INTRODUCTION TO RUSSIAN RESEARCH INFRASTRUCTURES

TYPES OF RESEARCH INFRASTRUCTURES

Core research facilities

Large-scale research infrastructures

Megascience projects

Supercomputer Centers

Biological resource collections

CORE RESEARCH FACILITIES CLASSIFIED BY TYPES OF SERVICES

> 650

Core Research Facilities

9 500

pieces of equipment of total value

80

billion rubles

1. Study of composition and structure of matter
2. Dimensional measurement
3. Study of properties of matter
4. Physical and mechanical testing
5. Electrical testing
6. Certification testing
7. Nuclear physics research
8. X-ray examinations and fluoroscopy
9. Spectral and mass spectral analyses
10. Microscopy
11. Astronomical research
12. Chromatographic services
13. Laser based studies
14. Nanoanalytics
15. Biomedical studies

CLASSIFICATION OF TYPES OF SERVICES BY THE OBJECT OF STUDY

1. Chemical compounds

2. Living organisms, viruses, genetically modified organisms

3. Explosives, weapons and military equipment

4. Solids and materials

5. Gaseous substances

6. Loose substances

7. Micro- and nano- objects

8. Cells

9. Instruments and equipment

10. Food and agricultural products, soils

11. Recyclables

12. Composite materials

13. Polymers

14. Energy carriers

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TOP 5 CORE RESEARCH FACILITIES WITH HIGHEST NUMBER OF CLIENTS IN 2020

Core Research Facility	Number of clients
Core research facility of the Belgorod state technological university named after V.G. Shukhov	161
Research and Development Centre for Testing and Finishing of Motor Vehicles of The Central research and development automobile and engine institute NAMI	156
The Head Regional Research Facility of the Moscow State University of Civil Engineering	143
Research and Analytical Center of the National Research center "Kurchatov Institute" – IREA	139
Core research facility "Bioresources and bioengineering of farm animals" of the Federal Research Center for Animal Husbandry named after Academy Member L.K. Ernst	101

LARGE-SCALE RESEARCH FACILITIES CLASSIFIED BY TYPE

> 390

Large-scale Research Facilities
of total value

₽ 41.1

billion rubles

Type	Share in total number
Nuclear and thermonuclear installations	☑ 5 %
Electrophysical installations and accelerators	☑ 13 %
Particle streams detectors	☑ 3 %
Astronomical complexes	☑ 4 %
Laser stations	☑ 2 %
Electrophysical, heat and mechanical test stands	☑ 15 %
Life and Earth sciences complexes	☑ 17 %
Biomedical research complexes	☑ 5 %

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TOP 5 LARGE-SCALE RESEARCH FACILITIES WITH HIGHEST NUMBER OF CLIENTS IN 2020

Large-scale Research Facility	Number of clients
All-Russian Collection of Industrial Microorganisms (State Research Institute of Genetics and Selection of Industrial Microorganisms of the National Research Center" Kurchatov Institute")	624
Collection of live plants of the N.A. Avrorin Polar-Alpine Botanical Garden (Kola Scientific Center of the Russian Academy of Sciences	100
"BS IKI-Monitoring" – Vega-Science satellite service (Space Research Institute of Russian Academy of Sciences)	95
All-Russian Collection of Microorganisms of the federal research center «Pushchino scientific center for biological research of the Russian academy of sciences» (G.K.Skryabin Institute of Biochemistry and Physiology of Microorganisms of the Russian Academy of Sciences)	81
Repository Science Collections of the Zoological Museum of Moscow State University (Lomonosov Moscow State University)	64

MEGASCIENCE PROJECTS IN THE RUSSIAN FEDERATION

№	Megascience facility	Location	Host organization	Time schedule
1	**International centre for neutron research on the basis of the highflux research reactor PIK**	**Gatchina** (Leningrad Oblast)	National Research Center "Kurchatov Institute"	Launched in February 2021. It shall reach full operating capacity by 2024.
2	**Complex of superconducting rings with colliding beams of heavy ions NICA**	**Dubna** (Moscow Oblast)	Joint Institute for Nuclear Research	Technological launch of the Booster in November 2020. Commissioning is scheduled for 2022.
3	**The Siberian Circular Photon Source (SKIF)**	**Koltsovo** (Novosibirsk Oblast)	Budker Institute of Nuclear Physics of the Siberian Branch of the Russian Academy of Sciences Boreskov Institute of Catalysis of the Siberian Branch of the Russian Academy of Sciences	Civil engineering design is completed and the construction started in 2021. Commissioning is scheduled for 2024.
4	**Synchrotron radiation source of the fourth generation**	**Protvino** (Moscow Oblast)	Institute for High Energy Physics named by A.A. Logunov of National Research Center "Kurchatov Institute"	It is planned to reach design capacity by 2027
5	**Russia's Photon Source accelerator complex (RIF)**	**Russky Island** (Primorsky Krai)	National Research Center "Kurchatov Institute"	Commissioning is scheduled for the end of 2026
6	**Synchrotron radiation source ("KISI-Kurchatov")**	**Moscow**	National Research Center "Kurchatov Institute"	It is planned to complete the upgrade by the end of 2022

