REMOTE-SENSING METHODS OF INDICATOR ESTIMATIONS OF GARDENING TERRITORIES PLACED BY MINING INDUSTRY WASTE

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Today across the world there are huge areas that are occupied by badlands left after intensive mining. Breeding dumps, sludge dumps, places of storage of ash and slag often represent a biological desert, which is difficult to remediate. For example, such places are sulfur rock dumps of mines in Donbas as a result of insufficient mineral nutrition and high acidity with sulfur concentration. Such zones show a low rate of self-growth and gardening. Mining wastes that accumulated for many years contain toxic components that are priority sources of environmental pollution.

The emergence of a sustainable vegetation cover in the post mining areas indicates the beginning of their biological recovery process which tends to accelerate and form a sustainable ecosystem. Vegetation is the dominant factor in the environment formation that can serve as an indicator for assessing the processes of disturbed lands remediation.

Using traditional field (labs) methods for studying vegetation cover in areas occupied by industrial waste are associated with a number of difficulties. For example, some places, such as ledges, loose embankments, swampy areas, can be dangerous to access and unsafe for botanical studies. In addition, such field research requires a lot of money for labor resources.

Modern GIS-technologies in combination with remote sensing methods based on multispectral satellite imagery allows to significantly simplify estimation of the vegetation cover and biomass on large areas. Moreover, they allow assessing the state of vegetation by biophysical indicators, followed by spatial and statistical analysis of the study areas.

The aim of the work was to investigate the dynamics of green plantations state on the rock dump territory with its sanitary protection zone of the coal mine "Stepova" (Pershotravensk, Dnipropetrovsk region) using remote-sensing methods.

The work used multispectral aerial photographs of high resolution that were obtained from the Sentinel-2A satellite. These images were processed in the ESA SNAP program using atmospheric correction modules and a biophysical processor. As a result, the maps of the surveyed territory were constructed for the summer periods of 2015 – 2017 according to the following indices: vegetative index, chlorophyll content in leaves, water content in leaves, coefficient of plants' absorption of solar radiation, canopy index and coating coefficient of leaves. Further on these indicators, a spatial statistical analysis of the territory was carried out using the ESRI ArcMAP program and the area statistics tools.

As a result of the analysis it was established that the area of green plantations on the territory of the sanitary protection zone increased during the study period by 5.8%. The area of green plantations on the territory of the dump almost did not change (-1.2%), as well as the state of plants on the average weighted indicators of chlorophyll and water content in the leaves.

Thus, based on biophysical indicators of the state of vegetation obtained using GIS-technologies combined with remote-sensing methods are advisable to evaluate the processes of ecosystem restoration in post mining areas.

Key words: Badlands, Reclamation, Gardening Territories, Remote-Sensing Methods