824	806	936	1025	1030	894
16 Pharmaceuticals	1045	2454	1927	2043	1692	1978	1907	2103	1716	1396
17 Macromolecular compounds and polymers	268	574	535	581	492	553	542	499	446	341
18 Food chemistry	855	2716	4401	2632	5029	3599	1731	1896	1472	628
19 Materials chemistry	742	1270	1077	1271	1099	1392	1072	1103	1040	716

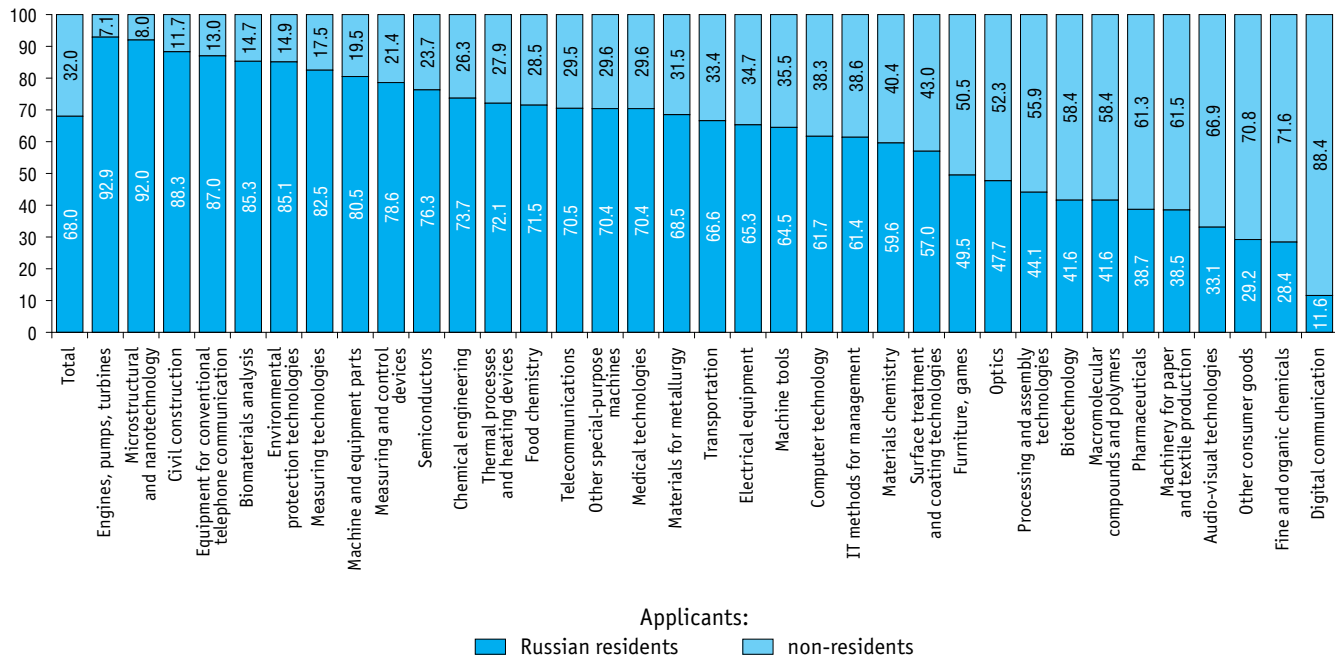
* Published patent applications of resident and non-resident applicants (patent publications).

** The sum of the indicators for each year does not coincide with the analog calculated for the data in Table 6.14, due to the difference in the indicators. Table 6.14 takes into account all filed patent applications (according to Rospatent data), table 6.16 – only the ones that have been published (according to the World Intellectual Property Organization data).

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
20 Materials for metallurgy	1351	1833	1857	1875	1366	1876	1417	1570	1242	986
21 Surface treatment and coating technologies	400	659	616	653	543	641	506	644	469	384
22 Microstructural and nanotechnology	1	15	201	244	184	266	201	214	160	112
23 Chemical engineering	988	1489	1275	1390	1198	1472	1455	1348	1226	1145
24 Environmental protection technologies	493	707	765	819	740	1062	935	884	714	872
25 Processing and assembly technologies	298	1041	782	745	643	717	720	705	682	551
26 Machine tools	948	1766	1244	1259	1023	1184	860	1154	770	705
27 Engines, pumps, turbines	958	2145	1764	1993	1699	2073	1675	1528	1141	3389
28 Machinery for paper and textile production	215	479	352	353	299	339	367	348	266	270
29 Other special-purpose machines	1155	2390	1820	2235	1814	2146	1874	2002	1844	1363
30 Thermal processes and heating devices	450	793	702	683	475	645	601	669	545	451
31 Machine and equipment parts	632	1416	1095	1319	1304	1436	1536	1358	1181	1317
32 Transport	745	2277	1836	2009	1990	2471	2543	2215	1980	1366
33 Furniture, games	170	521	465	610	493	596	637	565	521	374
34 Other consumer goods	227	596	618	706	838	681	802	785	833	679
35 Civil construction	1381	2443	2262	2403	2129	2599	2293	2153	2010	3014
Area not elsewhere classified	48	143	8	1	1			1	1	

6.17. PERCENTAGE DISTRIBUTION OF PATENT APPLICATIONS FILED IN THE RUSSIAN FEDERATION BY ASSIGNEE AND TECHNOLOGICAL AREA: 2021

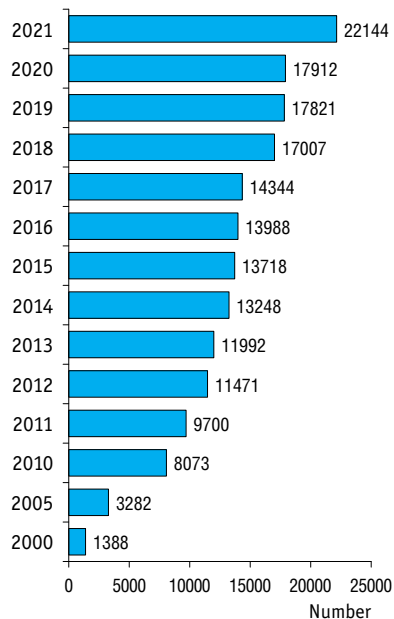


6.18. UTILITY MODEL APPLICATIONS AND GRANTS

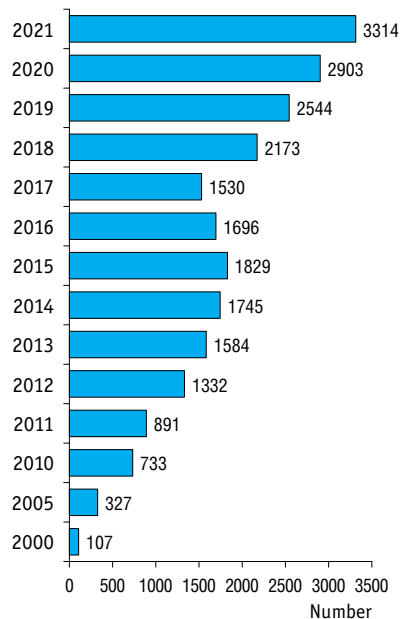
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Patent applications filed in the Russian Federation	4631	9473	12262	11906	11112	10643	9747	10136	9195	9079
By Russian residents	4549	9082	11757	11403	10643	10152	9262	9717	8859	8873
By non-residents	82	391	505	503	469	491	485	419	336	206
Patent grants received in the Russian Federation	4098	7242	10581	9008	8875	8774	9867	8848	6748	6955
By Russian residents	4041	6958	10187	8390	8474	8376	9391	8370	6502	6733
By non-residents	57	284	394	618	401	398	476	478	246	222
Patents in force in the Russian Federation	15498	28364	54848	57448	53263	50078	49345	49256	45953	42861

6.19. REGISTRATION OF INTELLECTUAL PROPERTY ITEMS IN THE FIELD OF INFORMATION TECHNOLOGY

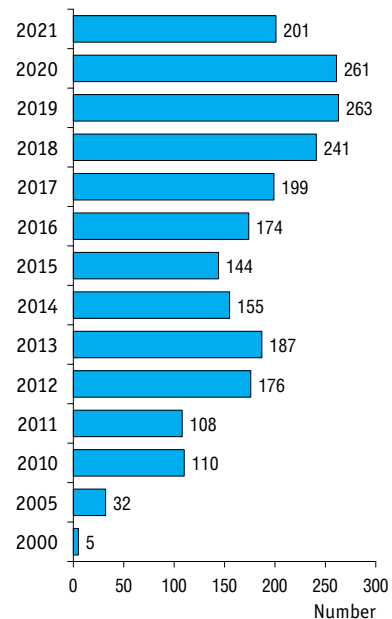
Computer programmes



Databases



Integrated circuit designs



Development and use of advanced manufacturing technologies

6.20. DEVELOPMENT OF ADVANCED MANUFACTURING TECHNOLOGIES BY DEGREE OF NOVELTY AND TYPE: 2020–2021

	Total		Of which technologies			
			new to the country		radically new	
	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	1989	2186	1788	1926	201	260
Design and engineering	349	438	311	382	38	56
Fabrication, processing, and assembling	638	658	558	573	80	85
Automated inspection and/or testing equipment	142	131	127	117	15	14
Communications, management, and geomatics	273	189	253	176	20	13
Production management information system and automation of production processes	190	256	182	235	8	21
Industrial computing and big data technologies	187	241	167	200	20	41
Green technology*	86	131	70	115	16	16
Energy efficient technologies	5	–	4	–	...**	–
Advanced production engineering and management methods	119	142	116	128	3	14

* Here and below in tables 6.23, 6.26; figure 6.28, since 2021, included in 'Green technologies' type.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

6.21. DEVELOPMENT OF ADVANCED MANUFACTURING TECHNOLOGIES BY DEGREE OF NOVELTY AND TYPE

	2000	2005	2010	2012*	2013	2014	2015	2016	2017	2018	2019
Advanced manufacturing technologies – total	688	637	864	1323	1429	1409	1398	1534	1402	1565	1620
Technologies new to the country	569	538	762	1188	1276	1245	1223	1342	1212	1384	1403
Design and engineering	136	125	191	269	367	390	323	352	358	420	403
Fabrication, processing, and assembling	231	239	336	491	469	450	471	449	417	441	447
Automated material handling	19	8	16	21	21	20	10	29	27	37	25
Automated inspection and/or testing equipment	66	72	98	101	108	84	82	111	107	114	98
Communications and control	74	52	67	194	195	187	218	264	194	266	295
Manufacturing information systems	14	20	17	55	66	59	78	80	44	65	73
Integrated management and control	29	22	37	57	50	55	41	57	65	41	62
Radically new technologies	72	60	102	135	153	164	175	192	190	181	217
Design and engineering	12	12	25	36	59	55	36	50	59	38	53
Fabrication, processing, and assembling	32	30	47	57	48	56	77	60	68	51	63
Automated material handling	1	–	2	2	1	2	2	5	7	3	4
Automated inspection and/or testing equipment	6	12	18	20	29	26	35	49	27	51	61
Communications and control	9	4	3	10	11	15	14	21	24	26	21
Manufacturing information systems	4	1	3	5	2	6	6	3	–	7	8
Integrated management and control	8	1	4	5	3	4	5	4	5	5	7

* Here and below in tables 6.24 and 6.29, due to the clarification of the composition of advanced production technologies, from 2011, the data are not comparable with the 2001–2010 data; from 2020, the data are not comparable with the data for previous years.

6.22. DEVELOPMENT OF ADVANCED MANUFACTURING TECHNOLOGIES BY DEGREE OF NOVELTY AND TYPE OF ECONOMIC ACTIVITY

	Total		Of which technologies			
			new to the country		radically new	
	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	1989	2186	1788	1926	201	260
Mining and quarrying	62	48	54	37	...*	11
Manufacturing	666	737	627	661	39	76
Electricity, gas, steam and air-conditioning supply	59	46	54	43	5	...*
Water supply; sewerage, waste management, and remediation activities	53	56	52	50	...*	6
Wholesale and retail trade; repair of motor vehicles and motorcycles	9	...*	9	...*	–	–
Information and communication	249	274	231	251	18	23
Professional, scientific and technical activities	...*	...*	...*	...*	...*	90
Of which research and development	403	421	336	347	67	74
Education	...*	...*	...*	...*	...*	50
Of which higher education	426	541	374	491	52	50
Other service activities	...*	...*	...*	...*	–	...*

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

6.23. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE AND DURATION: 2020–2021

	Total		Of which technology used during the period of, years						Technologies under experimental use	
			less than 1		1–5		6 and more		2020	2021
	2020	2021	2020	2021	2020	2021	2020	2021		
Advanced manufacturing technologies	242931	256582	20041	20949	86394	92965	136496	142668	2639	3451
Design and engineering	37556	36773	2664	2804	13439	12598	21453	21371	511	496
Fabrication, processing, and assembling	79691	86612	5967	6626	25173	27917	48551	52069	837	1078
Automated inspection and/or testing equipment	20857	21605	1701	1850	9025	9025	10131	10730	122	151
Communications, management, and geomatics	61364	54695	4984	3817	23247	22240	33133	28638	471	888
Production management information system and automation of production processes	20625	29529	1570	2842	7435	10360	11620	16327	179	226
Industrial computing and big data technologies	7269	9037	1386	1411	3192	4505	2691	3121	163	195
Green technology	2979	3823	301	301	992	1276	1686	2246	41	53
Energy efficient technologies	442	–	53	–	75	–	314	–	9	–
Advanced production engineering and management methods	12148	14508	1415	1298	3816	5044	6917	8166	306	364

6.24. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE AND DURATION

	2000	2005	2010	2012	2013	2014	2015	2016	2017	2018	2019
Advanced manufacturing technologies – total	70069	140983	203330	191372	193830	204546	218018	232388	240054	254927	262645
Of which technology used during the period of, <i>years</i>											
less than 1	23271	31932	19447	17180	17689	16179	16844	15671	17243	17146	18638
Design and engineering	7829	11491	5799	5329	3437	3712	3498	3418	4175	2706	2902
Fabrication, processing, and assembling	6616	6642	4739	4827	5702	4893	5323	5060	5083	6198	6373
Automated material handling	135	174	159	157	245	192	157	198	175	225	259
Automated inspection and/or testing equipment	846	998	1012	1033	1160	1234	1109	1099	1148	1171	1170
Communications and control	6600	11224	6661	5024	6528	5539	6067	4898	5089	5952	6690
Manufacturing information systems	800	1120	714	489	409	379	460	626	951	667	804
Integrated management and control	445	283	363	321	208	230	230	372	622	227	440
1–5	12638	57596	95761	85291	81562	84182	87543	88554	88721	90788	88314
Design and engineering	3252	19691	26890	17537	17460	16461	17869	16194	15064	15469	15063
Fabrication, processing, and assembling	4035	13045	20873	21763	19150	20635	21624	23177	24274	24580	24671
Automated material handling	122	328	790	649	709	757	882	958	933	988	933
Automated inspection and/or testing equipment	659	2086	4725	4875	5892	6294	6368	6537	6760	5701	5762
Communications and control	3850	20309	38700	36498	34678	36411	37103	37602	37552	39003	36778
Manufacturing information systems	364	1292	2438	2562	2435	2425	2500	2826	2732	3239	3341
Integrated management and control	356	845	1345	1407	1238	1199	1197	1260	1406	1808	1766

(continued)

	2000	2005	2010	2012	2013	2014	2015	2016	2017	2018	2019
6 and more	34160	51455	88122	88901	94579	104185	113631	128163	134090	146993	155693
Design and engineering	3304	12091	23441	16798	17838	18425	18464	21046	21891	22922	23957
Fabrication, processing, and assembling	24757	23289	29826	28989	30572	32583	36432	39489	40803	49622	50841
Automated material handling	428	468	904	764	869	1034	1090	1160	1376	1415	1435
Automated inspection and/or testing equipment	904	1441	3369	3611	4262	4735	5399	5887	6421	6845	7145
Communications and control	3263	12602	27437	34957	36822	42780	46797	54346	56884	59105	64852
Manufacturing information systems	659	765	1696	2120	2449	2751	3340	3823	4050	4351	4631
Integrated management and control	845	799	1449	1662	1767	1877	2109	2412	2665	2733	2832

6.25. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE OF ECONOMIC ACTIVITY AND DURATION

	Total		Of which technology used during the period of, years						Technologies under experimental use	
			less than 1		1–5		6 and more			
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	242931	256582	20041	20949	86394	92965	136496	142668	2639	3451
Mining and quarrying	11062	11474	941	814	5895	6137	4226	4523	24	37
Manufacturing	154315	162520	11322	11716	51410	55162	91583	95642	975	977
Electricity, gas, steam and air-conditioning supply	15710	17290	1347	969	5393	6880	8970	9441	354	225
Water supply, sewerage, waste management and remediation activities	5212	5402	570	455	2108	2391	2534	2556	45	24
Wholesale and retail trade; repair of motor vehicles and motorcycles	1298	361	91	30	1026	156	181	175	–	–
Information and communication	23916	24983	2454	2977	9429	10246	12033	11760	193	510
Professional, scientific and technical activities	25728	...*	2630	...*	8499	2989	14599	4411	554	71
Of which research and development	17597	19042	1736	1792	5509	5615	10352	11635	465	1129
Education	4873	6003	651	817	1924	2706	2298	2480	494	478
Of which higher education	4755	5895	645	814	1888	2671	2222	2410	494	478
Other service activities	816	1361	33	...*	709	...*	72	45	–	–

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

6.26. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE AND SOURCE OF ACQUISITION

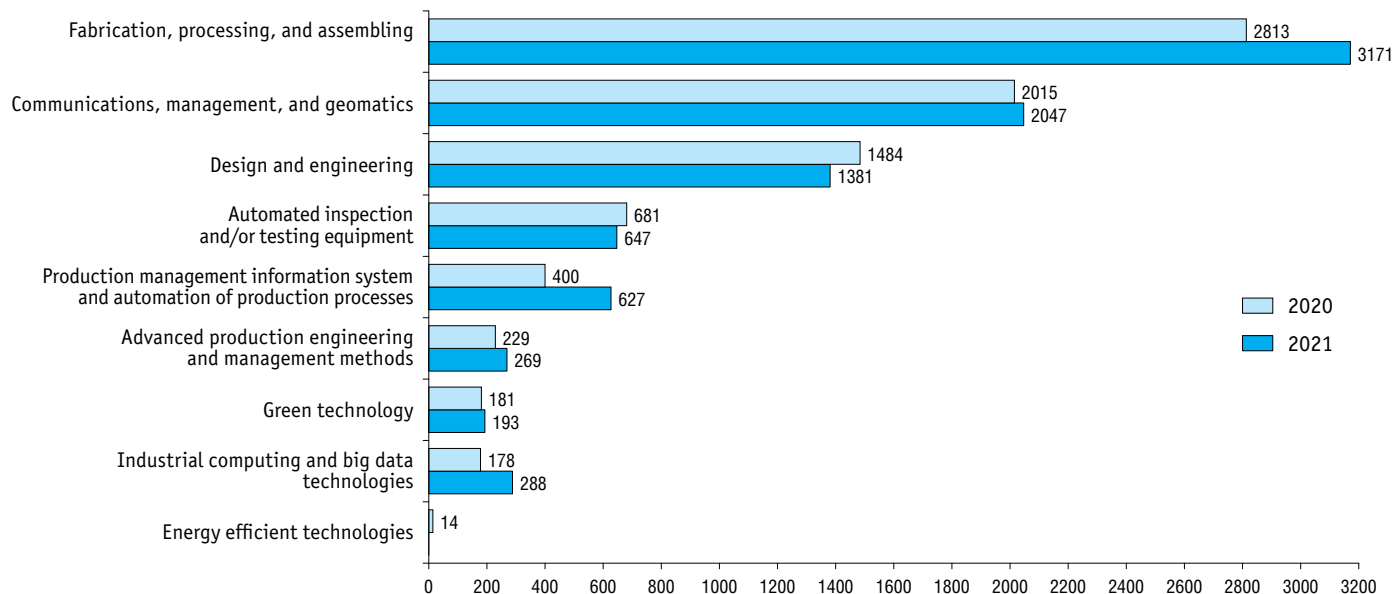
	Total		Of which technologies					
			developed in the reporting entity		acquired			
					in Russia		abroad	
	2020	2021	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	242931	256582	47999	53198	117815	122981	77117	80403
Design and engineering	37556	36773	7575	8023	21937	20143	8044	8607
Fabrication, processing, and assembling	79691	86612	28918	32014	22860	23680	27913	30918
Automated inspection and/or testing equipment	20857	21605	2278	2245	11095	11513	7484	7847
Communications, management, and geomatics	61364	54695	3504	3222	39468	36599	18392	14874
Production management information system and automation of production processes	20625	29529	2185	2900	11938	17962	6502	8667
Industrial computing and big data technologies	7269	9037	811	1373	3598	4568	2860	3096
Green technology	2979	3823	358	554	1667	2130	954	1139
Energy efficient technologies	442	–	42	–	99	–	301	–
Advanced production engineering and management methods	12148	14508	2328	2867	5153	6386	4667	5255

6.27. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE OF ECONOMIC ACTIVITY AND SOURCE OF ACQUISITION

	Total		Of which technologies					
			developed in the reporting entity		acquired			
					in Russia		abroad	
	2020	2021	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	242931	256582	47999	53198	117815	122981	77117	80403
Mining and quarrying	11062	11474	495	591	8182	8592	2385	2291
Manufacturing	154315	162520	35433	39211	65515	66424	53367	56885
Electricity, gas, steam and air-conditioning supply	15710	17290	454	550	11513	12829	3743	3911
Water supply; sewerage, waste management, and remediation activities	5212	5402	720	764	3875	3987	617	651
Wholesale and retail trade; repair of motor vehicles and motorcycles	1298	361	32	10	445	310	821	41
Information and communication	23916	24983	1501	1887	12609	14399	9806	8697
Professional, scientific and technical activities	25728	...*	7399	7889	12863	12869	5466	...*
Of which research and development	17597	19042	6410	6982	7568	8010	3619	4050
Education	4873	6003	1958	2289	2012	2231	903	1483
Of which higher education	4755	5895	1949	2281	1917	2147	889	1467
Other service activities	816	1361	7	7	800	1340	4	14

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

6.28. USE OF ADVANCED MANUFACTURING TECHNOLOGIES DEVELOPED USING PATENTS BY TYPE: 2020–2021



6.29. USE OF ADVANCED MANUFACTURING TECHNOLOGIES DEVELOPED ON THE BASIS OF INVENTION PATENTS BY TYPE

	2000	2005	2010	2012	2013	2014	2015	2016	2017	2018	2019
Advanced manufacturing technologies	2804	3072	1012	6032	9099	9519	9249	9617	9127	8802	8579
Design and engineering	1115	1055	274	1582	2193	2129	1819	1837	1606	1523	1720
Fabrication, processing, and assembling	1231	1411	337	2236	2670	3203	3274	3194	3190	2832	2801
Automated material handling	45	16	18	69	218	131	121	132	123	103	96
Automated inspection and/or testing equipment	171	262	116	739	726	715	704	769	763	807	834
Communications and control	182	258	209	1138	2844	2870	2775	3023	2844	2986	2615
Manufacturing information systems	9	44	31	172	321	316	395	500	470	386	366
Integrated management and control	51	26	27	96	127	155	161	162	131	165	147

6.30. ENTERPRISES' ASSESSMENT OF THE IMPACT OF ADVANCED MANUFACTURING TECHNOLOGIES

	Number of enterprises indicating the following impact of advanced manufacturing technologies							
	high		medium		low		no impact	
	2020	2021	2020	2021	2020	2021	2020	2021
Higher efficiency of the production process (labour productivity growth)	3910	4500	4868	4889	2156	1897	4155	3322
Lower costs (lower material costs, energy consumption, etc.)	2069	2276	5138	5280	2838	2671	5044	4381
Improvements in quality, lower reject rate	2815	3103	3882	3968	2479	2224	5913	5313
Accelerated production cycle, lower production/order fulfilment time	2679	2935	4390	4435	2334	2178	5686	5060
Higher production flexibility, adaptation and readjustment capabilities	1587	1739	4122	4131	2947	2820	6433	5918
Lower environmental impact	1034	1129	2507	2560	3338	3161	8210	7758
Output of goods and services with new consumer properties	1657	1724	3083	3100	2738	2568	7611	7216
Meeting the needs of supply chain partners	1701	1933	3654	3650	2719	2473	7015	6552
Compliance with technical standards, rules, and regulations	4042	4347	3652	3730	2234	2001	5161	4530
Entering foreign sales markets / strengthening export potential	777	796	2082	2023	3005	2779	9225	9010
Lower import dependence	865	895	2461	2505	3226	3022	8537	8186

6.31. IMPLEMENTATION OF TECHNOLOGY STRATEGY BY ENTERPRISES

	Number of enterprises			
	implementing technology strategy		without technology strategy	
	2020	2021	2020	2021
Cooperation with higher or secondary education institutions	4780	4854	12455	9839
Cooperation with research institutes	3531	3622	13693	11071
Cooperation with design organisations, design-and-engineering organisations	5553	5598	11679	9095
Remuneration of employees for proposals to improve goods and services, increase production efficiency	5391	5611	11822	9082
Competitive technology intelligence, comparative analysis (benchmarking) and analysis of technology trends (including roadmaps)	3042	3101	14168	11592
Implementation of on-the-job training programmes	7996	8084	9241	6609
Operation of knowledge, experience, best practices management systems	5010	5140	12200	9553
Application of collective planning and decision-making methods	5141	5259	12078	9434

6.32. ENTERPRISES' ASSESSMENT OF FACTORS HAMPERING INTRODUCTION OF ADVANCED PRODUCTION TECHNOLOGIES

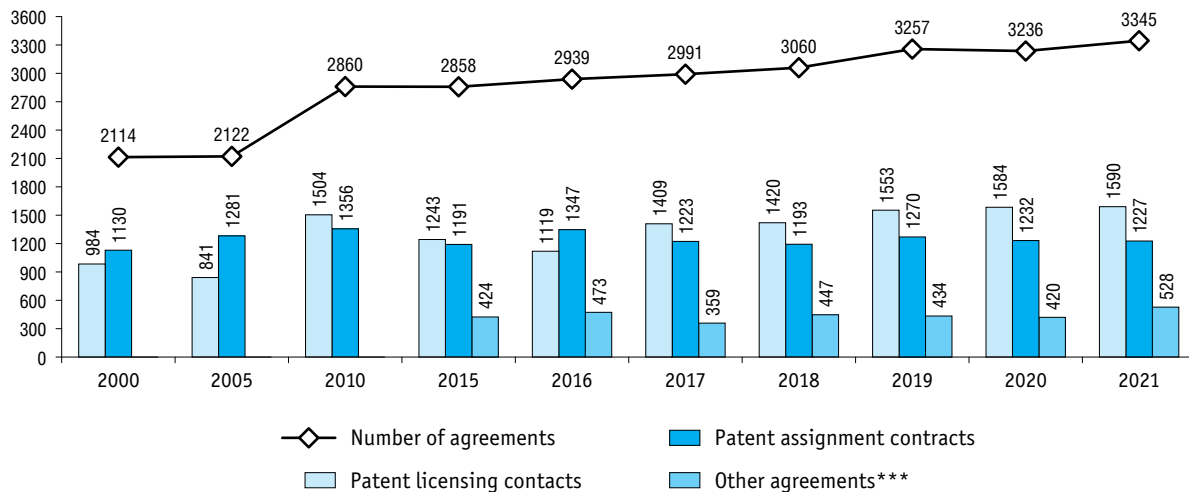
	Number of enterprises indicating significance of factors hampering the introduction of advanced production technologies									
	main or decisive		significant		insignificant		no such factors		do not know	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Lack of qualified personnel	951	825	2748	2600	5550	4821	5954	4890	2375	1557
Difficulties in hiring qualified personnel	1520	1564	4299	4186	4120	3359	5152	3980	2488	1604
Low technological level of the enterprise	1481	1098	3007	2694	4790	4207	5776	4980	2553	1714
Complex integration of new technologies into enterprise's existing production and organisational processes	1445	1168	3471	3193	4621	4169	5018	4093	3017	2070
Restrictions related to the current technical standards, regulations, and rules in the sales markets	838	657	2221	1861	4505	4013	6208	5418	3763	2744
Restrictions related to the requirements within current supply chains	700	495	1749	1525	4567	3996	6956	5985	3558	2692
Low return on investment / long payback period	1823	1560	3301	2904	3458	3060	5460	4543	3512	2626
Difficulties in attracting private financing	1074	777	2405	1954	3322	2879	7092	6261	3652	2822
Difficulties in attracting public funding	1346	1077	2465	2091	3080	2666	6678	5850	3992	3009
Tough access to non-financial support at the federal level	907	625	1797	1452	3247	2791	7032	6229	4544	3596
Tough access to non-financial support at the regional level	842	573	1751	1420	3382	2884	7056	6261	4497	3555
Regulatory and legal restrictions on access to technology in Russia	643	417	1388	1124	4312	3809	7032	6244	4153	3099
Regulatory and legal restrictions on access to technologies abroad	629	520	1759	1496	3754	3179	7152	6260	4233	3238

(continued)

	Number of enterprises indicating significance of factors hampering the introduction of advanced production technologies									
	main or decisive		significant		insignificant		no such factors		do not know	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Inefficient current regulation and protection of intellectual property rights	490	323	1183	914	3985	3450	7468	6673	4401	3333
Lack of information about advanced manufacturing technologies that can provide an economically significant effect for the enterprise	685	500	1975	1600	5103	4511	6667	5916	3110	2166
Absence/lack of technical support or related services from suppliers and partners	622	418	1811	1497	5455	4882	6668	5839	2979	2057
Introduction of advanced technologies is not included in enterprise's current development priorities	1155	796	1611	1196	3836	3398	7826	7058	3156	2245
Emergence of specific risks associated with the introduction and use of individual technologies	938	747	2777	2448	4475	3984	5706	4841	3644	2673
Other	527	349	1095	721	3650	3085	7286	6510	4976	4028

Commercialisation of technology in domestic market

6.33. STATE REGISTRATION* OF DISPOSITIONS OF THE EXCLUSIVE RIGHTS TO INVENTIONS, UTILITY MODELS, INDUSTRIAL DESIGNS BY PATENT ASSIGNMENT AND PATENT LICENSING CONTRACTS**

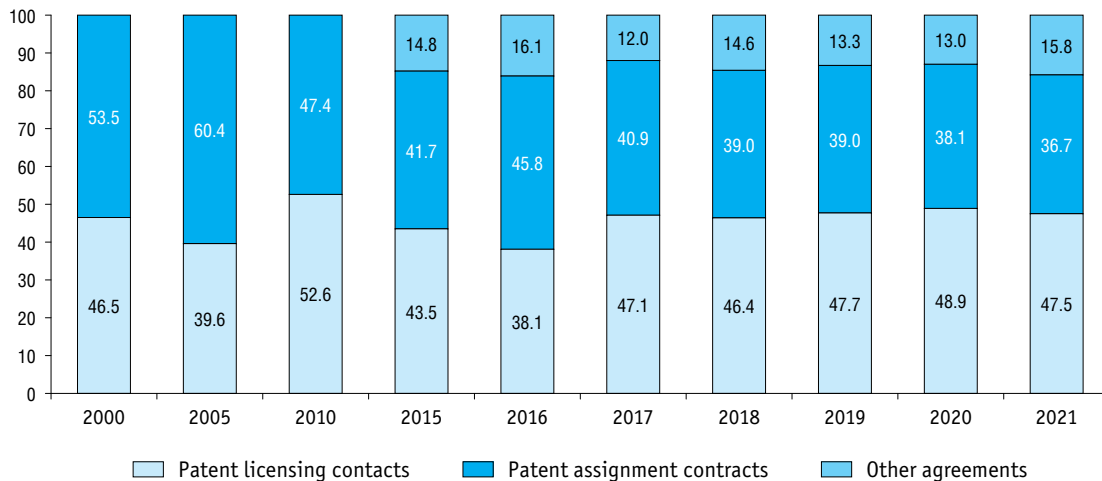


* Here and below: until October 1, 2014, registration of exclusive licences.

