Financial and legal relations and key legal concepts of ‘MEGASCIENCE’

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Abstract. The article looks at some issues related to legal regulation of funding, development, construction and operation of large-scale research facilities. In the course of study there have been singled out the peculiarities of social relations in ‘mega-science’ and various approaches to its definition have been provided. It has been established, that norms of financial law regulate the system of public relations, connected with financial activity in the field, including budget funding and involving other sources to construct large-scale research facilities, tax relief for research organizations involved in the construction and operation of global research facilities, and financial control over the process of mega-science projects implementation. Suggestions have been made about the necessity to devise and adopt a special federal law of the Russian Federation that would regulate such social relations and those in the field of international collaboration related to international research conducted by member states at mega-science plants. Possible formulations of key concepts used in mega-science have been provided.

1. Introduction
We cannot overestimate the importance of mega-science at the current stage of civilization development. Global challenges that the humanity presently faces are often met by using breakthrough scientific knowledge and technologies developed with the help of mega-science plants. Relevant scientific discoveries are of applied nature and are targeted at the next level of meeting the needs of the humanity in various areas.

When speaking about the importance of big science for the present and the future of the Russian Federation, we cannot help mentioning that the Russian Federation President Vladimir Putin was mentioning mega-science projects as one of the priorities of state financial policy in his speeches during five last years.

National projects, which include the development of research on the premises of mega-science plants, are part of state development strategy of Russia being implemented pursuant to Presidential Decree # 204 ‘On national goals and strategic tasks of the development of the Russian Federation until 2024’ dated May 7, 2018. Despite the negative impact of global COVID-19 pandemic, the above-mentioned national projects are a key factor in achieving national development goals of the Russian Federation envisaged in Presidential Decree #474 ‘On national development goals of the Russian Federation till 2030’ dated July 21, 2020.

Before 2024 international research is to start at the following mega-science plants (out of six plants in Russia) on the territory of the Russian Federation:
International Neutron Research Centre based on high-flux reactor PIK;
- Nuclotron-based Ion Collider facility (NICA);
- Synchrotron radiation source, 4th generation (ISSI-4);
- Siberian Synchrotron and Terahertz Radiation Centre.

Research plants of new generation include electron-positron collider Super Charm-Tau Factory and IGNITOR (magnetic confinement fusion) reactor.

Each of the above-mentioned projects is unique. Nevertheless, their implementation requires considerable material, financial, scientific and other resources, proper planning and control over designing, construction and operation of mega-science plants. This in turn preconditions proper organization of the activities.

Establishing International Intergovernmental Organization following the agreement between participant countries is one of the organizational and legal forms of such international cooperation. There are two types of such organizations - project type and framework type.

To implement ITER mega-science project following the Agreement on the Establishment of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project and the Agreement on the Privileges and Immunities of the ITER International Fusion Energy Organization for the Joint Implementation of the ITER Project, signed in Paris on November 21, 2006, there has been established special-purpose design international intergovernmental organization - ITER International Fusion Energy Organization.

European Organization for Nuclear Research (EONR) operating under framework Convention on EONR Establishment as of July 1, 1953 is an example of international intergovernmental framework organization. Russia conducts joint research on the premises of EONR laboratories following the agreement between the Russian Federation Government and EONR on further development of scientific and technological cooperation in high-energy physics as of 1996. In 2019 the Russian Government approved the signing of another agreement, which envisages extension of collaboration using EONR equipment [1].

Establishment of national legal entity incorporated on the territory of the country where global research facility is going to be constructed is another option for mega-science projects implementation. In such case research organizations representing participant countries that are parties to international agreements become members of such legal entities and direct participants of mega-science projects. As a rule, the countries involved make articles of incorporation of the established legal entity by signing an international treaty, which is the main instrument of its international legal institutionalization. Such principle is applied to German limited liability legal entities - European XFEL-GmbH (‘European X-ray Free-Electron Laser’ XFEL), FAIR GmbH (‘Facility for Antiproton and Ion Research’) and French civil company (Société civile) – European Synchrotron Radiation Facility (ESRF)).

