

МОНІТОРИНГ ТА ОХОРОНА ЗЕМЕЛЬ. ГЕОГРАФІЧНА КАРТОГРАФІЯ

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WEB-MAPPING POTENTIAL AND ITS USE FOR MAPPING OF LAND VALUE PARAMETERS

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Abstract. Web mapping is a powerful tool for visualizing geospatial information about those properties of land resources that determine the parameters of their value assessment, as well as the influence of natural and anthropogenic factors on land parameters. MapServer rendering of land valuation parameters can be solved with MapServer services. Another problem with web mapping of land parameters is the question of the qualitative and quantitative characteristics of the data that will be used to create the mapping materials. Currently, there are well-developed web-mapping technologies in the world that allow you to visualize the indicators and parameters of land and their condition by means of geo-mapping using a variety of techniques for displaying them to the user. Currently, the main features are: Map Server open source and ArcGIS Server commercial platform. Expanding the web mapping are the priority of expanding the palette of imaging tools and improving ways to display complex attribute, including simultaneous, information in combination with mapping images, while developing client-server technologies to implement OGC tasks using web 3.0 and web 4.0.

Keywords: web mapping, land resources, land valuation parameters, land quality mapping.

Topicality.

Web services as a tool for operating information about geospatial objects are widely used all over the world, including the field of natural resources management [12, 13, 21], among them the display of land parameters by means

of the geoportal of the Public Cadastral Map of Ukraine. At the same time, the potential of land resources web-mapping, including the parameters of land valuation, is not fully used in our country, and its implementation makes possible to improve the efficiency of administration significantly. A set of multiple

complex indicators displayed in the form of electronic maps is not only a difficult technical task, but also makes it tough to form their set and structure, which is the subject of study of electronic atlas mapping [7, 8, 9, 11, 17].

The aim of the study is to characterize the potential of web-mapping technologies for the parameters of land valuation and the factors that influence their implementation.

Analysis of recent research and publications.

Among the terms related to web mapping, the most commonly used are “Cartographic Web Service”, “Web Map”, “Web Mapping”. Although these new terms in cartography are firmly in the vocabulary and are often used in journalistic and scientific materials for some time, their exact and unambiguous definition is unfortunately not yet formulated, which often leads to their free interpretation by different authors [5].

A variety of mapping technologies are often used to visualize geospatial information. One of them is the creation of electronic atlases. The electronic atlas acts as a systemized set of interactive maps rendered using computer graphics and geoinformatics technologies [1, 17].

The basis for the development of modern mapping services is still Web 2.0 technologies that enable users to participate in content creation, including mapping. The operation of mapping services is based on mapping server software development technologies. The basis of the technology of all mapping servers is the creation of tile storage systems. The server stores vector and raster information in the form of bitmaps of the same size, but with different detail depending on the scale at which the map is viewed

by the user. The main advantage of using the tile system is the ability to transmit the necessary information via the Internet in the short term with additional data from the owner [10].

As a virtual atlas may be a computer program or online service, which is an alternative way of presenting classic atlases. A virtual atlas in the form of a program can already contain all the necessary information or upload the necessary data from the Internet (photos, satellite and aerial photos, reference data and descriptions, geographical names, etc.). A virtual atlas in the form of an online service implements an interface with the user via a web browser [1].

At the same time, as noted by A.P. Dyshlyk [4], the lack of accuracy and relevance of geospatial data, their slow updating, high cost and limited availability have not satisfied the ever-increasing demand of users for a long time. The process of creating vector maps is quite expensive and time-consuming. With the enlargement of the scale, the value of data sharply increases and its validity period is rapidly reduced. From a certain scale, the maintenance of large-scale maps (plans) in an up-to-date state of affairs, according to the author, becomes impossible at all.

Traditional cartography is being replaced by cybercartography, an information age cartography. This approach has been actively promoted by D.R.F. Taylor, a professor at Carleton University (Ottawa, Canada), starting with a speech at the 18th International Cartographic Conference in Stockholm (Sweden, 1997) [19]. Cybercartography is defined as “the organization, presentation, analysis and communication of spatial information on a wide variety of public interest topics in an interactive, dynamic, multisensory format using multimedia and multimodal interfaces” [4, 18-20].

Results of the study and discussion.

Geoportal is defined as a collection of Internet-based assets that maintains aggregate information about geo-information resources in a particular territory and geospatial data services, and provides access via the Internet. Geoportals are one of the most important technological components of any geospatial data infrastructure. They provide wide and open access to the geospatial data for citizens, economy units, scientific institutions, public authorities, local authorities, as well as dissemination and exchange in order to increase their production and use efficiency [3].

Fig. 1 presents the “evolution” of web-maps by O.P. Dyshlyk [4]: from static, which are essentially an electronic display of a paper map, through intermediate stages (distributed, animated, etc.) to interactive, analytical and

complex, which have developed tools for working with a web map, which is already a complex multilevel multimedia product.

Although, in our opinion, the author applies several classifications of web maps at the same time, which does not contribute to a better understanding of the process of historical (evolutionary) development of these cartographic works.