** Before 2008 – patent cession agreements.

*** Other agreements include pledge agreements, deeds of amendment to registered agreements, and early terminations of registered agreements.

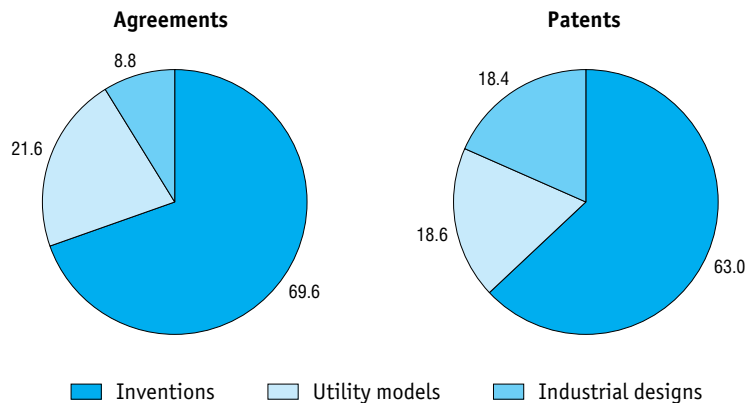
6.34. PERCENTAGE DISTRIBUTION OF DISPOSITIONS BY TYPE OF AGREEMENTS



6.35. STATE REGISTRATION OF DISPOSITIONS UNDER AGREEMENTS AND PATENTS WITH REGISTERED DISPOSITIONS BY TYPE OF INTELLECTUAL PROPERTY

	Agreements					Patents				
	2015	2018	2019	2020	2021	2015	2018	2019	2020	2021
Total	2858	3060	3257	3236	3345	6806	7357	8064	7878	8792
Inventions	1693	1929	2004	2160	2329	4271	4475	4333	4597	5540
Utility models	927	907	989	829	723	1795	2093	2369	2079	1637
Industrial designs	238	224	264	247	293	740	789	1362	1202	1615

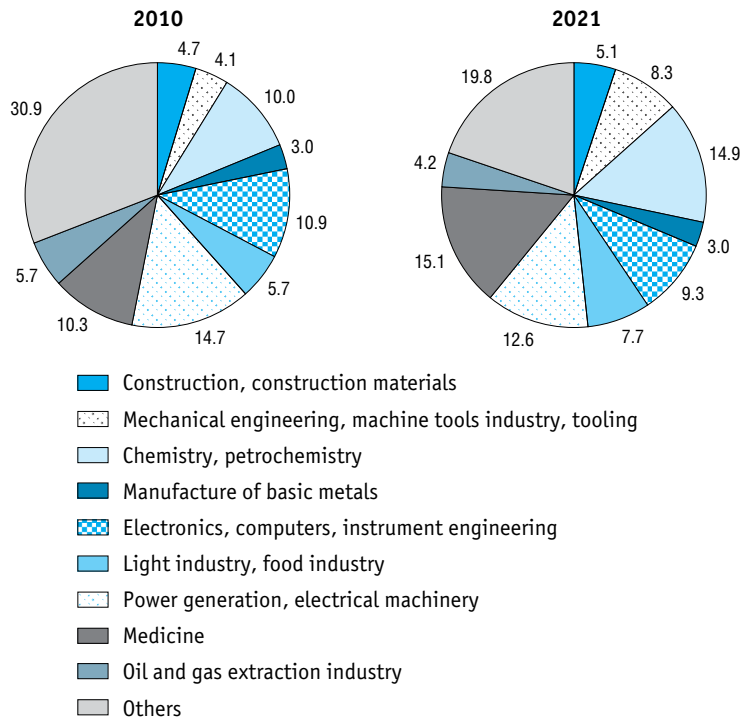
6.36. PERCENTAGE DISTRIBUTION OF DISPOSITIONS UNDER AGREEMENTS AND PATENTS WITH REGISTERED DISPOSITIONS BY TYPE OF INTELLECTUAL PROPERTY: 2021



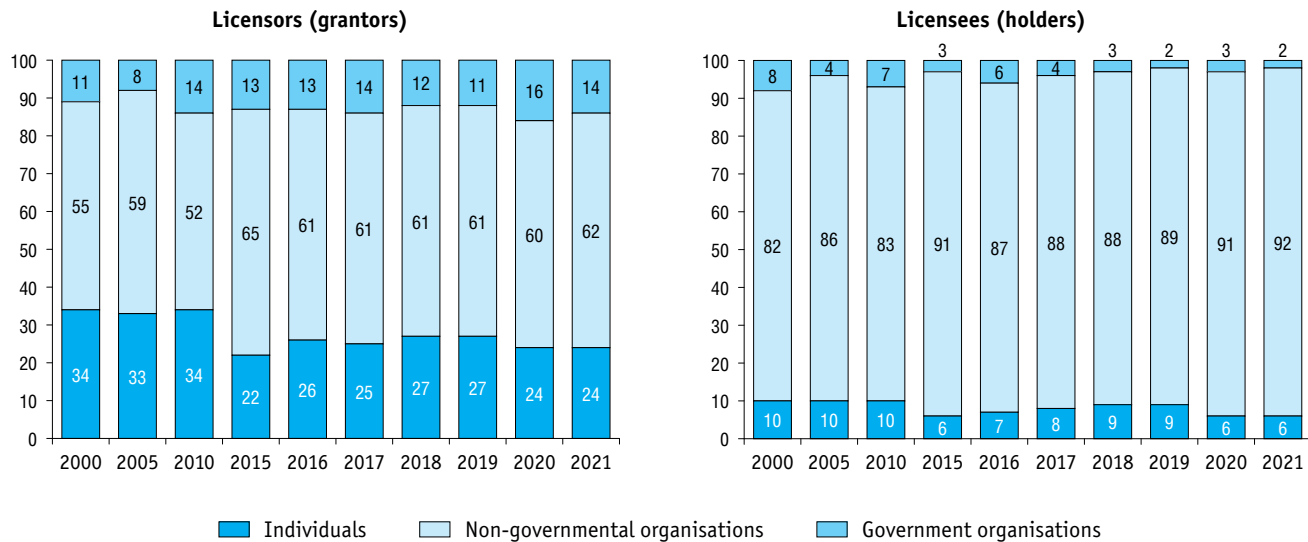
**6.37. STATE REGISTRATION OF DISPOSITIONS OF EXCLUSIVE RIGHTS TO INVENTIONS, UTILITY MODELS,
AND INDUSTRIAL DESIGNS BY TECHNOLOGY FIELD**

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Total	2114	2122	2860	2858	2939	2991	3060	3257	3236	3345
I. Construction, construction materials	89	108	135	226	259	240	247	249	185	169
II. Mechanical engineering, machine tools industry, tooling	345	417	118	205	257	223	222	277	194	278
III. Chemistry, petrochemistry	203	268	286	406	406	475	510	405	413	499
IV. Metallurgy	85	69	86	62	118	89	101	79	110	101
V. Electronics, computers, instrument engineering	78	165	311	222	315	316	309	342	290	310
VI. Textiles and light industry, food industry	323	105	163	257	239	192	176	206	180	257
VII. Power generation, electrical machinery	150	223	421	511	409	418	459	497	517	423
VIII. Medicine	264	249	294	396	379	429	376	401	410	505
IX. Oil and gas extraction industry	224	136	162	142	166	146	134	151	168	140
X. Other ownership	353	382	884	431	391	463	526	650	769	663

6.38. PERCENTAGE DISTRIBUTION OF DISPOSITIONS OF EXCLUSIVE RIGHTS TO INVENTIONS, UTILITY MODELS, AND INDUSTRIAL DESIGNS BY TECHNOLOGY FIELD



6.39. PERCENTAGE DISTRIBUTION OF DISPOSITIONS OF EXCLUSIVE RIGHTS TO INVENTIONS, UTILITY MODELS, AND INDUSTRIAL DESIGNS BY CATEGORY OF ECONOMIC ENTITY



International technological exchange

6.40. TECHNOLOGY BALANCE OF PAYMENTS BY CATEGORY OF CONTRACTS

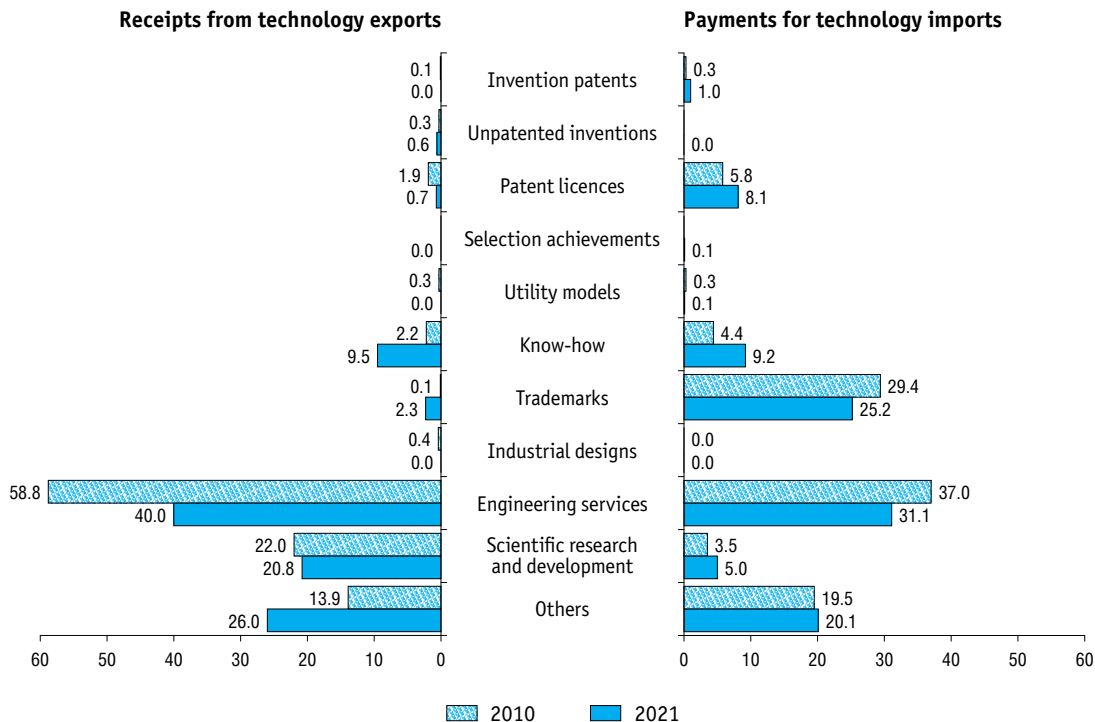
(thousand USD)

	Total	Invention patents	Unpatented inventions	Patent licences	Selective achievements	Utility models	Know-how	Trademarks	Industrial designs	Engineering services	Research and development	Other
Receipts from technology exports												
2005	389396.4	926.3	467.0	1788.0	...	...	517.9	5583.5	1017.3	150858.8	83214.4	145023.2
2010	627887.5	582.6	1987.0	11821.3	...	1718.9	13778.5	759.1	2531.0	368971.3	138356.8	87381.0
2011	584656.9	98.9	212.0	20334.7	...	688.0	4886.2	1251.7	2304.0	382161.5	111499.3	61220.6
2012	688469.9	21.0	–	21850.1	...	898.7	15653.4	999.4	2291.0	376428.2	170752.9	99575.2
2013	770584.8	81.0	110.0	25409.6	...	75.4	11798.9	388.2	2452.2	364000.7	235654.9	130613.9
2014	1279213.1	72.7	–	26610.9	...	35.9	11526.7	2765.3	2000.8	707674.2	356496.9	172029.7
2015	1654732.1	63.2	–	79062.3	...	4113.6	2474.5	3990.3	2492.1	1112557.2	164939.8	285039.1
2016	1277023.5	2.7	–	83102.3	...	2011.3	28737.5	861.6	50139.8	819004.6	140721.8	152441.9
2017	1181183.9	117.0	–	94811.6	...	3946.3	7026.2	2567.3	20044.9	720187.3	177833.0	154650.3
2018	1405475.1	156.0	118.9	13354.1	36.1	4481.2	9279.5	4876.6	445.4	723071.7	413637.8	236017.8
2019	3520119.7	1392.1	777.2	33959.7	35.5	1285.0	4699.8	4075.4	58.9	2588192.6	396776.1	488867.4
2020	4548522.4	960.7	85.4	1123483.0	84.5	1522.9	5676.3	34595.4	192.7	1110171.0	1299240.1	972510.4
2021	4662722.8	1501.9	30006.5	33311.2	1851.2	345.0	443805.3	108314.8	67.6	1862899.0	967740.1	1212880.2
Payments for technology imports												
2005	954199.2	8730.3	2983.5	19315.4	...	...	9489.7	191045.0	1519.5	582813.8	16512.8	121789.2
2010	1425983.3	4024.2	–	82853.9	...	3665.6	62117.0	419009.3	2.2	526913.5	49631.8	277765.8
2011	1862566.6	3531.0	–	71764.2	...	2264.3	92153.1	406684.6	26.2	692495.2	72676.4	520971.6
2012	2043187.9	6970.5	14.0	64208.4	...	5138.4	158428.1	465370.3	997.0	806467.1	66295.4	469298.7
2013	2463626.3	22600.3	–	85973.2	...	1998.2	133742.2	587894.4	704.3	959742.4	171256.5	499714.8

(continued)

	Total	Invention patents	Unpatented inventions	Patent licences	Selective achievements	Utility models	Know-how	Trademarks	Industrial designs	Engineering services	Research and development	Other
2014	2455830.7	20879.5	–	100797.0	...	4066.3	121719.8	381160.4	182.6	1147892.0	151488.5	527644.6
2015	2207406.8	9636.1	3.4	66104.7	...	3461.5	179228.9	318504.5	24447.9	1277698.4	110310.7	218010.7
2016	2498677.8	5401.4	83.0	80561.5	...	1053.7	104879.1	444761.5	10494.0	1547859.8	149109.0	154474.8
2017	3305202.5	11054.5	11.1	106056.2	34.9	8409.2	152032.3	504369.2	1393.0	2132582.6	83500.7	305758.8
2018	3064747.9	27630.7	2550.3	238898.0	725.4	11545.3	274002.3	521023.6	1739.1	1406835.4	107374.8	472423.0
2019	4836809.2	3837.7	863.2	220211.4	808.6	7175.1	486000.1	580453.2	4124.6	2823787.5	119855.8	589692.0
2020	4824951.5	3063.0	660.3	217013.4	1166.9	4431.7	421075.5	1020217.8	8459.8	1706243.1	263141.4	1179478.6
2021	5044265.4	52673.2	1299.9	409301.3	4991.9	3361.3	462292.4	1273074.4	1922.9	1569539.9	250213.1	1015595.1
Technology balance of payments												
2005	-564802.8	-7804.0	-2516.5	-17527.4	...	...	-8971.8	-185461.5	-502.2	-431955.0	66701.6	23234.0
2010	-798095.8	-3441.6	1987.0	-71032.6	...	-1946.7	-48338.5	-418250.2	2528.8	-157942.2	88725.0	-190384.8
2011	-1277909.7	-3432.1	212.0	-51429.5	...	-1576.3	-87266.9	-405432.9	2277.8	-310333.7	38822.9	-459751.0
2012	-1354718.0	-6949.5	-14.0	-42358.3	...	-4239.7	-142774.7	-464370.9	1294.0	-430038.9	104457.5	-369723.5
2013	-1693041.5	-22519.3	110.0	-60563.6	...	-1922.8	-121943.3	-587506.2	1747.9	-595741.7	64398.4	-369100.9
2014	-1176617.6	-20806.8	–	-74186.1	...	-4030.4	-110193.1	-378395.1	1818.2	-440217.8	205008.4	-355614.9
2015	-552674.7	-9572.9	3.4	12957.6	...	652.1	-176754.4	-314514.2	-21955.8	-165141.2	54629.1	67028.4
2016	-1221654.3	-5398.7	-83.0	2540.8	...	957.6	-76141.6	-443899.9	39645.8	-728855.2	-8387.2	-2032.9
2017	-2124018.6	-10937.5	-11.1	-11244.6	-34.9	-4462.9	-145006.1	-501801.9	18651.9	-1412395.3	94332.3	-151108.5
2018	-1659272.8	-27474.7	-2431.4	-225543.9	-689.3	-7064.1	-264722.8	-516147.0	-1293.7	-683763.7	306263.0	-236405.2
2019	-1316689.5	-2445.6	-86.0	-186251.7	-773.1	-5890.1	-481300.3	-576377.8	-4065.7	-235594.9	276920.3	-100824.6
2020	-276429.1	-2102.3	-574.9	906469.6	-1082.4	-2908.8	-415399.2	-985622.4	-8267.1	-596072.1	1036098.7	-206968.2
2021	-381542.6	-51171.3	28706.6	-375990.1	-3140.7	-3016.3	-18487.1	-1164759.6	-1855.3	293359.1	717527.0	197285.1

6.41. PERCENTAGE DISTRIBUTION OF TECHNOLOGY EXPORTS AND IMPORTS BY CATEGORY OF CONTRACTS



6.42. NUMBER AND VALUE OF TECHNOLOGY EXPORTS AND IMPORTS BY CATEGORY OF CONTRACT

	Number of contracts			Net value of the contract's subject matter, <i>thousand USD</i>		
	2010	2020	2021	2010	2020	2021
Exports						
Total	1867	5349	6783	3781498.5	39417629.1	40848739.7
Invention patents	7	16	9	355.7	111980.3	4095.9
Unpatented inventions	8	3	12	2753.0	85.4	30055.2
Patent licences	42	357	327	17161.5	1468104.7	76281.3
Selection achievements	...	2	6	...	84.5	6255.2
Utility models	10	8	3	7671.1	1880.5	394.0
Know-how	33	77	93	61792.9	24654.8	466172.5
Trademarks	19	120	173	2303.2	89121.4	169363.3
Industrial designs	1	5	4	26667.0	306.5	68.3
Engineering services	682	1562	2022	3055791.4	32778716.0	34433508.0
Research and development	692	1304	1687	407453.1	2800505.6	1945013.7
Other	373	1895	2447	199549.6	2142189.4	3717532.3
Imports						
Total	1943	5776	6701	3167052.2	13731974.3	19846206.3
Invention patents	5	19	29	15302.0	88422.1	217284.0
Unpatented inventions	–	17	25	–	977.8	2068.3
Patent licences	70	250	329	193240.4	744813.7	1863074.4
Selection achievements	...	36	91	...	2352.5	5454.4
Utility models	13	13	19	12845.7	16784.8	4303.4
Know-how	41	235	274	119778.5	687937.5	1332952.5
Trademarks	108	508	623	500110.5	1733528.9	3538146.3
Industrial designs	1	30	16	16.4	8050.5	3153.9
Engineering services	1080	2270	2494	1831177.5	5732190.5	9224563.7
Research and development	89	548	641	45522.9	614866.5	339543.8
Other	536	1850	2160	449058.3	4102049.5	3315661.6

6.43. TECHNOLOGY BALANCE OF PAYMENTS BY COUNTRY

(thousand USD)

	Receipts from technology exports			Payments for technology imports			Technology balance of payments		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Total	3520119.7	4548522.4	4662722.8	4836809.2	4824951.5	5044265.4	-1316689.5	-276429.1	-381542.6
CIS countries	140456.0	553 618.3	856316.7	55919.3	317810.4	182595.9	84536.7	235807.9	673720.8
Armenia	631.6	1408.8	3532.0	3218.9	31598.1	10630.5	-2587.3	-30189.3	-7098.5
Azerbaijan	2252.3	3799.3	8520.8	137.2	624.7	79.4	2115.1	3174.6	8441.4
Belarus	44353.9	251138.4	477553.8	21731.5	82816.7	99485.3	22622.4	168321.7	378068.5
Kazakhstan	41406.1	243380.8	96366.3	8914.7	12673.9	30783.1	32491.4	230706.9	65583.2
Kyrgyzstan	5179.3	10609.8	13422.5	411.2	267.2	366.5	4768.1	10342.6	13056.0
Moldova	858.0	1172.5	1054.3	35.1	25.9	15.1	822.9	1146.6	1039.2
Tajikistan	6009.0	5397.1	150348.5	23.4	39.8	...*	5985.6	5357.3	...*
Turkmenistan	1427.7	2477.3	2851.5	49.0	4.9	23.2	1378.7	2472.4	2828.3
Ukraine	3923.9	6147.2	10544.0	19752.9	187794.2	39356.1	-15829.0	-181647.0	-28812.1
Uzbekistan	34414.2	28087.1	92123.0	1645.4	1965.0	1837.5	32768.8	26122.1	90285.5
OECD countries	2349147.7	3207795.8	2662102.9	3933108.5	3795079.7	4337620.9	-1583960.8	-587283.9	-1675518.0
Australia	236.8	720.0	2915.5	4069.5	6266.6	26112.9	-3832.7	-5546.6	-23197.4
Austria	7085.5	13670.9	14442.3	56286.8	72762.4	83260.7	-49201.3	-59091.5	-68818.4
Belgium	4992.8	5494.8	7295.8	20850.8	53487.6	66817.8	-15858.0	-47992.8	-59522.0
Canada	3496.9	4762.2	9456.6	41527.4	24535.9	49085.9	-38030.5	-19773.7	-39629.3
Chile	82.8	59.0	...*	61.0	132.3	881.0	21.8	-73.3	...*
Colombia	155.9	210.5	...*	-	989.2	-	155.9	-778.7	...*
Costa Rica	-	9.1	-	-	1.7	-	-	7.4	-
Czech Republic	90129.2	89419.8	94731.2	820026.3	87500.4	169680.3	-729897.1	1919.4	-74949.1
Denmark	5802.9	6563.2	7657.6	28647.4	34320.0	36481.6	-22844.5	-27756.8	-28824.0
Estonia	3110.3	9271.3	6622.1	2385.9	1379.1	2795.8	724.4	7892.2	3826.3
Finland	23958.3	37522.3	29691.1	58840.6	63243.4	86853.4	-34882.3	-25721.1	-57162.3

(continued)

	Receipts from technology exports			Payments for technology imports			Technology balance of payments		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
France	28999.7	39993.8	86521.2	346487.1	310582.4	353329.3	-317487.4	-270588.6	-266808.1
Germany	1440756.3	411255.2	878259.3	665859.2	973227.9	469804.4	774897.1	-561972.7	408454.9
Greece	205.2	209.9	204.8	3629.8	4472.9	4241.0	-3424.6	-4263.0	-4036.2
Hungary	978.1	315.8	7432.8	31937.7	13127.3	3091.1	-30959.6	-12811.5	4341.7
Iceland	-	-	...*	1637.5	338.4	18.4	-1637.5	-338.4	...*
Ireland	32433.5	190070.9	102002.2	11851.8	63714.3	42159.8	20581.7	126356.6	59842.4
Israel	17848.2	16654.8	27341.3	1757.4	3647.1	54279.4	16090.8	13007.7	-26938.1
Italy	20821.6	13970.2	13328.2	86031.4	81534.0	324431.2	-65209.8	-67563.8	-311103.0
Japan	18882.2	210748.3	15006.3	51819.3	49340.3	63999.9	-32937.1	161408.0	-48993.6
Latvia	6446.4	1834.6	23630.6	49319.8	96466.6	13517.1	-42873.4	-94632.0	10113.5
Lithuania	537.0	738.9	20564.6	2088.9	2395.1	15514.0	-1551.9	-1656.2	5050.6
Luxembourg	6812.5	74511.8	10546.4	28932.4	33738.9	27227.0	-22119.9	40772.9	-16680.6
Mexico	126.4	776.9	111.6	11.0	36.9	...*	115.4	740.0	...*
Netherlands	42315.9	849537.4	215795.3	221659.2	135401.8	238278.4	-179343.3	714135.6	-22483.1
New Zealand	1.2	13.4	...*	175.6	16.1	...*	-174.4	-2.7	...*
Norway	12080.4	12012.6	7534.9	13685.1	7932.5	24936.7	-1604.7	4080.1	-17401.8
Poland	811.0	41585.6	14452.1	23218.5	127924.0	11232.6	-22407.5	-86338.4	3219.5
Portugal	60.0	579.4	1347.7	267.0	52.0	41.2	-207.0	527.4	1306.5
Republic of Korea	7560.6	17390.1	16975.4	162176.9	120845.9	155790.7	-154616.3	-103455.8	-138815.3
Slovakia	383.1	775.1	170.5	537.0	1051.1	747.7	-153.9	-276.0	-577.2
Slovenia	309.3	172.5	328.9	818.1	2621.6	4724.9	-508.8	-2449.1	-4396.0
Spain	1258.3	3628.1	7150.0	27326.0	27690.5	44292.9	-26067.7	-24062.4	-37142.9
Sweden	5478.5	6668.2	4628.1	37437.5	38545.0	62446.7	-31959.0	-31876.8	-57818.6
Switzerland	118847.8	322846.5	153773.0	194992.0	482322.3	816914.8	-76144.2	-159475.8	-663141.8
Türkiye	45900.5	20465.7	27295.5	194738.8	85211.9	43983.1	-148838.3	-64746.2	-16687.6
United Kingdom	124668.7	157611.7	157950.7	177867.9	343993.2	431977.7	-53199.2	-186381.5	-274027.0
United States	275573.9	645725.3	634321.2	564149.9	444231.1	608145.2	-288576.0	201494.2	26176.0

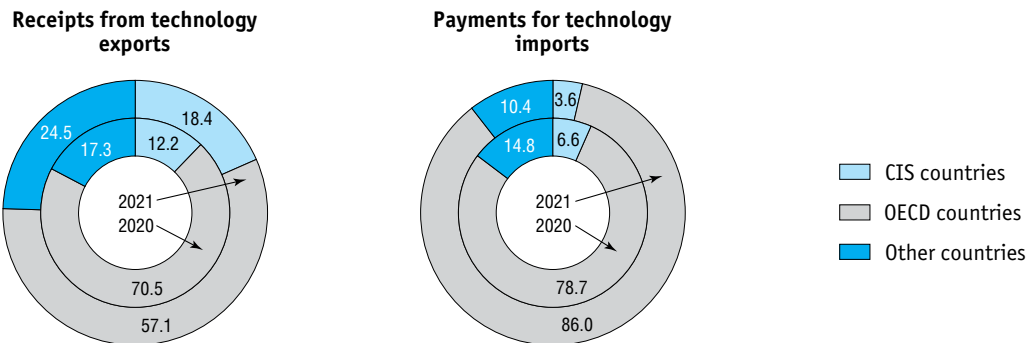
(continued)

	Receipts from technology exports			Payments for technology imports			Technology balance of payments		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Other countries	1030516.0	787108.3	1144303.2	847781.4	712061.4	524048.6	182734.6	75046.9	620254.6
Brazil	6079.1	162.3	1259.5	5496.6	4007.3	491.7	582.5	-3845.0	767.8
Bulgaria	1402.6	4366.0	4044.8	1229.3	1216.7	36242.5	173.3	3149.3	-32197.7
China	369742.0	279546.3	144687.0	399929.1	190690.8	128557.6	-30187.1	88855.5	16129.4
Cyprus	57743.8	132637.3	289631.6	133296.5	165418.9	163799.2	-75552.7	-32781.6	125832.4
Georgia	3503.0	969.8	1371.8	1598.7	184.6	324.9	1904.3	785.2	1046.9
Hong Kong (China)	6252.0	10919.2	10610.9	7203.6	2730.9	10900.9	-951.6	8188.3	-290.0
India	147853.5	153688.0	149690.2	3609.3	3359.3	27049.7	144244.2	150328.7	122640.5
Iran	4674.2	370.0	371.4	–	–	...*	4674.2	370.0	...*
Romania	1043.8	896.6	721.7	3586.7	16361.3	13000.8	-2542.9	-15464.7	-12279.1
Singapore	1027.1	21796.5	301699.0	57382.8	104695.7	6246.1	-56355.7	-82899.2	295452.9
South Africa	32128.9	299.4	–	1773.8	2989.0	–	30355.1	-2689.6	–
Taipei (China)	448.8	250.3	604.6	1711.3	1511.4	5650.1	-1262.5	-1261.1	-5045.5
Other	398617.2	181206.60	239610.7	230963.7	218895.5	...*	167653.5	-37688.9	...*

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

** From May 25, 2021, Costa Rica is a member of the OECD.

6.44. PERCENTAGE DISTRIBUTION OF TECHNOLOGY EXPORTS AND IMPORTS BY COUNTRY GROUP



6.45. TECHNOLOGY BALANCE OF PAYMENTS BY SECTOR OF PERFORMANCE

(thousand USD)

