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USE OF GIS SYSTEM IN ECOLOGY

Aydos Sabirovich,
Jaksibaev Rashid Nietalievich
Karakalpak State University named after Berdak
Teacher of the department of geodesy, cartography and natural resources

Annotation: This article examines GIS technology, its essence and application in solving environmental problems. Many ecologists are put off by these challenges and give up trying to use GIS in their research. However, GIS is a powerful tool for ecologists, and in our experience, if properly introduced, anyone can pick it up quickly and easily, greatly benefiting their research. We aim to do this using the kind of language that ecologists understand, and to show them how to use GIS for everyday tasks that ecologists need to know to quickly start using GIS in their research.
Key words: Ecology, environmental problems, GIS system, information technologies in solving environmental problems.

Introduction. Geographic Information System (GIS) is increasingly recognized as a crucial tool in various domains of environmental research. Nevertheless, acquiring proficiency in utilizing GIS for environmental research is not always a straightforward endeavor. This predicament is further exacerbated by the dearth of training, guidance, and advice tailored to the specific GIS skills required by ecologists, as opposed to geographers.

Humanity is currently experiencing rapid development across various domains, including science and technology. Despite the increasing industrial capacity, there is a notable lack of attention being given to the state of the environment. This oversight is unacceptable as humans are an integral part of our planet, just like other organisms. Environmental degradation, frequently resulting from human activity, poses a significant challenge. While humans strive to create comfort for themselves, they simultaneously contribute to the destruction of nature. Consequently, it is imperative to prioritize the incorporation of information technologies, such as Geographic Information Systems (GIS), in the resolution of environmental problems.

Literature review. A geographic information system (GIS) is a comprehensive system designed for the purpose of collecting, storing, analyzing, and visually representing spatial (geographic) data along with pertinent information pertaining to the relevant objects [1]. This term can also encompass a more restricted definition, wherein GIS serves as a tool facilitating the exploration, analysis, and modification of digital maps and accompanying data regarding objects, including their dimensions and elevations.

In the early 1900s, ecological studies began to adopt a systematic approach that allowed for the breakdown of data into measurable components and subsequent mapping of these components as distinct layers, such as soil, geology, and vegetation. This parametric approach has been significantly enhanced by advanced aerial photography technology, which enables researchers to observe, measure, and record individual parameters on ecological maps. The first institutions to use parametric mapping on a large scale were the US Soil Conservation Service, which thematically mapped soils and associated natural factors as a method for spatially predicting changes in agriculture [2]. Since the introduction of GIS applications in the early 1970s, the focus of GIS has primarily revolved around representing and analyzing land cover and land use for ecological purposes [6, 3]. In the early 1980s, environmental applications in GIS emerged as one of the main areas of GIS application, driven by the development of various datasets by national and local governments [5].

GIS tools surpass the capabilities of conventional mapping systems, encompassing fundamental functionality required for generating maps and plans of superior quality. The GIS concept inherently offers a diverse array of opportunities for the gathering, integration, and analysis of spatially distributed or location-based data. If the objective is to present existing data in the format of a map, graph, or diagram, to establish, augment, or modify a database, or to merge it with other databases, it is the right way to turn to GIS [4].

A geographic information system (GIS) is utilized for the purpose of generating maps that depict various key environmental parameters. Furthermore, these maps are employed to ascertain the degree and pace of degradation affecting flora and fauna as new data becomes available. By integrating satellite data, both local and large-scale anthropogenic impacts can be effectively monitored. It is highly recommended to incorporate information pertaining to anthropogenic loads within zoning maps for areas of significant environmental importance, such as parks and reserves. Additionally, with the aid of designated test areas encompassed within all layers of the map, it is feasible to assess the status of the natural environment and the rate at which degradation is occurring [7].

Discussion. Environmental issues worldwide necessitate prompt and appropriate actions, the efficiency of which relies on information processing and presentation. To adopt an integrated approach, it is imperative to consider the overarching features of the environment. These characteristics are numerous, and an organized approach to systematizing this information is also crucial. The grouping, presentation, comparison, and analysis of data depend on the researcher's expertise and the chosen methodology. At this juncture, the researcher's technical resources, encompassing suitable hardware and software for solving the task, assume significance, with modern geographic information systems technology serving as a supportive tool.

Conclusion. With the utilization of a Geographic Information System (GIS), the distribution and impact of pollution originating from both point and nonpoint sources in the atmosphere, land, and hydrological network can be modeled. The outcomes of these computations are then depicted on thematic maps, such as those showing vegetation or residential areas within a specific region. This enables a prompt evaluation of the immediate and future repercussions of extreme occurrences, such as oil spills and other environmentally detrimental substances, as well as the ramifications resulting from the continuous operation of point and area pollutants.

This system serves as a valuable tool for the temporal and spatial analysis of specific flora and fauna habitats. For instance, ecological parameters crucial for the survival of a particular animal species encompass suitable grazing areas, breeding grounds, adequate food resources, natural water sources, and an unpolluted environment. In such instances, GIS can swiftly identify areas with an optimal combination of these parameters, where conditions are conducive to the existence or restoration of a population of the said species.

It is commendable that contemporary technologies possess the capacity not only to ravage our natural environment, but also to shield and rehabilitate it. The arduous endeavors of developers involved in intricate systems, such as Geographical Information Systems (GIS), ought to yield advantageous outcomes for the global environmental predicament. In the pursuit of resolving environmental dilemmas, information technology serves as a promising stride towards the future.

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