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The Concept of Knowledge Co-production in the Context of Arctic Research

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Abstract. The review article focuses on the concept of knowledge co-production, which began to be developed at the beginning of the 21st century. Its appearance is associated with the transition to a new paradigm of scientific research, the need for which was caused by the complexity and social significance of global problems. The principle of transdisciplinarity was taken as a basis, which involves going beyond the limits of normative science and including various media and types of information in the production of knowledge. As a result, an approach to scientific research based on the joint production of knowledge was formed. Currently, the concept of "knowledge co-production" is debatable. A review of theoretical and methodological approaches to its definition made it possible to identify the main stages of the knowledge co-production process and the methodological difficulties faced by scientists. In most cases, they are associated with the presence of many different stakeholders in the process of knowledge co-production, differences in understanding of the purpose and objectives of research between representatives of the academic and non-academic community, lack of organizational and financial support. It is shown that the concept of knowledge co-production has received the greatest application in research on the sustainable development of the Arctic, where special attention is paid to the knowledge of indigenous peoples and their co-production.
Keywords: *knowledge, co-production, concept, methodological approach, transdisciplinarity, sustainable development, indigenous peoples, Arctic*

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Prerequisites for the emergence of the concept of knowledge co-production

In 1994, American sociologist Michael Gibbons published the book "The new production of knowledge: the dynamics of science and research in contemporary societies", in which he outlined the transition to a new paradigm of scientific research [1, Gibbons M.]. It was based on the principle of transdisciplinarity, which implies going beyond the boundaries of a particular scientific discipline and including various types of information produced by the non-academic community in the process of knowledge production. The new paradigm, called "Mode 2", was proposed as an alternative to the traditional method of scientific research with its characteristic hierarchy of disciplines and the autonomy of scientists. Despite subsequent criticism from academics who defended the

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need to preserve the objectivity and "purity" of scientific knowledge, the ideas presented in it received positive responses from those who were looking for more advanced mechanisms for interaction between science and society.

In 2001, the book "Re-thinking science: Knowledge and the public in an age of uncertainty" by M. Gibbons' co-author, Austrian sociologist Helga Nowotny, was published, in which the author and her colleagues presented additional arguments in favor of a new research paradigm [2]. In their opinion, the need for new ways of producing scientific knowledge is a response to the complexity and social significance of emerging environmental, economic, social and other problems. The authors believe that in conditions of openness and accessibility of information, this knowledge should be "socially sustainable", that is, created in cooperation with all parties interested in obtaining this knowledge, and its value should not be determined exclusively by the scientific community.

The ideas outlined in the books by M. Gibbons and H. Nowotny formed the basis of the concept of knowledge co-production, which began to be developed at the beginning of the 21st century. Its proponents believe that monodisciplinary scientific knowledge is not enough to solve the global problems of the modern world, so it is necessary to apply a transdisciplinary approach that promotes the expansion of methods of knowledge production through cooperation with the non-academic community [3, Lang D.J., Wiek A., Bergmann M.], [4, Brandt P., Ernst A., Gralla F. et al.], [5, Polk M.].

As it developed, the concept of knowledge co-production became most popular in studies on sustainable development [6, Miller C.A., Wyborn C]. In some Western countries, such as the USA, Great Britain, Germany, the knowledge co-production approach has been included in strategic plans for sustainable development. Despite the fact that this term has become widely used in public administration and scientific research, approaches to its definition are quite diverse [7, Metz A., Boaz A., Robert G.].

The process of knowledge co-production

According to existing research, the process of knowledge co-production includes several stages. First, scientists select stakeholders to develop research questions and solve a specific scientific problem. Then, data collection takes place: at this stage, researchers work closely with other participants in the process to ensure the reliability and accuracy of the information collected. Once the initial data is collected, scientists, together with other stakeholders, interpret the information and analyze the results. The research team then proceeds to draw conclusions that can be used to develop joint solutions [8, Brandt P., Ernst A., Gralla F. et al.].

Compared to the monodisciplinary approach, the advantage of the knowledge co-production approach is that it brings together scientists with people directly affected by the problem, as well as those who have managerial decision-making power. In this way, knowledge co-production allows for more effective solving of complex problems.