	Receipts from technology exports			Payments for technology imports			Technology balance of payments		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
Total	3520119.7	4548522.4	4662722.8	4836809.2	4824951.5	5044265.4	-1316689.5	-276429.1	-381542.6
Government sector	26050.0	16853.1	18736.9	2640.5	3458.3	22831	23409.5	13394.8	-4094.1
Business enterprise sector	3432080.6	4469821.5	4623580.7	4829741.7	4713995.4	5012509	-1397661.1	-244173.9	-388928.3
Higher education sector	61984.2	13984.1	11537.2	2249.6	1460.5	1661.8	59734.6	12523.6	9875.4
Private non-profit sector	4.9	47863.7	8868.0	2177.4	106037.3	7263.6	-2172.5	-58173.6	1604.4

6.46. TECHNOLOGY BALANCE OF PAYMENTS BY TYPE OF ECONOMIC ACTIVITY

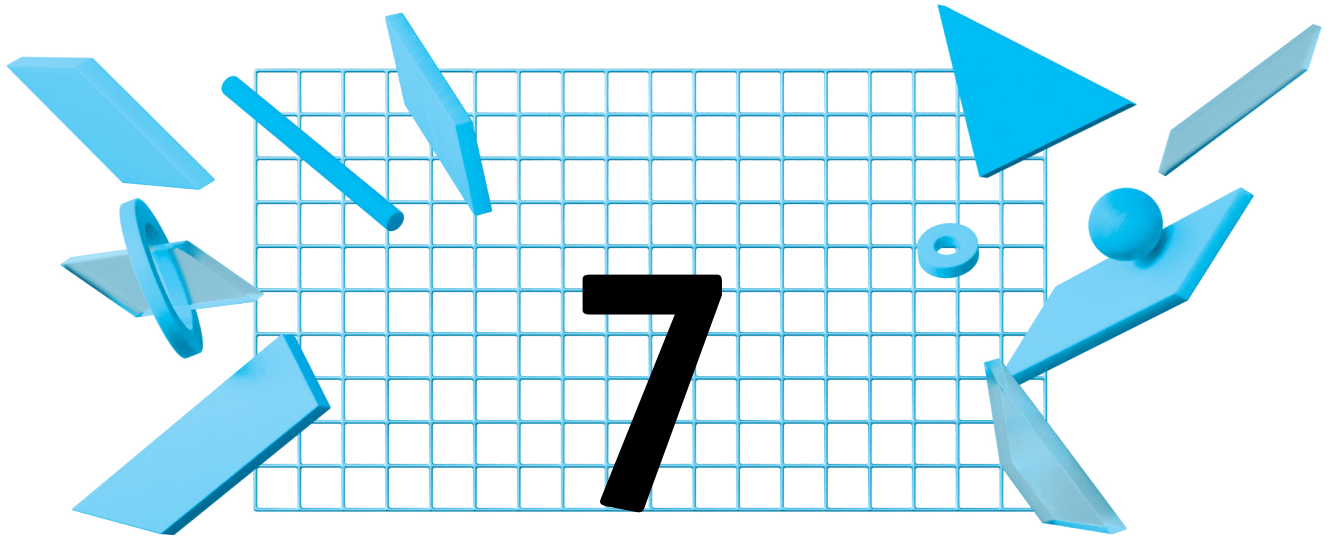
(thousand USD)

	Receipts from technology exports		Payments for technology imports		Technology balance of payments	
	2020	2021	2020	2021	2020	2021
Total	4548522.4	4662722.8	4824951.5	5044265.4	-276429.1	-381542.6
Agriculture, forestry and fishing	1753.6	2147.5	107798.2	68795.7	-106044.6	-66648.2
Mining and quarrying	884.6	1481.6	276635.8	196165.9	-275751.2	-194684.3
Manufacturing	142977.8	588474.3	2485563.6	2571356.5	-2342585.8	-1982882.2
Of which high tech:						
manufacture of basic pharmaceutical products and pharmaceutical preparations	1283.8	1644.4	7542.4	39885.4	-6258.6	-38241
manufacture of computer, electronic and optical products	9881.2	37542.2	58091.1	80561.2	-48209.9	-43019
manufacture of air and spacecraft and related machinery	14819.9	30537.6	1076.1	38591.2	13743.8	-8053.6
Electricity, gas, steam and air-conditioning supply	297.0	6697.5	5189.6	3122.4	-4892.6	3575.1
Water supply, sewerage, waste management and remediation activities	0.9	...*	1.3	–	-0.4	...*
Construction	11266.6	6064.1	47382.5	56334.3	-36115.9	-50270.2
Wholesale and retail trade; repair of motor vehicles and motorcycles	31607.9	250117.9	707880.9	1017180.1	-676273.0	-767062.2
Transportation and storage	23637.7	22100.4	36356.6	44976.6	-12718.9	-22876.2
Accommodation and food service activities	241.2	11200.8	119445.0	191333.7	-119203.8	-180132.9
Information and communication	3383678.0	2009893	281133.6	451361.2	3102544.4	1558531.8
Financial and insurance activities	25556.3	70178.8	233387.8	43301.1	-207831.5	26877.7
Real estate activities	773.3	2032.3	33271.5	12055	-32498.2	-10022.7

(continued)

	Receipts from technology exports		Payments for technology imports		Technology balance of payments	
	2020	2021	2020	2021	2020	2021
Professional, scientific and technical activities	914548.7	1671605.5	296228.2	308854.4	618320.5	1362751.1
Of which research and development	242813.6	956918.9	132446.7	48053.7	110366.9	908865.2
Administrative and support service activities	879.6	2993.5	110576.9	50282.5	-109697.3	-47289
Education	8686.4	15592.4	1119.8	5029.5	7566.6	10562.9
Of which higher education	8651.5	8474.6	1100.2	1424.7	7551.3	7049.9
Human health and social work activities	11.8		152.3	285.3	-140.5	-285.3
Art, entertainment and recreation	271.5	573.5	6393.8	22224	-6122.3	-21650.5
Other service activities	1449.5	1568.8	76434.1	1607.2	-74984.6	-38.4

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).



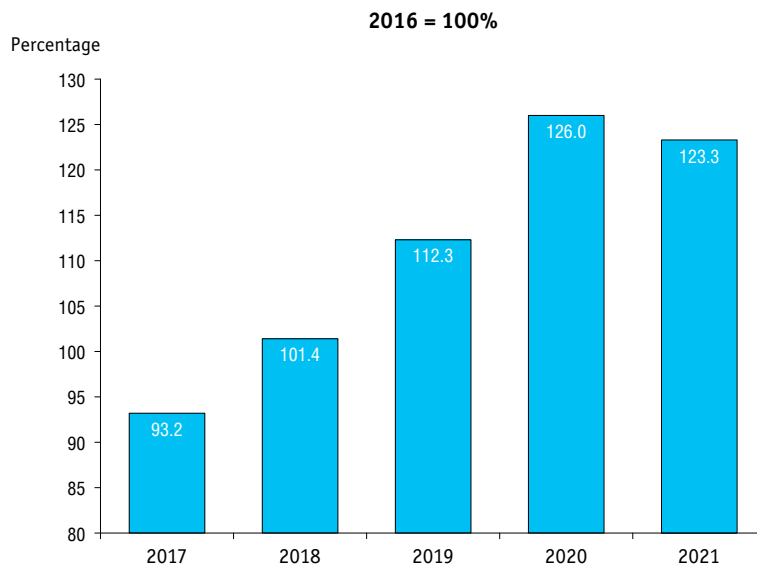
**SCIENCE AND TECHNOLOGY IN THE ARCTIC ZONE
OF THE RUSSIAN FEDERATION**

R&D institutions

7.1. R&D INSTITUTIONS BY TYPE

	2016	2017	2018	2019	2020	2021
Total	73	68	74	82	92	90

7.2. TRENDS IN THE TOTAL NUMBER OF R&D INSTITUTIONS



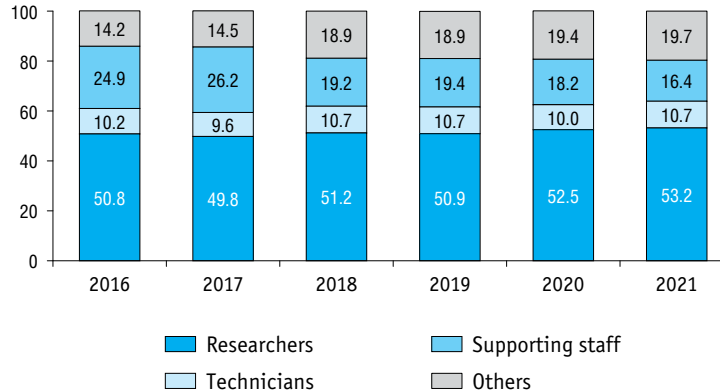
R&D personnel

7.3. R&D PERSONNEL BY OCCUPATION

(persons)

	2016	2017	2018	2019	2020	2021
Total	3615	3023	3291	3302	3315	3304
Researchers	1835	1505	1685	1682	1739	1757
Technicians	368	289	352	354	330	353
Supporting staff	900	791	632	641	603	542
Others	512	438	622	625	643	652

7.4. PERCENTAGE DISTRIBUTION OF R&D PERSONNEL BY OCCUPATION



7.5. RESEARCHERS BY AGE

(persons)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Total	1505	1685	1682	1739	1757	745	824	820	845	891
Age, years:										
under 29 inclusive										
30–34	185	216	193	198	207	92	116	105	109	114
35–39	229	279	259	247	233	112	130	127	111	120
40–44	201	254	281	305	303	108	124	129	131	138
45–49	146	163	175	222	221	86	92	102	125	126
50–54	115	125	145	135	175	58	56	66	61	87
55–59	151	158	127	140	131	80	80	63	70	66
60–64	135	135	149	148	158	80	84	84	81	84
65–69	210*	210*	110	118	112	94*	97*	56	66	67
70 and over	107	107	94	89	89	44	44	44	46	40
Doctors of Sciences	133	145	136	132	128	35	45	44	45	49
Doctors of Sciences	145	140	129	131	125	35	36	35	36	36
Age, years:										
under 29 inclusive										
30–34	–	–	–	–	–	–	–	–	–	–
35–39	1	–	–	–	1	–	–	–	–	–
40–44	–	1	...**	1	1	–	–	–	–	–
45–49	4	3	...**	2	2	–	–	...**	1	1
50–54	11	9	6	5	4	4	2	...**	1	1
55–59	12	11	9	10	9	5	4	3	4	4
60–64	19	18	18	15	16	6	8	8	6	7
65–69	51	48	19	22	19	14	14	7	9	7
70 and over	28	28	27	28	28	7	7	7	7	8
70 and over	47	50	46	49	45	6	8	7	8	8

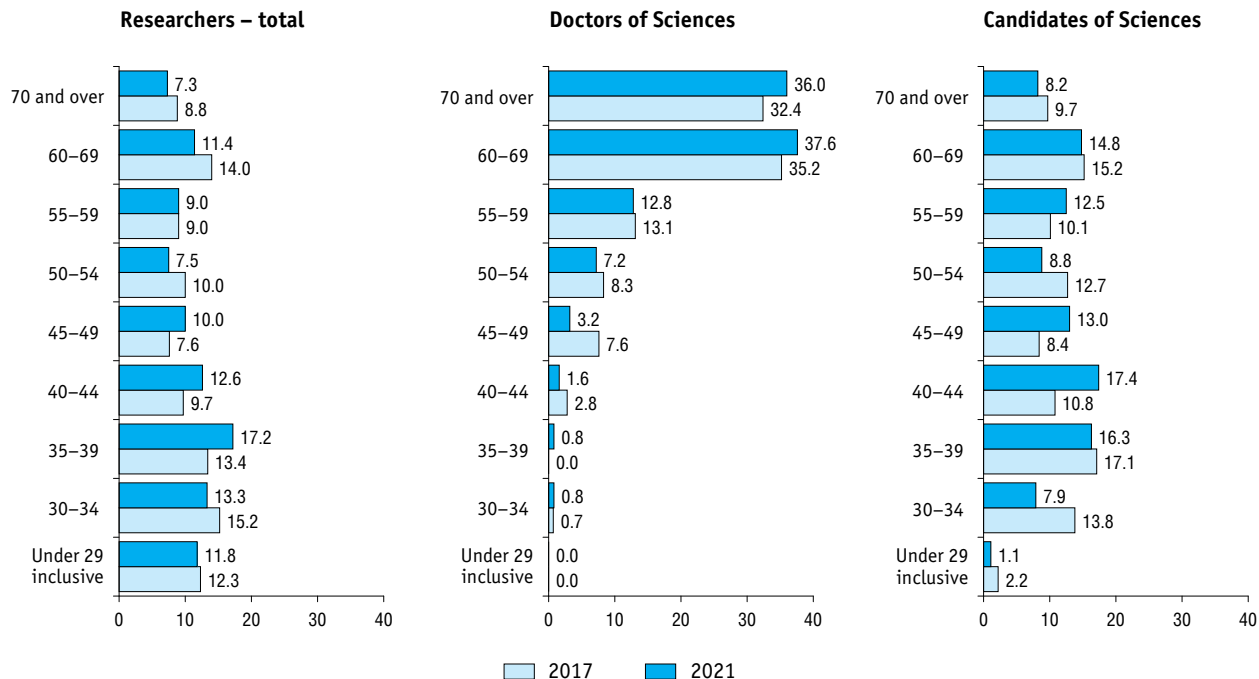
(continued)

	Researchers					Of whom – female				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Candidates of Sciences	545	540	539	532	546	271	278	277	283	297
<i>Age, years:</i>										
under 29 inclusive	12	6	9	5	6	5	4	7	4	3
30–34	75	65	54	48	43	30	30	26	26	22
35–39	93	99	95	95	89	48	48	44	38	45
40–44	59	63	66	82	95	35	41	47	57	58
45–49	46	54	62	56	71	21	26	32	27	38
50–54	69	66	57	56	48	39	35	27	29	29
55–59	55	52	63	63	68	35	34	37	37	36
60–64			43	45	47			26	29	31
65–69	83*	78*	35	34	34	39*	39*	16	17	17
70 and over	53	57	55	48	45	19	21	15	19	18

* Until 2019, the data was collected for the 60–69 age group.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

7.6. PERCENTAGE DISTRIBUTION OF RESEARCHERS BY AGE



Training of R&D personnel

7.7. MAIN INDICATORS OF POSTGRADUATE STUDIES

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons*
2016	18	716	172	174	8
2017	16	623	157	202	4
2018	10	643	178	111	4
2019	10	624	162	81	–
2020	10	664	183	79	–
2021	10	674	168	90	8

* Number of individuals who defended their thesis during their postgraduate studies (i.e., during the period of time specified in the order of admission).

7.8. MAIN INDICATORS OF POSTDOCTORAL STUDIES

	Number of institutions (at the end of the year)	Enrolment, persons (at the end of the year)	Entrants, persons	Graduates, persons	Of whom defended their thesis, persons*
2016	3	3	–	8	–
2017	2	5	2	–	–
2018	2	5	3	3	–
2019	...	4	1	2	2
2020	1	1	–	3	1
2021	1	2	–	1	1

* Number of individuals who defended their thesis during postdoctoral studies (i.e., during the period of time specified in the order of admission).

R&D funding**7.9. GROSS DOMESTIC EXPENDITURE ON R&D**

	2016	2017	2018	2019	2020	2021
Gross domestic expenditure on R&D, <i>thousand roubles:</i>						
at current prices	4396169.3	3545165.6	4749615.6	4896547.8	5075911.3	6001088.2
at constant 2010 prices*	2791927.7	2138089.1	2604098.7	2598878.9	2675334.1	2714933.1

* Calculated using GDP deflator as of April 08, 2022.

7.10. GROSS DOMESTIC EXPENDITURE ON R&D BY SOURCE OF FUNDS

	Gross domestic expenditure on R&D	Government*	Business enterprise sector	Higher education sector	Private non-profit sector	Own funds	Funds from abroad
At current prices, thousand roubles							
2016	4396169.3	3468857.8	371834.9	435.8	2258.5	436160.8	116621.5
2017	3545165.6	2750987.3	342183.5	466.1	1652.1	415347.0	34529.6
2018	4749615.6	3546257.5	427673.0	1875.8	1740.1	477254.8	294814.4
2019	4896547.8	3902170.1	405717.4	...**	1091.3	390142.5	195972.9
2020	5075911.3	4017885.2	404367.4	...**	...**	404265.4	248736.8
2021	6001088.2	4701420.9	509830.7	11568.5	7813.9	583233.0	187221.2
Percentage							
2016	100	78.9	8.5	0.01	0.05	9.9	2.7
2017	100	77.6	9.7	0.01	0.05	11.7	1.0
2018	100	74.7	9.0	0.04	0.04	10.0	6.2
2019	100	79.7	8.3	...**	0.02	8.0	4.0
2020	100	79.2	8.0	...**	...**	8.0	4.9
2021	100	78.3	8.5	0.19	0.13	9.7	3.1

* Including budget appropriations, general university funds and government sector institutions' funds.

** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

7.11. GROSS DOMESTIC EXPENDITURE ON R&D BY TYPE OF EXPENDITURE

	2016	2017	2018	2019	2020	2021
<i>At current prices, thousand roubles</i>						
Gross domestic expenditure on R&D	4396169.3	3545165.6	4749615.6	4896547.8	5075911.3	6001088.2
Current expenditure	4272469.7	3460522.0	4597882.3	4745925.8	4973742.3	5686618.1
Salaries	2655982.0	2137340.9	3016487.1	3049173.2	3233276.2	3566975.2
Of which for R&D personnel*	2431058.3	1937513.3	2836766.3	2855042.4	2973643.6	3221670.5
Social security payments**	692847.1	583686.2	804082.7	836624.8	883943.9	985908.4
Equipment	48682.2	62119.2	16100.6	45873.8	47275.9	127167.7
Other material costs	273830.9	206060.6	189452.9	228181.2	278717.5	395419.6
Other current expenditure	601127.5	471315.1	571759.0	586072.8	530528.8	611147.2
Capital expenditure	123699.6	84643.6	151733.3	150622.0	102169.0	314470.1
Land and buildings	26188.9	91.1	14446.8	...***	...***	...***
Including:						
land	–	–	–	–	–	–
buildings	–	91.1	14446.8	...***	...***	...***
Equipment	60294.2	75757.0	98191.9	45470.8	63004.7	253105.4
Intellectual property and results of intellectual activity	–	–	33808.4	33430.9	28230.4	22506.0
Other capital expenditure	37216.5	8795.5	5286.2	8040.3	8945.9	23530.7

(continued)

	2016	2017	2018	2019	2020	2021
	Percentage					
Gross domestic expenditure on R&D	100	100	100	100	100	100
Current expenditure	97.2	97.6	96.8	96.9	98.0	94.8
Salaries	60.4	60.3	63.5	62.3	63.7	59.4
Of which for R&D personnel*	55.3	54.7	59.7	58.3	58.6	53.7
Social security payments**	15.8	16.5	16.9	17.1	17.4	16.4
Equipment	1.1	1.8	0.3	0.9	0.9	2.1
Other material costs	6.2	5.8	4.0	4.7	5.5	6.6
Other current expenditure	13.7	13.3	12.0	12.0	10.5	10.2
Capital expenditure	2.8	2.4	3.2	3.1	2.0	5.2
Land and buildings	0.6	0.0	0.3	...***	...***	...***
Including:						
land	–	–	–	–	–	–
buildings	–	0.0	0.3	...***	...***	...***
Equipment	1.4	2.1	2.1	0.9	1.2	4.2
Intellectual property and results of intellectual activity	–	–	0.7	0.7	0.6	0.4
Other capital expenditure	0.8	0.2	0.1	0.2	0.2	0.4

* Excluding external multiple jobholders and independent contractors.

** National pension insurance, national health insurance, national social insurance.

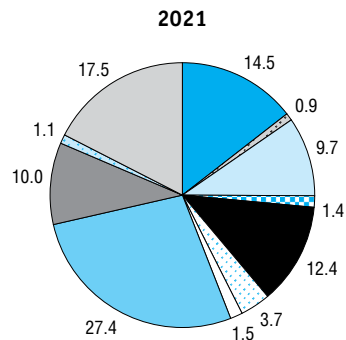
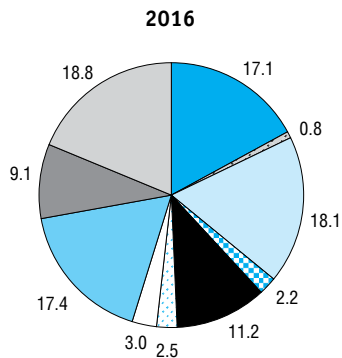
*** The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

7.12. GROSS DOMESTIC EXPENDITURE ON R&D BY PRIORITY S&T AREA AND SOURCE OF FUNDS: 2021

	Gross domestic expenditure on R&D by priority S&T area	Including at the expense of:					
		budgets of all levels	of which federal budget appropriations	own funds	government sector organisations' funds	business enterprise sector institutions' funds	other
At current prices, thousand roubles							
Total	2168035.4	1663150.9	1623802.2	169635.0	20725.1	202790.5	111733.9
Of which by Scopus subject category:							
information and telecommunications systems	54771.3	...*	...*	–	–	2798.0	...*
industry of nanosystems	...*	...*	...*	–	–	...*	...*
life sciences	743227.5	635020.3	621568.3	30758.1	...	39776.8	30545.8
rational use of natural resources	1104589.6	778016.4	774162.7	108534.6	13198.6	140107.6	64732.4
energy effectiveness, energy saving, and nuclear power engineering	77280.1	...*	...*	...*	...*	3082.6	...*
transport and space systems	67665.4	67665.4	67665.4	–	–	–	–
Percentage							
Total	100	76.7	74.9	7.8	1.0	9.4	5.2
Of which by Scopus subject category:							
information and telecommunications systems	100	...*	...*	–	–	5.1	...*
industry of nanosystems	100	...*	...*	–	–	...*	...*
life sciences	100	85.4	83.6	4.1	...*	5.4	4.1
rational use of natural resources	100	70.4	70.1	9.8	1.2	12.7	5.9
energy effectiveness, energy saving, and nuclear power engineering	100	...*	...*	...*	...*	4.0	...*
transport and space systems	100	100.0	100.0	–	–	–	–

* The data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of November 29, 2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

7.13. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SOCIO-ECONOMIC OBJECTIVE



- Agriculture
- Energy sector
- Industrial production
- Other economic objectives
- Environment control and environmental conservation
- Medical and other public health care activities
- Social development and community building
- General advancement of science
- Exploration and exploitation of the Earth and the atmosphere
- Peaceful uses of outer space
- Other

R&D Fixed Assets

7.14. R&D FIXED ASSETS

	2016	2017	2018	2019	2020	2021
	At current prices					
Fixed assets – total, million roubles	18854.1	19129.7	20221.8	21907.7	9958.4	9981.2
Per employee, thousand roubles	5215.5	6328.1	6144.6	6634.7	3004.0	3020.9
Per researcher, thousand roubles	10274.7	12710.8	12001.1	13024.8	5726.5	5680.8
Machinery and equipment, million roubles	6902.4	7243.6	7679.7	8272.1	2812.8	2553.4
Per employee, thousand roubles	1909.4	2396.1	2333.6	2505.2	848.5	772.8
Per researcher, thousand roubles	3761.5	4813.0	4557.7	4918.0	1617.5	1453.3
Machinery and equipment under 5 years, million roubles	1272.2	1130.2	1014.8	945.8	701.4	912.5
As a percentage of the total value of machinery and equipment	18.4	15.6	13.2	11.4	24.9	35.7

(continued)

	2016	2017	2018	2019	2020	2021
At constant 2010 prices*						
Fixed assets – total, million roubles	11303.4	11134.9	11147.7	11416.2	4917.7	4677.2
Per employee, thousand roubles	3126.8	3683.4	3387.3	3457.4	1483.5	1415.6
Per researcher, thousand roubles	6159.9	7398.6	6615.8	6787.3	2827.9	2662.0
Machinery and equipment, million roubles	4138.1	4216.3	4233.6	4310.6	1389.0	1196.5
Per employee, thousand roubles	1144.7	1394.7	1286.4	1305.5	419.0	362.2
Per researcher, thousand roubles	2255.1	2801.5	2512.5	2562.8	798.8	681.0
Machinery and equipment under 5 years, million roubles	762.7	657.9	559.4	492.9	346.4	427.6

*The data are calculated taking into account the GDP deflator as at April 08, 2022.

Development and use of advanced manufacturing technologies

7.15. DEVELOPMENT OF ADVANCED MANUFACTURING TECHNOLOGIES BY DEGREE OF NOVELTY AND TYPE

	Total		Of which technologies			
			new to the country		radically new	
	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	23	19	22	17	...*	...*
Design and engineering	...*	3	...*	3	–	–
Fabrication, processing, and assembling	5	...*	5	...*	–	–
Inspection and/or testing equipment	–	–	–	–	–	–
Communications, management, and geomatics	...*	...*	...*	...*	–	–
Production management information system and automation of production processes	...*	...*	...*	...*	–	...*
Industrial computing and big data technologies	–	–	–	–	–	–
Green technology	...*	...*	...*	–	...*	...*
Energy efficient technologies	–	–	–	–	–	–
Advanced production engineering and management methods	–	–	–	–	–	–

* Here and below in tables 7.16–7.17, the data are not published in order to ensure the confidentiality of primary statistics received from organisations, in accordance with Federal Law no. 282-FL of 29.11.2007 'On the Official Statistical Accounting and State Statistics System of the Russian Federation' (art. 4, para. 5; art. 9, para. 1).

7.16. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE AND DURATION

	Total		Of which technologies used during the period of						Technologies under experimental use	
			less than 1		1–5		6 and more			
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	8248	8678	393	623	4472	4772	3383	3283	14	27
Design and engineering	358	386	18	28	92	103	248	255	–	...*
Fabrication, processing, and assembling	372	382	14	25	120	116	238	241	–	...*
Automated inspection and/or testing equipment	1088	1142	83	83	535	574	470	485	...*	...*
Communications, management, and geomatics	4904	4820	148	211	3056	3152	1700	1457	10	9
Production management information system and Automation of production processes	820	1145	58	159	354	442	408	544	...*	...*
Industrial computing and big data technologies	231	327	41	57	118	184	72	86	–	6
Green technology	96	95	5	8	58	52	33	35	–	–
Energy efficient technologies	13	–	–	–	–	–	13	–	–	–
Advanced production engineering and management methods	366	381	26	52	139	149	201	180	...*	3

7.17. USE OF ADVANCED MANUFACTURING TECHNOLOGIES BY TYPE AND SOURCE OF ACQUISITION

	Total		Of which technologies					
			developed in the reporting entity		acquired			
					in Russia		abroad	
	2020	2021	2020	2021	2020	2021	2020	2021
Advanced manufacturing technologies	8248	8678	237	304	6158	6423	1853	1951
Design and engineering	358	386	8	17	284	290	66	79
Fabrication, processing, and assembling	372	382	...*	8	263	260	105	114
Automated inspection and/or testing equipment	1088	1142	25	25	792	819	271	298
Communications, management, and geomatics	4904	4820	38	71	4091	4052	775	697
Production management information system and Automation of production processes	820	1145	91	97	432	588	297	460
Industrial computing and big data technologies	231	327	11	7	105	195	115	125
Green technology	96	95	3	3	37	42	56	50
Energy efficient technologies	13	–	–	–	–	–	13	–
Advanced production engineering and management methods	366	381	57	76	154	177	155	128

7.18. ENTERPRISES' ASSESSMENT OF THE IMPACT OF ADVANCED MANUFACTURING TECHNOLOGIES: 2021

	Number of enterprises indicating the following impact of advanced manufacturing technologies			
	high	medium	low	no impact
Higher efficiency of the production process (labour productivity growth)	164	212	67	143
Lower costs (lower material costs, energy consumption, etc.)	72	206	102	206
Improvements in quality, lower reject rate	98	134	108	246
Accelerated production cycle, lower production/order fulfilment time	82	162	84	258
Higher production flexibility, adaptation and readjustment capabilities	68	145	97	276
Lower environmental impact	38	81	114	353
Output of goods and services with new consumer properties	35	90	82	379
Meeting the needs of supply chain partners	67	107	84	328
Compliance with technical standards, rules, and regulations	162	117	80	227
Entering foreign sales markets / strengthening export potential	21	45	69	451
Lower import dependence	30	81	106	369

7.19. IMPLEMENTATION OF TECHNOLOGY STRATEGY BY ENTERPRISES: 2021

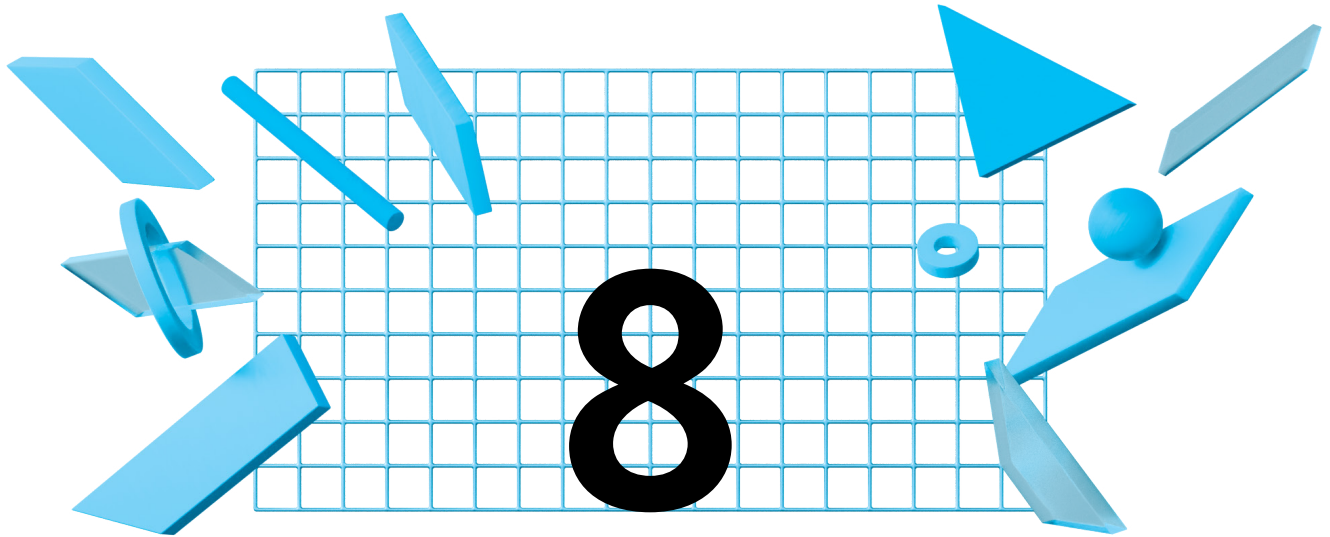
	Number of enterprises	
	with technology strategy	without technology strategy
Cooperation with higher or secondary education institutions	144	442
Cooperation with research institutes	125	461
Cooperation with design organisations, design-and-engineering organisations	215	371
Remuneration of employees for proposals to improve goods and services, increase production efficiency	216	370
Competitive technology intelligence, comparative analysis (benchmarking) and analysis of technology trends (including roadmaps)	120	466
Implementation of on-the-job training programmes	314	272
Operation of knowledge, experience, best practices management systems	202	384
Application of collective planning and decision-making methods	207	379

