Legal status of scientific collaborations in the implementation of megascience projects

E Gorlova
Kutafin Moscow State Law University (MSAL), Moscow, 125993, Russian Federation
gorlova_en@mail.ru

Abstract. Scientific collaboration can be viewed as an enlarged infrastructural element of the science and technology sector: an element comprising of scientific organizations, scientific equipment, and researchers. Thus, the formation of scientific collaborations requires the interaction of these three key elements. The projects which are currently under way or are planned for implementation in the coming years bring together research teams from different cities, countries and fields of scientific knowledge. These groups of researchers team up to achieve common goals on the basis of a decision taken by a state or a group of states to create a megascience project. The initiative to form a scientific collaboration may come from a scientific centre or a group of scientists, but the foundation of a scientific association within the framework of the megascience project occurs only as a result of a decision of a state or groups of states legalized in a specific way. This may come in the form of an international agreement on the foundation of a megascience project, the issuance of a directive from the public authority to establish a scientific centre, or the establishment of a legal entity with special powers to conduct activities within the megascience project. The study showed that the legal problems of scientific collaboration should be studied on the basis of the principles of interdisciplinarity, efficiency and effectiveness, independence, collaboration, financial security, freedom of movement of goods and funds for collaboration needs, priority of the public interest over the interests of individuals.

1. General provisions

The Russian Federation is currently seeking to take a significant place in the system of international high-tech development and research using the most advanced technologies. First of all, we are talking about research in physics and related areas. It is stipulated in the Main areas of the activity of Government of the Russian Federation for the period up to 2024, approved by the Government of the Russian Federation on 29 September 2018, that in order to develop modern infrastructure for research and development, international research on megascience unique scientific installations will be started.

A megascience unique scientific installation (hereinafter referred to as megascience projects) is a single complex system of scientific equipment, unparalleled in the world and created with the involvement of resources of international cooperation in order to obtain scientific results which contain fundamental breakthrough knowledge, technologies, or solutions of global importance which cannot be achieved with other hardware sets [1].

In order to implement the above-mentioned tasks, a number of megascience projects has now been launched in Russia and a number of advanced foreign countries. Among them: Nuclotron based Ion
Collider facility NICA (Russia), Novosibirsk free electron laser NovoFEL (Russia), International research centre with the source of fourth generation synchrotron radiation (ISSI 4, Russia), Large Hadron Collider at the Centre for Nuclear Research in Geneva (Switzerland), International Thermonuclear Experimental Reactor ITER (France), Facility for Antiproton and Ion Research FAIR (Germany), and a number of others. These projects are a clear example of the organization of scientific collaborations at the national and international levels.

Ambitious goals and fundamental challenges facing these megascience projects have necessitated the organization of cooperation in science and technology between the states and governments of the technically developed countries of the world, as well as between various research facilities and manufacturing companies both in Russia and within the scientific collaborations of Russian scientists with scientists from other countries.

Scientific collaboration can be viewed as an enlarged infrastructural element of the science and technology sector: an element comprising of scientific organizations, scientific equipment, and researchers [2]. Thus, the formation of scientific collaborations requires the interaction of three key elements: researchers (individual scientists as well as research teams), infrastructure that ensures uninterrupted functioning of research teams and their projects, and the state as a regulator of relations between scientific organizations and research teams.

The projects which are currently under way or are planned for implementation in the coming years bring together research teams from different cities, countries and fields of scientific knowledge [3]. These groups of researchers team up to achieve common goals on the basis of a decision taken by a state or a group of states to create a megascience project. The initiative to form a scientific collaboration may come from a scientific centre or a group of scientists, but the foundation of a scientific association within the framework of the megascience project occurs only as a result of a decision of a state or groups of states legalized in a specific way. This may come in the form of a conclusion of an international agreement on the foundation of a megascience project, the issuance of a directive or an order from the public authority to establish a scientific centre, or the establishment of a legal entity with special powers to conduct activities within the megascience project. These documents determine the legal status of all participants in international megascience projects, including states. Thus, based on the generally accepted principles and norms of international law, the states agree among themselves which scientific, technical, material and human resources each contracting state is able to invest in megasciences project. Infrastructural participants, such as companies producing hardware and equipment, have limited legal status: they participate in megascience projects only if it is possible for them to perform the work with the required characteristics and within the required time period.