Despite the innovative nature of the concept, scientists point out a number of methodological problems of the knowledge co-production approach. According to Swedish researcher Malin

Mobjörk, these problems are related to the question of "whether knowledge co-production is aimed at taking into account the opinions of stakeholders or at their actual participation in the process of producing new knowledge?" [9]. Back in 2005, researchers M. Lemos and B. Morehouse noted that co-production of knowledge can be successful if stakeholders are involved in the process at all stages of the research, starting with defining the problem, developing the research question, research design and ending with data collection, analysis and dissemination of results [10, Lemos M.C., Morehouse B.J.]. The same opinion is shared by D. Hegger and C. Dieperink, who consider the broad involvement of stakeholders, achieving a common understanding of the research purpose and a clear distribution of responsibilities for the project to be the main conditions for the success of knowledge co-production [11, Hegger D., Dieperink C.].

Swedish researcher Albert Norström, based on his own experience in various processes of knowledge co-production in the field of sustainable development, identified four fundamental principles: contextuality, pluralism, goal-setting and interactivity [12, Norström A.V., Cvitanovic C., Löf M.F. et al.]. M. Polk used the results of comparison of transdisciplinary research projects to determine the effectiveness of five elements of knowledge co-production, namely: stakeholder involvement, their participation in data collection, interaction between participants, evaluation of results and analyzing their applicability. As a result, stakeholder involvement and data collection were found to be the most effective, while analyzing the results and evaluating them were the least effective [5].

According to scientists, the presence of many different stakeholders in the co-production process can pose some challenges. The main problems include the differences in understanding the purpose and objectives of the research between representatives of the academic and non-academic community, the lack of organizational support for interaction activities, as well as a lack of time and finances [13, Cvitanovic C., Hobday A.J., van Kerkhoff L. et al.]. As the concept developed, effective ways of involving stakeholders in joint work and knowledge production were studied. For example, M. Reed refers to stakeholder consultation and training [14, Reed M.S.]. Brandt et al. point out the need for interaction and collaboration at all stages of the research [15, Brandt P., Ernst A., Gralla F. et al.]. At the same time, M. Polk notes that even in those centers dealing with transdisciplinary research, participants encountered a mismatch of expectations between researchers and stakeholders [5]. Due to these and other problems, some researchers have described the knowledge co-production approach as controversial and requiring the development of a strategy for its implementation in practice [16, Thompson M.A., Owen S., Lindsay J.M. et al.].

Knowledge co-production in the context of Arctic research

Since the early 2000s, the concept of knowledge co-production has been increasingly discussed in the context of research on the Arctic, where indigenous peoples live. Scientists believe that indigenous knowledge is key to interpreting natural and social processes in the Arctic, especially those resulting from climate change [17, Degai T., Petrov A.N., Badhe R. et al.].

Research activities in the Arctic are aimed at better understanding these changes and developing adaptation strategies. For a long time, these studies were conducted by the scientific community without taking into account the opinions of indigenous peoples. Changes in methodological approaches to research occurred due to the development of the concept of resilience and the realization that solutions to global problems should be sought at the local level [18, Nenasheva M.V.]. Since then, scientists have called for the integration of scientific and indigenous knowledge to address the challenges in the Arctic [19, Yua E., Raymond-Yakoubian J., Daniel R. et al.]. Today, the knowledge co-production approach is used to assess changes in the Arctic environment and make management decisions in the field of ecology [20, Obermeister N.], in climate change adaptation research [21, Raymond-Yakoubian J., Daniel R.], in studying the sustainable use of lands inhabited by indigenous peoples [19], etc.

On June 20, 2021, the International Congress of Arctic Social Sciences was held in Arkhangelsk, where much attention was paid to the knowledge of indigenous peoples. One of the results of the Congress was a joint statement proposing specific steps to involve indigenous peoples in Arctic research and knowledge co-production. In particular, it was proposed to support indigenous peoples in conducting research according to their own priorities and methodologies, to recognize the intellectual right of indigenous peoples to knowledge about the Arctic, and to work on creating an intellectual space for indigenous knowledge holders [22, Petrov A.N., Burn Silver S., Stuart Chapin F. et al.].

Conclusion

Knowledge co-production is an approach that provides a new perspective on the relationship between science and society. It is based on the principle of transdisciplinarity, which implies going beyond normative science and involving all parties interested in obtaining scientific knowledge and developing comprehensive solutions to a scientific problem in the process of scientific research. The methodology of knowledge co-production has not been fully defined, but there is no doubt about the practical significance of the new concept, the application of which can contribute to the sustainable development of the territories most affected by global challenges.

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