7.20. ENTERPRISES' ASSESSMENT OF FACTORS HAMPERING INTRODUCTION OF ADVANCED PRODUCTION TECHNOLOGIES: 2021

	Number of enterprises indicating significance of factors hampering the introduction of advanced production technologies				
	main or decisive	significant	insignificant	no such factors	do not know
Lack of qualified personnel	35	89	169	241	52
Difficulties in hiring qualified personnel	63	136	153	187	47
Low technological level of the enterprise	40	104	149	228	65
Complex integration of new technologies into enterprise's existing production and organisational processes	32	125	162	189	78
Restrictions related to the current technical standards, regulations, and rules in the sales markets	20	80	131	254	101
Restrictions related to the requirements within current supply chains	18	67	116	290	95
Low return on investment / long payback period	66	83	106	225	106
Difficulties in attracting private financing	27	37	87	327	108
Difficulties in attracting public funding	49	45	81	289	122
Tough access to non-financial support at the federal level	24	34	87	295	146
Tough access to non-financial support at the regional level	13	33	107	292	141
Regulatory and legal restrictions on access to technology in Russia	9	49	119	281	128
Regulatory and legal restrictions on access to technologies abroad	16	64	92	286	128
Inefficient current regulation and protection of intellectual property rights	7	26	119	318	116

(continued)

	Number of enterprises indicating significance of factors hampering the introduction of advanced production technologies				
	main or decisive	significant	insignificant	no such factors	do not know
Lack of information about advanced manufacturing technologies that can provide an economically significant effect for the enterprise	18	44	153	288	83
Absence/lack of technical support or related services from suppliers and partners	15	38	161	302	70
Introduction of advanced technologies is not included in enterprise's current development priorities	44	58	100	310	74
Emergence of specific risks associated with the introduction and use of individual technologies	23	78	158	234	93
Other	5	21	133	290	137

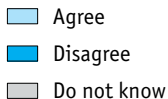
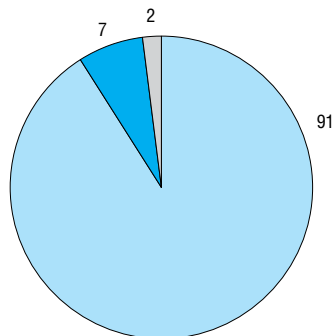


**PUBLIC ATTITUDES TOWARDS
SCIENCE AND TECHNOLOGY**

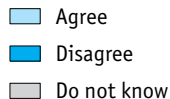
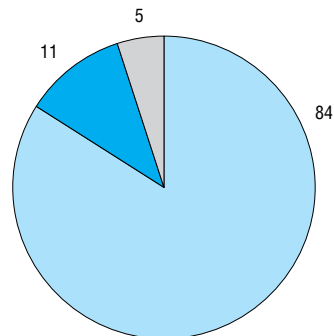
8.1. PUBLIC OPINION ON THE RUSSIAN SCIENCE AND SCIENTISTS: 2020–2021*

(as a percentage of respondents aged 18–65)

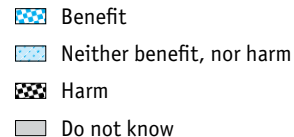
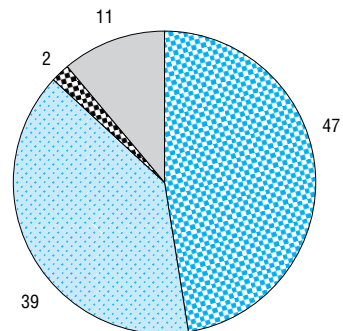
Science and technology make our life easier and more comfortable**



Most scientists want to work on the tasks that make the lives of ordinary humans better**



Does the work of Russian scientists benefit or harm you personally?

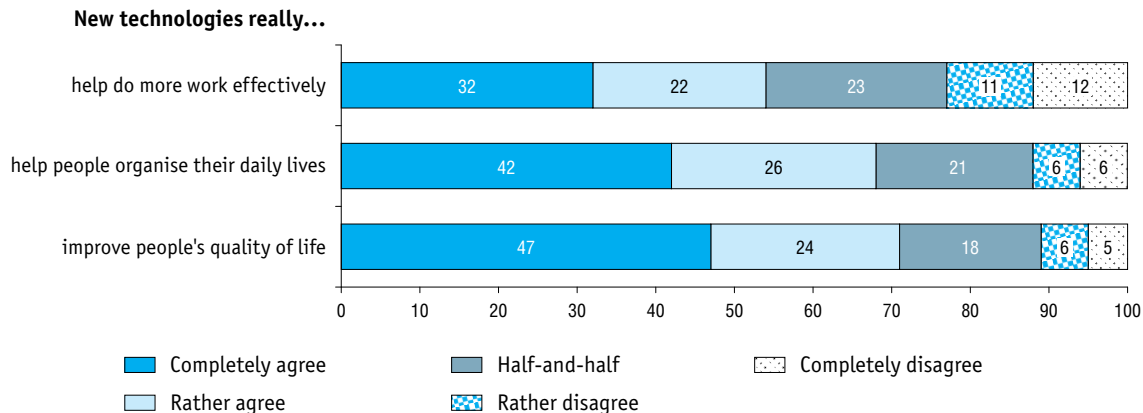


* Source: results of a representative survey of the Russian population aged 18–65 organised by the Russia Longitudinal Monitoring Survey – Higher School of Economics within the framework of the HSE Basic Research Programme (conducted in September 2020 – January 2021, with 7,467 participants).

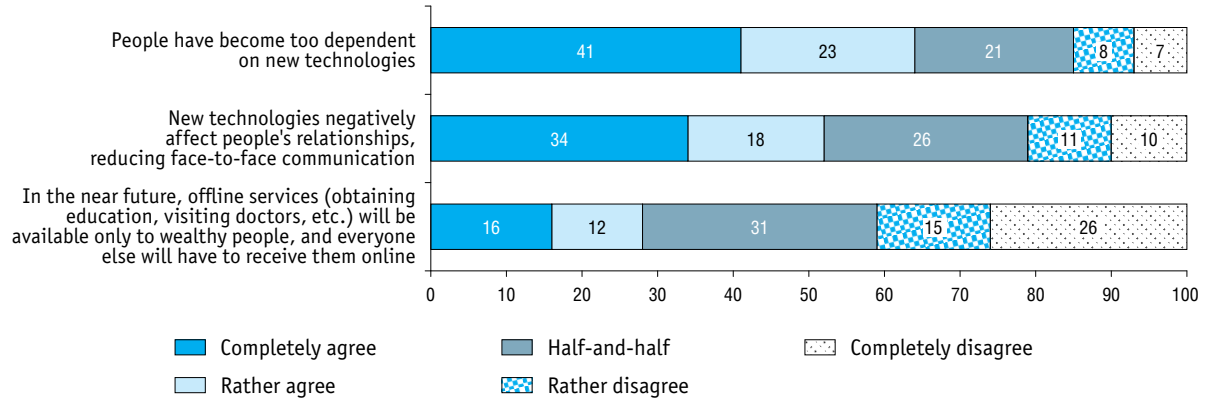
** The share of respondents who gave the answers 'completely agree' and 'mostly agree' and 'completely disagree' and 'mostly disagree'.

8.2. PUBLIC OPINION CONCERNING THE POSITIVE IMPACT OF TECHNOLOGICAL DEVELOPMENT: 2022*

(as a percentage of respondents aged 14 and over)

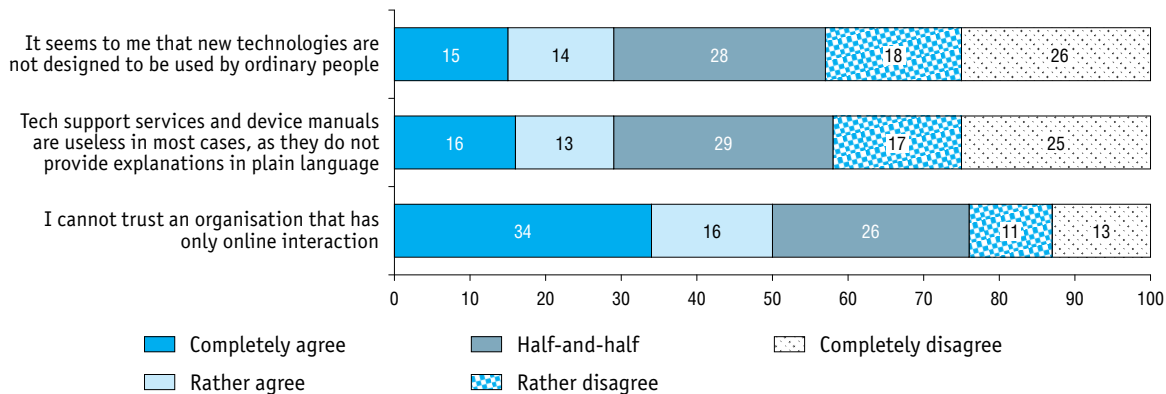


* Source: here and below in this section, the results of a representative survey of the adult Russian population aged 14 years and over conducted by HSE ISSEK within Digital Transformation Monitoring of the Economy and Society (carried out in August 4 — September 7, 2022 with of 10,021 participants).

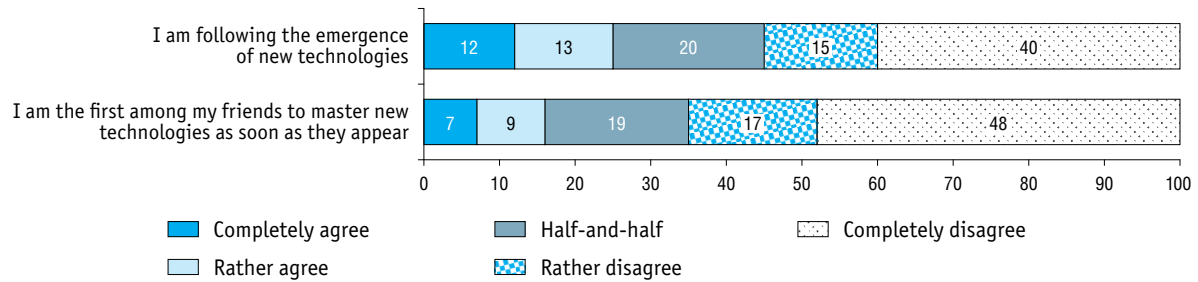
8.3. PUBLIC OPINION ON THE NEGATIVE IMPACT OF TECHNOLOGICAL DEVELOPMENT: 2022*(as a percentage of all respondents aged 14 and over)*

8.4. PUBLIC DISCOMFORT AND DISTRUST FROM INTERACTING WITH NEW TECHNOLOGIES: 2022

(as a percentage of all respondents aged 14 and over)

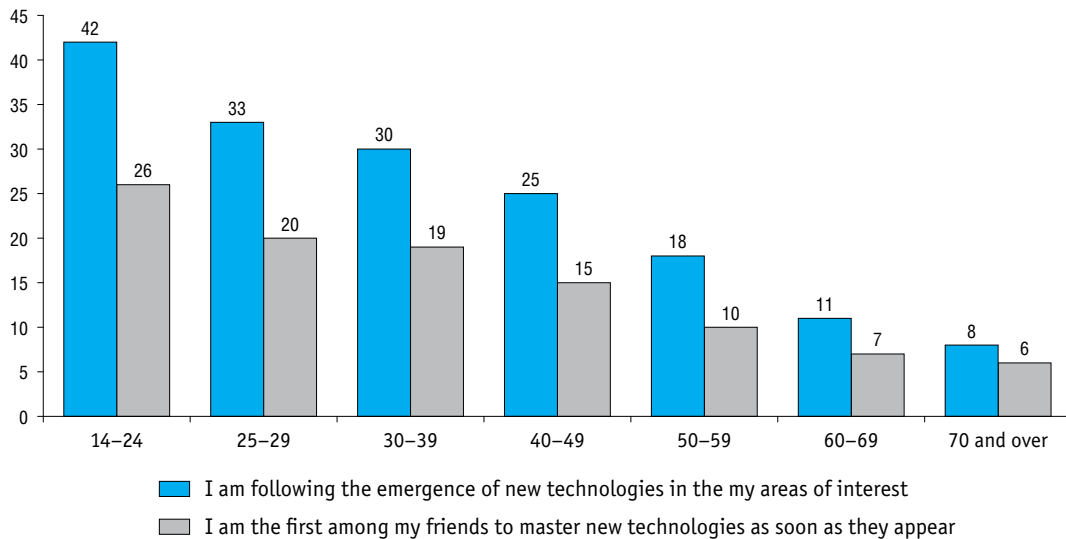


8.5. PUBLIC INTEREST IN NEW TECHNOLOGIES: 2022

(as a percentage of all respondents aged 14 and over)

8.6. PUBLIC INTEREST IN NEW TECHNOLOGIES BY AGE: 2022*

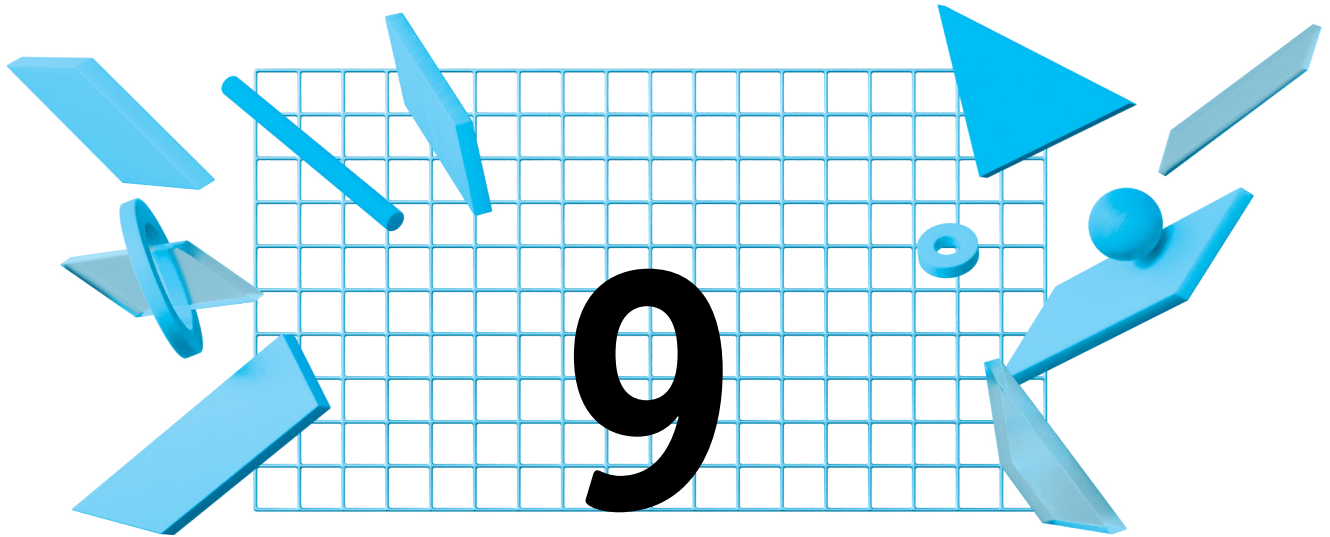
(as a percentage of all respondents in each age group)



* Aggregated share of respondents who 'completely' or 'rather' agree with these statements.

8.7. THE POPULARITY OF DIGITAL DEVICES: 2022*(as a percentage of all respondents aged 14 and over)*

	Household has it in the family	Household has it, but would like to buy a new or additional device	Household does not have it, but would like to buy one
Smartphones	84	4	2
Mobile computers (laptops and netbooks, etc.)	42	2	6
Desktop computer	32	1	4
Tablets	29	0.5	6
Feature phone	28	0.3	0.2
Smart TV (with Internet access)	24	1	12
Smart watches or fitness trackers	17	0.3	6
Game console	6	0.1	4
Robotic vacuum cleaner	6	0.1	16
Smart speaker with virtual assistant (Alice, Siri, Google Home, etc.)	5	0.1	6
E-book reader	5	0.1	2
Other smart home appliances (air conditioning, kettle, etc.) that can be controlled via the Internet	3	0.4	7



INTERNATIONAL COMPARISONS

9.1. GROSS DOMESTIC EXPENDITURE ON R&D

(million current USD PPPs)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia	10504.4	18120.5	33080.9	38818.6	39013.0	42246.1	41895.9	45687.0	47954.2	47618.0
CIS countries										
Armenia	15.6	41.9	52.1	72.9	73.2	76.1	67.3	75.2	82.6	89.4
Azerbaijan	93.1	126.4	295.3	320.5	289.4	257.2	266.2	301.8	327.5	336.6
Belarus	418.6	632.3	974.7	856.0	843.2	1014.3	1108.5	1092.5	1025.4	952.4
Kazakhstan	208.4	598.6	481.4	690.6	601.0	568.1	558.5	602.1	631.6	707.7
Kyrgyzstan	14.3	24.4	26.1	29.9	31.6	33.4	33.3	31.7	29.0	27.1
Moldova	...	56.7	67.1	81.2	82.3	81.5	86.3	85.7	77.5	90.6
Tajikistan	...	11.1	15.6	27.5	28.7	31.5	29.8	32.4	32.6	35.9
Ukraine	1948.6	3380.2	3151.8	2677.2	2299.6	2261.5	2517.1	2434.7	2203.8	...
Uzbekistan	221.7	212.0	240.8	344.9	373.1	324.5	292.9	286.4	363.2	382.3
OECD countries										
Australia	7942.8	...	20564.5	21157.1	...	22376.2	...	24011.8	...	...
Austria	4438.7	6837.0	9577.9	13143.4	14344.9	14567.3	15563.1	16140.4	15968.9	...
Belgium	5514.8	6225.2	8950.2	12647.8	13895.7	15301.0	17168.8	19702.7	20691.5	...
Canada	16744.9	23090.0	24889.1	27004.7	29014.6	29788.7	32190.0	32357.6	32628.5	31974.4
Chile	...	...	1021.0	1552.9	1576.3	1608.7	1764.9	1641.0	1615.2	...
Colombia	368.1	582.0	930.1	2280.7	1800.0	1809.6	2333.4	2540.6	2188.9	...
Costa Rica*	132.0	...	290.6	372.2	414.3	428.9	395.9	...	...	...
Czech Republic	1848.1	2619.5	3874.6	6853.0	6369.8	7274.5	8305.7	8814.7	8862.8	...
Denmark	...	4429.5	6959.2	8515.7	9208.0	9354.5	9877.9	9857.1	10401.7	...
Estonia	79.0	206.7	454.5	563.3	512.2	568.9	678.7	820.3	896.9	...
Finland	4494.0	5588.7	7741.8	6687.9	6727.4	7147.7	7540.5	7779.1	8204.6	...
France	33270.2	39530.1	50862.7	60541.3	63651.4	65592.8	68654.0	72330.4	74563.3	...

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Germany	53885.3	64028.3	86969.8	114097.6	122472.2	133668.0	142320.2	146486.1	144352.7	...
Greece	...	1627.0	1873.4	2797.4	2980.4	3544.8	3858.2	4151.9	4511.9	...
Hungary	957.3	1586.8	2454.0	3533.6	3235.5	3802.3	4703.1	4838.1	5184.6	...
Iceland	215.4	296.8	...	355.1	378.5	398.2	403.6	488.3	485.7	...
Ireland	1245.7	2006.5	3142.4	3839.4	3997.4	4692.3	4812.4	5285.5	5015.9	...
Israel	6166.8	6966.3	8628.3	12666.9	14588.5	15873.8	17003.0	18616.3	19780.1	...
Italy	15471.7	18241.2	25383.7	29994.8	33076.6	34488.8	37039.9	38740.5	37704.2	...
Japan	98935.2	128694.6	140511.5	168514.0	160269.3	166621.7	172035.8	172137.1	174065.4	...
Latvia	82.8	164.2	225.0	305.9	227.8	284.6	380.1	388.6	422.2	...
Lithuania	173.1	360.7	487.6	874.0	747.2	855.9	954.5	1071.1	1269.3	...
Luxembourg	380.7	498.8	652.2	769.4	835.9	849.6	829.9	856.0	795.9	...
Mexico	3357.5	5346.2	8612.8	9577.0	9241.7	8079.1	7788.1	7192.6	7157.1	...
Netherlands	9084.3	10892.4	12753.4	18282.0	19152.7	20560.0	21312.0	22355.2	23893.8	...
New Zealand	...	1189.3	...	2121.8	...	2740.8	...	3185.0	...	...
Norway	...	3275.8	4672.5	6061.8	6308.0	7095.1	7593.6	7702.2	7676.9	...
Poland	2616.3	2984.9	5771.3	10232.0	10354.7	11807.2	14669.1	16945.7	18096.7	...
Portugal	1401.6	1808.2	4425.4	3819.8	4179.9	4490.5	4847.6	5192.8	5692.0	...
Republic of Korea	18520.6	30618.3	52146.6	76922.0	80816.0	90289.9	100282.6	102988.6	112868.2	...
Slovakia	391.2	441.0	829.3	1886.4	1273.5	1450.2	1427.7	1439.7	1559.5	...
Slovenia	486.9	676.5	1169.4	1433.0	1406.9	1407.2	1572.8	1738.7	1793.4	...
Spain	7729.7	13251.1	20068.7	19815.3	20633.5	22293.2	23656.3	24593.5	25132.6	...
Sweden	...	10388.2	12544.2	15489.1	16250.6	17569.8	18086.3	19011.6	20099.2	...
Switzerland	5967.4	...	...	16639.9	...	17720.9	...	19438.5	...	...
Türkiye	2835.1	4595.6	10070.1	17734.3	19855.1	21572.2	23602.5	23856.5	25012.7	...
United Kingdom	25145.8	30639.7	37539.7	45451.0	48184.7	50793.1	54185.4	55983.7	...	...
United States	268558.0	326231.0	408496.0	507401.0	533465.0	565929.0	618531.0	678603.0	720880.0	...

* From May 25, 2021, Costa Rica is a member of the OECD.

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
EU countries which are not OECD members										
Bulgaria	259.8	348.9	622.8	1253.1	1101.4	1124.1	1218.8	1422.4	1453.8	...
Croatia	497.1	564.7	630.7	812.5	896.2	950.8	1124.2	1342.3	1454.3	...
Cyprus	33.5	75.3	123.1	128.6	158.8	179.2	217.3	266.8	289.5	...
Malta	...	47.6	69.9	119.2	100.7	112.4	127.2	136.2	148.8	...
Romania	480.7	844.7	1569.6	2090.9	2301.4	2675.5	2863.4	2952.8	2907.4	...
Other countries										
Argentina	1877.8	2221.5	4155.9	5363.8	4693.4	5782.0	5123.0	4724.3	...	...
Brazil	16571.0	20513.8	32465.4	40477.3	37133.4	33011.3	35905.9	...	...	...
China	32899.1	86219.6	212161.6	366080.9	393015.5	420815.6	465287.5	526183.2	583754.5	...
Egypt	767.6	1282.4	3416.0	7647.4	7489.2	7217.2	8292.6	...	...	...
Georgia	27.3	35.6	...	134.8	137.0	136.9	152.6	...	...	...
India	16742.4	27942.7	41237.1	49624.3	51812.0	55127.0	59117.8	...	...	...
Indonesia	678.5	...	...	...	6734.6	6889.5	7053.5	...	...	...
Iran	...	5972.7	3391.6	4454.4	...	9736.2	...	...	...	...
Iraq	...	...	139.4	139.5	129.0	181.7	182.1	...	...	...
Malaysia	1404.7	...	5993.8	9605.8	11093.2	...	9261.8	...	...	...
Pakistan	438.5	2175.9	...	2145.8	...	2245.4	...	...	...	...
Peru	150.3	...	...	412.6	446.1	475.2	532.6	...	...	...
Serbia	...	...	655.8	859.2	932.3	1014.0	1127.9	...	...	...
Singapore	3203.8	5389.3	7383.6	10467.9	10402.4	10160.6	10270.5	11013.6	...	...
South Africa	...	3979.4	4384.0	5551.1	5795.2	6025.6	5637.3	5147.9	...	...
Taipei (China)	9147.9	15291.5	25044.6	33058.8	34340.6	36522.7	40334.3	44089.9	47935.4	...
Thailand	1125.0	1468.6	...	6698.3	8919.5	12078.4	...	...	...	...
United Arab Emirates	...	...	...	5380.8	5770.5	...	8443.0	...	...	...
Viet Nam	...	...	...	2494.9	...	3565.6	...	...	...	...

9.2. GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia	1.05	1.07	1.13	1.10	1.10	1.11	0.99	1.04	1.09	0.99
CIS countries										
Armenia	0.19	0.26	0.24	0.25	0.23	0.23	0.19	0.18	0.21	0.20
Azerbaijan	0.34	0.22	0.22	0.22	0.21	0.18	0.18	0.20	0.22	0.20
Belarus	0.72	0.68	0.67	0.50	0.50	0.58	0.60	0.58	0.55	0.50
Kazakhstan	0.18	0.28	0.15	0.17	0.14	0.13	0.12	0.12	0.13	0.13
Kyrgyzstan	0.16	0.20	0.16	0.12	0.11	0.11	0.10	0.09	0.09	0.20
Moldova	...	0.40	0.37	0.31	0.28	0.25	0.25	0.24	0.23	0.20
Tajikistan	...	0.10	0.09	0.10	0.11	0.11	0.09	0.09	0.09	0.10
Ukraine	0.93	1.00	0.80	0.61	0.48	0.45	0.47	0.43	0.41	...
Uzbekistan	0.36	0.24	0.15	0.16	0.17	0.15	0.12	0.11	0.14	0.10
OECD countries										
Australia	1.47	...	2.18	1.88	...	1.79	...	1.80	...	...
Austria	1.89	2.37	2.73	3.05	3.12	3.06	3.09	3.13	3.22	...
Belgium	1.94	1.79	2.06	2.43	2.52	2.67	2.86	3.16	3.38	...
Canada	1.86	1.97	1.83	1.69	1.73	1.69	1.74	1.75	1.84	1.61
Chile	...	...	0.33	0.38	0.37	0.36	0.37	0.34	0.34	...
Colombia	0.14	0.17	0.19	0.37	0.27	0.26	0.31	0.32	0.29	...
Costa Rica	0.41	...	0.48	0.44	0.44	0.43	0.37	...	...	...
Czech Republic	1.11	1.16	1.33	1.92	1.67	1.77	1.90	1.93	1.99	...
Denmark	...	2.39	2.92	3.05	3.09	2.93	2.97	2.90	2.97	...
Estonia	0.60	0.92	1.58	1.47	1.24	1.28	1.41	1.63	1.75	...
Finland	3.24	3.32	3.71	2.87	2.72	2.73	2.76	2.80	2.91	...
France	2.09	2.05	2.18	2.23	2.22	2.20	2.20	2.19	2.35	...