International treaties and agreements establish the norms regulating general and financial liabilities of the parties. General norms are further elaborated in local acts of international intergovernmental organizations and legal entities that implement certain parts of mega-science projects. However, it seems reasonable to deal with large-scale research infrastructural facilities constructed as part of mega-science projects in Russia and abroad separately to take a closer look at the peculiarities of financial relations that take place during the construction and operation phases of such projects.

2. General description of social relations in mega-science

Social relations that arise in mega-science develop dynamically and become one of the most important drivers of Russia’s economy. That is why it is especially important to provide legislative framework to regulate them.

Taking into account crucial importance of social relations in legal regulation, it is especially important to give an exact definition and single out the object of legal regulation in mega-science. Thus, we are going to give a definition of mega-science as a legal category.
2.1. The concept of mega-science

It is notable that the attempt to formulate the definition of mega-science was undertaken in the first edition of draft federal law ‘On scientific, technical and innovative activity in the Russian Federation’, which made unique mega-science plants equal to unique international mega-science plants (in later editions the term ‘mega-science’ was removed from the draft law).

A so-called ‘object’ or material approach, which defines mega-science category as a characteristic of research facilities of global importance, was applied when devising legal concept of mega-science.

Let us refer to legal doctrine. It should be noted that the majority of Russian researchers of the legal phenomenon of mega-science apply material approach when giving legal definition of ‘mega-science’ or ‘mega-science class’. This considerably expands the terminology of the field.

A Chetverikov mentions that term ‘mega-science’ is generally applicable to ‘facilities, devices and other infrastructure’, which form the basis of large-scale scientific projects ‘meant to make breakthrough discoveries’ [2].

When describing ‘unique mega-science facilities’ D Moshkova and D Lozovsky provide the following characteristics of this category:

- they are unique large research facilities;
- they are unparalleled in any country of the world;
- their functioning is targeted at achieving breakthrough innovations and state-of-the-art technologies;
- their construction and maintenance are subject to international cooperation;
- their construction and operation require considerable financial and human resources. [3].

As a synonym of ‘mega-science’ Y Kozheurov and E Teymurov apply the term of ‘global research facilities’, ‘which are physically large, expensive and technically unique research facilities constructed and operated as part of international cooperation (collaboration) of states, international organizations and other actors without international legal personality (state agencies, research institutes and institutions that provide funding) meant for long-term research aimed at the acquisition of breakthrough knowledge, which considerably compliments or alters the world-vision.’ [4].

‘Process’ approach to the definition of ‘mega-science’ views the phenomenon as the activity of specially authorized entities conducted as part of international cooperation between the states involved.

In this context the term ‘mega-science’ is used as applied to ‘mega-science projects’, which are ‘international research projects aimed at creation and operation of mega-science plants and achieving scientific breakthrough and innovative results of global caliber’. [5].

Finally, ‘legal’ approach to the definition of ‘mega-science’ characterizes it as the system of economic and organizational legal relations.

From this point of view ‘mega-science’ is a system of public relations settled in legal provisions, which arises between various entities during the implementation of mega-science projects as part of international cooperation, including relations on construction and operation of global infrastructural facilities (mega-science research plants) and their funding [6].

According to clause ‘e’ of art. 71 of the Constitution of the Russian Federation the Russian Federation is responsible for the federal policy and federal programmes in the field of scientific and technical development of the Russian Federation.

As mega-science sphere belongs to the inter-sectoral realm, it is suggested that legal norms related to it should be drafted in a separate federal law that regulates relevant social relations.

Clause 1 of the above-mentioned federal law regulates “public relations that arise in the course of funding, designing, construction and operation of unique global research facilities and the use of the results of research and other activities at such sites”.
2.2. Financial and legal relations in mega-science

As has been mentioned above, legal relations in mega-science are of complex, public and inter-sectoral nature.

