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GEOINFORMATION SYSTEMS OF FORMATION AND USE OF LANDS OF THE NATURAL FUND OF REGIONS: MODERN EDUCATIONAL DIRECTIONS OF PROGRAMS OF PREPARATION OF MASTERS

The relevance of the research topic on the development and implementation of master's programs geographic information systems of formation and use of lands of the natural fund of the regions is proved. The purpose of the study is to determine the directions and features of the development of the educational master's program geographic information systems of formation and use of lands of the natural fund of the regions. In accordance with the set goal the following tasks are solved: substantiation of components of the master's program on geoformation systems of formation and use of lands of natural fund of regions; characteristics of practical aspects of application of the master's program on geographic information systems of formation and use of lands of the natural fund of regions. The components of the master's program on geoformation systems of formation and use of lands of the natural fund of regions are determined. The objectives of the study within the framework of the master's program in geoformation systems of formation and use of lands of the natural fund of the regions are substantiated. The practical aspects of its implementation are determined. The modules of the master's program of formation and use of natural fund lands are offered: directions and features of application of geoformation systems in the field of formation and use of natural fund lands; methods and models used in geoformation analysis; directions and features of formation and use of natural fund lands; implementation of the system of formation and use of natural resources with the use of geographic information systems; development of scientifically sound recommendations for improving the efficiency of formation and use of natural resources.

It is established that the development and implementation of a master's program in geographic information systems for the formation and use of natural resources allows the use of modern information systems to solve complex problems of land use, taking into account spatial, environmental and investment factors. On the basis of this program is the training of masters who implement the acquired knowledge in scientific and practical fields, which allows to create conditions for the development of areas of formation and use of natural resources.

Keywords: *geoinformation systems, formation and use of natural resources, educational areas, master's program.*

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Introduction

Modern directions of regional development require a rethinking of approaches to the formation and use of natural resources. Of particular importance are the processes of protection of this land fund and the environment, ensuring the efficiency of their use, the use of information support tools. In this context, it should be noted the use of information systems for the formation and use of lands of the natural resources of the regions. To perform this complex task, it is necessary to train specialists in geographic information systems in the field of formation and use of natural resources of the regions. Thus, the research topic is relevant and important for regional development, scientific and educational systems.

Analysis of existing research

Scientific developments on the application of geoinformation systems and technologies are identified [1–7].

In addition, there are unresolved issues regarding the definition and application of geographic information systems in the field of formation and use of natural resources and training of qualified specialists in this field.

The objectives of the study

The purpose of the study is to determine the directions and features of the development of the educational master's program geographic information systems of formation and use of lands of the natural fund of the

regions. In accordance with the goal the following tasks are solved: substantiation of the components of the master's program in geographic information systems of formation and use of lands of the natural fund of the regions; characteristics of practical aspects of application of the master's program on geoformation systems of formation and use of lands of the natural fund of regions.

Main part

The components of the master's program on geoformation systems of formation and use of lands of the natural fund of regions are determined. The master's program is aimed at the formation of theoretical foundations, development and application of geoformation systems based on spatial information and information and analytical support for the formation and use of natural resources of the regions. The master's program uses cartographic information and geodetic information and equipment for training.

Substantiated learning objectives within the master's program in geoformation systems of formation and use of natural resources of the regions, which are to create in graduates the ability to solve complex specialized problems and practical problems in the process of professional activity or training, involving theoretical knowledge of geographic information systems and equipment in the field of topographic and geodetic production in order to obtain and analyze geospatial data on the formation and use of natural resources of the regions.

According to the Law of Ukraine «On the Nature Reserve Fund of Ukraine» it is determined:

– natural territories and objects - nature reserves, biosphere reserves, national nature parks, regional landscape parks, reserves, natural monuments, protected tracts;

– artificially created objects - botanical gardens, dendrological parks, zoological parks, natural monuments, parks-monuments of garden and park art;

– reserves, natural monuments, botanical gardens, dendrological parks, zoological parks and parks-monuments of landscape art, depending on their ecological and scientific, historical and cultural value may be of national or local importance;

– depending on the origin, other features of natural complexes and objects declared nature reserves or monuments, purpose and necessary mode of protection:

– reserves are divided into landscape, forest, botanical, general zoological, ornithological, entomological, ichthyologic, hydrological, general geological, paleontological and karst-speleological;

– natural monuments are divided into complex, virgin, botanical, zoological, hydrological and geological. Natural monuments can be located on the territory of other objects of the nature reserve fund [8].