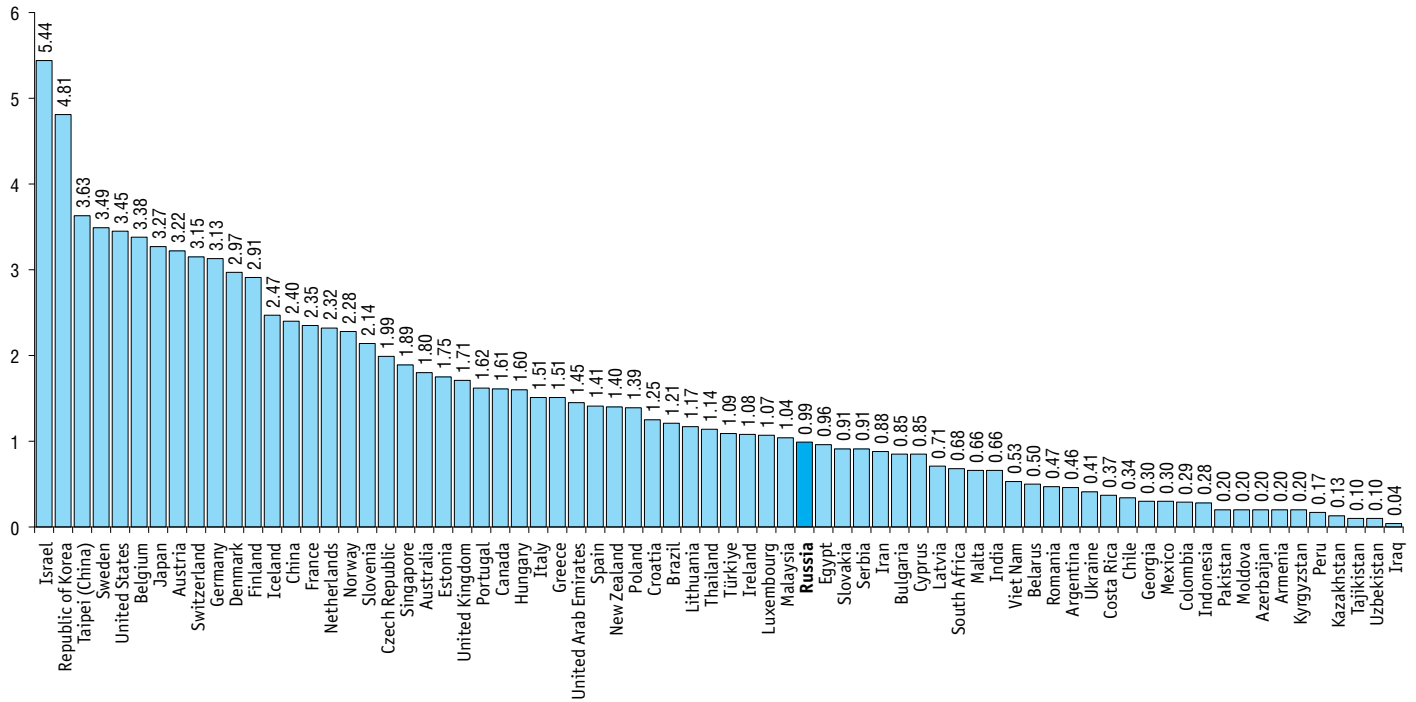
(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Germany	2.41	2.44	2.73	2.93	2.94	3.05	3.11	3.17	3.13	...
Greece	...	0.58	0.60	0.97	1.01	1.15	1.21	1.28	1.51	...
Hungary	0.79	0.92	1.13	1.34	1.18	1.32	1.51	1.48	1.60	...
Iceland	2.57	2.68	...	2.18	2.11	2.08	2.00	2.33	2.47	...
Ireland	1.08	1.19	1.59	1.18	1.18	1.25	1.17	1.23	1.08	...
Israel	3.93	4.04	3.92	4.26	4.51	4.66	4.80	5.14	5.44	...
Italy	1.00	1.04	1.22	1.34	1.37	1.37	1.42	1.46	1.51	...
Japan	2.86	3.13	3.10	3.24	3.11	3.17	3.22	3.21	3.27	...
Latvia	0.43	0.53	0.61	0.62	0.44	0.51	0.64	0.64	0.71	...
Lithuania	0.59	0.75	0.78	1.04	0.84	0.90	0.94	0.99	1.17	...
Luxembourg	1.58	1.56	1.42	1.25	1.27	1.24	1.17	1.18	1.07	...
Mexico	0.31	0.40	0.49	0.43	0.39	0.33	0.31	0.28	0.30	...
Netherlands	1.79	1.77	1.70	2.15	2.15	2.18	2.14	2.18	2.32	...
New Zealand	...	1.12	...	1.23	...	1.35	...	1.40	...	...
Norway	...	1.48	1.65	1.94	2.04	2.10	2.05	2.16	2.28	...
Poland	0.64	0.56	0.72	1.00	0.96	1.03	1.21	1.32	1.39	...
Portugal	0.72	0.76	1.54	1.24	1.28	1.32	1.35	1.40	1.62	...
Republic of Korea	2.13	2.52	3.32	3.98	3.99	4.29	4.52	4.63	4.81	...
Slovakia	0.64	0.49	0.61	1.16	0.79	0.89	0.84	0.83	0.91	...
Slovenia	1.36	1.42	2.05	2.20	2.01	1.87	1.95	2.04	2.14	...
Spain	0.88	1.10	1.36	1.22	1.19	1.21	1.24	1.25	1.41	...
Sweden	...	3.36	3.17	3.22	3.25	3.36	3.32	3.39	3.49	...
Switzerland	2.26	...	...	3.04	...	3.03	...	3.15	...	...
Türkiye	0.47	0.56	0.79	0.88	0.94	0.95	1.03	1.07	1.09	...
United Kingdom	1.61	1.55	1.64	1.63	1.65	1.66	1.71	1.71	...	...
United States	2.62	2.50	2.71	2.79	2.85	2.91	3.01	3.18	3.45	...

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
EU countries which are not OECD members										
Bulgaria	0.50	0.44	0.56	0.95	0.77	0.74	0.75	0.83	0.85	...
Croatia	1.04	0.85	0.74	0.83	0.85	0.85	0.95	1.08	1.25	...
Cyprus	0.23	0.37	0.44	0.48	0.52	0.54	0.62	0.71	0.85	...
Malta	...	0.53	0.59	0.72	0.56	0.55	0.58	0.57	0.66	...
Romania	0.37	0.41	0.46	0.49	0.48	0.50	0.50	0.48	0.47	...
Other countries										
Argentina	0.39	0.42	0.56	0.62	0.53	0.56	0.49	0.46	...	...
Brazil	1.05	1.00	1.16	1.37	1.29	1.12	1.17	1.21	...	...
China	0.89	1.31	1.71	2.06	2.10	2.12	2.14	2.23	2.40	...
Egypt	0.19	0.24	0.43	0.72	0.71	0.68	0.72	0.84	0.96	...
Georgia	0.22	0.18	...	0.30	0.29	0.27	0.28	0.28	0.30	...
India	0.76	0.82	0.79	0.69	0.67	0.67	0.66	...	...	...
Indonesia	0.07	...	...	...	0.25	0.24	0.23	0.27	0.28	...
Iran	...	0.62	0.26	0.42	...	0.83	...	0.88	...	...
Iraq	...	...	0.04	0.04	0.04	0.05	0.04	0.03	0.04	...
Malaysia	0.47	...	1.04	1.28	1.42	...	1.04	...	...	...
Pakistan	0.12	0.40	...	0.25	...	0.24	...	0.20	...	...
Peru	0.11	...	...	0.12	0.12	0.12	0.13	0.16	0.17	...
Serbia	0.85	0.40	0.70	0.81	0.84	0.87	0.92	0.89	0.91	...
Singapore	1.82	2.15	1.93	2.17	2.07	1.90	1.81	1.89	...	...
South Africa	...	0.86	0.74	0.80	0.82	0.83	0.75	0.68	...	...
Taipei (China)	1.91	2.33	2.82	3.00	3.09	3.19	3.35	3.49	3.63	...
Thailand	0.24	0.22	...	0.62	0.78	1.00	1.11	1.14	...	...
United Arab Emirates	...	...	...	0.90	0.96	...	1.28	1.31	1.45	...
Viet Nam	...	...	...	0.44	...	0.53	...	0.53	...	...

9.3. GROSS DOMESTIC EXPENDITURE ON R&D AS A PERCENTAGE OF GDP: 2021*



* Or nearest years for which data are available.

9.4. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE: 2021*

	Gross domestic expenditure on R&D	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
Russia	100	31.4	57.8	10.2	0.7
CIS countries					
Armenia	100	85.1	–	14.9	–
Azerbaijan	100	81.7	3.0	15.3	–
Belarus	100	25.5	64.4	10.1	0.0
Kazakhstan	100	34.0	34.9	19.4	11.7
Kyrgyzstan	100	71.7	15.2	13.1	–
Moldova	100	60.0	21.0	19.0	–
Tajikistan	100	89.9	–	10.1	–
Ukraine	100	40.0	52.1	7.9	–
Uzbekistan	100	45.6	31.8	21.6	1.0
OECD countries					
Australia	100	9.5	51.0	35.7	3.7
Austria	100	7.5	69.5	22.4	0.6
Belgium	100	8.3	73.9	16.9	0.9
Canada	100	7.1	52.3	40.3	0.3
Chile	100	11.1	35.6	47.6	5.8
Colombia	100	6.2	51.6	21.3	20.8
Costa Rica	100	13.2	37.5	48.2	1.2
Czech Republic	100	17.1	61.0	21.6	0.3
Denmark	100	3.4	61.6	34.6	0.4
Estonia	100	9.8	55.0	33.6	1.6
Finland	100	7.6	67.0	24.6	0.8

* Or nearest years for which data are available.

(continued)

	Gross domestic expenditure on R&D	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
France	100	11.9	66.2	20.2	1.7
Germany	100	14.6	66.6	18.7	...
Greece	100	21.5	46.1	31.8	0.6
Hungary	100	9.9	76.5	13.0	...
Iceland	100	3.4	67.9	28.7	...
Ireland	100	4.1	70.0	25.9	...
Israel	100	1.3	90.3	7.6	0.7
Italy	100	13.2	61.8	23.1	1.9
Japan	100	8.3	78.7	11.7	1.4
Latvia	100	18.8	30.9	50.2	...
Lithuania	100	15.5	48.2	36.3	...
Luxembourg	100	25.4	51.3	23.3	...
Mexico	100	26.3	21.5	50.9	1.3
Netherlands	100	5.6	66.6	27.8	...
New Zealand	100	16.7	59.6	23.8	...
Norway	100	12.4	54.3	33.2	...
Poland	100	2.0	62.8	34.9	0.2
Portugal	100	4.9	57.0	36.0	2.1
Republic of Korea	100	10.1	79.1	9.0	1.8
Slovakia	100	19.7	54.1	26.2	0.0
Slovenia	100	13.8	73.3	12.2	0.7
Spain	100	17.5	55.6	26.6	0.3
Sweden	100	4.4	72.3	23.1	0.1
Switzerland	100	0.9	67.5	28.9	2.7
Türkiye	100	6.8	64.8	28.4	...
United Kingdom	100	6.9	67.4	23.5	2.2
United States	100	9.5	75.3	11.3	4.0

(continued)

	Gross domestic expenditure on R&D	Government sector	Business enterprise sector	Higher education sector	Private non-profit sector
EU countries which are not OECD members					
Bulgaria	100	25.7	67.5	6.1	0.7
Croatia	100	19.9	47.9	32.2	...
Cyprus	100	6.2	44.3	36.1	13.5
Malta	100	0.9	63.5	35.7	...
Romania	100	31.9	59.0	8.8	0.3
Other countries					
Argentina	100.0	39.1	36.1	23.7	1.1
China	100.0	15.7	76.6	7.7	...
Egypt	100.0	28.0	3.9	68.0	0.0
Georgia	100.0	23.2	...	76.8	...
India	100.0	56.1	36.8	7.1	...
Indonesia	100.0	70.5	7.3	22.0	0.2
Iran	100.0	40.3	25.1	33.6	0.9
Iraq	100.0	24.0	2.3	73.7	...
Malaysia	100.0	13.4	43.9	42.6	0.1
Pakistan	100.0	36.5	...	63.5	...
Serbia	100.0	29.3	39.0	31.7	0.0
Singapore	100.0	11.5	60.9	27.6	...
South Africa	100.0	23.5	31.0	41.1	4.4
Taipei (China)	100.0	9.6	82.5	7.8	0.1
Thailand	100.0	5.4	80.0	13.8	0.7
United Arab Emirates	100.0	25.4	61.9	12.6	...
Viet Nam	100.0	21.3	73.0	5.3	0.4

**9.5. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D
BY SOURCE OF FUNDS: 2021***

	Gross domestic expenditure on R&D	Government	Business enterprise sector	Other national sources	Funds from abroad
Russia	100	67.5**	29.0	1.5	1.9
CIS countries					
Armenia	100	77.0	17.2	2.1	3.7
Azerbaijan	100	79.2	20.8	...	–
Belarus	100	41.9	48.4	0.5	9.2
Kazakhstan	100	58.6	33.4	6.1	1.9
Kyrgyzstan	100	70.6	26.7	0.3	2.4
Moldova	100	65.0	28.4	–	6.6
Tajikistan	100	99.2	0.7	–	0.1
Ukraine	100	43.0	32.0	1.0	24.0
Uzbekistan	100	62.5	37.3	–	0.2
OECD countries					
Australia	100	34.6	61.9	1.9	1.6
Austria	100	33.3	49.8	0.3	16.6
Belgium	100	17.8	64.3	3.2	14.7
Canada	100	32.3	43.5	14.8	9.4
Chile	100	39.3	34.7	23.9	2.1
Colombia	100	25.0	53.4	16.4	5.2
Costa Rica	100	51.9	1.3	0.0	2.2
Czech Republic	100	34.0	35.6	1.3	29.1
Denmark	100	28.7	59.2	6.5	5.6

* Or nearest years for which data are available.

** Including budget funds, general university funds, and government sector institutions' funds (including own funds).

(continued)

	Gross domestic expenditure on R&D	Government	Business enterprise sector	Other national sources	Funds from abroad
Estonia	100	37.0	50.1	0.5	12.4
Finland	100	27.7	56.0	2.3	14.1
France	100	31.4	56.7	3.8	8.1
Germany	100	29.7	62.6	0.4	7.3
Greece	100	42.7	39.9	3.0	14.4
Hungary	100	32.5	50.2	0.7	16.6
Iceland	100	30.4	38.6	0.1	30.9
Ireland	100	22.6	62.8	1.3	13.3
Israel	100	9.6	38.1	0.9	51.4
Italy	100	33.7	52.8	2.2	11.3
Japan	100	15.2	78.3	6.0	0.5
Latvia	100	38.1	27.0	1.7	33.2
Lithuania	100	28.4	38.7	2.6	30.3
Luxembourg	100	43.2	51.3	1.6	3.9
Mexico	100	76.9	17.8	4.1	1.3
Netherlands	100	30.3	56.9	2.5	10.4
New Zealand	100	31.1	49.9	9.8	9.1
Norway	100	46.1	44.5	1.5	7.8
Poland	100	39.0	50.6	3.2	7.2
Portugal	100	37.3	52.2	4.0	6.5
Republic of Korea	100	22.4	76.6	0.8	0.2
Slovakia	100	39.6	43.7	2.4	14.3
Slovenia	100	25.1	49.5	0.8	24.6
Spain	100	38.5	49.2	4.6	7.7

(continued)

	Gross domestic expenditure on R&D	Government	Business enterprise sector	Other national sources	Funds from abroad
Sweden	100	24.2	62.4	4.2	8.8
Switzerland	100	27.4	64.7	1.9	6.0
Türkiye	100	28.4	57.2	12.4	2.0
United Kingdom	100	27.1	53.6	4.8	14.5
United States	100	20.1	66.2	6.5	7.2
EU countries which are not OECD members					
Bulgaria	100	25.3	35.4	0.5	38.8
Croatia	100	36.9	37.6	4.2	21.3
Cyprus	100	35.5	38.0	5.4	21.1
Malta	100	30.3	60.2	1.2	8.2
Romania	100	32.9	55.6	0.6	10.9
Other countries					
Argentina	100	60.8	26.5	2.5	10.2
Brazil	100	53.6	43.5	2.9	...
China	100	19.8	77.5	...	0.4
Egypt	100	95.4	3.9	0.2	0.5
Georgia	100	42.5	1.7	43.8	10.3
India	100	63.2	36.8	...	...
Indonesia	100	87.7	8.0	3.3	0.1
Iran	100	61.6	30.9	7.4	...
Iraq	100	97.3	1.8	0.9	...
Malaysia	100	27.9	38.2	25.9	5.5
Pakistan	100	61.8	...	35.4	1.3

(continued)

	Gross domestic expenditure on R&D	Government	Business enterprise sector	Other national sources	Funds from abroad
Serbia	100	43.4	2.1	44.9	9.6
Singapore	100	36.6	55.3	3.0	5.1
South Africa	100	56.3	27.1	3.0	13.5
Taipei (China)	100	16.8	82.5	0.6	0.1
Thailand	100	12.2	80.8	6.2	0.7
Viet Nam	100	26.9	64.1	1.4	4.5

9.6. PERCENTAGE DISTRIBUTION OF GROSS DOMESTIC EXPENDITURE ON R&D BY SECTOR OF PERFORMANCE: 2021*

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
Russia	100	18.7	69.9	4.8	2.0	2.9	1.6
CIS countries							
Armenia	100	49.0	26.5	3.6	2.3	6.3	12.3
Azerbaijan**	100	25.5	34.5	8.6	11.9	6.3	13.2
Belarus	100	14.9	71.9	4.1	4.5	3.5	1.1
Kazakhstan	100	29.0	40.0	8.1	13.5	2.8	6.7
Kyrgyzstan	100	47.9	20.4	7.6	9.0	2.2	12.8
Moldova**	100	39.9	18.2	11.7	14.2	9.2	6.7
Tajikistan	100	19.2	13.0	9.4	27.8	17.7	12.9
Ukraine	100	20.6	63.7	3.7	5.8	4.1	2.1
Uzbekistan	100	41.5	29.0	5.6	9.4	7.2	7.3
OECD countries							
Australia	100	30.8	41.8	15.2	4.8	6.0	1.5
Chile	100	27.4	30.3	12.0	15.5	12.1	2.6
Czech Republic	100	37.3	47.4	6.2	2.9	3.2	3.0
Denmark	100	20.5	37.1	31.6	2.6	5.6	2.5
Greece	100	14.2	45.5	21.0	3.5	8.6	7.2
Hungary	100	21.7	61.9	5.9	4.1	3.3	2.5
Iceland	100	8.7	2.8	7.5	2.1	8.0	3.1
Latvia	100	25.5	36.3	13.3	13.1	8.0	3.9
Luxembourg	100	17.9	11.1	2.8	0.0	10.1	3.8
Mexico	100	20.8	44.2	10.5	6.4	12.2	5.9
Netherlands	100	21.9	40.9	16.6	8.3	8.9	3.4
Poland	100	23.3	49.7	12.5	4.1	6.6	3.8
Portugal	100	23.6	46.6	11.9	3.4	9.9	4.7

(continued)

	Total	Natural sciences	Engineering and technology	Medical sciences	Agricultural sciences	Social sciences	Humanities
Republic of Korea	100	17.7	71.0	5.8	1.9	2.2	1.4
Slovakia	100	22.5	54.8	7.2	3.4	6.4	5.7
Slovenia	100	30.5	44.5	15.5	3.2	3.4	2.8
Spain	100	19.1	53.1	14.2	5.9	5.1	2.5
Türkiye	100	4.6	70.0	11.8	3.0	6.6	4.0
United Kingdom	100	7.2	5.2	8.0	1.4	6.7	6.2
EU countries which are not OECD members							
Bulgaria	100	16.0	54.2	18.3	5.1	2.4	4.1
Croatia	100	12.9	44.6	19.7	6.8	11.1	4.9
Cyprus	100	44.5	32.5	5.2	4.0	10.3	3.5
Malta	100	14.4	54.4	13.6	1.4	11.1	5.1
Romania	100	16.2	69.8	4.7	5.2	2.1	2.1
Other countries							
Argentina	100	18.3	20.6	7.3	8.7	9.8	5.6
China	100	16.6	70.8	3.4	7.1	2.1***	...
Georgia	100	14.2	21.8	14.7	...	15.6	17.4
India	100	22.6	47.6	6.8	14.5	2.9	...
Iraq	100	18.0	28.7	15.5	11.9	7.3	18.6
Malaysia	100	11.2	36.3	8.9	5.0	9.1	1.8
Serbia	100	40.6	30.2	3.0	9.9	11.8	4.5
Singapore	100	11.8	62.3	19.3	3.6	...	...
South Africa	100	30.5	19.0	21.5	9.0	16.9	3.1
Taipei (China)	100	9.2	80.1	6.4	1.7	2.0	0.6

* Or nearest years for which data are available. For individual countries, the total does not equal 100%.

** Percentage distribution of current expenditure on R&D by type of R&D activity.

*** Including humanities.

**9.7. PERCENTAGE DISTRIBUTION OF CURRENT EXPENDITURE ON R&D
BY TYPE OF R&D ACTIVITY: 2021***

	Current expenditure on R&D	Basic research	Applied research	Development
Russia	100	18.7	19.6	61.7
CIS countries				
Armenia	100	33.6	2.8	63.6
Azerbaijan	100	56.4	20.3	23.3
Belarus	100	15.7	31.1	53.2
Kazakhstan	100	18.9	63.0	18.1
Kyrgyzstan	100	74.5	8.0	17.5
Moldova	100	9.0	77.5	13.5
Tajikistan	100	44.3	36.3	19.4
Ukraine	100	24.7	23.5	51.8
Uzbekistan	100	16.3	21.0	62.7
OECD countries				
Australia	100	20.1	38.7	41.2
Austria	100	17.8	33.9	48.3
Belgium	100	12.8	50.7	36.5
Chile	100	36.5	38.4	25.1
Czech Republic	100	27.3	43.1	29.5
Denmark	100	18.6	32.3	49.1
Estonia	100	19.3	30.1	50.7
France	100	22.7	41.4	36.0
Greece	100	34.8	34.9	30.3
Hungary	100	21.0	22.5	56.4

* Or nearest years for which data are available. For the majority of countries (apart from Russia and other CIS countries, except Kazakhstan and Ukraine, as well as Austria, Hungary, Iraq, United States, Chile, and Japan), the data are given as a percentage of the current expenditure on R&D. For individual countries, the total does not equal 100%.

(continued)

	Current expenditure on R&D	Basic research	Applied research	Development
Iceland	100	18.2	51.5	30.3
Ireland	100	23.6	30.1	44.6
Israel	100	10.0	10.1	79.9
Italy	100	22.2	40.1	37.7
Japan	100	12.8	19.4	67.8
Latvia	100	30.7	38.5	30.8
Lithuania	100	22.0	49.5	28.5
Luxembourg	100	40.4	41.6	18.0
Mexico	100	30.7	30.1	39.3
Netherlands	100	25.4	44.4	30.3
New Zealand	100	22.4	38.2	37.5
Norway	100	18.5	37.7	43.9
Poland	100	33.2	15.7	51.0
Portugal	100	19.3	39.0	41.7
Republic of Korea	100	14.4	21.6	64.0
Slovakia	100	39.4	22.0	38.6
Slovenia	100	21.9	36.7	41.5
Spain	100	23.7	45.6	30.6
Switzerland	100	42.0	29.0	29.0
United Kingdom	100	18.3	43.2	38.5
United States	100	15.1	19.6	65.3

(continued)

	Current expenditure on R&D	Basic research	Applied research	Development
EU countries which are not OECD members				
Bulgaria	100	12.7	62.1	25.2
Croatia	100	27.4	23.7	48.9
Cyprus	100	13.2	61.6	25.2
Malta	100	48.5	27.6	23.9
Romania	100	18.8	61.2	20.0
Other countries				
Argentina	100	21.2	38.7	40.0
China	100	6.0	11.3	82.7
Georgia	100	24.9	7.6	...
India	100	14.4	22.2	19.5
Iraq	100	30.5	64.5	5.1
Malaysia	100	39.3	36.2	24.5
Serbia	100	33.6	42.1	24.3
Singapore	100	22.8	31.4	45.7
South Africa	100	32.0	46.6	21.4
Taipei (China)	100	7.0	21.7	71.3

9.8. GOVERNMENT BUDGET APPROPRIATIONS ON R&D

(million current USD PPPs)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia	4685.4	13258.0	26074.9	33514.7	37315.6	28215.3	31645.5	33146.4	37382.7	39674.2
OECD countries										
Australia	2851.6	3729.1	4658.7	4610.5	4764.6	5266.7	5121.1	5147.6	6428.2	6193.9
Austria	1418.4	1836.6	2695.3	3436.2	3701.4	3728.7	3806.3	3904.5	4302.9	4620.2
Belgium	1581.2	2004.6	2839.0	3171.7	3439.6	3787.7	3834.7	4319.6	4563.2	4634.2
Canada	4589.4	6777.1	8475.9	7946.8	8450.4	9111.6	9010.2	9183.2	...	...
Chile	...	...	...	822.1	936.8	976.5	1045.4	1001.9	...	...
Colombia	28.7	171.2	407.2	614.0	509.0	618.4	559.7	548.0	482.2	...
Czech Republic	827.5	1129.0	1653.2	2151.0	2225.2	2467.1	2698.3	2828.1	2977.4	2900.1
Denmark	1135.5	1329.3	2350.2	2794.4	2694.4	2829.1	2954.6	3039.9	3397.8	3491.5
Estonia	43.6	89.9	200.7	261.3	275.0	267.6	338.5	317.7	349.1	394.6
Finland	1316.8	1648.0	2297.6	2205.0	2084.7	2183.6	2285.2	2327.2	2706.1	2671.6
France	14878.1	18220.2	19143.1	17526.4	18009.5	19150.4	20577.9	21907.0	23385.9	24347.6
Germany	17231.6	19732.0	28589.4	34098.5	37667.8	40496.1	43184.5	45260.4	50343.4	52810.6
Greece	627.2	895.8	947.4	1515.5	1607.7	1538.4	1979.3	2288.4	2646.9	2963.4
Hungary	...	696.1	761.2	725.4	1060.3	1001.3	930.7	889.8	1723.4	1347.9
Iceland	75.8	94.0	119.3	138.8	166.4	180.7	193.0	191.7	...	...
Ireland	320.0	710.7	970.9	909.4	905.6	930.6	966.5	970.1	1081.9	1204.7
Israel	1293.3	1044.9	1350.5	1837.6	1997.4	2062.3	2173.3	2210.8	2446.2	...
Italy	9507.2	11199.3	12349.8	11333.0	12467.6	12743.8	13224.4	14510.4	16601.3	17580.8
Japan	21231.4	27617.8	32128.0	33610.4	33802.9	42399.7	45814.1	54961.4	90877.3	81463.0
Latvia	34.3	57.4	59.3	93.7	108.6	123.8	130.4	137.4	160.6	166.6
Lithuania	...	169.8	262.1	273.7	278.7	298.7	299.2	335.9	358.4	376.4
Luxembourg	24.7	81.5	204.0	379.9	394.5	410.3	420.8	446.2	440.7	513.8

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Mexico	2115.8	2963.4	5133.2	7092.3	6597.6	5669.5	5520.0	4999.8	5069.0	5217.2
Netherlands	3801.0	4391.9	5687.3	6025.7	6192.8	6338.9	7107.7	7092.9	7834.0	8840.4
New Zealand	...	...	680.7	872.3	933.0	1054.0	...	...	...	...
Norway	1062.1	1535.9	2380.4	2916.3	3081.1	3477.9	3651.1	3660.9	3890.6	4005.1
Poland	1546.2	1548.8	2907.4	4157.6	3526.9	4122.7	3462.0	5697.5	5689.1	5807.5
Portugal	1079.1	1045.6	1563.3	1174.1	1240.2	1270.4	1303.7	1296.9	1303.3	1362.8
Republic of Korea	5014.5	9886.5	16291.9	22029.6	22297.4	22348.5	23100.9	24118.0	29415.1	32332.6
Slovakia	216.7	244.6	503.6	672.8	600.7	593.6	623.9	667.6	713.7	724.2
Slovenia	175.7	273.3	341.5	268.5	282.1	299.1	337.7	385.7	433.5	475.9
Spain	5134.3	6440.7	11429.2	9089.8	9422.4	9505.6	9922.0	10238.3	11098.5	11562.3
Sweden	1725.6	2508.0	3269.6	3741.9	3897.9	4034.1	4084.4	4114.1	4397.2	4902.2
Switzerland	1526.0	...	3164.7	4752.8	...	5760.7	5668.7	5881.1	6374.1	6674.4
Türkiye	...	...	4551.0	6913.4	7345.4	7738.7	7977.7	7747.5	6522.6	6592.3
United Kingdom	9490.9	12116.1	13316.9	14663.5	15006.9	16000.0	17162.8	17677.9	18209.0	...
United States	72681.0	111332.0	119382.0	115220.0	126093.0	127306.0	144459.0	149971.0	169901.0	165560.0
Other countries										
Argentina	1059.1	1190.8	2324.1	...	...	...	...	...	...	...
Romania	182.7	448.5	967.7	1104.2	1338.4	997.9	983.4	1184.6	1124.5	1026.2
Taipei (China)	2955.7	4884.0	7038.9	7434.9	7647.0	7817.0	7643.1	8115.7	8190.8	8190.5

9.9. R&D PERSONNEL: 2021*
(*person-years; in full-time equivalent*)

	R&D personnel	Researchers
Russia	729434	389222
CIS countries		
Armenia	4889	3726
Azerbaijan	19754	14351
Belarus	25644	16321
Kazakhstan	21617	17092
Kyrgyzstan	3827	3474
Moldova	3165	2920
Tajikistan	3585	3186
Ukraine	58544	51427
Uzbekistan	14053	12406
OECD countries		
Australia	147809	100414
Austria	87049	55052
Belgium	119466	76312
Canada	256120	182760
Chile	16348	9962
Costa Rica	...	1725
Czech Republic	84671	48080
Denmark	62169	45017
Estonia	6783	5370
Finland	56488	43554

* Or nearest years for which data are available. For CIS countries (excluding Russia), the number of R&D personnel is given in individuals (headcount). The data for Kyrgyzstan, the Republic of Moldova, Tajikistan, Uzbekistan and Ukraine include researchers and technicians in the number of R&D personnel.

