

Impact of anthropogenic phosphorus load on freshwater objects in the Russian Federation

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Annotation

Relevance of the research topic

According to estimates of the World Organization of Health to the 2025 year about 40 % of the world's population will not be able to meet their household needs due to the widespread decline in the quality and availability of water. Solving the problem of food security through land reclamation has led to significant discrepancies in local phosphorus balances (In the framework of the study presented by the author, the term "Phosphorus" denotes the number of available mineral forms of phosphorus (PO_4^{3-} , HPO_4^{2-} , H_2PO_4^-) in recalculation on the total P). The use of phosphorus-containing mineral and organic fertilizers to increase the volume of production of production of crop leads to a sharp increase in the concentration of phosphorus in freshwater sites, which in its turn is one of the causes of changes in the trophic status of data objects. Study the dynamics of the trophic status of the water masses of the largest lakes of the Russian Federation (RF) show a significant increase in the number of eutrophication objects, but despite on it, in the Russian road map for the development of production and consumption of mineral fertilizers in the period up to 2025 year, the approved order of the Government of the Russian Federation of March 29, 2018 No 532-r, it is planned to increase the use of phosphate fertilizers by 18% of the current level (up to 3.45 million tons).

On the other hand, the addition of mineral fertilizers, significant sources of inflow of phosphorus in the components of the biosphere can be organic fertilizer enterprises chemical industry and synthetic detergents (CMC), in respect of which the present time in many European countries there is a ban or a significant restriction on the production and use of funds containing phosphorus in their composition. The issue

of introducing restrictive measures for phosphorus-containing SMS is also being discussed in the Russian Federation.

Summarizing the above, the creation of tools for conducting evaluation and prediction of anthropogenic phosphorus load on freshwater objects becomes urgent task at the implementation of a rational approach to the use of resources and sustainable development of the chemical industry industry of the Russian Federation.

The aim of the thesis work consists in determining and predicting the level of anthropogenic phosphorus load to the RF subjects with changing climatic parameters and / or the volume of consumption of phosphate fertilizers.

To achieve the goal of the dissertation research, the following interrelated scientific and technical **tasks were** formulated and performed :

1. Analysis of the current state of scientific research on methods for assessing anthropogenic phosphorus load on a global and regional scale.
2. Development of a procedure for collecting, analyzing and processing primary data and compiling a database for calculating the level of anthropogenic phosphorus load on freshwater objects in the Russian Federation.
3. Development of a procedure for calculating the migration of phosphorus in the components of the biosphere, taking into account the limits of resistance of these components to anthropogenic impact established by the concept of "planetary boundaries" .
4. Determination of priority sources of phosphorus supply to freshwater objects of the Russian Federation.
5. Forecasting changes in the level of anthropogenic phosphorus load depending on changes in climatic parameters and / or the volume of consumption of phosphorus fertilizers.

Scientific novelty of the dissertation research:

1. A method for assessing the level of anthropogenic phosphorus load on freshwater objects in the Russian Federation has been developed, which is characterized by the simultaneous accounting of phosphorus migration processes in several components of the biosphere and determining the limits of resistance to

anthropogenic impact on the basis of the concept of "planetary boundaries" applied on a global scale. The technique allows for screening calculations for each individual constituent entity of the Russian Federation, which can be used to conduct a primary analysis of the state of the components of the biosphere in the territories under consideration.

2. The assessment of the current level of anthropogenic phosphorus load on freshwater objects in the constituent entities of the Russian Federation was carried out, as well as the forecasting of the load level, including a change in climatic parameters and an increase in the consumption of phosphorus fertilizers. Based on the results obtained, priority sources of phosphorus intake into freshwater objects for all constituent entities of the Russian Federation were determined.

The practical significance of the thesis work

The results of the dissertation work were used: as one of the methods for assessing the ecological state of the territories where the enterprises- members of the ROSKHIMREAKTIV Association are located , producing various phosphorus - containing compounds and reagents; by the YOSYA LLC enterprise when creating a software package within the framework of the stage of the competition of the prefecture of the city of Marseille (France), which is confirmed by a certificate of implementation.

The following research results of scientific and practical importance are submitted for defense :

1. The procedure for collecting, analyzing and processing primary data and a database for calculating the anthropogenic phosphorus load on freshwater objects in the Russian Federation.

2. The procedure for calculating the migration of phosphorus in the components of the biosphere, taking into account the processes of transboundary transport in the aquatic environment.

3. Assessment and forecasting of anthropogenic phosphorus load on freshwater objects and its visual presentation for the constituent entities of the

Russian Federation under various scenarios that take into account global climatic changes and an increase in the consumption of phosphorus fertilizers.

4. Determination of priority sources of phosphorus supply to freshwater objects of the Russian Federation.