Environmental management of natural-anthropogenic complexes of rural areas

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Abstract. The article presents the results of the study of natural-anthropogenic complexes of rural areas as self-developing polysubject environments. In this case, a self-developing polysubject environment is understood as a set of subjects that form the technological, social, economic and ecological subsystems of natural-anthropogenic complexes, taking into account their values and culture. Such an approach to determining the object of management is characteristic of the post-nonclassical type of scientific rationality, within which management is carried out through the impact on the environment, culture and values. Currently, in relation to the natural-anthropogenic complexes of rural areas, separate elements of such a management system are being formed, which, nevertheless, are already showing certain efficiency. In this article, the authors made an attempt to identify and describe the elements of environmental management using the example of managing the sustainable development of natural-anthropogenic complexes that are formed in the process of grain production.

1. Introduction
The relevance of the application of environmental management of sustainable development of natural-anthropogenic complexes (NAC) in rural areas is associated with the need to search for answers to global challenges that seriously manifested themselves in 2020. The high level of networking in all spheres of human life, from social contacts to the creation of high-tech industries, which peaked at the end of 2019, served as the basis for the widespread development of network forms of management. Any large public or private project was necessarily based on a network of suppliers of resources and equipment, a network of intermediaries ensuring effective interaction between business entities, a network of consumers with its complex social and organizational structure. The more extensive the network was, the more sustainable the project was considered, since project risks were distributed relatively evenly across all network participants. If some element of the network unexpectedly left it, the principles of network interaction and risk distribution neutralized the loss of this element without significantly affecting the entire network as a whole. Global, transnational networks were considered the most stable, and they were the ones that were most hit during the period of the emergence and sharp spread of the new coronavirus infection.

The closure of the borders led to the fact that in a relatively short period of time all global networks were destroyed - some for always, some for a certain period of time. According to various forecasts, the restoration of the previous level of network interaction on a global scale will not happen in the coming years, as the pandemic of the new coronavirus infection in the world continues to gain momentum.
The coronavirus pandemic had a significant impact on the sustainable development of agricultural systems in individual countries and regions, hit the poor in the rural population, destroyed traditional economic ties in both developed and developing countries [1-8].

Thus, in spite of the obvious advantages, network management and the network form of organizing relationships between subjects in the modern world carries significant risks, which can be reduced by switching to environmental management.

2. Materials and methods
The methodological approach, on the basis of which the present study was carried out, is presented in the works of V. Stepin [9-10] and V. Lepsky [11], as well as in the earlier work of the authors [12].

In accordance with the above methodology, the management of sustainable development of rural areas NAC is considered in the basic paradigm of the relationship "subject-metasubject", characteristic of the post-nonclassical type of scientific rationality. At the same time, the NAC of rural areas is presented in the form of a polysubjective self-developing environment, which includes the subjects of four subsystems - technological, economic, social and environmental, united into a complex self-developing system, in conjunction with their sets of values and culture. It is a set of values and cultural landmarks that distinguish poly-subject self-developing environments from network communities, since even a temporary destruction of network connections makes it impossible to follow network goals and values, makes these goals and values either useless or unattainable. Temporary disruption of traditional ties in a polysubjective self-developing environment is perceived by the subjects less painfully, since the subjects themselves are carriers of the system of values and culture, on the basis of which such polysubjective environments are created. It should be borne in mind that the network community in the process of evolution can turn into a poly-subject self-developing environment. For this, it is necessary that all community actors share a common value system, which is not imposed from outside by fashion trends, temporary necessity or the opinion of the majority, but is an integral and organic part of the worldview of the subject himself participating in the network community. On this basis, a common culture is formed that unites subjects in a polysubject self-developing environment. It can be a culture of production, ecological culture, culture of social communication, etc.

In any case, the presentation of the NAC of rural areas as a polysubject self-developing environment requires, at the methodological level, the development of appropriate management tools, different from directive management. The use of soft forms of control in this case allows one to penetrate more deeply into the motives of the behavior of subjects and correlate them with the influence of the external environment.

