Conventional and institutional models of international scientific and technical cooperation on the example of marine scientific research

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Abstract. A unifying aspect in researchers' understanding of the essence of the legal model is that it acts in such a way that describes objects, processes or phenomena of legal life. With due regard to the forms of international cooperation, we can identify conventional and institutional models of international scientific and technical cooperation (ISTC). The institutional model characterizes the status and activities of the subjects. The conventional model primarily reflects a set of legal regulators of the interaction between subjects. However, the conventional model is not limited solely to international agreements and customs. It also includes instruments containing soft law rules. To elucidate the ISTC models in the field of marine research, the authors have analyzed the concept of “marine scientific research” as well as the development of the institution governing the interaction between subjects of international law and other actors in the field of marine scientific research (MSR) and the exchange of technologies within the framework of international law of the sea. As a result of the study, the authors conclude that the conventional model of ISTC in the field of MSR is based on the 1982 UN Convention on the Law of the Sea and includes bilateral and multilateral international agreements, decisions and resolutions of competent international organizations, and legal instruments containing soft law rules aimed at specifying various aspects of cooperation. The institutional model in MSR means creation of international intergovernmental and non-governmental organizations. ISTC institutional models can be divided into ecosystem models and collaboration models. Ecosystem models create the necessary legal, organizational, economic and other conditions (environment) for international cooperation and joint marine scientific research. Collaborative models are created directly for the implementation of international scientific research. However, there is no strict borderline between them.

1. Introduction
At the present stage of the development of social relations, it is difficult to find areas of activity in which international cooperation is not carried out at least to some extent. Globalization processes, on the one hand, and the need to resolve scientific problems that cannot be solved solely by one State and on which the successful development of the State depends, on the other hand, give rise to the need for international cooperation in this area. Moreover, international scientific cooperation is economically beneficial for the development of science and education [1].
Successful solution of the objectives concerning transition to the digital space and active promotion of national science at the international level require to investigate the experience of the regulation of scientific and technical cooperation under international law to identify the most successful models of interaction that can be laid as the basis of domestic projects for the promotion of Russian science and technology on the global level.

To date, there are many examples of successful scientific and technological cooperation in various fields and at different levels, and the scope of international scientific cooperation continues to grow. To some extent, the number of scientific publications within the framework of international cooperation is indicative of this process. Thus, the number of scientific papers co-authored by researchers from different countries grew from 8% in 1988 to 25% by 2009 [2]. In the years that followed, there was even more significant increase. According to the data of research of scientific interaction and mobility of scientists for 2008-2015, the index of co-authored scientific papers varies depending on the level of development of the State from 46.94% for developed countries to 77.39% for developing states, while the global average equals 70.32% [3]. However, it should be borne in mind that joint scientific works are prepared not only within the framework of cooperation on the basis of international law, but also in the context of informal, interpersonal interaction between researchers. In this regard, it is impossible to rely on the number of joint scientific works as an absolute indicator of the development of international scientific and technical cooperation.

The largest number of international scientific projects are carried out with the participation of the United States, second in this rating goes Britain followed by Italy, France, Spain and Germany. Some Latin American States –Brazil and Argentina– are not inferior to European leaders in participation in international scientific and technical cooperation [4].

International scientific and technical cooperation is growing due to various reasons. Some researchers argue that the list of such reasons is virtually infinite and depends on a given situation in question [5].

At the regional level, the growth of international scientific and technical cooperation is associated with the following factors:

- geographical proximity: neighboring countries often have similar research projects or mutually supplementary interests and common publications;
- history of the development of States and peoples: common ethnic, linguistic or other types of ties formed by historical interactions (including colonial relations);
- common language that facilitates cooperation;
- existence of certain problems and issues, such as disease control or disaster mitigation;
- economic factors: they include investments in a particular area due to research priorities set by scientists and policymakers, individual scientists collaborating with specific scientific agencies, and the need to share funds and equipment;
- expertise: cooperation may be driven by the need for the best or most appropriate peer review to achieve the objectives of the scientific inquiry. Many developing countries have top-class institutions and scientists;
- availability of certain research instruments and equipment, databases and laboratories in the State [6].

