

The Use of Automated Geomorphological Clustering for Purposes of Urban Planning (The Example of the City of Kazan)

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Abstract: Differentiation of the relief into separate elementary geomorphological sections yields the basis for most adequate determination of the boundaries of urban geosystems. In this paper the results of approbation of relief classification methods based on Artificial Neuron Networks are presented. The developed model of the restored landscapes represents the city territory as a system of geomorphologically homogenous terrains. The results can be used in the analyzing of informal arrangement of a territory, which is necessary for the adjustment of visual properties of a landscape by planning methods.

Key words: Artificial Neuron Networks • Relief classification • Landscape planning • Geomorphological clustering • City territory • Urban landscape • Functional zoning

INTRODUCTION

City is a complex system for sanitation, utilities, land usage, housing and transportation within a compact settlement area. Such clustering of people predetermines high concentration of the entirety of economic and social relations, which inevitably leads to the creation of a complex and sometimes self-contradictory, system. The conflict of interests in the given system generates a considerable and diverse set of problems to do with most different aspects. One of such aspects is a sphere of effective planning and protection of the environment.

Land-use planning and adoption of managerial decisions in conditions of urban territories, from the viewpoint of inventory and proper organization of a geographical space, would be facilitated if a city was built on a plain site of homogeneous genesis. Unfortunately, managerial decisions in cities are often made either without regard to any natural characteristics of a specific territory, or with regard to just a few factors. As a case in point one can take the development of the infrastructure for the World University Games to take place in 2013 in the city of Kazan. Planned comprehensive transformation of a number of natural ecological systems (river Kazanka, Lake Kaban, coastal territory, etc), neglect of a

scientifically grounded impact of such transformations on the environment and of public opinion led to the escalation of the social unease in the city.

Qualified managerial decisions in a big modern city should be based, first of all, on full and reliable information on key subsystems; in particular, on the environmental situation in the city. Attempts at distinguishing in a city of landscape elements of different taxonomy by traditional approaches are oftentimes doomed to failure by virtue of either full or partial transformation of soil covering, biogeocenoses, underground waters and even composition of underlying rock. In this sense "landscape" mapping of urban territories should be based on the most reliable diagnostic property allowing for regional differentiation of geosystems, the source of a true information about the landscape structure of a city - the relief. Differentiation of the relief into separate elementary geomorphological sections yields the basis for most adequate determination of the boundaries of urban geosystems.

Development of computer engineering and advanced information technologies allow for the use of modern geoinformation systems for effective modeling of the environment. Application of GIS technologies in the landscape mapping proved to be very successful,