Due to extremely high capital intensity of mega-science projects in the Russian Federation they are mostly funded from the state budget under so-called special-purpose programmes (national projects are subdivided into federal projects). Thus, public relations existing for the purpose of funding and control over the activity of the international organizations and other parties involved aimed at designing, construction and operation of unique global research facilities - mega-science plants, is subject to legal regulation.

Therefore, legal relations in the financial cooperation of the states participating in mega-science projects are of primary importance during the implementation of mega-science projects and include:

- relations in funding the projects from the state budget and involving other sources of financing to construct and operate the research plants;
- relations in financial supervision over the use of financial resources allocated for mega-science projects implementation;
- relations on the use of income raised as the result of mega-science plants exploitation;
- relations related to obtaining tax benefits and receiving special tax treatment by research organizations and other entities involved in construction and operation of such global infrastructural facilities.

3. The most important definitions in mega-science.

It is suggested that the following definitions in the federal law, which would allow to additionally single out the relevant legal relations, should be used. Such definitions include the elements of the above-mentioned scientific approaches to the concept of mega-science.

3.1. ‘Mega-science’ projects.

Social relations in mega-science arise in the process of implementation of expensive unique international projects of global caliber. We suggest the following definition of such category:

‘Mega-science projects’ - the activity of parties to international collaboration on construction and exploitation of unique mega-science plants.

3.2. ‘Mega-science’ plants.

Facilities that include properties, unique equipment, intellectual property, including patent rights and other property meant for research, become the material result of mega-science projects implementation. Operation of such complexes to conduct research and obtain scientific knowledge is the main goal of international collaboration of parties to mega-science projects.

‘Unique mega-science plants’ are unrivalled global research facilities created as the result of international collaboration and used for the purposes of fundamental scientific research aimed at obtaining innovative scientific and technical results of global importance.

3.3. International cooperation.

Implementation of mega-science projects is impossible without consolidation of financial, human, intellectual and industrial resources of several countries. Mega-science plants are also of crucial geopolitical importance as the results of their exploitation can have considerable impact on the global economy and social environment.

‘International collaboration’ is cooperation of two or more states that undertake under agreements or other binding documents to finance and provide facilities (real property, equipment, intellectual property objects, etc.) for mega-science projects implementation; they also undertake to provide competent labour resources and perform other obligations for the purpose of construction and collaborative exploitation of unique mega-science plants.
3.4. Parties to international cooperation.
As the subject of international collaboration mega-science projects are characterized by a certain set of parties involved with various legal status.

*Parties to international collaboration in mega-science projects* - public-law entities (participant states), international organizations established by them, research organizations and other legal entities duly authorized by them pursuant to effective state legislation.

4. Conclusion
The following conclusions can be made from the conducted study of legal regulation of financing mega-science research facilities:

- mega-science is a multi-dimensional phenomenon, which can be viewed from various angles. On the one hand, mega-science projects are large-scale research infrastructures with unique research equipment of global caliber, on the one hand they envisage some activity of the authorized entities as part of international cooperation between countries in designing, construction and operation of large research plants. From the legal point of view, mega-science projects are a system of public relations settled by legal provisions, which arise between various entities during the implementation of mega-science projects as part of international cooperation, including relations on creation and operation of global infrastructural facilities (mega-science research plants) and their funding, as well as relation on financial control.

- mega-science projects are implemented for public benefit - their main goal is to conduct complex scientific research and gain new breakthrough knowledge and develop innovative technologies for the benefit of all humankind. Such research is not commercially attractive for business, because as a rule it solves fundamental scientific tasks and cannot be applied for making profit. Thus, mega-science projects require high-priority state funding.

- legal relations in the financial cooperation of participant countries in mega-science projects are crucial in the system of public relations, which arise in the process of construction and operation of large-scale research facilities. Norms of financial law regulate the system of public relations, connected with financial activity in the field including budget funding and involving other sources to create large-scale research facilities, receiving tax relief for research organizations involved in the construction and operation of global research facilities, financial control in the process of mega-science projects implementation.

- in order to fulfill their obligations participant countries make monetary and non-monetary input on the basis of international cooperation.

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