However, only a few named factors contribute to the development of scientific and technical cooperation exceeding the regional context. Thus, John P. Holdren, Adviser to U.S. President Barak Obama for Science and Technology and Director of the White House Office of Science and Technology Policy, having a long experience of working on issues of strengthening Soviet-American and then Russian-American relations, writes that the US government is interested in developing scientific and technical cooperation for the following reasons:
Working with other countries can provide access to valuable additional expertise, and it shares costs, allows pursuing complementary lines of effort, and helps avoid duplication of effort;

- The goals are global public goods—e.g., combating epidemic disease, curing cancer, reducing oil dependence, mitigating climate change, improving nuclear-reactor safety;

- Resulting economic advances. For example, the partner countries are less likely to become sources of major refugee flows and regional political instability, and are more likely to advance economically to the point of becoming significant markets for U.S. products.

- Diplomatic benefits. The benefits of mutually beneficial cooperation in science and technology provide a positive rationale for maintaining decent relationships even in the face of disagreement on other issues [7].

Similar reasons for the growth of scientific and technical cooperation names Peter Strohschneider, the President of the German Research Foundation [8].

Catalytic effects of all the above factors on international scientific and technical cooperation are certainly not absolute, their effect and range vary depending on specific situations.

At the same time, it should be noted that there is a tendency in modern research aimed at assessing the effectiveness and necessity of international scientific and technological cooperation in order to reject an extremely positive assessment of international cooperation, while investigating its shortcomings. In particular, researchers name the problems of collaboration between partners “unequal” in their abilities [4], differences of stances and objectives pursued by scientists and political figures in approaches to the implementation of joint scientific projects [9], the efficacy of international agreements made between the parties. Of course, the growing number of international agreements in the field of scientific and technical cooperation does not entail the emergence of real partnership and implementation of major scientific projects. For example, between 1995 and 1998 the United States concluded more than 800 bilateral and multilateral agreements on scientific and technical cooperation (as of 1991, there were 668), with only a small number of those agreements resulting in implementation of joint scientific projects and achievement of positive results [10].

This paper attempts to study models of international scientific and technical cooperation with a view to identifying their key components, intra-system interconnections and evaluation prospects for such models, taking into account the level of development of States, ranking of scientific and technological challenges, national interests and priorities of the Russian Federation.

The first part of the paper highlights the concept of the conventional model of international scientific and technical cooperation and defines its content. Then, the authors analyze the conventional and institutional models of international scientific cooperation in one of the most developed areas, namely: international marine scientific research.

2. The Definition of the Conventional Model of International Scientific and Technical Cooperation

The active use of the term “legal model” began with the publication of the writings by A.F. Cherdantsev. The term has now entered the realm of the legal science and is actively used by researchers in relation to various manifestations of legal reality: the “legal model of the State,” “legal model of local self-government,” “legal model of international scientific collaborations,” “legal model of regulation of official relations,” “legal model of the prosecutor's activities,” “legal model of the patent,” “legal model of charity and charitable organizations,” “legal model of trust,” “legal model of usufruct,” “legal model of the budget system,” “legal model of economic integration,” etc.

However, the vast majority of works do not elucidate the concept of the legal model, while its understanding is very different due to the affiliation of researchers to different law schools and peculiarities of the humanities in general.

The attempt to define the concept of the legal model was made by A. S. Bezrukov in his PhD thesis. In particular, he gave the following definition of the legal model: “the legal model means created as a result of abstraction, idealization (for theoretical and meta-theoretical models) or
observation (for material models) form of reflection of legal (or surrounding) reality in relation of its conformity with the object under study, serving as a means of distraction and expression of the internal structure of a complex legal phenomenon (or visibility in the description of objects of the material world), carrying information about the object or performing a special descriptive (demonstration) task” [11].

V.S. Pletnikov, to a certain extent approving, but at the same time criticizing this definition, under the concept of the model as applied to legal science in general proposes to understand “the image (intellectually volitional description), sufficiently repeating the essential properties of the simulated object, process or phenomenon of state-legal life, formed under the influence of the whole set of objective and subjective factors of social development” [12].

In the literature, we can find the definition of the legal model as a set of characteristics that reflect a particular legal phenomenon, object or process [13].

Yu. A. Tikhomirov defines the legal model as “a predicted version of optimal legal regulation of future phenomena and processes, defining the goals and means of forming a new legal state and allowing the evaluation of the related actual results” [14].

Some foreign researchers percept the model as a kind of meta-norms (meta-rules) addressed to the State or directly to the rulemaking body in order to form a certain image for its further implementation [15]. Under this understanding, legal models act as certain guide-lines for rule-makers. Model legislation acts constitute a vivid illustration of this approach.

