



Soil-ecological risks for soil degradation estimation

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Soil degradation includes the processes of soil properties and quality worsening, primarily from the point of view of their productivity and decrease of ecosystem services quality. Complete soil cover destruction and/or functioning termination of soil forms of organic life are considered as extreme stages of soil degradation, and for the fragile ecosystems they are normally considered in the network of their desertification, land degradation and droughts /DLDD/ concept. Block-model of ecotoxic effects, generating soil and ecosystem degradation, has been developed as a result of the long-term field and laboratory research of sod-podzol soils, contaminated with waste, containing heavy metals. The model highlights soil degradation mechanisms, caused by direct and indirect impact of ecotoxicants on “phytocenosis- soil” system and their combination, frequently causing synergistic effect. The sequence of occurring changes here can be formalized as a theory of change (succession of interrelated events). Several stages are distinguished here – from heavy metals leaching (releasing) in waste and their migration downward the soil profile to phytoproductivity decrease and certain phytocenosis composition changes. Phytoproductivity decrease leads to the reduction of cellulose content introduced into the soil. The described feedback mechanism acts as a factor of sod-podzolic soil self-purification and stability.

It has been shown, that using phytomass productivity index, integrally reflecting the worsening of soil properties complex, it is possible to solve the problems dealing with the dose-reflecting reactions creation and determination of critical levels of load for phytocenosis and corresponding soil-ecological risks.

Soil-ecological risk in “phytocenosis- soil” system means probable negative changes and the loss of some ecosystem functions during the transformation process of dead organic substance energy for the new biomass composition.

Soil-ecological risks estimation is possible in qualitative, semi-quantitative and quantitative forms.

It has been shown that two principle indicators: (i) total technogenic load on soil-vegetation cover, (ii) critical load on the researched ecosystem are required for the qualitative assessment of soil-ecological risk for the systems with sod-podzol soils.