

Design of Geochemical Maps of Industrial City Using Gradient Boosting and Geographic Information System

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Abstract : Geochemical maps of distribution of polluting elements V, Cr, Mn, Co, Ni, Cu, Zn, Mo, Cd, Pb on the territory of the Pavlodar city (Kazakhstan), which is an industrial hub were designed. The samples of soil were taken from 100 locations. Elemental analysis has been performed using XRF. The obtained data was used for training of the computational model with gradient boosting algorithm. The optimal parameters of model as well as the loss function were selected. The computational model was used for prediction of polluting elements concentration for 1000 evenly distributed points. Based on predicted data geochemical maps were created. Additionally, the total pollution index Zc was calculated for every from 1000 point. The spatial distribution of the Zc index was visualized using GIS (QGIS). It was calculated that the maximum coverage area of the territory of the Pavlodar city belongs to the moderately hazardous category (89.7%). The visualization of the obtained data allowed us to conclude that the main source of contamination goes from the industrial zones where the strategic metallurgical and refining plants are placed.

Keywords : Pavlodar, geochemical map, gradient boosting, CatBoost, QGIS, spatial distribution, heavy metals

Conference Title : ICEEST 2023 : International Conference on Ecological, Environmental Science and Technology

Conference Location : Venice, Italy

Conference Dates : April 03-04, 2023