SUPERCOMPUTERS. EXAMPLES OF APPLICATIONS

- Plasma physics and static mechanics

- Molecular and atomic physics

- Gas dynamics and the theory of turbulence

- Astrophysics, space research

- Meteorology, studying and simulating climate change and atmospheric processes, including long-range weather forecasting

- Nuclear power, simulating nuclear tests

- Quantum chemistry, solid state chemistry

- Molecular dynamics, theory of surface phenomena

- Genetics, dna analysis and decoding

- Seismic exploration, seismic data processing

- Geospatial research in the oil and gas industry

- Simulating prototypes and vehicle crash tests in the automotive industry

- Design of complex electronic devices

- Pharmacology and synthesis of new medicinal agents

- Ensuring national security (including cyber security), analyzing the military and political processes

- Simulation, situational modeling and decision support

- Visualization, virtual environment, image recognition, rendering, text-to-speech synthesis

- Artificial intelligence

- Big data analytics

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RUSSIAN SUPERCOMPUTERS RANKED IN THE WORLD TOP 500 LIST (NOVEMBER 2021)

Rank	Name	Site
19	Chervonenkis	Yandex
36	Galushkin	Yandex
40	Lyapunov	Yandex
43	Christofari Neo	SBER Sberbank
72	Christofari	SBER Sberbank
241	Lomonosov-2	Lomonosov Moscow State University
294	Grom	MTC MTS

THE TYPES OF BIOLOGICAL RESOURCE COLLECTIONS

1. Collections of microorganisms (pathogens, non-pathogenic-microorganisms, microorganisms used in biotechnology)

2. Collections of cell cultures

3. Collections of crop plants

4. Herbarium collections

5. Living plants collections

6. Collections of life breeding wild and laboratory animals

7. Livestock collections

8. Zoology museum collections

9. Collections of human biological material (biobanks)

10. Living collections of marine and freshwater species.

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BIOLOGICAL RESOURCE COLLECTIONS. EXAMPLES OF APPLICATIONS

>> Analyzing morphological characteristics of microorganisms

>> Proteomic-based biotyping

>> Culturing microorganisms

>> Genomic sequencing

>> Reframing periodization in global history

>> Identifying patterns in geospatial data for predicting mineral deposits occurrence

>> Quantifying the rate of earthquake occurrence in seismic source zones

>> Studying viral infections for diagnostic and therapeutic purposes

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WORLD-CLASS RESEARCH CENTERS

4 **International Math Centres**

- Steklov International Mathematical Center
- The Euler International Mathematical Institute
- Moscow Centre for Fundamental and Applied Mathematics
- Mathematical Center in Akademgorodok (Novosibirsk)

3 **Genomic Research Centers**

- World-Class Genomic Research Center for ensuring biological security and technological independence as part of the Federal Science and Technology Program for the Development of Genetic Technology
- Kurchatov Genomic Center
- Center for Precision Genome Editing and Genetic Technologies for Biomedicine

WORLD-CLASS RESEARCH CENTERS

10 **World-class Research Centers working**
in Priority areas of S&T

- AgriTechnologies for the Future
- World-Class Research Center "Digital biodesign and personalized healthcare
- "Center of Photonics"
- Personalised medicine center
- Human Capital Multidisciplinary Research Center
- World-Class Research Center Efficient development of the global liquid hydrocarbon reserves
- World-class research center Pavlov Center "Integrative Physiology to Medicine, High-Tech Healthcare and Technologies of Stress Resistance"
- Supersonic International Center
- The national center of the personalized medicine of endocrine diseases
- World-Class Research Center for Advanced Digital Technologies

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NATIONAL TECHNOLOGY INITIATIVE

Markets

- AeroNet
- AutoNet
- MariNet
- NeuroNet
- HealthNet
- FoodNet
- EnergyNet
- TechNet

- SafeNet
- WearNet
- EduNet
- GameNet
- EcoNet
- HomeNet
- SportNet

Technologies

1. Big data
2. Artificial intelligence
3. Distributed ledger systems
4. Quantum technologies
5. New and portable energy sources
6. New production technologies
7. Sensorics and robotics
8. Technologies of wireless communication
9. Technologies for controlling the properties of biological objects
10. Neurotechnologies, AR/VR technologies.

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THANK YOU FOR YOUR ATTENTION