



GIS-technology for the rationalization of Landscape-environmental systems

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Landscape-environmental line is being actively developed in Russia landscape science. Its basic aim is to investigate the results of interactions between natural, economic and social structures in various spatial and time scales. Such works demand the application of new GIS-technologies for analysis of concrete landscape units. Nowadays the map "Landscape-environmental system of Europe" at the scale of 1:5 Mln has been created at the Faculty of Geography of the Moscow State University. Approaches and methods have been demonstrated on the fragment of this map including the key area of the British Isles. Following stages of research have been worked: 1. Elaboration of LES model. Landscape-environmental system (LES) is a unit of *natural landscapes* changed by various economic activities. LES is a complex geosystem, which develops and functions as a result of interactions between *natural* (relief, climate, water, soils and vegetation), *technological* (material objects of settling and activities of society: arable, pastoral, silvicultural or their combinations) and *management* subsystems. 2. Compilation of series of the maps. The maps "*Geographic Belts, Natural Zones and Types of Landscapes in Europe*", "*Economic development systems of Europe*" were created at the scale of 1:5 Mln. So, the area of British Isles was divided into two zones, seven classes and 68 present-day landscapes types. Totally there are 613 landscape units on the map *Present-Day Landscapes of Europe*. The legend shows a complex hierarchy of these natural-territorial units. 3. Elaboration of GIS Landscape-Environmental Systems (LES) of Europe. A specialized geographical information system (GIS) has been elaborated in order to organize storage and processing of this vast data array. The GIS includes the following sections: A. Cartographic, i.e. digital versions of maps; B. Thematic database – data array

of 48 000 parameters on nature components, systems of economic development and natural-anthropogenic processes. C. Main technical and program means; D. Results of GIS-technologies realization. The main problem was the calculation of areas because the most widespread in Europe at present are landscapes without any predominant type of land use. This is particularly true for densely populated regions with highly developed infrastructure and, sometimes, with very diverse relief pattern. Fragmentation of land use systems, i.e. their rapid changes over short distances, is particularly characteristic of the European countries. 4. Investigation of *natural-anthropogenic processes* in landscapes. These processes are stimulated by economic activities. There are *two types* of processes: positive (constructive) and negative (destructive). Due to the processes of the first type the productivity of landscapes is being maintained or even increased. They are typical for the areas with long-lasting differentiated soil cultivation, careful monitoring of humus and NPK content in soils and their hydro-physical parameters and application of complex crop rotation to reduce the risk of water and wind erosion. Different ameliorations provide for high yields even from the lands with rather low natural fertility. The processes of the second type lead to the degradation or destruction of landscapes. They are the result of the insufficient agricultural activities or the influence of industrial and urban emissions and wastes.

The GIS was used to compile maps of particular natural-anthropogenic processes, as accelerated erosion, compaction, acidification, pollution, etc. and to calculate the areas of landscapes with these processes.