It is determined that the lands of the nature reserve fund are areas of land and water space with natural complexes and objects of special nature protection, ecological, scientific, aesthetic, recreational and other value, which according to the law are granted the status of territories and objects. nature reserve fund.

Lands of the nature reserve fund of Ukraine, as well as lands of territories and objects that have special ecological, scientific, aesthetic, economic value and are objects of complex protection, belong to the lands of the nature reserve fund and other nature protection or historical and cultural purpose. On the lands of the nature reserve fund and other nature protection or historical-cultural purpose any activity that negatively affects or may negatively affect the condition of natural and historical-cultural complexes and objects or prevents their use for the intended purpose is prohibited. On the lands of territories and objects of the nature reserve fund, which are created in the exclusion zone and the zone of unconditional (obligatory) resettlement of the territory, which was exposed to radioactive contamination as a result of the Chornobyl catastrophe, any activity that does not ensure radiation safety is prohibited [8].

For the implementation of the master's program, the regulatory and legal provision for the formation and use of natural resources:

– laws of Ukraine: «On environmental protection», «On the nature reserve fund of Ukraine», «On fauna», «On flora»;

– codes: Land, Forest, Water codes of Ukraine;

– international programs and conventions: on wetlands of international importance, mainly as habitats for waterfowl, on the protection of world cultural and natural heritage, on the protection of wild flora and fauna and natural habitats in Europe, on the conservation of migrants species of wild animals, on the protection of the Black Sea from pollution, on the protection of biological diversity, the Pan-European Strategy for the Conservation of Biological and Landscape Diversity, on the protection and reproduction of transboundary watercourses and international lakes.

The objectives of the legislation of Ukraine on the protection, use and reproduction of wildlife are:

– regulation of relations in the field of protection, use and reproduction of wildlife;

– preservation and improvement of wildlife habitat;

– providing conditions for the preservation of all species and population diversity of animals.

It should be noted that for the formation and use of natural lands are determined by the basic provisions for the creation of wildlife, which are covered by the Law «On Fauna»:

– wild animals - chordates, including vertebrates (mammals, birds, reptiles, amphibians, fish, etc.) and invertebrates (arthropods, mollusks, echinoderms, etc.)

in all their species and population diversity and at all stages of development (embryos, eggs, pupae, etc.), which are in a state of natural will, kept in semi-free conditions or in captivity;

– parts of wild animals (horns, skin, etc.);

– products of wildlife (honey, wax, etc.);

– objects of fauna, as well as burrows, huts, dens, anthills, beaver enclosures and other housing and structures of animals, places of breeding, molting, nesting colonies of birds, permanent or temporary clusters of animals, spawning grounds, other areas that are their environment existence and migration routes are subject to protection. Ownership of wildlife is acquired and exercised in accordance with the Constitution of Ukraine, the Law and other laws of Ukraine. Objects of the animal world, which are in a state of natural freedom and are located within the territory of Ukraine, its continental shelf and exclusive (marine) economic zone, are objects of property rights of the Ukrainian people. On behalf of the Ukrainian people, the rights of the owner of wildlife objects, which are a natural resource of national importance, are exercised by public authorities and local governments within the limits set by the Constitution of Ukraine. Every citizen has the right to use the objects of the animal world - the objects of property rights of the Ukrainian people in accordance with this Law and other laws of Ukraine. Wildlife objects in Ukraine can be in state, communal and private ownership. Wildlife objects in Ukraine are under state protection regardless of the right of ownership. During the measures for the protection, rational use and reproduction of wildlife, as well as during the implementation of any activity that may affect the habitat of wild animals and the state of wildlife;

– preservation of the conditions of existence of species and population diversity of the animal world in a state of natural will;

– inadmissibility of deterioration of habitat, migration routes and breeding conditions of wild animals;

– preservation of the integrity of natural groups of wild animals;

– observance of scientifically substantiated norms and limits of use of objects of the animal world, maintenance of their inexhaustible use, and also reproduction;

– rational use of useful properties and products of wildlife;

– payment for special use of wildlife;

– regulation of the number of wild animals in the interests of public health and prevention of harm to the environment, economic and other activities;

– taking into account the results of environmental impact assessment of objects of economic and other activities that may adversely affect the state of the animal world.