As for the freedom to join scientific collaborations, legal entities established by the state, and companies with state participation have virtually none of such: the state actually assigns them a task within the framework of the project planned and uses them to carry out their tasks in a particular area at will. Similarly, scientists and research teams enter into scientific collaborations if they have the right qualifications to meet the goals and objectives of a certain megascience project. Of course, these subjects are not subject to power coercion, but the freedom to choose a research area is somewhat limited. It can be argued that researchers and groups of scientists do not have full freedom of will when entering into scientific collaboration, but are obeying the public authority and provisions of international agreements and regulations restricting their legal status.

The infrastructure of the megascience projects is provided by production companies capable of performing the most complex engineering tasks using innovative technologies unparalleled in the world. Typically, such enterprises are commercial entities based on the private form of ownership. Their activities within the framework of megascience projects, including interaction with the state, are mediated by civil law contracts (e.g. supply contracts, contract agreements, sales contracts). At the same time, the participation of the state and other public actors in megascience projects is mediated by national regulations and international agreements.
2. The role and importance of the state in the creation of scientific collaborations

The role of the state in the implementation of megascience projects is hard to overestimate [4]. The existence of megascience unique scientific installations was made possible by the organizational, financial and material contribution of a number of states united by common goals. It should be understood that a unique scientific installation is an unparalleled in the world set of equipment used in science and technology; and scientific collaboration, in its turn, is the integration of equipment, researchers using this equipment, and relevant infrastructure (buildings, facilities, technical and material resources, development companies and equipment makers). Thus, the state is not a direct participant of scientific collaborations, but without the initiative of the state or a group of states, the foundation of scientific collaborations would not have been possible.

Currently, states participate in megascience projects by transferring significant public powers to specially established non-profit organizations – (such as Euratom – The European Atomic Energy Community, Rosatom – Russian State Nuclear Energy Corporation), as well as by establishing international intergovernmental research organizations (e.g. Joint Institute for Nuclear Research, ITER International Organization for Thermonuclear Energy, European Organization for Nuclear Research (CERN), endowed with the rights of legal entities). Thus, the construction of megascience unique scientific installation ITER was started after years of discussion and design, its founders were the European Atomic Energy Community (Euratom), the Government of India, the Government of China, the Government of Korea, the Government of the Russian Federation, the U.S. Government and the Government of Japan.

In Russia alone, more than 200 research institutes and institutions worked on the design of this installation. Currently, the ITER reactor engineering and technical project, designed to use thermonuclear fusion as an energy source, is being implemented under the auspices of the International Atomic Energy Agency (IAEA). It is obvious that international scientific collaborations are endowed with international legal status, which, on the one hand, expands their powers, but on the other hand, denotes a rigid framework of due and possible behaviour and creates the need to use harmonization tools based on the principles of reciprocity and common interests of participants. It should be noted that scientific collaborations are given strictly defined rights and responsibilities stipulated in regulations and international agreements in order to carry out their activities. The list of these rights and responsibilities must be in line with the objectives of the given research and consistent with the national and/or international law. Since the creation of national and international legal norms is the prerogative of the state, the legal status of scientific collaborations is solely formed by the state (or a group of states).

In addition, the state provides financial resources for the work of scientific collaborations, because the construction of the unique scientific installation and the implementation of applied research on this equipment requires the investment of huge sums of money – the budget the construction of each megascience unique scientific installation of the international level is worth tens of billions of euros. Of course, in the future, the results of research activities obtained by scientific collaborations can be used for commercial purposes and bring profit, but from the moment of construction to the moment of successful commercial use of the results many years might pass, and each year of construction and existence of the unique scientific installation requires allocation of money: to pay the scientists, and to equip the scientific collaborations. The burden of these costs falls on the founding member states of the megascience unique scientific installations.

