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Critical loads of pollutants on ecosystems of the Republic of Kazakhstan

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A quantitative assessment of the ecological risk of ecosystems will prevent negative consequences by taking measures to reduce the harmful effects on vulnerable ecosystems, thus achieving maximum environmental benefits by reducing emissions of pollutants. It is necessary to ensure that the anthropogenic loads of pollutants fit within the framework of natural fluctuations of different parts of biogeochemical food chains to prevent contamination and degradation of ecosystems.

Calculation of critical loads was carried out based on the methodology of the European Coordination Center for Effects. Critical load is a quantitative estimate of deposition of a pollutant below which no significant effects on sensitive elements of ecosystems, in accordance with the current level of knowledge [1].
Therefore, it is necessary to calculate the following indicators for the calculation of critical loads:
• maximum acidity load (CL (A) max);
• minimum nitrogen load (CL (N) min);
• eutrophying nitrogen load (CL (N) nutr) [2].
Formulas for calculating critical loads:
• CL(N)min= N*i+N*u
• CL(N)nutr= N*i+N*u + Nl+N*de
• CLmax(A)=Ct*(BCw-ANCle)+(Bdep-BCu) [2].
Based on the calculated indicators, maps were constructed. The creation of a vector basis for the ecosystems of the Republic of Kazakhstan included the systematization of 160 types of ecosystems.

Results and conclusion

• The main factor affecting the stability of ecosystems to acid deposition is the content of basic cations in the soil; therefore, the most stable ecosystems for the intake of nitrogen oxides and sulfur are herb-red-steppe steppes on typical chernozem soils, fescue-feather grass on dark chestnut soils and wormwood-sod- on light chestnut soils, which occupy 23% of the territory of the republic.
• On soils with a low content of acid neutralizing components, ecosystems with low acid resistance have been formed, occupying 12% of the study area. These ecosystems are represented by psammophyte-sand-feather-grass communities on sands and also saxaul communities on sands, which have a low ability to neutralize acids.
• At the heart of the formation of ecosystem resilience to depositions of nitrogen compounds is a biological factor that reflects the level of nitrogen absorption, at which phytomass will not increase. Ecosystems with the highest nitrogen loads do not cause eutrophication predominate in the north and are represented by herbage-feather grass steppes on chernozems and also saxaul communities, because these communities absorb a larger amount of available nitrogen due to significant biomass .
• Psammophytic shrub communities on sands, biyurgun and boylach communities on solonetzes, which are prevalent in the south, have a low resistance to the intake of nitrogen compounds, which affects the reduction in the uptake and accumulation of nutrient nitrogen in the ecosystem.

References

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