– citizens in accordance with the law have the right to: general and special use of wildlife; own individual objects of the animal world; to compensate for damage caused by wild animals;

– citizens are obliged by law to: protect wildlife and wildlife habitats; to promote the reproduction of renewable objects of the animal world; use objects of the animal world in accordance with the law; to compensate the damage caused by them to the animal world as a result of violation of the requirements of the legislation on protection, use and reproduction of the animal world [9].

The task of the legislation of Ukraine on flora is to regulate public relations in the field of protection, use and reproduction of wild and other non-agricultural vascular plants, mosses, algae, lichens, as well as fungi, their groups and habitats. Natural plant resources according to their ecological, economic, scientific, health, recreational value and other features are divided into natural plant resources of national and local importance. Natural plant resources of national importance include: a) objects of flora within: inland sea waters and the territorial sea, the continental shelf and the exclusive (marine) economic zone of Ukraine; surface waters (lakes, reservoirs, rivers, canals), located and used in more than one area, as well as their tributaries of all orders; natural and biosphere reserves, national nature parks, as well as reserves, natural monuments, botanical gardens, dendrological parks, zoological parks, parks-monuments of landscape art of national importance; b) forest resources of state importance; c) rare and endangered vascular plants, mosses, algae, lichens, as well as fungi, the species of which are listed in the Red Book of Ukraine; d) rare and endangered and typical natural plant communities listed in the Green Book of Ukraine. The legislation of Ukraine may include other objects of the plant world as natural plant resources of national importance. Natural plant resources of local significance include wild and other non-agricultural vascular plants, mosses, algae, lichens, as well as fungi that are not classified as natural plant resources of national importance. During the implementation of activities that affect the state of protection, use and reproduction of flora, it is necessary to comply with the following basic requirements: preservation of natural spatial, species, population and coenotic diversity of flora; preservation of habitat conditions of wild plants and natural plant communities; scientifically sound, inexhaustible use of natural plant resources; implementation of measures to prevent the negative impact of economic activity on flora; protection of flora from fires, protection from pests and diseases; implementation of measures for the reproduction of flora; regulation of the distribution and number of wild plants and the use of their reserves, taking into account the interests of public health. These requirements are taken into account during the development of

draft legislation, national, interstate, regional programs and the implementation of measures for the protection, use and reproduction of flora. State administration in the field of protection, use and reproduction of flora is carried out by the Cabinet of Ministers of Ukraine, the Council of Ministers of the Autonomous Republic of Crimea, local executive bodies and local governments, the central executive body implementing state policy on state supervision (control) in the field of protection environment, rational use, reproduction and protection of natural resources, and other central executive bodies in accordance with their competence. Citizens and their associations in accordance with the law have the right to participate in the consideration of central executive bodies, the Council of Ministers of the Autonomous Republic of Crimea, local executive bodies and local governments issues related to the protection, use and reproduction of flora. bodies in the implementation of measures for the protection, non-exhaustive use and reproduction of flora, as well as to initiate appropriate measures [10].

The master's program defines the principles and concepts of development and implementation of geographic information system of formation and use of lands of the natural fund of the regions, deepening knowledge of mathematics, information technology, spatial analysis, geodesy.

Methods and techniques of geoformation analysis, use of geoformation technologies, formation and processing of geospatial data on lands of the natural fund of regions are applied. Geodetic, navigation, aerial survey equipment, photogrammetric and cartographic tools, specialized geoformation software are used.

In the process of preparing masters, general competencies are defined and formed: ability to written and oral communication; to study and perceive the acquired values in the field of geographic information systems of formation and use of lands of the natural fund of regions; formation of critical thinking and provision of communications in the field of formation and use of the natural fund of regions; time planning and development of new ideas, creativity and ability to think systematically; opportunities to analyze information; opportunities to conduct research and ensure security in the field of formation and use of natural resources; ability to communicate effectively at the professional and social levels.

The master's program defines special competencies, which are aimed at: the formation of scientific concepts, theories and methods for the development and implementation of geographic information systems for the formation and use of natural resources; creation of information-analytical and normative-legal support; knowledge of technical characteristics, design features, purpose and rules of operation of geographic information systems; specialized software and information systems and basic programming skills to solve applied professional problems; ability to use knowledge and technologies of geoformation analysis in the field of formation and use of natural resources; ability to apply methods and models of geoformation analysis, systems and technologies; ability to identify, classify and describe digital models through the use of analytical methods and modeling methods; identifying opportunities to research and solve problems in the field of formation and use of natural resources.