A unifying aspect in researchers’ understanding of the essence of the legal model is that it acts in such a way that reflects (describes) objects, processes or phenomena of legal life. At the same time researchers differentiate ideal (gnoseological) and real (ontological) legal models. The ideal model is as abstract as possible, reflecting the most general and essential characteristics of an object, process, or phenomenon. Such models form a prerequisite for creating real models [11] [12].

Ideal models are not part of the legal system in the sense that these rules are not the source of law. But the rule-maker feels bound by these rules or principles. A State or other entity with rulemaking functions is willing to embody these images only because the chosen normative model is morally, politically and ideologically accepted or demanded by the society.

The real model is directly involved in legal regulation and it represents the embodiment of the abstract image (or idea) [11] [12]. Real legal models primarily form the rule of law and larger normative entities (legal institutions, branches of law, etc.).

Some researchers also refer legal constructs to legal models. Thus, V.N. Isayev with reference to A.F. Cherdantsev argues that the legal construct is an ideal model reflecting a complex systemic structure of legal relations, legal facts or their elements, regulated by law [16]. A.S. Bezrukov points out that “in a narrow sense the legal model should contain the most general characteristics of any phenomenon, while the legal construct to a greater extent represents a finished “creation” adapting the model to specific social conditions” [11]. In fact, the author equates the legal construct with the real legal model.

At the same time, it seems that any legal models are ideal. Thus, a rule of law, though it acts as a real legal model, since it is directly consolidated and accordingly implemented in the legal system, still remains just a proper pattern of behavior. The rule of law forms in the minds of subjects an ideal pattern of behavior in a particular situation. As A.S. Bezrukov notes referring the rules of law to real legal models, “the real legal relationship is preceded by its ideal model, which is formed in the mind of the subject under the influence of the rule of law” [11].

The scientific literature provides an approximate structure of legal models [14]. However, it seems that the complexity of the structure of the legal model will vary depending on its object.

In addition, at present, the domestic legal science also identifies general legal models that are further divided into models of domestic and international importance. The latter are mainly “aimed at building international legal channels of cooperation, seeking consolidating legal values and ensuring uniformity in the practice of ensuring them” [17].
Based on the above, legal models of international scientific and technical cooperation can be understood as a certain image (description) of regulation of interaction of subjects of international law among themselves and with other actors without international legal personality, reflecting the most essential characteristics of such interaction (conceptual and ideological basis, limits of regulation, set of legal regulators, the status and activities of entities, legal risks and expected results of interaction).

As is known, international cooperation, including cooperation in the field of science and technology, takes place in two forms: conventional and institutional. Accordingly, it is possible to talk about conventional and institutional models for international scientific and technical cooperation. Such differentiation helps to better understand the legal models of international scientific and technical cooperation and is, to some extent, indicative, as both are closely related and reflect different sides of the legal model. The conventional model of international scientific and technical cooperation primarily reflects a set of legal regulators governing interaction between subjects (entities). The institutional model to a greater extent characterizes the status and activities of the subjects (entities).

It should be stated that there is a different approach in literature to the definition of the forms of international scientific and technical cooperation. In particular, L.P. Anufrieva, criticizing the attribution of “harmonization”, “convergence” and “unification” by some scholars to forms of international scientific and technical cooperation, offers to distinguish between “legal forms of cooperation” and “forms of legal cooperation”. The author further points out that “established” forms of cooperation include such forms of activities that are able to give rise to new scientific, applied, technological, methodological, production, etc. knowledge” [17]. While agreeing that “harmonization”, “convergence” and “unification” should not be included in the forms of international cooperation, including cooperation on issues concerning science and technology, it is necessary to notice that the acquisition of new scientific, technological, methodological, production and other knowledge is the result of a particular activity and it does not characterize the type of organization of the relevant activities [17].

However, the conventional model is not limited solely to international agreements and customs. As Prof. L.P. Anufrieva notes, if earlier the special international agreements concerning each of the situations emerging in the process of international scientific and technical cooperation were developed, at present time the conventional model is complicated due to more precise regulation of interaction issues in constitutional documents. It serves the purpose of achieving uniformity in further agreements on special issues [17].