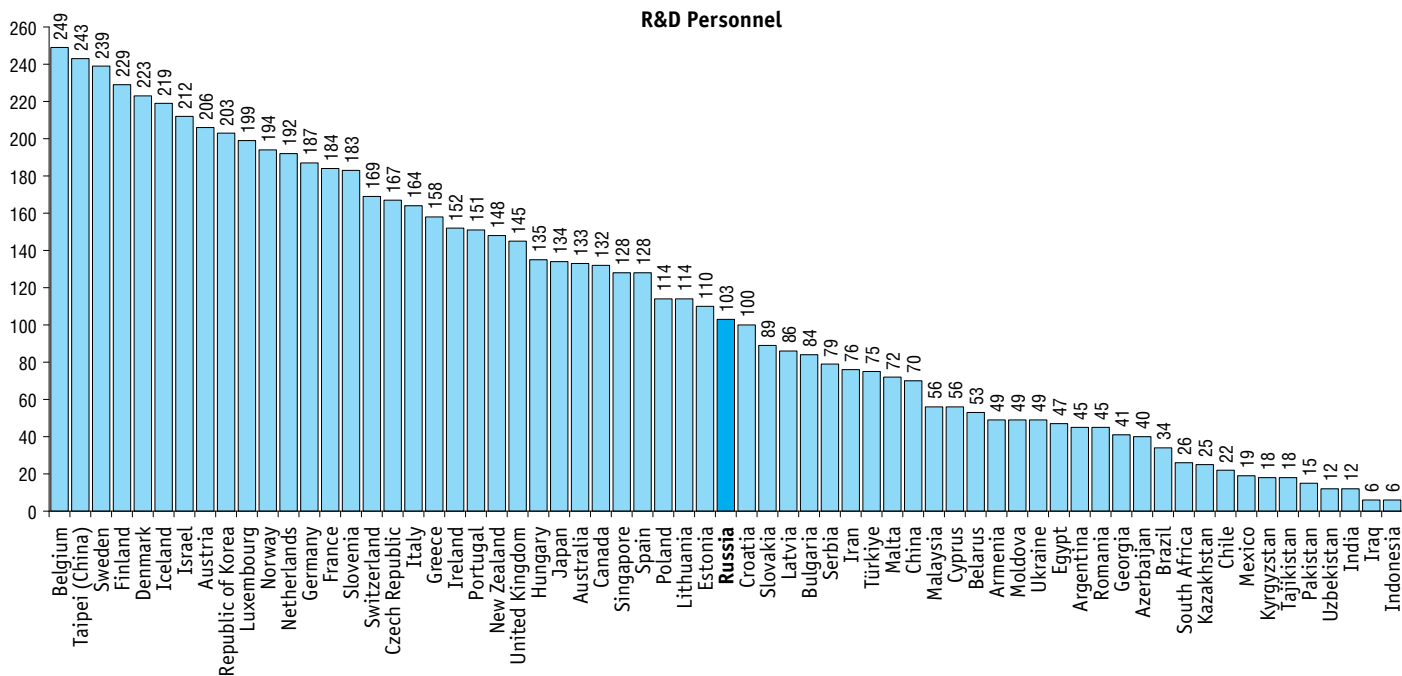
(continued)

	R&D personnel	Researchers
France	501053	340004
Germany	749851	459510
Greece	60537	44317
Hungary	61149	43324
Iceland	4075	2381
Ireland	34721	22992
Israel	77143	...
Italy	357696	172719
Japan	911620	689889
Latvia	7054	4526
Lithuania	14891	11017
Luxembourg	6028	3206
Mexico	69988	44966
Netherlands	172436	106064
New Zealand	39000	28000
Norway	51660	38615
Poland	185313	135650
Portugal	69628	56202
Republic of Korea	545435	446739
Slovakia	22358	17519
Slovenia	17451	11071
Spain	249473	154125
Sweden	115940	100059
Switzerland	85853	47699
Türkiye	199371	149731
United Kingdom	475093	316296
United States	...	1586497

(continued)

	R&D personnel	Researchers
EU countries which are not OECD members		
Bulgaria	25122	16230
Croatia	16528	9508
Cyprus	2325	1625
Malta	1883	1044
Romania	34270	19113
Other countries		
Argentina	84953	55114
Brazil	316495	179989
China	5234508	2281134
Egypt	125348	67589
Georgia	7829	5859
India	552969	341818
Indonesia	74895	57815
Iran	183933	118987
Iraq	5615	4271
Malaysia	83763	68880
Pakistan	101437	69769
Serbia	21442	15164
Singapore	48513	42295
South Africa	41856	28358
Taipei (China)	279647	163536
Thailand	138644	93457
United Arab Emirates	40064	22911
Viet Nam	84733	66953

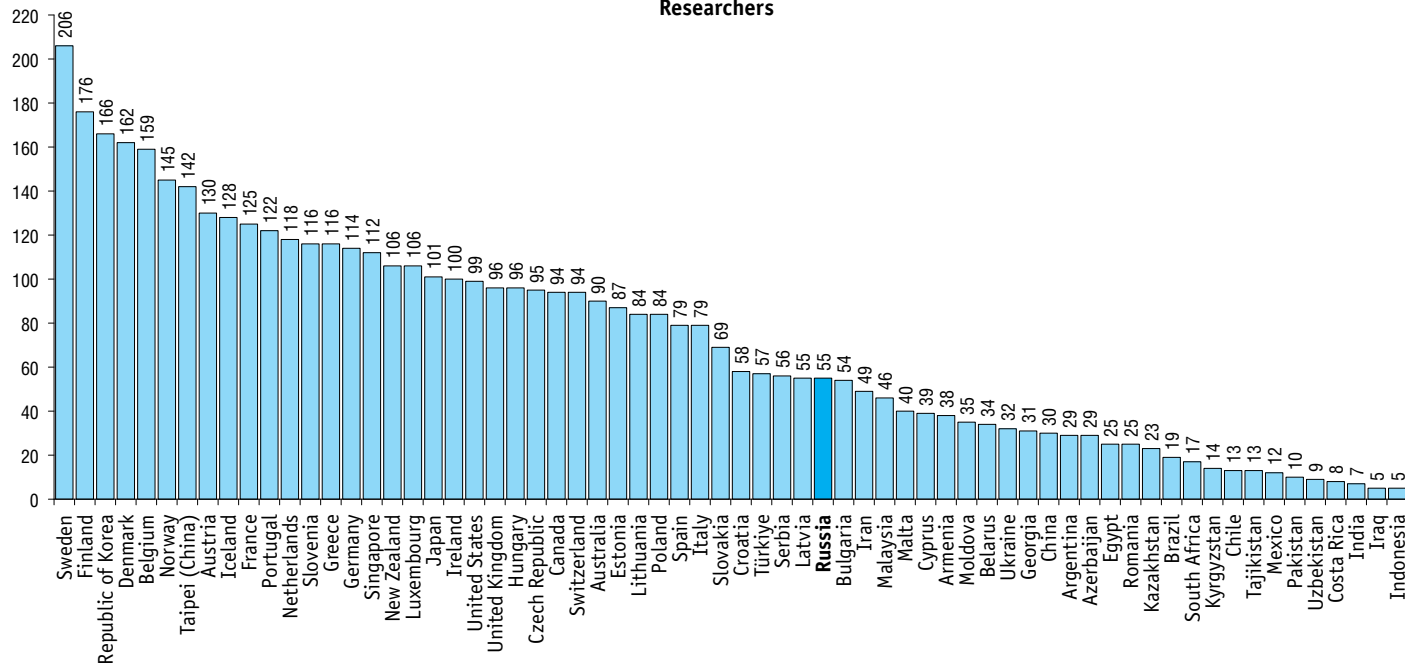
9.10. R&D PERSONNEL PER 10,000 EMPLOYMENT: 2021*



* Or nearest years for which data are available. For CIS countries (excluding Russia), the calculation is headcount-based, for the rest of the countries it is FTE-based.

(continued)

Researchers



**9.11. PERCENTAGE DISTRIBUTION OF RESEARCHERS
BY SECTOR OF PERFORMANCE: 2021***

	Government sector	Business enterprise sector	Higher education sector
Russia	32.6	46.5	20.2
CIS countries			
Armenia	73.0	–	27.0
Azerbaijan	55.6	3.6	40.8
Belarus	29.1	59.0	11.9
Kazakhstan	32.2	17.2	42.0
Kyrgyzstan	28.0	13.0	59.0
Moldova	55.0	4.7	40.3
Tajikistan	57.2	–	42.8
Ukraine	50.3	26.6	23.1
Uzbekistan	25.6	14.2	59.9
OECD countries			
Australia	...	27.9	60.6
Austria	7.4	63.3	28.4
Belgium	8.3	64.3	26.0
Canada	4.5	60.5	34.7
Chile	13.6	26.6	51.3
Costa Rica	28.6	...	69.7
Czech Republic	17.3	53.3	29.0
Denmark	3.7	56.2	39.7
Estonia	10.0	43.2	45.0

* Or nearest years for which data are available. For CIS countries (excluding Russia), the calculation is headcount-based, for the rest of the countries it is FTE-based.

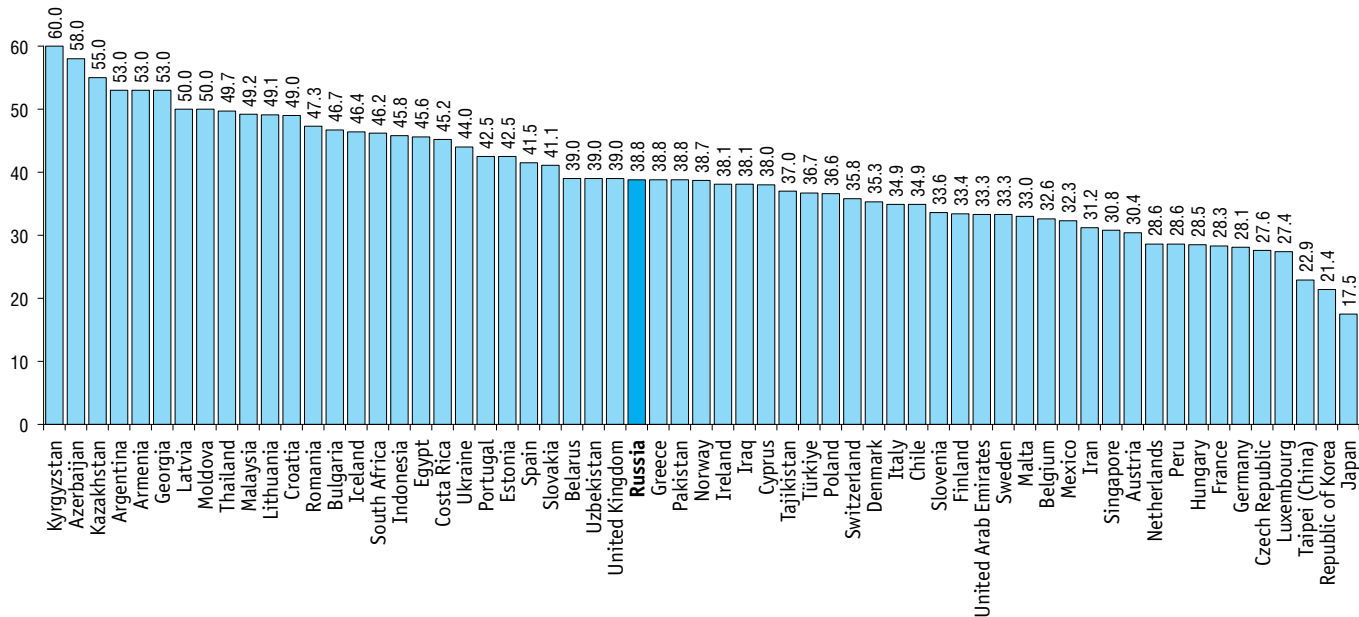
(continued)

	Government sector	Business enterprise sector	Higher education sector
Finland	7.9	62.0	29.1
France	9.4	61.8	27.2
Germany	13.6	60.1	26.2
Greece	19.3	29.8	50.4
Hungary	15.5	60.6	23.9
Iceland	5.5	49.3	45.3
Ireland	3.0	45.5	51.4
Italy	14.2	48.8	34.1
Japan	4.4	74.7	19.7
Latvia	14.3	25.5	60.2
Lithuania	15.3	30.9	53.8
Luxembourg	25.4	31.6	43.0
Mexico	13.0	47.2	38.6
Netherlands	6.0	70.2	23.9
New Zealand	6.8	35.7	57.1
Norway	11.9	51.0	37.0
Poland	2.6	53.1	43.8
Portugal	3.2	43.8	51.4
Republic of Korea	6.2	81.8	10.0
Slovakia	18.2	27.2	54.5
Slovenia	17.1	59.9	22.0
Spain	15.2	39.2	45.4
Sweden	4.2	77.6	18.3
Switzerland	1.4	48.3	50.4
Türkiye	4.0	64.9	31.1
United Kingdom	2.3	41.8	54.5
United States	...	72.3	...

(continued)

	Government sector	Business enterprise sector	Higher education sector
EU countries which are not OECD members			
Bulgaria	29.1	49.8	20.5
Croatia	22.5	26.4	51.1
Cyprus	6.2	35.4	47.1
Malta	2.2	46.8	51.0
Romania	34.1	33.1	31.8
Other countries			
Argentina	48.1	11.2	40.1
Brazil	3.4	26.6	69.3
China	17.5	58.5	24.0
Egypt	33.6	6.3	59.8
Georgia	11.1	...	88.9
India	23.1	34.0	36.5
Indonesia	13.1	7.5	78.0
Iran	22.5	19.2	57.2
Iraq	9.9	0.8	89.4
Malaysia	4.1	15.8	79.9
Pakistan	7.4	...	92.6
Serbia	22.4	10.5	67.1
Singapore	6.2	52.2	41.7
South Africa	9.3	11.4	78.1
Taipei (China)	9.9	72.3	17.7
Thailand	9.3	60.8	29.2
United Arab Emirates	10.8	77.9	11.3
Viet Nam	49.7	24.1	25.8

9.12. FEMALE RESEARCHERS AS A PERCENTAGE OF THE TOTAL NUMBER OF RESEARCHERS: 2021 *



* Or nearest years for which data are available. The calculation is headcount-based.

9.13. MAIN PUBLICATION ACTIVITY INDICATORS FOR PUBLICATIONS INDEXED IN SCOPUS BY COUNTRY: 2017–2021*

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors**	Highly cited publications as a percentage of the total number of publications by country's authors***
Russia	554959	3.61	19.1	0.44
CIS countries				
Armenia	6208	0.04	44.5	2.06
Azerbaijan	7585	0.05	26.4	1.41
Belarus	12283	0.08	29.9	1.30
Kazakhstan	23729	0.15	23.4	0.74
Kyrgyzstan	2075	0.01	31.3	2.99
Moldova	2643	0.02	32.5	1.44
Tajikistan	1142	0.01	27.1	1.05
Turkmenistan	79	0.0	39.4	2.53
Ukraine	82726	0.54	18.2	0.49
Uzbekistan	9256	0.06	14.9	0.55
OECD countries				
Australia	501802	3.26	66.2	2.51
Austria	132233	0.86	59.9	2.20
Belgium	168671	1.10	64.6	2.52
Canada	531664	3.46	64.0	2.06
Chile	79130	0.51	51.0	1.29
Colombia	69947	0.45	34.3	0.93

* Here and below in table 9.15 and figure 9.19, the HSE ISSEK estimates, based on the data from the Scopus SciVal web-based analytics solutions according to Scopus as at June 01, 2022.

** Q1 journals have a highest CiteScore (an integral publication citation indicator for scientific publications indexed in Scopus) in the top 25% of journals for one of its classified subdisciplines. The indicator is calculated for publications in scientific journals rated by CiteScore.

*** Highly cited publications are the top 1% of the most cited publications during the year they were published.

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
Costa Rica	6129	0.04	45.5	1.66
Czech Republic	127089	0.83	44.8	1.20
Denmark	143124	0.93	69.5	2.63
Estonia	18147	0.12	57.4	2.51
Finland	105777	0.69	65.5	2.10
France	566937	3.69	58.8	1.76
Germany	870808	5.66	58.7	1.76
Greece	98559	0.64	51.5	1.90
Hungary	59910	0.39	48.6	1.70
Iceland	8533	0.06	65.8	3.04
Ireland	77034	0.50	62.8	2.48
Israel	108739	0.71	64.0	2.08
Italy	600049	3.90	53.8	1.78
Japan	645721	4.20	47.8	1.02
Latvia	12860	0.08	37.5	1.23
Lithuania	21942	0.14	46.8	1.31
Luxembourg	11083	0.07	61.6	2.46
Mexico	134868	0.88	41.5	1.00
Netherlands	300359	1.95	69.1	2.64
New Zealand	79432	0.52	61.9	1.94
Norway	119683	0.78	63.3	2.03
Poland	257189	1.67	41.7	0.98
Portugal	137362	0.89	53.4	1.62
Republic of Korea	443818	2.89	53.2	1.42
Slovakia	44789	0.29	33.5	0.82

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
Slovenia	33762	0.22	49.8	1.63
Spain	491756	3.20	55.9	1.62
Sweden	209461	1.36	67.7	2.36
Switzerland	234726	1.53	66.9	2.93
Türkiye	246016	1.60	32.8	1.08
United Kingdom	957872	6.23	65.8	2.29
United States	3100331	20.16	62.6	1.87
EU countries which are not OECD members				
Bulgaria	30084	0.20	27.9	1.05
Croatia	38887	0.25	37.0	1.32
Cyprus	16303	0.11	51.8	2.15
Malta	4605	0.03	45.8	2.04
Romania	81494	0.53	34.0	1.10
Other countries				
Algeria	40821	0.27	27.5	0.95
Argentina	73615	0.48	48.4	1.13
Bangladesh	39284	0.26	42.7	1.76
Brazil	422758	2.75	40.5	0.78
China	3423284	22.26	49.9	1.57
Ecuador	24629	0.16	33.5	0.86
Egypt	132297	0.86	39.5	1.48
Ethiopia	25865	0.17	40.8	1.02
Georgia	9558	0.06	52.7	3.08
Hong Kong (China)	118826	0.77	71.8	3.55

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
India	910208	5.92	32.4	0.87
Indonesia	202202	1.31	11.3	0.24
Iran	318811	2.07	39.9	1.29
Iraq	63383	0.41	17.1	0.72
Jordan	27329	0.18	33.7	1.47
Kenya	18343	0.12	55.8	1.53
Lebanon	18331	0.12	48.2	1.84
Malaysia	179135	1.16	30.3	1.27
Morocco	41939	0.27	27.3	0.86
Nigeria	57544	0.37	30.0	0.98
Pakistan	124314	0.81	39.3	1.94
Peru	22779	0.15	34.6	1.15
Philippines	24591	0.16	33.6	1.20
Qatar	22457	0.15	58.4	2.95
Saudi Arabia	154126	1.00	47.7	2.66
Serbia	40938	0.27	39.1	1.29
Singapore	111903	0.73	69.8	3.95
South Africa	131615	0.86	47.1	1.48
Taipei (China)	191625	1.25	58.4	1.27
Thailand	98731	0.64	38.5	0.85
Tunisia	41311	0.27	36.2	0.66
United Arab Emirates	44063	0.29	51.2	2.18
Viet Nam	61894	0.40	45.5	2.30

9.14. MAIN PUBLICATION ACTIVITY INDICATORS FOR PUBLICATIONS INDEXED IN WEB OF SCIENCE BY COUNTRY: 2017–2021*

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors**	Highly cited publications as a percentage of the total number of publications by country's authors***
Russia	409298	3.05	25.7	0.40
CIS countries				
Armenia	5817	0.04	40.3	1.15
Azerbaijan	7442	0.06	29.3	1.01
Belarus	10476	0.08	34.9	0.80
Kazakhstan	17350	0.13	30.1	0.59
Kyrgyzstan	1731	0.01	33.8	2.95
Moldova	2744	0.02	31.9	0.66
Tajikistan	907	0.01	27.1	0.99
Turkmenistan	74	0.0	39.3	2.70
Ukraine	64684	0.48	29.7	0.38
Uzbekistan	3873	0.03	27.6	0.49
OECD countries				
Australia	498306	3.72	52.7	1.73
Austria	126118	0.94	51.9	1.67
Belgium	163365	1.22	54.2	1.90
Canada	518811	3.87	51.6	1.50
Chile	73352	0.55	48.0	1.08

* Here and below in table 9.16 and figure 9.18 and 9.20, HSE ISSEK estimates, based on the data from the analytical system InCites (Clarivate Analytics) according to Web of Science as at March 12, 2022.

** Q1 journals are included in the SCIE and SSCI sub-bases and make the top 25% of the rating by Journal Impact Factor at least in one of its classified subdisciplines. The indicator is calculated for publications in scientific journals rated by impact factor.

*** Highly cited publications are the top 1% of the most cited publications during the year they were published. Indicator includes articles and reviews in scientific journals listed in Science Citation Index-Expanded (SCIE) and Social Sciences Citation Index (SSCI) sub-databases.

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
Colombia	61232	0.46	38.8	0.79
Costa Rica	7475	0.06	41.9	1.03
Czech Republic	114814	0.86	43.2	0.97
Denmark	140190	1.05	56.5	1.91
Estonia	16734	0.12	50.4	2.04
Finland	101873	0.76	53.2	1.51
France	523537	3.90	52.3	1.37
Germany	804646	6.00	51.3	1.32
Greece	91923	0.69	43.8	1.45
Hungary	55566	0.41	41.7	1.37
Iceland	8731	0.07	50.8	2.19
Ireland	74114	0.55	53.0	1.79
Israel	107534	0.80	50.8	1.44
Italy	555396	4.14	48.2	1.34
Japan	577611	4.31	38.6	0.79
Latvia	11451	0.09	45.6	1.03
Lithuania	20842	0.16	38.4	0.91
Luxembourg	10588	0.08	53.6	1.86
Mexico	127127	0.95	32.9	0.74
Netherlands	290724	2.17	57.5	2.00
New Zealand	78545	0.59	48.5	1.48
Norway	113722	0.85	51.1	1.65
Poland	243617	1.82	36.6	0.74
Portugal	128797	0.96	49.3	1.18
Republic of Korea	410600	3.06	43.4	0.92

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
Slovakia	41570	0.31	33.1	0.68
Slovenia	30680	0.23	43.8	1.19
Spain	478352	3.57	52.6	1.21
Sweden	205162	1.53	54.4	1.70
Switzerland	226467	1.69	57.5	2.11
Türkiye	260665	1.94	22.6	0.70
United Kingdom	945085	7.05	54.7	1.62
United States	2960048	22.07	51.5	1.30
EU countries which are not OECD members				
Bulgaria	25873	0.19	35.0	0.94
Croatia	36216	0.27	36.1	0.93
Cyprus	14520	0.11	46.0	1.68
Malta	4307	0.03	38.0	1.39
Romania	85285	0.64	31.0	0.88
Other countries				
Algeria	34431	0.26	24.5	0.84
Argentina	74353	0.55	41.3	0.87
Bangladesh	31037	0.23	37.0	1.47
Brazil	398260	2.97	34.7	0.60
China	2791789	20.82	45.6	1.15
Ecuador	21979	0.16	40.6	0.69
Egypt	121272	0.90	32.8	1.09
Ethiopia	23695	0.18	29.8	0.79
Georgia	5479	0.04	48.0	2.21

(continued)

	Number of publications	Country's share in the world total number of publications	Publications in Q1 journals as a percentage of the total number of publications by country's authors	Highly cited publications as a percentage of the total number of publications by country's authors
Hong Kong (China)	118654	0.88	60.4	2.22
India	706839	5.27	32.0	0.60
Indonesia	109518	0.82	35.3	0.25
Iran	299138	2.23	31.8	0.89
Iraq	29664	0.22	32.8	0.92
Jordan	21985	0.16	29.1	1.21
Kenya	17325	0.13	46.2	1.23
Lebanon	16566	0.12	38.6	1.50
Malaysia	132903	0.99	36.5	0.98
Morocco	31481	0.23	31.2	0.60
Nigeria	45506	0.34	29.6	0.82
Pakistan	124872	0.93	29.0	1.28
Peru	18126	0.14	41.0	1.02
Philippines	18331	0.14	40.8	1.26
Qatar	21664	0.16	50.0	1.74
Saudi Arabia	150328	1.12	38.0	1.78
Serbia	38233	0.29	30.8	1.01
Singapore	107231	0.80	59.9	2.38
South Africa	125705	0.94	38.1	1.15
Taipei (China)	177598	1.32	45.7	0.98
Thailand	78120	0.58	37.1	0.80
Tunisia	36845	0.27	27.5	0.49
United Arab Emirates	37202	0.28	44.6	1.46
Viet Nam	54359	0.41	38.6	1.80

9.15 MAIN CITATION INDICATORS FOR PUBLICATIONS INDEXED IN SCOPUS BY COUNTRY: 2017–2021*

	Number of citations of publications by country's authors*	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average**
Russia	2263412	1.87	4.08	0.52
CIS countries				
Armenia	87202	0.07	14.05	1.78
Azerbaijan	61883	0.05	8.16	1.04
Belarus	102055	0.08	8.31	1.05
Kazakhstan	133264	0.11	5.62	0.71
Kyrgyzstan	60966	0.05	29.38	3.73
Moldova	26572	0.02	10.05	1.28
Tajikistan	7122	0.01	6.24	0.79
Turkmenistan	583	0.0	7.38	0.94
Ukraine	381251	0.31	4.61	0.58
Uzbekistan	31806	0.03	3.44	0.44
OECD countries				
Australia	6849403	5.65	13.65	1.73
Austria	1693297	1.40	12.81	1.62
Belgium	2394799	1.98	14.20	1.80
Canada	6556103	5.41	12.33	1.56
Chile	747414	0.62	9.45	1.20
Colombia	486522	0.40	6.96	0.88
Costa Rica	92505	0.08	15.09	1.92

* The analysis includes citations the 2017–2021 publications have received in between the point in time when it was indexed in the Scopus base and June 01, 2022.

** Average citation level of publications is calculated as a ratio of the number of citations the 2017–2021 publications have received in between the point in time when they were indexed in the Scopus base and June 01, 2022, to the total number of the 2017–2021 publications indexed in Scopus.

(continued)

	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Czech Republic	1056711	0.87	8.31	1.06
Denmark	2145502	1.77	14.99	1.90
Estonia	281005	0.23	15.48	1.96
Finland	1386029	1.14	13.10	1.66
France	6411565	5.29	11.31	1.43
Germany	9852721	8.13	11.31	1.44
Greece	1137590	0.94	11.54	1.46
Hungary	637405	0.53	10.64	1.35
Iceland	169716	0.14	19.89	2.52
Ireland	1019194	0.84	13.23	1.68
Israel	1327761	1.10	12.21	1.55
Italy	6855443	5.66	11.42	1.45
Japan	5156708	4.25	7.99	1.01
Latvia	118231	0.10	9.19	1.17
Lithuania	206126	0.17	9.39	1.19
Luxembourg	183602	0.15	16.57	2.10
Mexico	1011207	0.83	7.50	0.95
Netherlands	4489012	3.70	14.95	1.90
New Zealand	972284	0.80	12.24	1.55
Norway	1497593	1.24	12.51	1.59
Poland	1990143	1.64	7.74	0.98
Portugal	1474477	1.22	10.73	1.36
Republic of Korea	4289766	3.54	9.67	1.23
Slovakia	314993	0.26	7.03	0.89
Slovenia	357418	0.29	10.59	1.34

(continued)

	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Spain	5249653	4.33	10.68	1.35
Sweden	2919077	2.41	13.94	1.77
Switzerland	3652649	3.01	15.56	1.97
Türkiye	1728475	1.43	7.03	0.89
United Kingdom	12511054	10.32	13.06	1.66
United States	36446756	30.07	11.76	1.49
EU countries which are not OECD members				
Bulgaria	223752	0.18	7.44	0.94
Croatia	327633	0.27	8.43	1.07
Cyprus	193518	0.16	11.87	1.51
Malta	65245	0.05	14.17	1.80
Romania	584302	0.48	7.17	0.91
Other countries				
Algeria	291092	0.24	7.13	0.90
Argentina	636456	0.53	8.65	1.10
Bangladesh	354531	0.29	9.02	1.15
Brazil	3038590	2.51	7.19	0.91
China	31915857	26.33	9.32	1.18
Ecuador	167790	0.14	6.81	0.86
Egypt	1204798	0.99	9.11	1.16
Ethiopia	233707	0.19	9.04	1.15
Georgia	142018	0.12	14.86	1.89
Hong Kong (China)	1963603	1.62	16.53	2.10
India	5885805	4.86	6.47	0.82

(continued)

	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Indonesia	601646	0.50	2.98	0.38
Iran	2881458	2.38	9.04	1.15
Iraq	310554	0.26	4.90	0.62
Jordan	242394	0.20	8.87	1.13
Kenya	215124	0.18	11.73	1.49
Lebanon	214690	0.18	11.71	1.49
Malaysia	1353198	1.12	7.55	0.96
Morocco	276474	0.23	6.59	0.84
Nigeria	396258	0.33	6.89	0.87
Pakistan	1190817	0.98	9.58	1.22
Peru	179401	0.15	7.88	1.00
Philippines	191090	0.16	7.77	0.99
Qatar	330838	0.27	14.73	1.87
Saudi Arabia	1800336	1.49	11.68	1.48
Serbia	373104	0.31	9.11	1.16
Singapore	1892649	1.56	16.91	2.15
South Africa	1242695	1.03	9.44	1.20
Taipei (China)	1716888	1.42	8.96	1.14
Thailand	667187	0.55	6.76	0.86
Tunisia	299805	0.25	7.26	0.92
United Arab Emirates	439411	0.36	9.97	1.27
Viet Nam	601073	0.50	9.71	1.23

9.16. MAIN CITATION INDICATORS FOR PUBLICATIONS INDEXED IN WEB OF SCIENCE BY COUNTRY: 2017–2021

	Number of citations of publications by country's authors*	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average**
Russia	1613671	1.69	3.94	0.55
CIS countries				
Armenia	59503	0.06	10.23	1.44
Azerbaijan	42201	0.04	5.67	0.80
Belarus	67209	0.07	6.42	0.90
Kazakhstan	89312	0.09	5.15	0.72
Kyrgyzstan	43427	0.05	25.09	3.52
Moldova	16802	0.02	6.12	0.86
Tajikistan	5307	0.01	5.85	0.82
Turkmenistan	505	0.0	6.82	0.96
Ukraine	248102	0.26	3.84	0.54
Uzbekistan	18486	0.02	4.77	0.67
OECD countries				
Australia	5636760	5.90	11.31	1.59
Austria	1390682	1.45	11.03	1.55
Belgium	2001112	2.09	12.25	1.72
Canada	5398372	5.65	10.41	1.46
Chile	607075	0.64	8.28	1.16
Colombia	374640	0.39	6.12	0.86
Costa Rica	66410	0.07	8.88	1.25

* The analysis includes citations the 2017–2021 publications have received in between the point in time when it was indexed in the Scopus base and June 01, 2022.

** Average citation level of publications is calculated as a ratio of the number of citations the 2017–2021 publications have received in between the point in time when they were indexed in the Scopus base and June 01, 2022, to the total number of 2017–2021 publications indexed in Scopus.