The results of training in the educational master's program geographic information systems of formation and use of lands of the natural fund of the regions are:

– use orally and in writing technical Ukrainian language and be able to communicate in a foreign language (English) among specialists in geodesy and land management;

– know the theoretical foundations of geographic information systems and technologies, spatial and geodetic support;

– to form regulatory and legal support for the formation and use of natural resources, areas and features of state registration of land, other real estate and restrictions on their use;

– apply methods and models, technologies for the application of geodetic instruments, geographic information systems and technologies, unmanned technologies for the formation and use of natural resources;

– use methods of collecting information in the field of formation and use of natural resources;

– use geodetic and photogrammetric equipment and technologies, methods of mathematical processing of geodetic and photogrammetric measurements;

– use methods and technologies of land management design, territorial and economic land management, land use planning and protection, cadastral surveys and maintenance of the state land cadaster;

– use methods and models of geoformation analysis in the field of formation and use of natural resources;

– develop projects of land management, land management and cadastral documentation and land valuation documentation, compile maps and prepare cadastral data using computer technology, geographic information systems and digital photogrammetry;

– process the results of geodetic measurements, topographic and cadastral surveys, using geographic information technologies and computer software and database management systems;

– process the results of geoformation analysis of the formation and use of natural resources;

– have methods and models of geoformation analysis;

– have methods of land management design, territorial and economic land management, planning the formation and use of natural resources;

– have methods of organizing topographic, geodetic and land management production from field measurements;

– have geoformation technologies for modeling and analysis of spatial objects and phenomena;

– to evaluate the lands of the natural fund.

The modules of the master's program of formation and use of lands of natural fund are offered:

– directions and features of application of geoinformation systems in the field of formation and use of natural fund lands;

– methods and models used in geoformation analysis;

– directions and features of formation and use of natural fund lands;

– implementation of the system of formation and use of natural resources with the use of geographic information systems;

– development of scientifically sound recommendations for improving the efficiency of formation and use of natural resources.

The practical aspects of application of the master's program on geoformation systems of formation and use of lands of the natural fund of regions which are generalized in the developed geoformation maps of the corresponding indicators are defined (fig. 1–5).

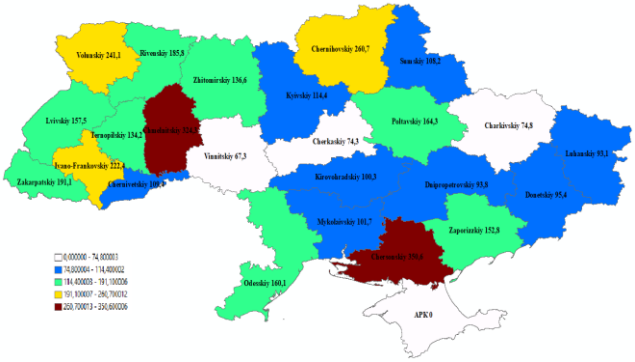

Fig. 1. Geographic information map of land areas of reserves and national nature parks by region as of January 1, 2019, thousand hectares according to [11].

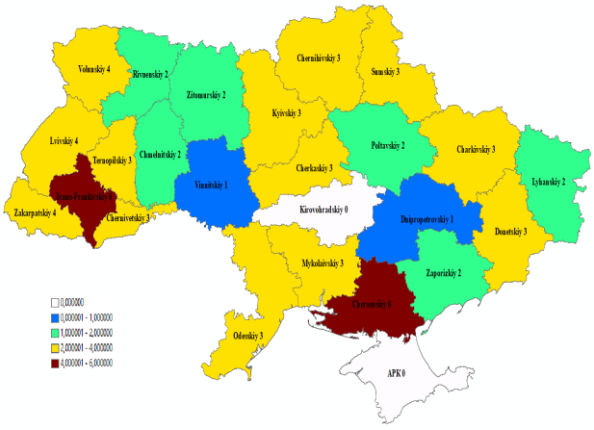

Fig. 2. Geoinformation map of the number of NPF objects by regions, units according to [11]

Fig. 3. Geographic information map of the number of nature reserves by region, units according to [11]