Like the majority of modern social problems, the problems of scientific and technological cooperation are too multifaceted and cannot be regulated solely by a hierarchical legal system based on rigid requirements enforced by sanctions. Of course, in each particular case of international scientific and technical cooperation, States still play a significant role in pursuing national interests. States determine the vector of development for international scientific and technical cooperation. At the same time, the implementation of joint scientific projects raises many issues that cannot be resolved either within the framework of international law or within the national legal framework. Scientific collaborations now include many actors who are not subjects of international law [14]. However, their participation in joint international scientific projects is a prerequisite for the projects’ implementation. These actors enter into memorandums of understanding and special agreements, forming their own rules of conduct. In this regard, acts containing soft law rules as well as national legal instruments are of particular importance in the context of international scientific collaborations.

In the case of international scientific collaborations, experts note that participants consciously reject strict legal norms in favor of regulating relationships under soft law. The reason for this is the absence of risks of unscrupulous actions on behalf of partners in scientific and technological interaction, the long-term nature of the relationships and the common interest in implementation of joint projects, reputation concerns, existence of obligations that are ethical to some extent and moral in nature. This kind of regulation proves its effectiveness in practice [18].

First, instruments containing soft law rules are typically developed within the existing international legal framework. Thus, memorandums of understanding, on the basis of which a number of
collaborations have been established within the framework of CERN, are concluded on the basis of the Convention on the Establishment of the European Organization for Nuclear Research adopted in 1953 or other international instruments. Second, they aim to specify and complement the norms contained in international treaties governing international scientific and technical cooperation in the relevant field. Third, they have a significant impact on the characteristics of the model of international scientific and technical cooperation, in particular, they extend the limits of regulation and the range of legal regulators, the status and activities of interaction between subjects (entities). In this regard, memorandums of understanding and other international instruments containing soft law rules should be considered as part of conventional models of international scientific and technical cooperation.

In fact, States are creating a hybrid and multi-purpose system with decentralized regulation, but which they can direct towards the necessary development destination.

3. Conventional Models of International Scientific and Technical Cooperation in the Field of Marine Scientific Research

International Law of the Sea is one of the oldest and most developed branches of international law, which is now an integral part of the set of rules governing matters of scientific and technical cooperation between States, international organizations and other entities, including non-subjects of international law. Scientific and technical cooperation today penetrate virtually all areas of international cooperation in the field of ocean exploration and rational use (utilization) of the World Ocean, whether it pertains to shipping, fishing, protection of the marine environment from pollution, etc. [19].

However, the norms of international law of the sea governing scientific and technical cooperation in the field of marine scientific research prior to the adoption of the 1982 UN Convention on the Law of the Sea (hereinafter referred to as the 1982 Convention) were not included into universal international treaties.

Prior to the adoption of the 1958 Geneva Conventions on the Law of the Sea, marine scientific research was fragmented and was not considered in the context of the international legal regime of the World Ocean. Cooperation in marine scientific research was governed by separate inter-state agreements. In particular, this is evidenced by the fact that the Draft Articles on the Law of the Sea prepared by the United Nations International Law Commission (hereinafter referred to as the United Nations Commission) did not include the freedom of scientific research in the list of freedoms of the high seas. Only in the comments to Article 27, the Commission highlighted that, in addition to the freedoms listed therein, there may be other freedoms of the high seas, including the freedom of scientific research [20]. In the end, the text of the 1958 Geneva Convention on the Law of the Sea did not contain the rule concerning the freedom of scientific research.

At the same time, a number of norms concerning scientific research were enshrined in the 1958 Geneva Convention on the Continental Shelf. Thus, Article 5 Para 1 of the Convention under consideration stipulated that “[e]xploration of the continental shelf and the exploitation of its natural resources must not result [...] in any interference with fundamental oceanographic or other scientific research carried out with the intention of open publication.” Para. 8 of the quoted article clarified that such studies were possible with the consent of the coastal State, but the coastal State shall not, under general rule, normally withhold its consent if the request is submitted by a qualified institution with a view to purely scientific research into the physical or biological characteristics of the continental shelf and if in any event the results of such research shall be published. The coastal State was entitled to participate or be represented in the research.

It was the issues of the use and research of the continental shelf that contributed to the further implementation of norms concerning international scientific and technical cooperation in the international legal regime of the World Ocean. In 1968, in its Report to the United Nations General Assembly, the Committee on the Peaceful Uses of the Sea-bed and the Ocean Floor beyond the Limits of National Jurisdiction underlined the necessity to develop norms concerning marine scientific research. Para. 10 of the Declaration prepared by the Special Committee stated that “[S]tates shall
promote international co-operation in scientific research exclusively for peaceful purposes: (a) by participation in international programs and by encouraging co-operation in scientific research by personnel of different countries; (b) through effective publication of research programs and dissemination of the results of research through international channels; (c) by cooperation in measures to strengthen research capacity of developing countries, including the participation of their nationals in research programmes”. Moreover, they were advised to differentiate between basic and applied marine scientific research [21].