(continued)

	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Czech Republic	845021	0.88	7.36	1.03
Denmark	1788834	1.87	12.76	1.79
Estonia	216771	0.23	12.95	1.82
Finland	1110503	1.16	10.90	1.53
France	5303382	5.55	10.13	1.42
Germany	8130653	8.51	10.10	1.42
Greece	894852	0.94	9.73	1.37
Hungary	520737	0.54	9.37	1.31
Iceland	135766	0.14	15.55	2.18
Ireland	826415	0.86	11.15	1.56
Israel	1092030	1.14	10.16	1.42
Italy	5510946	5.77	9.92	1.39
Japan	4280127	4.48	7.41	1.04
Latvia	86932	0.09	7.59	1.07
Lithuania	158700	0.17	7.61	1.07
Luxembourg	141863	0.15	13.40	1.88
Mexico	801818	0.84	6.31	0.88
Netherlands	3749255	3.92	12.90	1.81
New Zealand	804536	0.84	10.24	1.44
Norway	1207949	1.26	10.62	1.49
Poland	1616141	1.69	6.63	0.93
Portugal	1175604	1.23	9.13	1.28
Republic of Korea	3488388	3.65	8.50	1.19
Slovakia	242917	0.25	5.84	0.82
Slovenia	275328	0.29	8.97	1.26

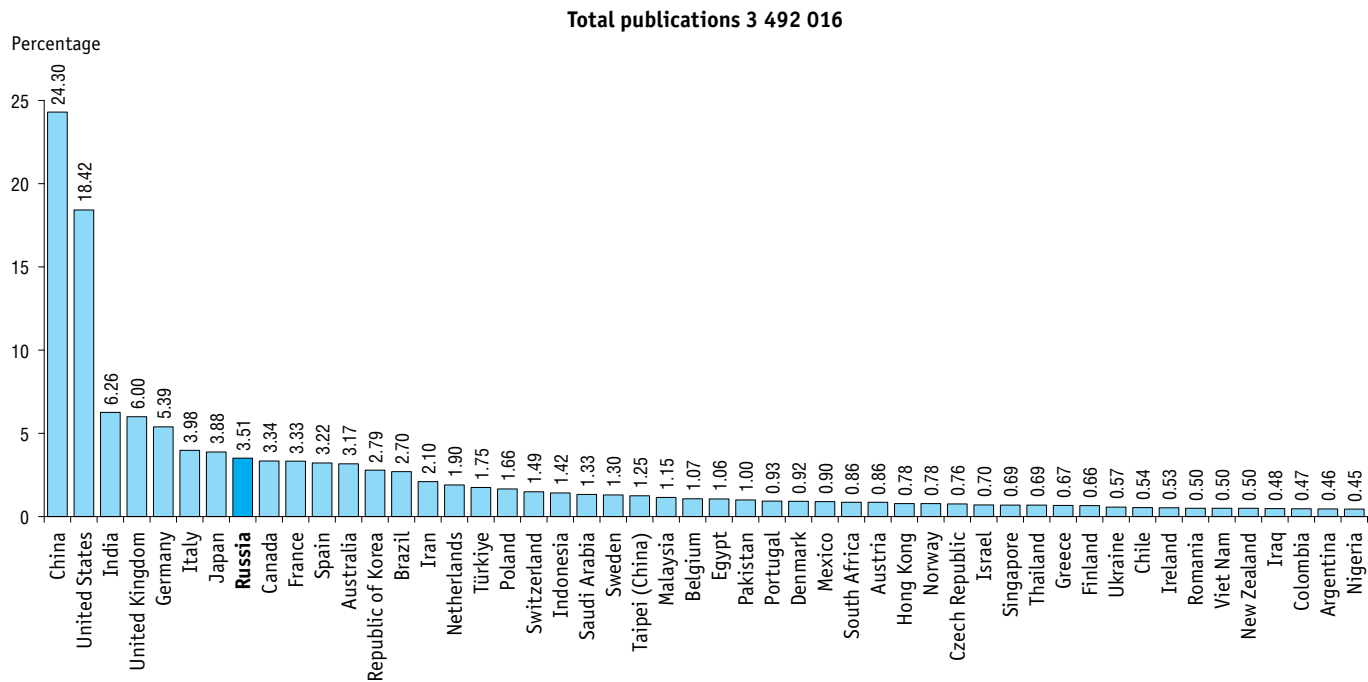
(continued)

	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Spain	4318889	4.52	9.03	1.27
Sweden	2431071	2.54	11.85	1.66
Switzerland	3034964	3.18	13.40	1.88
Türkiye	1379306	1.44	5.29	0.74
United Kingdom	10254741	10.73	10.85	1.52
United States	29937998	31.32	10.11	1.42
EU countries which are not OECD members				
Bulgaria	167590	0.18	6.48	0.91
Croatia	247560	0.26	6.84	0.96
Cyprus	139745	0.15	9.62	1.35
Malta	44600	0.05	10.36	1.45
Romania	474333	0.50	5.56	0.78
Other countries				
Algeria	214633	0.22	6.23	0.87
Argentina	521585	0.55	7.01	0.98
Bangladesh	253260	0.26	8.16	1.14
Brazil	2414746	2.53	6.06	0.85
China	25101933	26.26	8.99	1.26
Ecuador	122343	0.13	5.57	0.78
Egypt	911717	0.95	7.52	1.05
Ethiopia	184114	0.19	7.77	1.09
Georgia	67838	0.07	12.38	1.74
Hong Kong (China)	1596781	1.67	13.46	1.89
India	4277257	4.47	6.05	0.85

(continued)

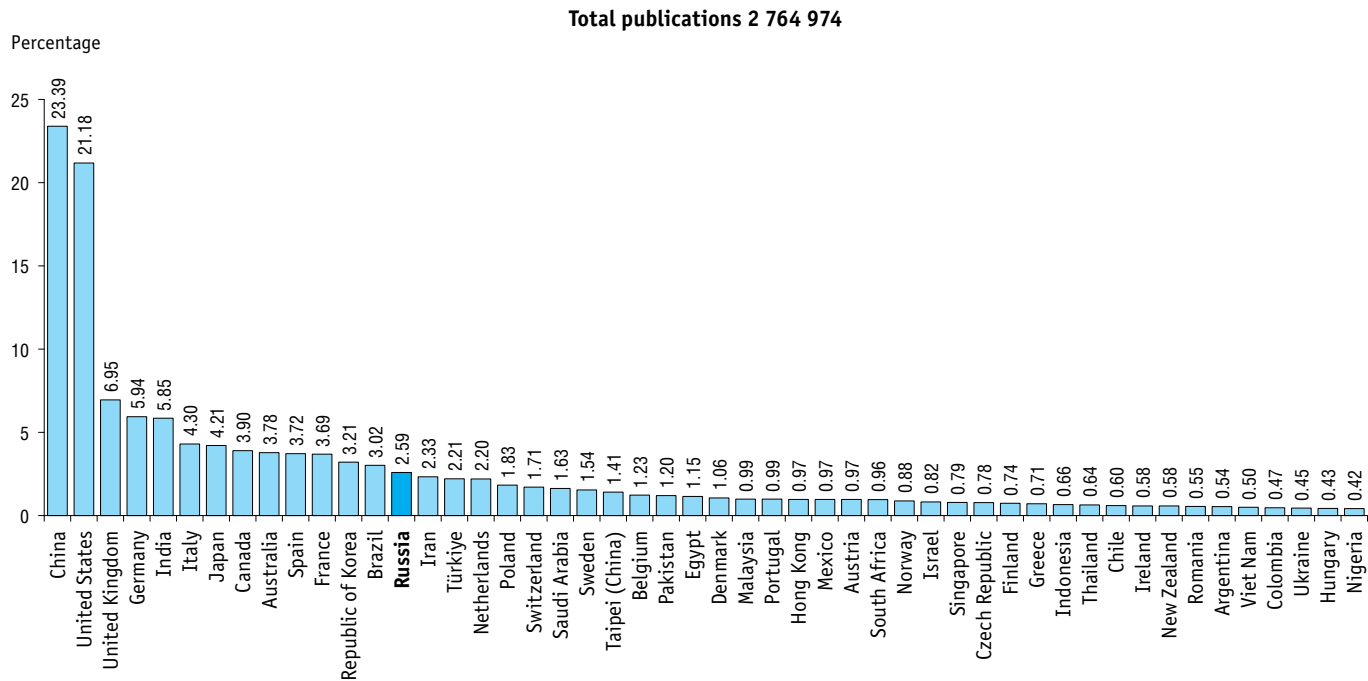
	Number of citations of publications by country's authors	Country's share in the world total number of citations	Number of citations per publication by country's authors	Ratio of the country's average citation level to the world citation average
Indonesia	299404	0.31	2.73	0.38
Iran	2280647	2.39	7.62	1.07
Iraq	189395	0.20	6.38	0.90
Jordan	176980	0.19	8.05	1.13
Kenya	172833	0.18	9.98	1.40
Lebanon	167414	0.18	10.11	1.42
Malaysia	947514	0.99	7.13	1.00
Morocco	176723	0.18	5.61	0.79
Nigeria	292704	0.31	6.43	0.90
Pakistan	928076	0.97	7.43	1.04
Peru	140441	0.15	7.75	1.09
Philippines	144065	0.15	7.86	1.10
Qatar	254542	0.27	11.75	1.65
Saudi Arabia	1428089	1.49	9.50	1.33
Serbia	282519	0.30	7.39	1.04
Singapore	1530119	1.60	14.27	2.00
South Africa	1008322	1.05	8.02	1.13
Taipei (China)	1384572	1.45	7.80	1.09
Thailand	511941	0.54	6.55	0.92
Tunisia	219097	0.23	5.95	0.83
United Arab Emirates	322217	0.34	8.66	1.22
Viet Nam	464980	0.49	8.55	1.20

9.17. COUNTRIES' SHARES IN THE WORLD TOTAL NUMBER OF PUBLICATIONS INDEXED IN SCOPUS: 2021*

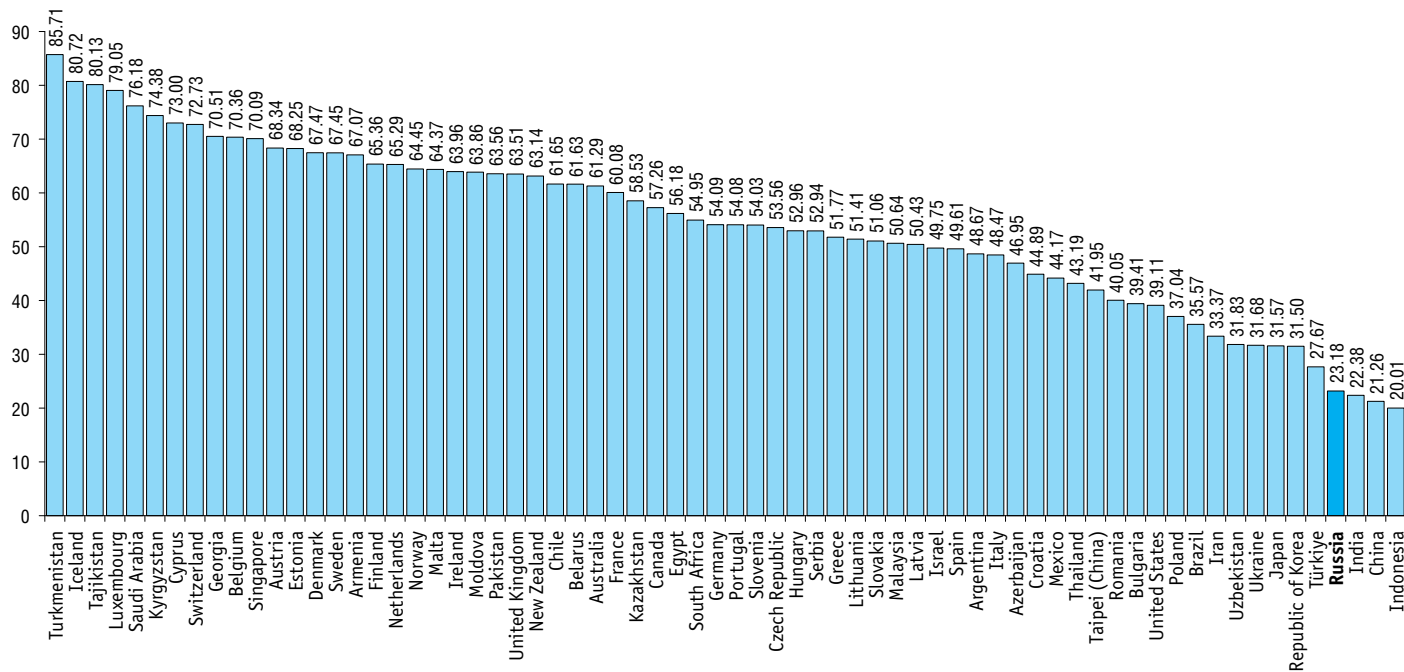


* HSE ISSEK estimates, based on the Scopus data as at November 12, 2022.

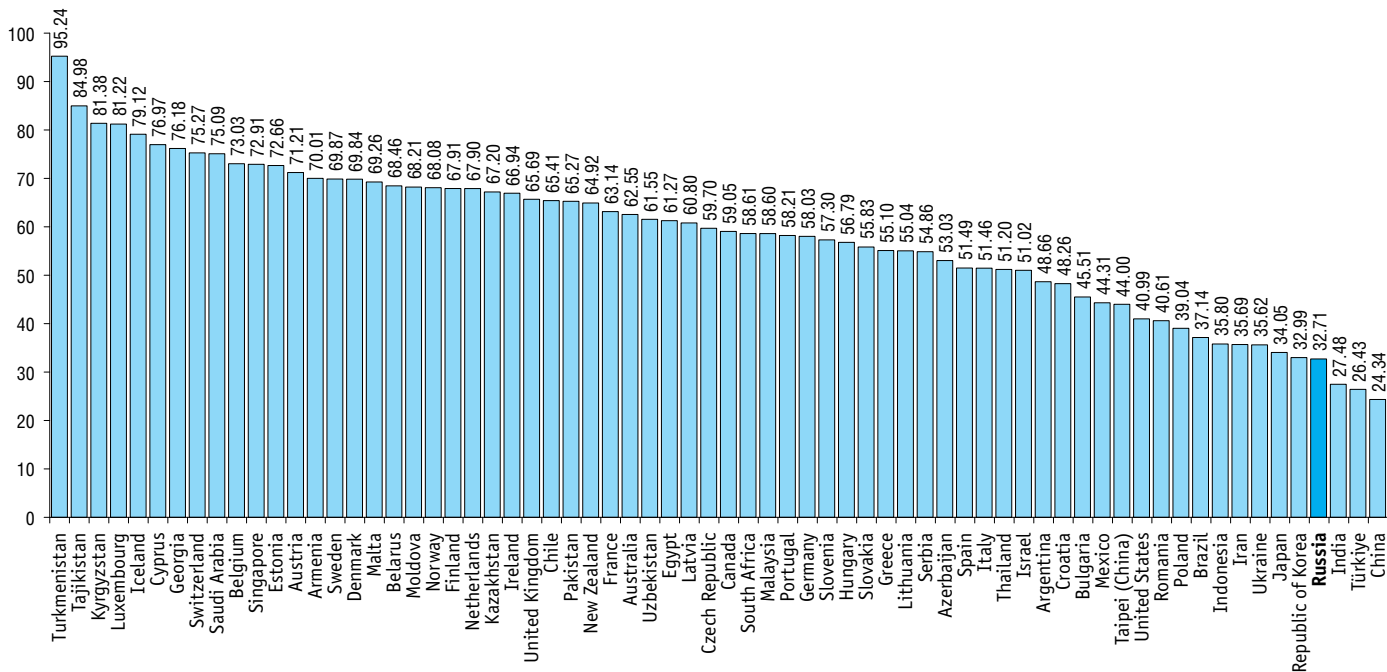
9.18. COUNTRIES' SHARES IN THE WORLD TOTAL NUMBER OF PUBLICATIONS INDEXED IN WEB OF SCIENCE: 2021



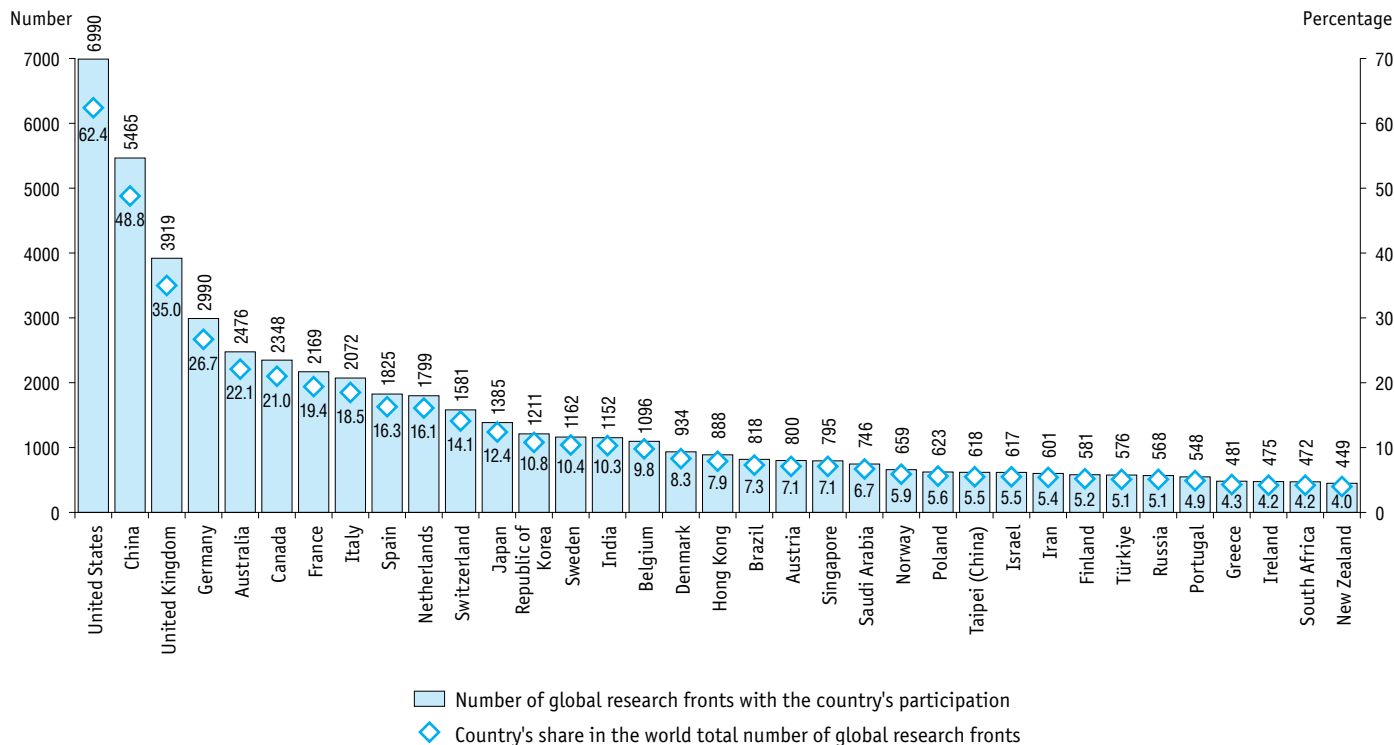
9.19. PUBLICATIONS CO-AUTHORED WITH FOREIGN RESEARCHERS AS A PERCENTAGE OF THE TOTAL NUMBER OF COUNTRY'S PUBLICATIONS INDEXED IN SCOPUS: 2021



9.20. PUBLICATIONS CO-AUTHORED WITH FOREIGN RESEARCHERS AS A PERCENTAGE OF THE TOTAL NUMBER OF COUNTRY'S PUBLICATIONS INDEXED IN WEB OF SCIENCE: 2021

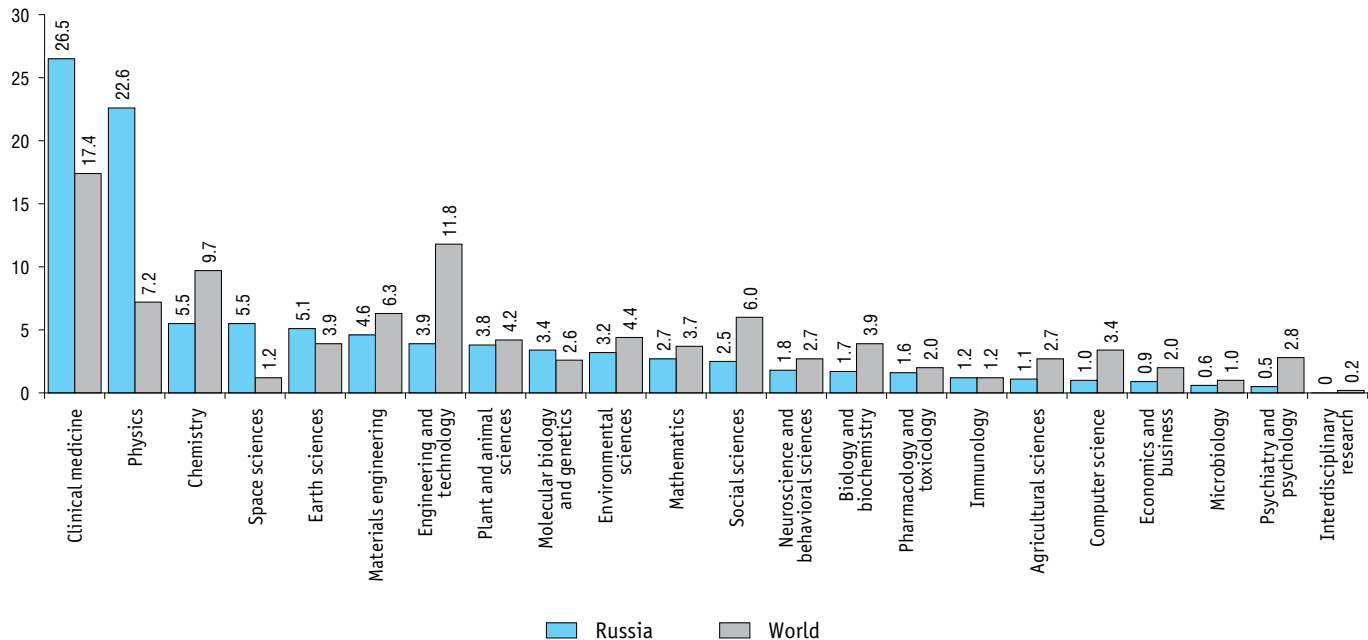


9.21. GLOBAL RESEARCH FRONTS BY COUNTRY: 2017–2022*



* Here and below in figure 9.22, HSE ISSEK estimates, based on the data from the analytical system InCites (Clarivate Analytics) according to Web of Science as at August 31, 2022.

9.22. PERCENTAGE DISTRIBUTION OF PUBLICATIONS WITHIN GLOBAL RESEARCH FRONTS IN RUSSIA AND THE WORLD BY FIELD OF SCIENCE AND TECHNOLOGY: 2017–2022*



* Indicator includes articles and reviews in scientific journals listed in Science Citation Index-Expanded (SCIE) and Social Sciences Citation Index (SSCI) sub-databases for 2017–2021 and January – August 2022.

9.23. RESIDENT AND ABROAD PATENT APPLICATIONS BY PATENT OFFICE

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Russia	28688	32254	42500	45517	41587	36454	37957	35511	34984	30977
CIS countries										
Armenia	127	208	142	115	126	110	105	116	70	48
Azerbaijan	...	287	271	184	163	226	171	167	108	135
Belarus	1198	1462	1933	691	521	524	547	393	394	386
Kazakhstan	1515	1626	1964	1503	1224	1228	982	...	900	...
Kyrgyzstan	84	131	140	126	89	146	...	93	64	87
Moldova	250	388	150	124	155	110	113	100	96	76
Tajikistan	52	36	10	1	...	...	...	2	8	...
Ukraine	7224	5592	5312	4497	4095	4047	3968	3852	3183	3393
Uzbekistan	968	444	632	507	555	553	650	543	588	665
OECD countries										
Australia	22001	23857	24887	28605	28394	28906	29957	29758	29294	32409
Austria	2301	2505	2673	2441	2315	2305	2207	2274	2297	...
Belgium	820	622	760	1097	1173	1217	1110	1133	1150	1214
Canada	39622	39888	35449	36964	34745	35022	36161	36488	34565	18855
Chile	3120	3007	1076	3274	2907	2894	3100	3237	2805	446
Colombia	1769	1761	1872	2242	2203	2372	2223	2157	2121	58569
Costa Rica	75	440	614	599	506	523	498	499	536	926
Czech Republic	4939	830	982	952	839	860	732	813	729	1276
Denmark	1870	1823	1768	1732	1850	1772	1501	1579	1478	9609
Estonia	804	38	97	36	30	41	30	32	23	117
Finland	2903	2059	1833	1416	1368	1529	1487	1396	1685	36
France	17353	17275	16580	16300	16218	16247	16222	15869	14313	1434
Germany	62142	60222	59245	66893	67899	67712	67898	67434	62105	11078

(continued)

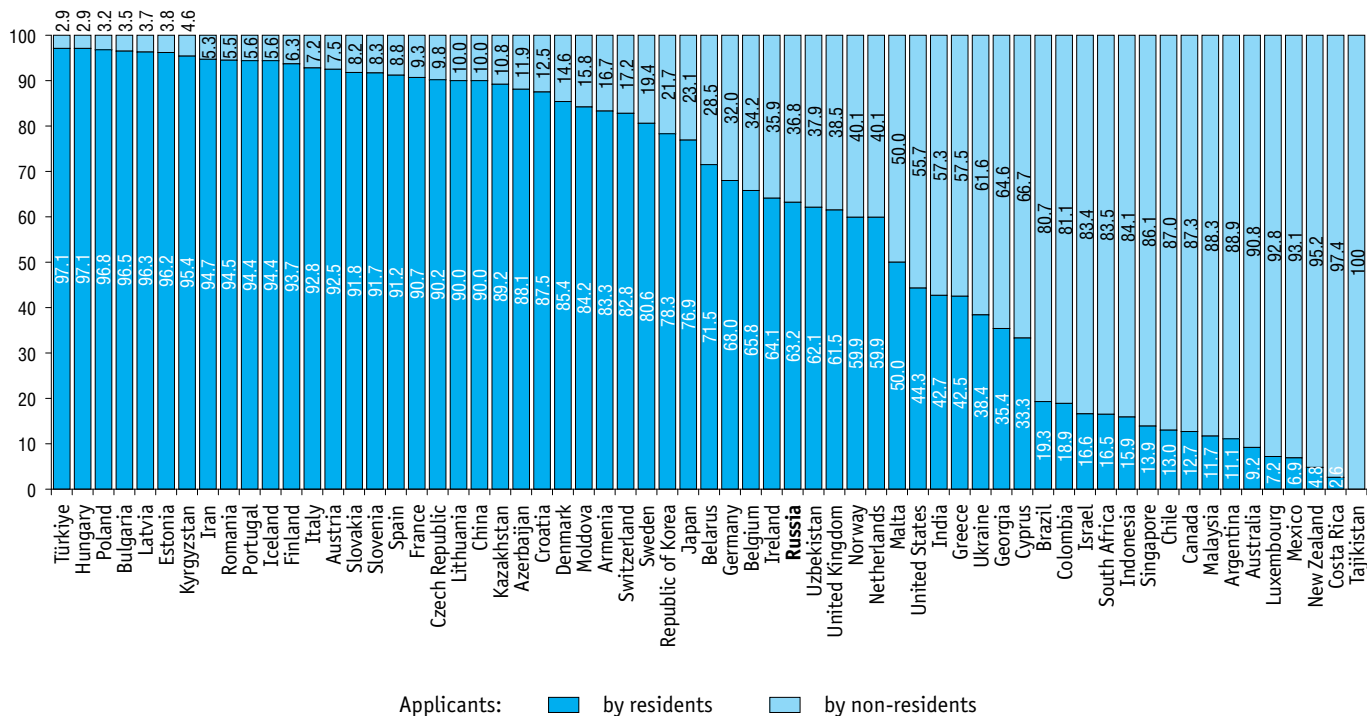
	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
Greece	340	482	744	573	646	589	579	594	763	37155
Hungary	4937	1202	696	633	665	532	443	450	456	2287
Iceland	876	592	76	46	38	44	66	62	47	581
Ireland	439	406	350	203	149	137	108	93	129	108
Israel	6802	6826	7306	6908	6419	6813	7363	7738	8123	90
Italy	9273	9331	9723	9687	9821	9674	9821	10127	11008	1553
Japan	436865	427078	344598	318721	318381	318481	313567	307969	288472	16161
Latvia	179	169	185	137	113	97	110	87	94	3470
Lithuania	127	115	114	119	153	127	105	123	113	6852
Luxembourg	176	88	100	247	444	668	395	476	808	1580
Mexico	13061	14435	14576	18071	17413	17184	16424	15941	14312	3488
Netherlands	2994	2850	2767	2494	2604	2606	2505	2677	3023	753
New Zealand	7048	7005	6636	6501	6386	6160	6238	6014	5765	237998
Norway	6700	5986	1813	1805	2060	2060	1674	1539	1444	159
Poland	7303	6583	3430	4815	4396	4041	4322	3999	4098	...
Portugal	146	205	545	945	751	680	690	807	958	591473
Republic of Korea	102010	160921	170101	213694	208830	204775	209992	218975	226759	8476
Slovakia	2040	250	282	256	235	206	231	234	221	1662
Slovenia	431	373	453	...	...	...	278	...	...	14759
Spain	3194	3353	3779	3020	2922	2343	1674	1447	1555	600
Sweden	5068	2960	2549	2428	2384	2297	2280	2190	2196	3082
Switzerland	2551	2098	2155	1923	1771	1628	1615	1717	1685	1555
Türkiye	3433	1146	3357	5841	6848	8555	7466	8088	8158	2196
United Kingdom	32747	27988	21929	22801	22059	22072	20941	19250	20649	26
United States	295895	390733	490226	589410	605571	606956	597141	621453	597172	289200

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021
EU countries which are not OECD members										
Bulgaria	940	313	260	291	241	225	198	193	246	171
Croatia	875	1012	278	186	188	159	136	211	129	88
Cyprus	70	64	8	7	4	12	4	5	3	3
Malta	116	...	19	11	4	12	17	12	11	10
Romania	1290	984	1418	1053	1063	1178	1147	939	864	817
Other countries										
Argentina	6636	5269	4717	4125	3809	3443	3667	3702	3492	3669
Brazil	17283	18498	24999	30219	28010	25658	24857	25396	24338	24232
China	51906	173327	391177	1101864	1338503	1381594	1542002	1400661	1497159	1585663
Georgia	418	475	362	271	274	232	260	197	215	254
India	8538	24382	39762	45658	45057	46582	50055	53627	56771	61573
Indonesia	3890	4304	5630	9153	9639	9303	9754	11481	8160	8800
Iran	616	4494	11636	14279	15632	16259	12823	12147	12030	...
Malaysia	6227	6286	6383	7727	7236	7072	7295	7551	6828	7534
Singapore	8236	8605	9773	10814	10980	10930	11845	14136	13265	14590
South Africa	3295	7004	6383	7497	7210	7544	6915	6914	6688	10960

Source: Rospatent data, WIPO database, November 2022.

