IDENTIFICATION OF ORGANIC COMPONENTS OF SOLID WASTE ON SATELLITE IMAGERY WHILE MANAGING ENVIRONMENTAL SAFETY

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Solid domestic wastes contain a components which can become nutrients for a pretty wide spectrum of types of microorganisms some of which are harmful for human and environment. The climate on territory of Ukraine promotes their intensive reproduction in such conditions. All organisms, including microorganisms, mainly consist of carbon and therefore represent the carbon containing components of waste dumps, namely organic. Monitoring of the conditions of microbiological pollution of urban systems on the territory of which surely there are solid waste damps as part of technogenic and ecological safety of these systems, can take one of main places in ecological safety management systems.

Data of remote scanning of Earth (RSE) from the Space is such source of information, that allows to get an actual operative picture of places of location of illegal waste dumps with low time expenses. RSE methods in combination with Geo Information Systems (GIS) and methods of mathematical modeling provides possibilities for complex studying of sources of formation of ecological danger and making decisions about ways for handling them. For successful carrying out tasks of the study it is necessary to use Space images of ultrahigh spatial resolution (0.5 – 15 m) in spectral diapason 0.4 – 1.1 microns with spatial reference.

The present study was carried out for the example of Dergachi polygon of solid domestic waste in Kharkiv region. Results of the study shows that in this case using of universal method we can not allocate the solid waste dump on the general background of a Space image with acceptable accuracy because this task solves many errors of 1st kind. For the polygon implementation of allocation of presumable place of accumulation of waste was executed using a model that was based on analysis of statistical moments of different orders (average value, dispersion, asymmetry and excess) in accordance with following algorithm: a) finding of average number of pixels in specific part of image by the way of developing of its model in program Toolbox/Model maker using the command Focal Scan/Fokal Mean; b) marking on the image the sector of polygon that corresponds to selected model for calculation of average number of pixels; c) developing of model of dispersion in Focal Scan/ Focal Standard deviation and presenting it on picture and then selecting of diapason of values of dispersion using histograms; d) determination in accordance with histograms of required parameters for detection of zone of accumulation of waste and then allocation of areas of carbon containing materials and organic components of legal or illegal dumps from other components of landscape; e) loading of image in program Arc Map, creation of shape-files and classification, vectorization and calculation of value of area.

Thus, in present study a model was developed that is based on the method of exclusion («cutting-out») on image of sectors of dump with low degree of danger such as construction debris and rock masses. This model allows to allocate areas of carbon containing materials and organic components of legal or illegal dumps. That allows increasing of efficiency of implementation of ecological monitoring.

Key words: Ecological Safety; Earth Remote Scanning; Organic Pollution, Waste dumps; Space Image; GIS-Technologies