The 1982 Convention further developed the norm on international scientific and technical co-operation in the field of marine scientific research.

The list of subjects and issues to be discussed at the Third Law of the Sea Conference prepared by the United Nations Committee on the Seabed in 1972 covered the issue concerning scientific research: a) the nature, characteristics and objectives of scientific research; b) access to scientific information; c) international co-operation [22].

The most debated issues at the Third Conference were the concept of marine scientific research and their differentiation into fundamental (or pure) and applied research. In particular, a number of delegations suggested that fundamental research should extend full freedom on the exclusive economic zone and on the continental shelf, requiring only notifying the coastal State, while for the applied research it was required to obtain the consent of the coastal State [21]. Such a distinction was considered to be unfounded and was not enshrined in the 1982 Convention.

With regard to the concept of marine scientific research, many different definitions have been proposed varying in degrees of specification of activities and their features. Thus, Canada in 1972 proposed the following definition of marine scientific research: “any research or study, whether fundamental or applied, intended to increase knowledge about the marine environment, including all its resources and living organisms, and embraces all related scientific activity” [21].

In 1973, the USSR, the Ukrainian Soviet Socialist Republic, and Bulgaria proposed to define marine scientific research as any fundamental or applied research and related experimental work carried out by States and their legal and physical entities as well as international organizations that do not directly target industrial exploitation but are intended to obtain information concerning all aspects of natural processes and phenomena occurring in the sea, on the seabed and in its subsoil, necessary for the peaceful activities of States for the further development of navigation and other forms of utilization of the sea, as well as the use of airspace over the World Ocean [21].

In 1975, a group of 9 socialist countries proposed the definition of marine scientific research as any research or related experimental work in the marine environment that are designed to enhance human knowledge and are conducted for peaceful purposes [21].

The final text of the 1982 Convention did not contain the concept of marine scientific research because States were unable to reach unanimity. At the same time, most of the proposals were reflected in the general provisions of Part XIII of the 1982 Convention.

It should be noted that the issue of distinguishing scientific research from other activities is of practical importance. For example, Japan has repeatedly referred to the scientific nature of activities in legal disputes arising out of Japanese fishing and whaling under the disguise of scientific research.

Thus, on 31 May 2010 Australia applied to the United Nations International Court of Justice (hereinafter referred to as the Court of Justice, the ICJ) to institute proceedings against Japan in connection with its extensive whaling program under the Second Phase of the Japanese Whaling Research Programme under Special Permit in the Antarctic (JARPA II). In Australia's view, Japan, under the disguise of scientific research, violated obligations assumed by Japan under the 1946 International Convention for the Regulation of Whaling (ICRW):

- maintaining the zero commercial catch limit set out in paragraph 10 (e) of the Schedule to the 1946 Convention;
- prohibition of commercial fishing for fin-whales in the Southern Ocean pursuant to paragraph 7 (b) of the Schedule to the 1946 Convention;
• compliance with the moratorium on the taking, killing or treating of whales, except minke whales, by factory ships or whale catchers attached to factory ships, in violation of paragraph 10 (d) of the Schedule to the 1946 Convention;
• compliance with requirements of paragraph 30 of the Schedule to the 1946 Convention [23].

In this regard, the International Court of Justice had to turn to determining the content of the term “scientific research”. Paragraphs 72 to 86 of the ICJ’s decision in this case are devoted to the analysis of the concept under consideration. The Court based on expert opinions made by Mr. Marc Mangel and Mr. Walløe invited by the parties, examined the four essential characteristics they proposed for distinguishing research as a special activity:

• defined and achievable objectives (questions or hypotheses) that aim to contribute to knowledge important to the conservation and management of stocks;
• “appropriate methods”, including the use of lethal methods only where the objectives of the research cannot be achieved by any other means;
• peer review;
• the avoidance of adverse effects on stock.

The Court noted that the first characteristic proposed by the experts should be accepted, although experts may disagree about the level of specificity required of such a hypothesis, it may be stated in sufficient general form (Whaling in the Antarctic (Australia v. Japan: New Zealand intervening), Judgment of the I.C.J. March 31, 2014 In: I.C.J. Reports 2014. Para. 74).