3. Results
NAC of rural areas, which are formed in the process of grain production, as polysubjective self-developing environments, are characterized by the characteristics of their constituent entities, depending on the latter's belonging to a particular subsystem. Considering that the proposed approach to the study of NAC in rural areas is relatively new, we will try to identify possible or desirable systems of values and culture of subjects related to the technological, economic, social and environmental subsystems of NAC from the point of view of sustainable development. This will make it possible to determine the basic mechanisms and technologies of environmental management that can be effectively applied to the HSC.

The subjects of the NAC technological subsystem of rural areas, which are formed in the process of grain production, can be oriented towards the following values and benchmarks.

In the field of technologies and technical equipment: environmental - minimizing the impact on the natural environment in the process of grain production, social - maximum relief of labor of workers involved in the implementation of technological processes, technological - full automation of processes, replacement of all manual operations with robotic systems.
In the field of providing seed material: introduction of traditional varieties, for which producers have created the necessary material and technical base, established channels for the supply of resources and sale of finished products; the introduction of new varieties focused on minimizing the ecological footprint of product production.

In fact, the choice of one or another landmark by each subject forms its development strategy, and the totality of the subjects' strategies can form the development strategy of the natural-anthropogenic complex as a whole. If the NAC is a polysubject self-developing environment, then all participants in its technological subsystem will be focused on one development strategy. More precisely, this development strategy is the only one for them, and the question of choice in this case is not worth it, since internal beliefs and the internal value system do not allow an alternative choice. Obviously, from the point of view of sustainable development of NAC, the most acceptable value guidelines for the subjects of the technological subsystem are environmental guidelines with the simultaneous introduction of new varieties.

In the subsystem of economic relations, the following value orientations of the subjects can be distinguished: obtaining innovative competitive products due to the unique quality of grain, obtaining traditional competitive products by improving technological processes and minimizing the cost of production, increasing the competitiveness of products by optimizing the system of its distribution and delivery to the end consumer, creation of fundamentally new market segments with innovative products, including the formation of a distribution and delivery system to the end consumer. This list is certainly not final. But it is already clear that in the long term, the sustainable development of NAC in rural areas that are formed in the process of grain production is possible only if there is a unique product that forms new market segments.

In the subsystem of social relations, the investment of subjects in the formation of human capital, which is used in the NAC of rural areas, is the basis of sustainable development. Even if, over time, manual labor is completely replaced by the use of robotic systems, in rural areas there will be a need for personnel with completely new competencies in the service of these systems.

In the subsystem of environmental relations, the main and main value is to minimize the negative impact on the environment during the production and distribution of products. The ideal option here is the use of technologies that, within the framework of the general development cycle of the NAC, allow individual plots of land to fully recover to their original natural state.

4. Discussion
If we assume that the above value orientations are shared by all subjects that are part of the natural-anthropogenic complex, it becomes clear how soft management methods can be applied to ensure the sustainable development of NAC in rural areas of the region.

The basic management model in this case is “human-sized systems”, that is, systems in which a person with his / her value orientations and culture is an integral and central part. By shaping the system of values in society, we thereby lay the strategy for its development into the human-sized system. If a PAC subject is brought up in the spirit of respect for the environment, his development strategy, as an element of a particular PAC subsystem, will never be based on thoughtless exploitation of natural resources. Accordingly, when choosing the technological component of the NAC development, this subject will give preference to technologies that cause the least damage to the environment. And in order for this to really happen, at the level of state authorities, it is necessary to create compensation mechanisms that allow such entities to compete with those who extract super-profits from the barbaric exploitation of natural resources.

5. Conclusion
At first glance, the described situation seems to be a utopia, but forecasts of the further development of the world economy, the deterioration of the ecological situation, the impossibility of returning to the global networked economy in the aggregate force us to look for new approaches and models in managing complex self-developing systems. Despite the destruction of transnational network models
of interaction between the subjects of economic relations, they are being replaced by more complex models, which are "national islands" that are formed within the boundaries of individual states. One of such models can be a self-developing polysubject environment, in the center of which there is a person with his value and cultural reference points.

Acknowledgments
«The reported study was funded by RFBR according to the research project № 19-010-00482»

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