9.24. PERCENTAGE DISTRIBUTION OF PATENT APPLICATIONS BY APPLICANT AND COUNTRY: 2021*



* Or nearest years for which data are available.

Source: Rospatent data, WIPO database, November 2022.

9.25. RESIDENT AND ABROAD PATENT APPLICATIONS BY COUNTRY OF ORIGIN

	Number of applications				Number of applications per 1,000,000 population				Number of applications per 1,000,000 labour force			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
Russia	30696	29712	30283	25881	212.5	205.8	210.2	180.4	411.8	404.1	416.0	360.6
CIS countries												
Armenia	165	211	135	105	55.9	71.3	45.6	35.4	132.5	166.4	112.3	86.0
Azerbaijan	414	584	244	338	41.7	58.3	24.2	33.3	81.3	114.4	50.3	68.2
Belarus	1479	1284	1278	1118	156.7	136.3	136.2	119.7	292.1	255.3	257.0	227.0
Kazakhstan	1633	902	1548	...	89.3	48.7	82.5	...	178.1	99.6	168.3	...
Kyrgyzstan	4	161	127	120	0.6	24.9	19.3	17.9	1.6	63.0	51.3	47.0
Moldova	160	123	132	75	59.1	46.2	50.4	29.1	188.2	129.8	148.5	89.6
Tajikistan	56	105	32	...	6.2	11.3	3.4	...	24.1	43.8	13.2	...
Ukraine	2541	2467	1710	1703	56.9	55.6	38.7	38.9	120.1	117.4	83.7	83.9
Uzbekistan	480	456	379	428	14.6	13.6	11.1	12.3	34.3	32.2	27.0	29.8
OECD countries												
Australia	12263	12611	11907	12821	490.9	497.2	463.5	498.1	925.5	933.9	883.0	939.1
Austria	14561	14482	13763	...	1647.1	1630.9	1543.3	...	3131.6	3103.6	2967.6	...
Belgium	14591	14229	13478	13959	1276.9	1238.5	1167.5	1204.6	2840.8	2745.4	2614.2	2673.7
Canada	24482	25174	23855	26504	660.5	669.5	627.1	693.0	1200.3	1210.7	1163.1	1261.3
Chile	946	968	862	930	50.5	51.1	45.1	48.4	105.2	106.5	101.0	109.4
Colombia	637	638	597	692	12.8	12.7	11.7	13.5	24.4	24.3	24.0	26.7
Costa Rica	116	114	87	129	23.2	22.6	17.1	25.1	49.0	45.9	36.7	53.3
Czech Republic	2251	2269	1953	1920	211.8	212.6	182.6	179.4	414.2	417.8	362.4	357.0
Denmark	13387	13187	13586	14083	2310.6	2268.0	2329.8	2404.6	4474.0	4349.7	4487.1	4622.6
Estonia	270	278	297	350	204.2	209.5	223.4	263.3	382.7	394.0	420.5	497.4
Finland	11572	11486	12053	12822	2098.1	2080.2	2179.7	2313.7	4209.3	4168.5	4388.9	4558.8

(continued)

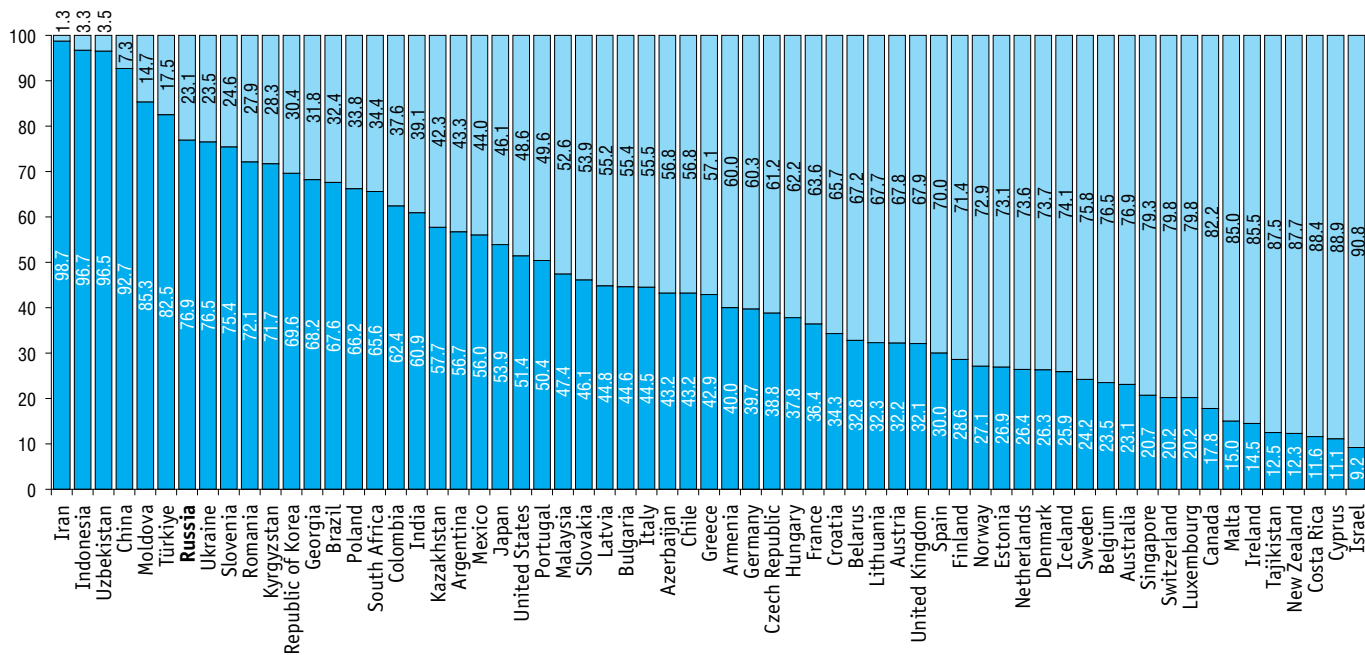
	Number of applications				Number of applications per 1,000,000 population				Number of applications per 1,000,000 labour force			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
France	69145	67389	64287	66087	1030.4	1002.1	954.1	979.1	2258.1	2205.7	2124.8	2133.7
Germany	180091	178359	168092	165656	2172.2	2146.5	2021.3	1992.8	4103.7	4021.5	3813.5	3778.0
Greece	1137	1164	1129	1387	105.9	108.6	105.5	130.1	237.6	242.7	239.6	297.4
Hungary	1340	1449	1299	1463	137.1	148.3	133.2	150.7	282.3	303.5	273.6	297.6
Iceland	281	252	286	371	796.7	698.9	780.4	996.5	1319.9	1169.9	1340.0	1865.7
Ireland	6335	6492	7065	7058	1301.5	1315.7	1417.1	1403.7	2663.7	2676.6	2928.1	2826.0
Israel	15482	16095	16223	17341	1742.9	1777.7	1760.5	1851.9	3782.6	3882.0	3947.7	4116.4
Italy	32289	32028	32551	34166	534.4	536.2	547.5	578.4	1235.1	1237.8	1297.2	1369.1
Japan	460375	453816	423264	412851	3630.4	3583.7	3352.3	3284.9	6761.6	6600.8	6175.7	6051.7
Latvia	175	177	231	281	90.8	92.5	121.6	149.2	175.9	180.5	235.9	298.5
Lithuania	230	247	325	477	82.1	88.4	116.3	170.6	156.7	167.8	219.7	325.4
Luxembourg	3199	2727	2686	2695	5261.9	4398.4	4260.7	4217.1	10446.2	8603.4	8298.8	8052.2
Mexico	2693	2535	2102	1993	21.3	19.9	16.3	15.3	48.8	44.8	39.6	34.8
Netherlands	36544	35468	32812	32770	2120.8	2044.9	1881.3	1869.0	3932.7	3752.7	3457.3	3310.9
New Zealand	3039	2177	2377	2679	620.1	437.2	467.0	523.0	1088.6	770.5	825.0	924.8
Norway	6513	6238	5982	5841	1226.1	1166.4	1112.0	1080.0	2319.2	2200.6	2105.5	1969.5
Poland	6757	6174	6334	5916	177.9	162.6	167.1	156.6	371.8	341.2	351.4	324.1
Portugal	1646	2150	1874	1985	160.1	209.0	182.0	192.7	312.9	406.6	360.8	382.5
Republic of Korea	232022	248550	260614	267517	4497.9	4801.5	5027.6	5169.9	8157.1	8656.5	9152.5	9369.7
Slovakia	560	569	569	410	102.8	104.3	104.2	75.3	203.4	206.9	209.0	147.7
Slovenia	738	516	671	...	355.9	247.1	319.5	...	712.1	501.9	656.1	...
Spain	10292	9926	10170	10875	219.9	210.6	214.7	229.8	445.0	425.6	442.3	466.6
Sweden	25320	27772	26221	27801	2488.4	2701.8	2532.6	2669.1	4689.0	5090.7	4776.2	5000.6
Switzerland	46754	46147	44806	48244	5491.2	5381.4	5187.9	5546.7	9423.9	9272.5	8988.5	9720.7

(continued)

	Number of applications				Number of applications per 1,000,000 population				Number of applications per 1,000,000 labour force			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
Türkiye	9360	10047	10110	10868	113.7	120.4	119.9	127.8	283.8	300.6	319.7	333.2
United Kingdom	56225	54794	53079	53608	846.0	819.8	791.3	796.2	1629.1	1575.6	1530.5	1547.0
United States	515215	521738	496123	509853	1576.4	1589.1	1496.6	1536.2	3129.4	3136.3	3011.5	3093.9
EU countries which are not OECD members												
Bulgaria	459	466	602	466	65.3	66.8	86.8	67.5	138.3	138.4	183.2	142.3
Croatia	201	327	248	303	49.2	80.4	61.3	77.7	112.4	184.2	140.5	174.6
Cyprus	432	354	360	414	363.3	295.4	298.2	340.6	699.6	563.2	570.1	650.5
Malta	396	378	428	407	817.1	749.9	830.5	787.4	1586.6	1423.3	1555.9	1478.5
Romania	1501	1181	1157	1114	77.1	61.0	60.1	58.3	166.0	131.0	129.2	132.1
Other countries												
Argentina	755	815	1239	716	17.0	18.1	27.3	15.6	37.8	39.9	64.5	34.2
Brazil	6859	7458	7271	6900	32.7	35.3	34.2	32.2	66.9	71.5	75.3	69.4
China	1460243	1328067	1441086	1538549	1041.0	943.4	1021.3	1089.3	1826.5	1660.0	1818.4	1942.4
Georgia	128	89	120	132	34.3	23.9	32.2	35.6	67.0	47.5	68.1	75.7
India	30035	34052	37895	43133	22.2	24.9	27.5	31.0	63.4	70.5	82.8	91.5
Indonesia	1451	3141	1358	1445	5.4	11.6	5.0	5.2	10.9	23.1	10.0	10.4
Iran	12074	11705	11550	...	147.6	141.2	137.5	...	443.9	428.9	446.2	...
Malaysia	2060	2141	1923	1862	65.3	67.0	59.4	56.8	132.7	134.8	119.5	114.4
Singapore	7414	7378	7946	9764	1314.8	1293.6	1397.5	1790.4	2122.2	2084.8	2305.7	2982.3
South Africa	1861	1517	1457	2751	32.2	25.9	24.6	45.8	82.3	66.0	68.3	121.4

Source: WIPO and World Bank database, November 2019.

9.26. PERCENTAGE DISTRIBUTION OF PATENT APPLICATIONS BY APPLICANT AND PATENT OFFICE: 2021*



Patent applications: ■ resident (filed with the patent office of the country) ■ abroad (filed abroad)

* Or nearest years for which data are available.

Source: Rospatent data, WIPO database, November 2022.

9.27. NUMBER OF TRIADIC PATENT FAMILIES*

	2000	2005	2010	2015	2016	2017	2018	2019	2020
Russia	85	91	87	90	115	126	138	133	136
OECD countries									
Australia	517	479	307	352	364	372	386	366	361
Austria	347	411	389	403	376	434	437	418	437
Belgium	456	543	465	425	425	409	411	393	401
Canada	612	720	554	590	654	625	668	664	662
Chile	2	6	14	13	10	13	14	14	14
Colombia	2	2	3	5	3	9	9	9	8
Costa Rica	2	...	1	...	...	...	...	...	...
Czech Republic	10	25	15	53	56	37	49	47	45
Denmark	290	390	301	326	304	302	314	316	318
Estonia	1	3	3	4	4	4	4	4	4
Finland	434	391	227	268	280	307	301	296	295
France	2927	3048	2463	2305	2140	2018	1924	1851	1880
Germany	7640	7145	5063	4761	4913	4700	4593	4355	4381
Greece	11	24	5	10	15	26	30	30	29
Hungary	41	58	38	36	51	31	42	44	41
Iceland	13	7	3	4	2	3	3	3	3
Ireland	51	99	65	100	105	110	112	116	125
Israel	386	502	355	516	504	597	613	583	590
Italy	832	966	683	828	941	869	927	917	910
Japan	18263	18932	19308	17796	18070	18317	18158	17708	17469
Latvia	5	10	1	4	5	4	3	4	5
Lithuania	1	1	1	4	7	5	5	6	6
Luxembourg	22	21	19	23	36	22	30	32	33
Mexico	9	19	16	30	25	21	21	20	18
Netherlands	1264	1762	826	1139	962	907	893	856	855

* Aggregate amount of patent applications filed simultaneously to the European patent office (EPO), the United States patent and trademark office (USPTO), and the Japanese patent office (JPO).

(continued)

	2000	2005	2010	2015	2016	2017	2018	2019	2020
New Zealand	72	73	45	70	58	58	58	58	59
Norway	138	141	115	101	142	113	135	129	128
Poland	9	18	62	81	77	73	73	70	75
Portugal	5	16	18	33	49	38	47	49	50
Republic of Korea	909	2747	2458	2258	2393	2898	3160	3362	3244
Slovakia	2	2	8	9	11	9	9	9	10
Slovenia	9	22	16	7	9	14	13	14	15
Spain	196	293	239	293	329	289	325	327	322
Sweden	793	970	642	731	780	810	886	867	864
Switzerland	1005	1083	1064	1225	1208	1273	1293	1298	1304
Türkiye	5	16	33	50	65	55	67	63	65
United Kingdom	2361	2165	1659	1687	1639	1678	1692	1709	1708
United States	15629	17372	12767	13703	13411	13096	13366	13057	13040
EU countries which are not OECD members									
Bulgaria	2	7	2	9	9	4	4	4	4
Croatia	6	13	6	3	7	8	9	10	10
Cyprus	...	4	1	...	1	1	1	1	2
Malta	2	1	...	3	2	2	2	3	3
Romania	...	7	6	14	14	9	11	9	8
Other countries									
Argentina	8	16	8	11	14	9	9	8	10
Brazil	41	75	68	65	67	63	65	62	61
China	87	524	1425	3259	3501	4429	5036	5893	5897
India	68	202	374	419	360	360	385	371	394
Singapore	83	171	109	121	137	136	136	143	140
South Africa	52	49	30	25	28	21	24	24	22

Source: OECD database, November 2022.

TECHNICAL NOTES

Postgraduate studies is the main form of academic personnel training in scientific research institutions, higher education institutions and additional vocational (professional) education institutions. Only individuals having a higher education attainment (specialist's degree or master's degree) are eligible to apply to postgraduate programmes of academic personnel training. In accordance with Federal Law no. 273-FL of December 29, 2012 'On the Education in the Russian Federation', since January 1, 2014, the fields of studies that postgraduates can enrol in are listed in the Order of the Ministry of Science and Higher Education of the Russian Federation no. 1061 of September 12, 2013 'On the Approval of the Lists of Professions and Fields of Studies in Higher Education'.

Postgraduate students of foreign states are foreign nationals, persons without citizenship enrolled on general terms, as well as foreign nationals, persons without citizenship, as well as fellow Russian citizens living abroad, enrolled under higher education programmes in accordance with a quota established by the Government of the Russian Federation (Decree no. 2150 of the Government of the Russian Federation December 18, 2020 'On Establishing of a Quota for the Education of Foreign Citizens and Persons without Citizenship in the Russian Federation').

A citizen of the Russian Federation who also has another citizenship is considered by the Russian Federation only as a citizen of the Russian Federation, except in cases provided for by an international treaty of the Russian Federation or a federal law.

Person without citizenship is a natural person who is not a citizen of the Russian Federation and does not have proof of citizenship

(allegiance) of a foreign state (item 1 art. 2 of Federal Law no. 115-FZ of July 25, 2002 'On the Legal Status of Foreign Citizens in the Russian Federation').

Federal budget appropriations on civil S&T are the federal budget funds allocated for basic and applied research to be applied in civil S&T. In accordance with a new budget appropriations classification introduced on January 01, 2005, Subsection 0601 'Basic Research' and Subsection 0602 'Advanced Technologies and Priority S&T Areas Development' listed in Section 06 'Basic Research and Scientific and Technological Progress Promotion' of the Federal Budget refer to basic and applied research, respectively.

Technology balance of payments is the total sum of the money transfers on intangible transactions connected with technology imports and exports.

Gross domestic expenditure on R&D is the actual expenditure on research and development in the country (including R&D funded from abroad but excluding payments made abroad) in monetary form. The estimation is based on the statistical accounting regarding research and development performed by organisations using their own domestic resources during the reporting year, irrespective of the source of funds.

Gross domestic expenditure on R&D includes:

- current expenditure – expenditure on salaries, consolidated social security payments, acquisition or manufacture of special-purpose equipment (including at the expense of the production cost of the tasks performed), other material expenditures (the cost of raw materials, material supplies, components,

semi-finished products, fuel, energy, industrial works and services, etc. acquired from third parties) and other current expenditure;

- capital expenditure – expenditure on land acquisition, buildings acquisition or construction, machinery and tools acquisition included into fixed assets, as well as intellectual property items and results of intellectual activity, etc.

Gross domestic expenditure on R&D is expressed both at current and constant prices calculated using the gross domestic product deflator.

Global research front is a group (cluster) of actively cited publications indexed together in the Web of Science if they are jointly cited by other publications at a certain point in time. The joint citation indicates the semantic proximity of such works and allows to consider the entire cluster as an area of scientists' special attention to a certain problem. Global research fronts include articles and reviews in scientific journals listed in Science Citation Index-Expanded (SCIE) and Social Sciences Citation Index (SSCI) sub-databases. Publications that form global research fronts include two groups of publications indexed in the Web of Science. The first group is the so-called highly-cited publications that were included in the 1% of the most cited publications in the year of their publication and in their subject category(s) of Web of Science. The second group is the so-called most popular publications (hot papers) that have been published in the last two years and are included in 0.1% of the most cited in the year of their publication and in their subject category(s) of Web of Science.

Grants are cash and other assets provided irrevocably and free of charge by individuals and legal entities, including foreign citizens

and foreign legal entities, as well as international organisations entitled to offer grants in the Russian Federation in accordance with the procedures established by the Government of the Russian Federation, to implement specific S&T programmes and projects, to conduct specific scientific research under the conditions laid down by grantors [Federal Law no. 127-FL of August 26, 1996 'On Science and State Scientific and Technical Policy' (as amended)].

Postdoctoral studies are a form of a highly-qualified personnel training programme undergone by persons with a Candidate of Sciences degree. Only Candidates of Sciences can be accepted to postdoctoral studies. The doctoral thesis is written by postdoctoral students in higher education institutions, additional professional (vocational) education institutions and research institutes. The postdoctoral student prepares a thesis for the Doctor of Sciences degree in the chosen scientific specialty in accordance with the Academic Degrees Nomenclature, approved by the Ministry of Science and Higher Education of the Russian Federation.

Innovation expenditure is the actual expenditure in monetary form, connected with the implementation of different or all types of innovative activities (research and development, acquisition of machinery and equipment, engineering, etc.) performed within an organisation. Innovation expenditure includes current expenditure and capital expenditure. At the same time, the stage of the innovation process does not matter, whether at the final stage, when the equipment is already commissioned and mastered in operation, i.e. production is organised and goods (works or services) are produced, or at the initial or intermediate stage, for example, when new equipment is still being installed or only ready for operation, but has not been put into

work, has not been tested and has not been used in the production of goods (works or services).

Invention is a technical and/or engineering solution in any sphere pertaining to a product (namely, a device, material, strain of microorganism, plant and animal cell culture) or to a method (a process of manipulating material objects with the help of material means), including to the application of a product or a method for a specified purpose. An invention must be new, innovative, and applicable for industrial use.

Country's Scientific Specialisation Index (in a specific field of science) is calculated as a ratio of a number of publications in a specific field of science to the total number of publications of the country's authors in scientific journals indexed in Web of Science or Scopus, as well as to this country's share in the world total number of indexed publications. If the index value of a country is above 1.0, the field of science is considered to be this country's scientific specialisation.

Engineering means execution of engineering and consulting services under a contract for the preparation and maintenance of the production and sales process, maintenance of construction and operation of industrial, infrastructure and other facilities.

Innovation activity of enterprises describes the involvement degree of enterprises (organisations) in general or specific innovative activity during a given period of time. **Innovation activity of enterprises** is calculated as a ratio of the number of innovation-active enterprises to the total number of surveyed enterprises in the reporting year. The methodology for calculating this indicator was approved by Rosstat Order no. 818 of December 27, 2019. Any changes in 2017 data are due to the recalculation of the indicator according to the specified method.

Innovative activity includes all developmental (R&D), financial or commercial activity related to creation of technologically new or significantly improved goods or services that have been introduced on the market and differ significantly from the previously produced goods and services; or technologically new or significantly improved business processes that differ significantly from the previously used business processes.

Innovative goods and services are products (goods and services) that are new or have undergone technological (and/or biological for agricultural enterprises) modification in the last three years (including the reporting period). According to the degree of novelty, there are two types of innovative goods, works, and services – those newly introduced (or those that have undergone substantial technological changes) and those significantly improved.

Sources of R&D funds are the primary sources of funds for R&D, which amount is determined following the direct money transfer from the client organisation to the executing organisation.

Generally, the R&D funds of the reporting organisation are subdivided into own funds of organisations and the funds that have been received from other organisations and institutions, irrespective of their affiliation with various sectors of activity.

The following sources are included in the sources of funds:

- budget funds (including federal budget funds, regional budget funds and municipal budget funds of the Russian Federation);
- general university funds;
- funds from foundations for S&T and innovation;
- funds from abroad;
- government sector organisations' funds;

- business enterprise sector units' funds;
- higher education sector institutions' funds;
- private non-profit sector organisations' funds;
- own funds of organisations.

Competitive R&D funding (programme funding) means funds received by the organisation, which came first according to the decision of a competition commission after summarising the results of a competition for scientific, technical programmes, innovation and other R&D-related projects, based on the best R&D project implementation conditions presented by this organisation in comparison to other participants.

Licence is a permit by which the owner (licenser), subject to certain conditions and a fixed remuneration, gives an interested party (licensee) the exclusive right for an industrial property item or a know-how or the rights to use the item of the contract as agreed in a special contract (agreement). Patent licence entitles the owner to use the patent, lists the scope of assigned rights, the territory and the period of its use, as well as the payment form.

Tax expenditure, as defined by the Concept on Raising Efficiency of 2019–2024 Budget Expenditure, approved on January 31, 2019 in the resolution of the Government of the Russian Federation, are revenues' shortfalls in budgets of the Russian budgetary system caused by applicable tax incentives and other instruments (preferences) on taxes, levies, duties, and contributions to the compulsory social insurance, designed as means of state (municipal) support according to the objectives of state (municipal) programmes and/or the objectives of the socio-economic policy not included on state (municipal) programmes.

Research and development (R&D) is creative activity performed on a regular basis in order to increase the total amount of scientific knowledge, inter alia the knowledge concerning humanity, nature, and society, as well as to find new application areas for this knowledge.

Know-how are sensitive non-proprietary technological knowledge and processes, practical experience, including methods, techniques, and skills necessary for the design, calculation, construction, and production of any goods, R&D or other works; compositions and recipes of materials, substances, alloys and others; treatment methods and therapies; mining and quarrying methods; specifications, formulas and recipes; documentation, organisational charts, experience in design, marketing, management, economics and finance, and other information not available to the general public.

R&D fixed assets (capital) include:

- buildings and structures;
- machinery and equipment, including pilot plant devices, scientific instruments, automation equipment and computer hardware, etc.;
- transport vehicles;
- tools, furniture, and other fixed assets on the balance sheet of scientific organisations and their pilot and experimental facilities used in the course of their main activity.

Alienation of exclusive right is one of the ways to dispose of an exclusive right, through which the full transfer of the right from the right-holder to the legal successor takes place.

Innovation patent is a title of protection granted for an invention that certifies inventor's priority, inventorship, and the right of exclusive use of this invention during patent's term of validity.

Advanced manufacturing technology is defined as computer-controlled, micro-electronics- or digital technology based process or equipment used in the design, manufacture or handling of a product, including organisation of such processes.

R&D personnel are all individuals whose creative activity performed on a regular basis is aimed at increasing the total amount of scientific knowledge and finding new application areas for this knowledge, and they are involved in the provision of direct services associated with research and development.

R&D personnel can be divided into the following categories:

- Researchers are professionals engaged in R&D and direct creators of new knowledge, products, processes, methods, and systems, as well as managers of these activities. Generally, researchers have diplomas of higher education;
- technicians – employees, taking part in research and development and performing technical operating functions (operation, exploitation and maintenance of scientific instruments, lab equipment, computers, as well as preparation of materials, designs and blueprints, conduction of experiments, tests and assays, etc.), supervised, as a rule, by fellow researchers. Generally, technicians have secondary vocational education and/or the necessary vocational (professional) knowledge and experience;
- supporting staff – employees performing supporting work associated with research and development: employees of economic planning department, financial subdivisions, patent services, S&T information subdivisions, S&T libraries; workers who assemble, debug, tune, maintain and repair scientific instruments and devices; workers in pilot and experimental facilities; lab

assistants without higher education or secondary vocational education;

- others include staff engaged in maintenance, as well as those performing general functions connected with the overall activity of the organisation (accountants, HR personnel, clerical workers, logistic support staff, typists, etc.).

Patent activity indicators:

- inventiveness ratio – number of patent applications filed in the Russian Federation by Russian residents per 10,000 population
- self-sufficiency ratio – number of patent applications filed in the Russian Federation by Russian residents to the total number of patent applications filed in the Russian Federation;
- technological dependency ratio – number of patent applications filed in the Russian Federation by non-residents to the number of patent applications filed in the Russian Federation by Russian residents.

Publication activity are indicators calculated on the basis of Scopus and Web of Science databases, as well as Elsevier's SciVal analytical resources (Scopus-based) and Clarivate Analytics InCites (Web of Science-based). A publication, unless specified otherwise, refers to three types of documents indexed in Scopus or Web of Science: Article, Review and Conference Paper/Proceedings Paper. A publication belongs to a country if it is listed in the affiliated address of the author or one of the co-authors and has been recognised by Web of Science and Scopus. If one or more co-authors give additional affiliation in a different country, such publication is considered to be written in international cooperation.

Utility model is a technical solution pertaining to equipment. Utility models must be new and applicable for industrial use.

Applied research encompasses original activities aimed at acquisition of new knowledge for the purpose of solving specific practical problems. Applied research determines possible ways of using the results of basic research and new methods of solving previously defined problems.

Product innovation is a new or improved good or service that differs significantly from the previous goods or services and that has been introduced on the market.

Industrial design is a design and engineering solution for a manufactured or artisan product that determines its external appearance. The industrial design must be new and original.

Business process innovation is a new or improved business process that differs significantly from the previous business processes and that has been brought into use.

Development are regular activities, based on knowledge received from realisation of research and practical experience, and aimed at the production of new products/processes or the improvement of existing products/processes.

Sectors of R&D performance:

government sector involves departments' and agencies' organisations involved in government of the state and satisfaction of the needs of the society, in general; non-profit organisations, fully or partially, financed and controlled by the government;

business enterprise sector involves organisations and enterprises, which main activity is associated with commercial production of goods and services, including organisations of public ownership; private non-profit organisations providing services to said organisations;

higher education sector involves higher education institutions, irrespective of their source of funds and legal status, as well as scientific research institutes, experimental facilities, teaching hospitals under their control or affiliated therewith;

private non-profit sector involves private non-commercial organisations that do not seek profit (professional communities, voluntary associations, etc.) and private organisations.

Selection achievements are the results of intellectual activity in the field of creating biologically new objects with certain properties, having a duly registered exclusive right of an individual or a legal entity. Selection achievements, i.e. plant varieties and animal breeds, constitute a special type of patent and legal protection items. In Russia, only plant varieties and animal breeds registered in the State Register of Protected Selection Achievements could be regarded as protected items of intellectual property, if these results of intellectual activity meet the requirements established by the Civil Code of the Russian Federation for such selection achievements.

Land territories of the Arctic zone of the Russian Federation include the territories of the following Russian regions: Murmansk Region, Nenets, Chukotka and Yamal-Nenets Autonomous Regions; partially the territories of the following Russian regions included in the Arctic Zone: Republic of Karelia, Komi Republic, Republic of Sakha (Yakutia), Krasnoyarsk Region, Arkhangelsk Region, as well as sections of the continental shelf of the Russian Federation.

Trademark is an original graphic image, a combination of figures, letters, or words, etc., intended to distinguish the goods and services of some manufacturers from similar goods and services of other manufacturers.

Trade in technology with foreign countries (international commercial-based technological exchange) encompasses all commercial transactions regarding import and export of technology and technological services, including deals between joint ventures and foreign organisations registered in Russia, their branches (representative offices), and their foreign parent companies.

Basic research means experimental or theoretical research aimed at acquiring new knowledge without any particular practical application. Hypotheses, theories, methods, etc. are obtained as a result of the basic research. It may conclude with recommendations on conducting applied research in order to identify the ways of implementing obtained scientific results, by scientific publications, etc.

SCIENCE AND TECHNOLOGY INDICATORS IN THE RUSSIAN FEDERATION: 2023

Data Book

Translated by *M. Rukhalenko*

Design *A. Sevodneva*

Desk-top publishing *A. Korzun*

National Research University Higher School of Economics Institute
for Statistical Studies and Economics of Knowledge

20 Myasnitskaya st., Moscow, 101000, Russia

Tel.: +7 (495) 621-28-73

issek.hse.ru

issek@hse.ru