The ICJ also agreed that the use of lethal methods is only possible when the objectives of the research are not practically and scientifically feasible in other ways, and they commensurate with the expected results.

There was no doubt among the Court and the parties to the case that scientific research should not have an adverse effect on the resources under study (Para. 85).

However, the Court did not agree that a programme can be said to involve scientific research only if the proposals and the results are subjected to peer review, although such practice is a common one in the scientific community (Para. 84).

At the same time, the Court did not offer its own definition of the term “scientific research” and, based on the above characteristics, held that the implementation of the JARPA II programme was not for scientific purposes. At the same time, the ICJ emphasized that the scientific nature of the activity does not depend solely on the perception of it as such by the State itself (Para. 61).

Similarly, Japan referred to the scientific nature of activities actually aimed at fishing in Southern Bluefin Tuna Case heard by the International Tribunal for the Law of the Sea in 1999 [24].

The 1982 Convention is the first attempt to consolidate, at a universal level, international law rules concerning marine scientific research carried out by States and international organizations. It has established foundations and a framework for international cooperation in marine scientific research, which was further elaborated in greater detail on the basis of multilateral and bilateral agreements. At the same time, the regulation of marine scientific research should be based primarily on the relevant provisions of the 1982 Convention, followed by other international treaties. This is directly derived from the provisions of Art. 300 and 311 of the 1982 Convention, as well as from the doctrine of international law [21].

Part XIII of the 1982 Convention is devoted to marine scientific research. It includes 6 sections:

• general provisions;
• international cooperation;
• conduct and promotion of marine scientific research;
• scientific research installations or equipment in the marine environment;
responsibility and liability;
settlement of disputes.

The provisions of these sections define the conceptual framework of the interaction, the vector and limits of regulation, and the potential outcomes of the cooperation.

The conceptual basis of the conventional model of international scientific and technical cooperation in the field of marine scientific research is formed by the interaction between States, international organizations and other actors in order to promote and facilitate knowledge concerning the substance of phenomena and processes taking place in the marine environment and the relationship between them with due regard to the rights and obligations of other States by means of bilateral and multilateral agreements based on the provisions of the 1982 Convention.

The 1982 Convention stipulates that such research shall be conducted exclusively for peaceful purposes with appropriate scientific methods and means, without unjustified interference with other legitimate uses of the sea (art. 240 of the 1982 Convention).

Cooperation should result in simplification and creation of conditions for joint marine scientific research, accessibility of information on major scientific programmes and their objectives, as well as the knowledge gained from marine scientific research by means of publication and dissemination through appropriate channels (art. 244 of the 1982 Convention).

Since 1960, due to the establishment of the Intergovernmental Oceanographic Commission of UNESCO (hereinafter the IOC), the majority of marine scientific research undertaken within the framework of the international scientific and technical cooperation, are carried out under its auspices. Under Article 1 of the Charter, the IOC is a body with functional autonomy within the UNESCO. Taking into account the contribution of the IOC to the development of international scientific and technical cooperation in this field, the 1982 Convention recognized it as a competent international organization in marine scientific research and transfer of marine technology.

Thus, the conventional model of international scientific and technical cooperation in the field of marine scientific research includes the constitutional and other formal texts of the IOC, in particular, the IOC Statutes and the IOC Rules of Procedure, which are, in fact, UNESCO resolutions.

The decisions of IOC bodies involved in the implementation of international programmes and projects in the field of marine scientific research also constitute a key element of the conventional model. The IOC consists of primary and secondary subsidiary bodies. The primary subsidiary bodies include:

- scientific and/or technical committees. They are established by the Assembly or the Executive Council to implement the decisions of those bodies. For example, the Intergovernmental Panel on Harmful Algae Blooms (1991), the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWS) (2005) et al.
- sub-commissions. They are established by the Governing Organs of the IOC upon request of Member States to promote, develop and coordinate IOC programmes on marine scientific research, operational ocean observation systems and relevant activities. For example, the Sub-Commission for the Caribbean and Adjacent Regions (1982), the Sub-Commission for Africa and the Adjacent Island States (2012), etc.,
- regional committees responsible for coordinating and monitoring the scientific and servicing activities of the IOC at the regional level: Regional Committee for the Central Indian Ocean (1982), Regional Committee for the Black Sea (1995);
- joint subsidiary bodies established in cooperation with other organizations for the successful development and implementation of scientific and other programmes, namely: Joint IOC-IHO Guiding Committee for the General Bathymetric Chart of the Oceans (GEBCO) (1974), Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM) (1999).