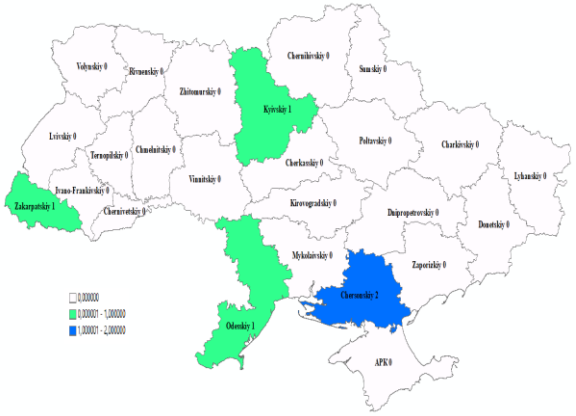

Fig. 4. Geographic information map of the number of biosphere reserves by region, units according to [11]

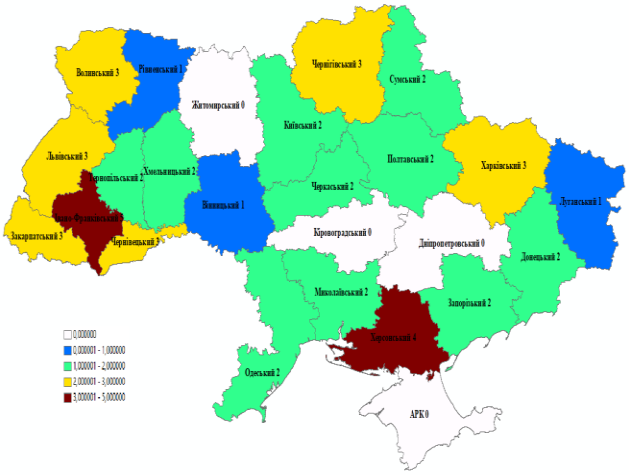

Fig. 5. Geographic information map of the number of national nature parks by region, units according to [11]

Conclusions

The development and implementation of a master's program in geographic information systems for the formation and use of natural resources allows the use of modern information systems to solve complex problems

of land use, taking into account spatial, environmental and investment factors. On the basis of this program is the training of masters who implement the acquired knowledge in scientific and practical fields, which allows to create conditions for the development of areas of formation and use of natural resources.

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ГЕОІНФОРМАЦІЙНІ СИСТЕМИ ФОРМУВАННЯ ТА ВИКОРИСТАННЯ ЗЕМЕЛЬ ПРИРОДНОГО ФОНДУ РЕГІОНІВ: СУЧАСНІ ОСВІТНІ НАПРЯМКИ ПРОГРАМ ПІДГОТОВКИ МАГІСТРІВ

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Доведено актуальність теми дослідження щодо розробки та впровадження магістерських програм географічних інформаційних систем формування та використання земель природного фонду регіонів. Метою дослідження є визначення напрямків та особливостей розвитку програми освітньої програми географічних інформаційних систем формування та використання земель природного фонду регіонів. Відповідно до поставленої мети вирішуються такі завдання: обґрунтування складових магістерської програми з геоінформаційних систем формування та використання земель природного фонду регіонів; характеристики практичних аспектів застосування магістерської програми з геоінформаційних систем формування та використання земель природного фонду регіонів. Визначено складові магістерської програми з геоінформаційних систем формування та використання земель природного фонду регіонів. Обґрунтовано цілі дослідження в рамках магістерської програми з геоінформаційних систем формування та використання земель природного фонду регіонів. Визначено практичні аспекти його реалізації. Запропоновано модулі магістерської програми формування та використання земель природного фонду: напрямки та особливості застосування геоінформаційних систем у галузі формування та використання земель природного фонду; методи та моделі, що використовуються в аналізі геоінформації; напрями та особливості формування та використання земель природного фонду; впровадження системи формування та використання природних ресурсів із застосуванням геоінформаційних систем; розробка науково обґрунтованих рекомендацій щодо підвищення ефективності формування та використання природних ресурсів.

Встановлено, що розробка та реалізація магістерської програми в геоінформаційних системах формування та використання природних ресурсів дозволяє використовувати сучасні інформаційні системи для вирішення складних проблем землекористування з урахуванням просторових, екологічних та інвестиційних факторів. На основі цієї програми здійснюється підготовка магістрів, які впроваджують набуті знання в науково-практичній галузі, що дозволяє створити умови для розвитку сфер формування та використання природних ресурсів.

Ключові слова: *геоінформаційні системи, формування та використання природних ресурсів, освітні галузі, магістерська програма.*