3. Interaction within scientific collaborations

An important element of the functioning of any scientific collaboration is a well-established process of interaction between its researchers and its infrastructure. On the one hand, effective interaction within a collaboration is facilitated by the common interests of its researchers. On the other hand, the convergence of the interests of the interactors occurs only when their cooperation is mutually aided rather than competitive, allowing all the interactors to achieve top results through cooperation.
Effective mutual learning and obtaining a common intellectual product becomes possible only on the basis of open cooperation; ultimately, cooperation is the goal of creating scientific collaboration [5]. Of course, there is not only partnership, but also competition between states, scientists and scientific organizations. The preponderance of competition will inevitably lead to a decline in the efficiency of scientific collaborations. The economic impact of such scientific associations is to reduce the costs for all participants, to improve development efficiency, and to externalize the advances in scientific and technological progress for the benefit of the global community. An important global challenge for megascience projects is to train a new generation of scientists with interdisciplinary skills, capable of performing a wide range of tasks and ready to work on the breakthrough innovations and technologies which solve or help to solve global problems, to use new methods of transformation of matter and field, to involve new materials, to make scientific discoveries. This global challenge cannot currently be solved by a single state or a single research centre; the pooling of knowledge, effort and resources, and the importance of genuine partnerships in the implementation of long-term and large-scale megascience projects, conducting research and development work in various fields of knowledge is the task of the entire global community.

An important aspect of scientific collaboration is the collective use of scientific infrastructure and equipment on a national and international scale [6]. Users are not limited to scientific organizations only, but can also include commercial manufacturing companies, and government agencies and institutions.

From the legal point of view, such interaction should be legally designed to ensure the rights and interests of all participants in scientific collaborations. Currently, the legal regulation of megascience unique scientific installations is quite disparate and does not fully cover the legal status of scientific collaborations as key subjects of this activity.

4. The legal status of scientific collaboration
In order to understand the content of the legal personality of scientific collaborations, it is necessary to study in detail the rights and responsibilities enshrined in their regulations and agreements. As a rule, scientific collaborations are national or international organizations with legal rights, or groups of such organizations with a clear system of interaction between their members. In the case of the megascience unique scientific installations, it should be noted that scientific collaboration may refer both to the organization with the name of a megascience project, and to separate units within this organization which carry out various research. Agreements on the foundation of unique scientific installations such as ITER, FAIR, CERN, as well as other agreements concluded for the purpose of their activities, provide for the creation of legal entities capable of implementing the objectives of these projects. These legal entities may be commercial or non-profit organizations.

International agreements give these entities the following rights: to enter into agreements with states or international organizations; conclude contracts; to adopt regulations of their activities; to acquire, own and dispose of property; to obtain licenses and permits; to initiate legal proceedings; to own intellectual property created during the implementation of the megascience project; to form their budget through contributions from member States in cash and in-kind; to open bank accounts in any currency and to dispose funds in those accounts; to be immune from jurisdiction; sanctity of property; exemptions from taxes and duties.

The list of basic responsibilities is as follows: to carry out the assigned tasks; to protect the intellectual property developed during the implementation of the megascience project.

Legal issues of intellectual property protection and the transfer of the right for intellectual results are among the most pressing and complex projects in the field of megascience projects. Monetary contributions of different member states of such projects may vary 10 to 20-fold, while the intellectual property created is generally indivisible and, in accordance with international agreements, each state has equal rights to receive them. For example, the Agreement to establish an international organization for joint implementation of the thermonuclear energy ITER project provides that the science and technology benefits will be shared among the Project Parties on an equal footing for research and
development in the field of thermonuclear energy, and that other benefits associated with the project will be shared commensurate with the contribution of the Parties. It should be noted that only the states here act as Parties, while individual scientific collaborations do not get the rights for the intellectual property they create, in accordance with the agreements on the creation of megascience projects such rights belong to the organization implementing the project. The issues of transfer, remuneration and distribution of intellectual property rights to third parties also still need to be addressed.

Moreover, logistical support of the functioning of scientific collaboration, as well as issues of organization and pay of researchers who may or may not be in employment relations with the megascience project organization, also require additional settlement.