Secondary subsidiary bodies include:
Task Teams. They may be established by the governing or primary subsidiary bodies of IOC (with the exception of joint subsidiary bodies) to deal with separate issues. For example, the Advisory Body of Experts on the Law of the Sea (1997), the IPHAB Task Team on the development of a Global HAB Status Report (2015), et al.;

Groups of Experts. Small subsidiary bodies composed of specialists selected in their personal capacity for their scientific or technical expertise. They will undertake detailed scientific and technical studies on behalf of IOC bodies. These include the Group of Experts on the Global Sea Level Observing System (1988), Global Ocean Observing System Steering Committee (GOOS-SC) (2011), Expert Group on Integrated Coastal Area Management (ICAM) and related matters (1999), etc.

In addition, the IOC is actively cooperating with other important intergovernmental and non-governmental organizations in the field of marine scientific research, including Food and Agriculture Organization (UNFAO), International Atomic Energy Agency (IAEA), ICES, PICES, International Hydrographic Organization (IHO), Scientific Committee on Ocean Research (SCOR), etc.

In almost all cases, such cooperation is undertaken on the basis of instruments that are not legally binding for the parties, e.g. memorandums of understanding, letters of cooperation. In practice, there are also cases of cooperation on the basis of letters of agreement or partnership agreements.

Thus, the authors conclude that the conventional model of international scientific and technical cooperation in the field of marine scientific research is based on the 1982 UN Convention on the Law of the Sea and includes, as appropriate, bilateral and multilateral international agreements, decisions and resolutions of competent international organizations, as well as numerous legal instruments, containing soft law rules aimed at specifying various aspects of cooperation. Other paragraphs are indented (BodytextIndented style).

4. Institutional Models of International Scientific and Technical Cooperation in the Field of Marine Scientific Research
A rather detailed study of institutional models of the ISTC was carried out by A.O. Chetverikov [25]. He refers to the institutional models:

- Establishment of international intergovernmental organization, which, in turn, the scholar subdivides into a project type and framework type;
- Establishment of a legal entity under the national law of the States participating in projects of international scientific and technical cooperation (constituent documents of such legal entities may be approved both by an international agreement and developed independently by scientific organizations of the State Parties). The most popular organizational and legal forms of legal entities for international scientific projects are limited liability companies, associations and foundations;
- Establishment of transnational and supranational legal entities;
- Establishment of international consortia of scientific organizations without the status of a legal entity (unincorporated entities);
- Establishment of European research infrastructure consortia within the EU.

States, pursuing national interests, continue to play a leading role and determine the vector for international scientific and technical cooperation. At the same time, among participants of scientific collaborations there is a significant number of entities that cannot be equated due to their legal status with traditional subjects of international law or cannot be classified as subjects of international law under the existing classification. However, their participation in international scientific projects is imposed by the realities of research interaction and becomes a necessary condition for projects' success and effectiveness. As an example, it is sufficient to refer to the network of partners of UNESCO Intergovernmental Oceanographic Commission or the Scientific Committee on Ocean
Research. In most cases, such interaction is carried out on the basis of recommendatory instruments that do not impose legal obligations on the parties. This leads to a sufficiently flexible regulatory model in international scientific collaborations, with the increasing importance of national regulation and soft law.

The institutional model of the ISTC in marine scientific research is mainly expressed in the establishment of international intergovernmental and non-governmental organizations (founded as legal entities under relevant national laws). It should be noted that, in practice, there have been cases when international scientific and technical cooperation was carried out on the basis of an international non-governmental organization and subsequently, for these purposes, an international intergovernmental organization has been established, as happened, for example, in the case of the European Molecular Biology Organization (EMBO) and the European Molecular Biology Laboratory (EMBL).

European research infrastructure consortium has also been established within the European Union for the purpose of international cooperation in marine scientific research. A peculiarity that converges these consortia with international intergovernmental organizations is that they are established by States. Moreover, in the host State, such consortia, in order to provide them with certain legal benefits and guarantees, are in some cases treated as an international organization for the purposes of proper application of tax and customs laws [25]. At the same time, their constitutional documents are approved by the European Commission, and they themselves have the status of a legal entity. These characteristics allow us to allocate them to an independent model and exclude them from being assigned to institutional models of an international intergovernmental organization or legal entity.

