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CHANGES IN THE ENVIRONMENTAL SITUATION IN THE VOLGA REGION FROM 2000 TO 2016

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The study is devoted to the dynamics of changes in the ecological situation in the Volga region. Chronological period from 2000 to 2016 is selected for the period of the research. Taking into account ecological and economic aspects allows us to trace the dependence of changes in the environmental situation on trends in the economy. The study was carried out taking into account the analysis of the main environmental problems of the region, as well as the study of the origins of their formation. The result of the study is an integrated assessment of the environmental situation in the Volga region on the basis of the ecological and economic index.

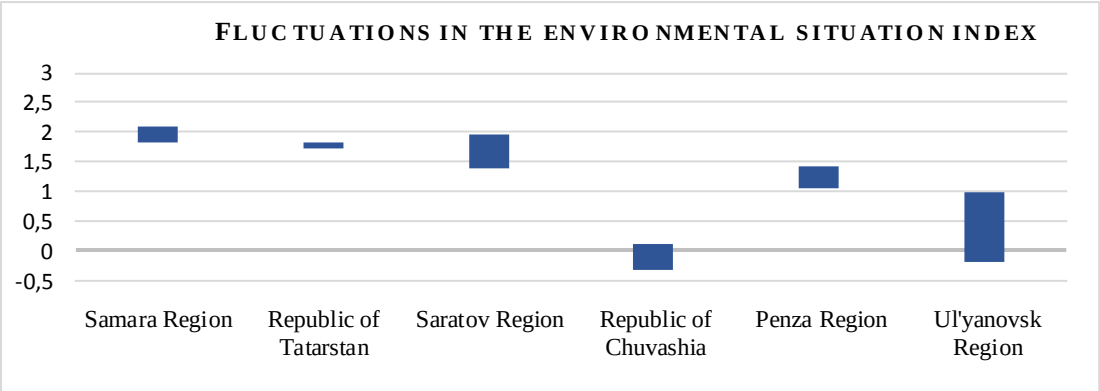
Keywords: the Volga region, environmental situation, assessment, integral index.

The current environmental situation in many regions of Russia has become a reflection of both the global trends of the twentieth century and the results of the socio-economic policy of the Soviet Union. The command and administrative model of the economy, which assumed large-scale industrialization and increase of production power, caused the emergence of environmental problems in the Volga region - one of the industrial centers of the USSR. Among the modern environmental problems of the Volga region include: soil pollution, water bodies and atmospheric air, reduction of forest area, reduction of biological diversity, shallowing of rivers, destruction of the ecological system of the Volga river.

Today, the importance of the Volga region for the economic, social and cultural development of the country is very great because of the existing economic and natural resource potential and beneficial EGP. The Volga economic region is one of the largest macro-regions of Russia and occupies a leading position in the development of economic sectors: in terms of industrial development, the Volga region ranks third after the Central and Ural Federal districts, and in terms of agricultural development-second after the Central Federal district and surpasses all CIS countries except Ukraine.

To assess the anthropogenic impact on the natural environment, indicator systems in a disaggregated form and integrated indices are used, allowing to take into account both environmental and economic indicators. Since the calculations require statistical data reflecting the dynamics of the impact on the environment in different periods, the indicators available in open statistical sources (Rosstat) were taken as a basis: the volume of investments in fixed assets aimed at environmental protection and rational use of natural resources (IOS); emissions of pollutants into the atmosphere from stationary sources; the level of discharge of pollutants from wastewater into river basins; the volume of waste and MSW.

Table 1



The environmental situation index revealed the main trends in the state of the environment, which consist in a consistent approximation of the calculated index. This fact points to the stabilization of the situation in the most developed regions of the Volga region, on the one hand, and the deterioration of the situation in economically underdeveloped regions, on the other. In General, the ecological situation in many regions of the Volga region is characterized as critical and requires further study of the factors of its change.

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SUBSTRATE CREATION FROM SEWAGE SLUDGE FOR BIOLOGICAL SOIL REMIDIATION

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This paper investigates the possibility of using man-made waste, mainly sewage sludge (SS) from sewage treatment plants in Lviv, as a component to create a substrate that can be used for biological reclamation of disturbed lands.

Keywords: sewage sludge, utilization, soil, zeolite, bioindication.

Wastewater treatment creates a significant amount of sewage sludge, which, when accumulated on sludge sites, adversely affects the environment (soil and groundwater contamination, greenhouse gas formation, etc.) and human health. As a result of ineffective approaches to utilization of sewage sludge, loss of valuable material and energy resources that can be used as secondary raw materials. Therefore, it is important to find available ways of sludge disposal. In our work, we propose to test the hypothesis of the possibility of using a mixture of man-made wastes containing an organic component to create a substrate that can be used for biological reclamation of land.

Two types of sewage sludge from Lviv MWTP were used for the study: fresh and settled. Bioindication was performed in accordance with State Standards of DSTU ISO 11269–1:2004 and 11269–2:2002. The following plants were used for bioindication: common barley (*Hordeum vulgare*), white mustard (*Sinapis alba*) and cress-salad (*Lepidium sativum*). The research was carried out in three stages: ***stage 1:*** studies were performed with settled sewage sludge and soil mixed in ratios (%): 100:0; 80:20; 60:40; 40:60; 20:80; 0:100. In the Petri dishes on the created substrate were planted seeds of barley, white mustard and cress-salad; ***stage 2:*** the study was carried out with fresh sewage sludge, with the addition of dark gray podzol soil in ratios (%): 100:0; 80:20; 60:40; 40:60; 20:80; 0:100. In the Petri dishes were planted seeds of common barley, etched barley (Vitawax 200 FF) and cress-salad. The repeatability is fourfold; ***stage 3:*** the study was performed with fresh sewage sludge with the addition of dark gray podzol soil in ratios (%): 100:0; 80:20; 75:25; 70:30; 65:35; 60:40 and zeolite (%): 0; 5; 7,5; 10, on which the seeds of barley were planted. Repeatability is threefold. During the studies phenological observations were conducted on the following indicators: time of appearance of sprouts, their number per day, total germination.

As a result of the ***first stage*** of research, it was found that the germination of plants was not observed in any samples, except for the control, which is explained by the presence of pathogenic microflora in the settled sewage sludge, which inhibited the growth of plants. During the ***second stage***, it was found that the germination of plants did not occur on substrates, where the proportion of sewage sludge exceeded 40 %. In these samples, the presence of pathogenic microflora was also observed. In samples with a sewage sludge level of 20 %, the germination of plants in each sample averaged 80 %. During the ***third stage*** of research, it was found that, when added to the mixture of sewage sludge and soil zeolite, germination was observed in all samples. In this case, the highest rate of ascent of barley showed samples with a zeolite level of 10 %, the average germination rate was 90 % (Fig. 1).