The above-mentioned groups of relations are governed by civil law, employment law, banking law, tax law, procedural law, and international law. Consequently, the legal status of scientific collaborations is a complex legal phenomenon.

5. The structure of a scientific collaboration
A scientific collaboration comprises two categories of members: institutions and funding agencies. The role of the institutions is to carry out research and development work. The task of the funding agencies is to provide the institutions with the financial resources they need to carry out these works[7]. Institutions may include any scientific or educational organizations, regardless of their country of origin, legal form or form of ownership, Russian examples being Moscow State University (MSU), Institute of Nuclear Physics named after G.I. Budker (Novosibirsk), and so on.

Collaboration agreements allow the two categories of members to overlap if a scientific organization is able to provide itself with the necessary financial resources. To ensure the functioning of scientific collaboration, it has to have its own organizational mechanism: a system of management bodies of general and special competence, such as the General Director, representatives, spokespersons, and Supervisory board.

The FAIR project will include four scientific collaboration groups: NUSTAR (Stars and nuclei), PANDA (Antiproton Annihilation at Darmstadt), CBM (Compressed Baryonic Matter) and APPA (Atomic, Plasma and Physics), each representing a combination of several collaborations. For example, the APPA project involves 4 scientific collaborations: BIOMAT (Biology and Material Science), FLAIR (Facility for Low-Energy Antiproton and Heavy Ion Research), HED@FAIR (High Energy Density Science at FAIR), and SPARC (Stored Particles Atomic Research Collaboration). Thus, dozens of scientific collaborations with a narrow specialization can operate within the framework of one megascience project, united by a common global goal, and one of the tasks of the management bodies created under the megascience project is the organization of the effective interaction between the collaborations.

6. Final provisions
The status of a scientific collaboration as an organization (international organization) with the rights of a legal entity (usually a commercial organization, or without specifying an organizational form), as well as close communication with the state provide a number of advantages: public financing, the possibility of individual legal regulation, special legal status with exemptions from general rules, the right to apply to the state for legal, financial, and other support. At the same time, to conduct their activities scientific collaborations must conclude and implement various economic agreements in which they act on a par with other actors of civil relations. Moreover, if a scientific collaboration is international in nature, international law and the current state of international relations should be taken into account.

Thus, it is clear that the legal problems of scientific collaboration should be studied in accordance with civil law, budget law, and international law on the basis of the principles of interdisciplinarity, efficiency and effectiveness, independence, collaboration, financial security, freedom of movement of goods and funds for collaboration needs, priority of the public interest over the interests of individuals.
Acknowledgments
This research was supported by the Russian Foundation for Basic Research (grant 18-29-15036 mk "Models of legal regulation of unique scientific facilities of "megascience" class at the national and international levels in the context of technological development of the Russian Federation").

References
[1] Tkachenko R V 2019 J Projects of the class “megascience” as one of the main directions of implementation of the budget policy of Russia Courier of the Kutafin Moscow State Law University (MSAL) 7 42-47
[2] Bogatov V V, Syroezhkina D S 2016 J Scientific collaboration as an element of science infrastructure Science. Innovation. Education 4 30-44
[3] Oldham G International scientific collaboration: a quick guide. Bringing science and development together through original news and analysis. Available online: https://www.scidev.net/global/policy-brief/international-scientific-collaboration-a-quick-gui.html (accessed 14.10.2019)
[4] Diane H. Sonnenwald Scientific Collaboration: A Synthesis of Challenges and Strategies. Swedish School of Library and Information Science Göteborg University and University College of Borås Sweden. Available online: http://datafedwiki.wustl.edu/images/f(fc/Sonnenwald-ScientificCollabOverview.pdf) (accessed 14.10.2019)
[5] Inshakov O V 2013 J Collaboration as a form of knowledge-based economy organization Economy of region 3 38-45
[6] Inshakova E I, Morozov M V 2016 J Exogenous factors of megascience centers development in contemporary Russia Science Journal of VolSU. Global Economic System 2 117-127
[7] Chetverikov A O 2019 J Large Hadron Collider as a legal phenomenon LEX RUSSICA 4 151-169