All institutional models of ISTC can be subdivided into ecosystem and collaboration models. Ecosystem models create the necessary environment, legal, organizational, economic and other conditions for international cooperation and joint conduct of marine scientific research by various entities and actors. However, they do not conduct scientific research directly. Examples of ecosystem institutional models in marine scientific research include the UNESCO IOC and SCOR.

Collaborative models are created directly for undertaking international scientific research. They can be established either for one specific project or for various marine scientific research projects. Examples of such models include the European Research Infrastructure Consortium “European Marine Biological Resource” (The European Marine Biological Resource Centre; EMBRC-ERIC/ECIDB) and GRID-Arendal.

It cannot be said that collaborative institutional models do not create the necessary environment, legal, organizational, economic and other conditions for the implementation of the international cooperation and joint conduct of marine scientific research by various entities and actors. Neither can we deny the implementation of scientific projects by ecosystem models. Thus, IOC Groups of experts with the status of secondary subsidiary bodies undertake scientific and technical research on behalf of IOC bodies. Such groups include Expert Team on Marine Climatology (ETMC), Observations Coordination Group (OCG), Practical Data Management Techniques Group, etc. However, there is no strict borderline between them, but if the former are predominantly focused on creating the necessary environment and conditions for the simplification and strengthening of international scientific and technical cooperation, collaborative models mainly adapt the developed mechanisms of interaction to the needs of a particular project.

5. Conclusion

Although there are many works devoted to the legal models, few authors attempt to elucidate the content of the term. The definitions of the legal model proposed by the researchers differ in the number of clarifying features, but are uniform in the fact that the legal model operates in a way that reflects (describes) objects, processes or phenomena of legal life. All legal models, in our view, are ideal. They represent the ideal image that must be implemented by the subjects (entities) to whom it is addressed.
With due regard to the forms of international cooperation, we can identify conventional and institutional legal models of international scientific and technical cooperation. Such differentiation helps to better understand the legal models of international scientific and technical cooperation and is, to some extent, indicative, as both are closely related and reflect different sides of the legal model. The institutional model to a greater extent characterizes the status and activities of the subjects (entities), while the conventional model of international scientific and technical cooperation primarily reflects a set of legal regulators of the interaction between subjects (entities). However, the conventional model is not limited solely by international agreements (treaties) and customs. It also includes instruments containing soft law rules.

Up to the present moment, States and other subjects of international law have been unable to reach a common understanding of the term “marine scientific research”, as evidenced by, *inter alia*, jurisprudence and case law of the International Court of Justice and the Tribunal for the Law of the Sea. At the same time, the need for joint marine scientific research has led to the emergence of an entire institution within the framework of international law of the sea governing the interaction between the subjects of international law and other actors in the field of marine scientific research and technology exchange.

Analysis of the legal regulation of the activities of the most efficient entity coordinating the interaction between States and other entities in the field of marine scientific research—the Intergovernmental Oceanographic Commission of UNESCO—asserts that the conventional model for international scientific and technical cooperation in marine scientific research is based on 1982 UN Convention on the Law of the Sea and includes, as appropriate, bilateral and multilateral international treaties, decisions and resolutions of competent international organizations, and numerous instruments containing soft law rules aimed at detailing various aspects of interaction.

The institutional model of the ISTC in marine scientific research is mainly expressed in the establishment of international intergovernmental and non-governmental organizations (they are founded as legal entities under relevant national law). European research infrastructure consortium also serves as a stand-alone institutional model.

Institutional models of international scientific and technical cooperation can be divided into ecosystem models and collaboration models. Ecosystem models create the necessary legal, organizational, economic and other conditions (environment) for international cooperation and joint marine scientific research without conducting scientific research *per se*. Collaborative models are created directly for the implementation of international scientific research.

As ecosystem institutional models, the UNESCO IOC and SCOR make the most visible contribution to the formation of normative and organizational conditions (environment) for the implementation of international projects in the field of ocean exploration, financing of such projects and engaging a large number of bodies and programmes of international intergovernmental and non-governmental organizations, national scientific institutions, related structures and individual scientists.

Collaboration models of international scientific and technical cooperation, such as ECIDB and GRID-Arendal, carry out international research projects and act as an integrated platform for scientists and various research institutions around the world and are largely based on the organizational, financial and structural frameworks developed by ecosystem models.

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