Due to the formations of web technologies development, both atlas information systems of non-classical or neo-classical type and classical type of the formations following after Web 1.0 are taken into account. According to V.S. Chabanyuk, O.P. Dyshlyk [9], a feature of this interpretation of formations following Web 1.0 is controllability and evolution. According to the authors, controllability means that such new generation systems must and will conform to the above conceptual framework, and evolutionary means that non-geograph-

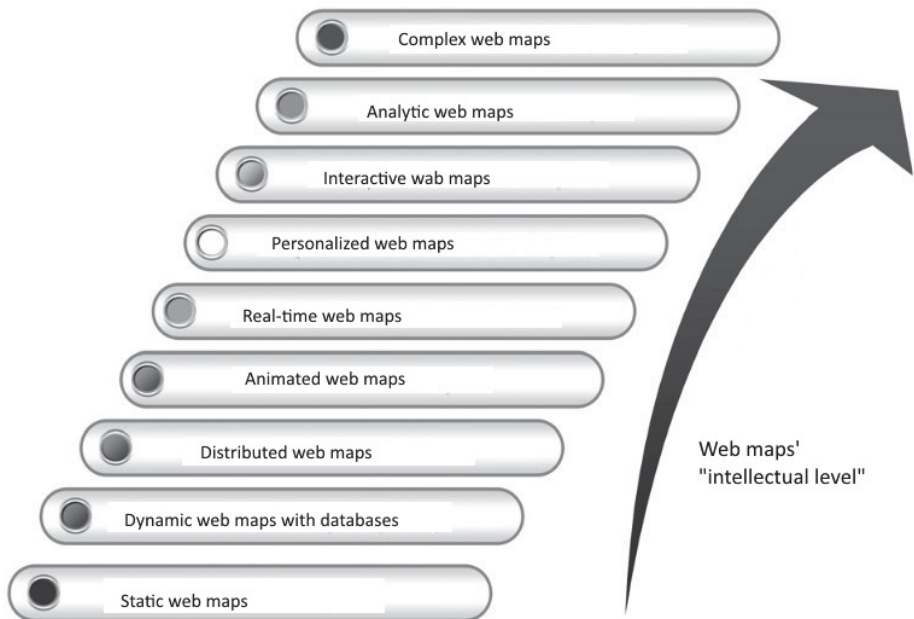


Fig. 1. Web maps types (according to O.P. Dyshlyk [4]).

ic and neo-cartographic works cannot have a revolutionary nature. Web 1.0x1.0 formation is intermediate between Web 1.0 and Web 2.0. Its purpose is to take into account the phenomenon of mobile devices - smartphones and tablets. Their development and prevalence forces atlas developers to create solutions that need to work on these devices with relatively small screen space, and also under offline conditions, i.e. disconnection from the Internet (by V.S. Chabanyuk, A.P. Dyshlyk, [9]).

Web 4.0 services are considered to be standalone, proactive, self-learning, collaborative, and content-based content formed on mature semantic and content technologies and artificial intelligence (AI). They will support responsive content presentation that will use a web-based database through a smart agent. Examples include sensor and implant-interacting services, natural language services, or virtual reality services. [15]. Today we are already watching their formation.

From the point of view of the issue under consideration, MapServer is best known for its web mapping capabilities among all similar tools, and it also comes with a command line toolkit. It can be used for such tasks as to create static map images for web pages, documents or e-mail [14].

A large number of modern mapping software, as well as the vast majority of online mapping materials and projects, are focused specifically on the use of this approach in visualization and data access.

Some applications require the availability of data in specific file or database formats. This is especially true for commercial products, as most vendors support their own proprietary, poorly supported for all formats from competitors. This use of proprietary data formats

has led to a historical dependency on the specific vendor product. However, recent advances in geoinformatics software have led to cross-application support for most competitor formats. This, in turn, has led to compatible neutral standards for vendors through non-profit organizations such as the Open Geospatial Consortium (OGC). Using Open Geospatial Consortium (OGC) web services standards called Open Web Services (OWS) enables various web mapping applications to communicate with each other or with other programs. In this case, the program can only be a web support for mapping services, without having its own graphical component of the display interface [12, 13]. Instead, using an Internet connection standard, other applications may request data from a remote web service. This interaction allows different software tools to communicate with each other without having to know which server is providing the information. [14, 16].

Due to these standards, a significant amount of data can be made available in the native formats of various commercial vendors. These include ESRI shapefiles, Intergraph Microstation (DGN) project files, MapInfo TAB files, and Oracle spatial databases that can all be displayed together without conversion. Other formats can also be used, including Geography Markup Language (GML), Web Map Server (WMS), Web Feature Server (WFS), with PostGIS data and other databases. Being able to access multiple formats “on-the-fly” without conversion at the same time makes MapServer one of the few options for those who cannot (or will not) make significant data conversions to a particular format. MapServer supports a variety of formats, some of which are native to the MapServer executable, while oth-

ers are available through GDAL/OGR libraries. The latter approach is required for formats not programmed directly in MapServer. Access through libraries adds an extra layer of communication between MapServer and the data source itself (though in some cases it can lead to poor performance) [14].

Another problem for web mapping of land valuation parameters is the issue of qualitative and quantitative characteristics of the data themselves, which will be used to create the mapping materials that are the subject of separate research [2, 6].

Thus, according to the authors (Kovalchuk I.P., Kovalchuk A.I. [6]), atlases of land value should contain as basic analytical maps of general-geographical, hydrogeological, geomorphological topics, soils and their properties, maps of socio-economic orientation (with a reflection of land use for various purposes - agricultural, industrial, forestry, water management, transport, residential, recreational, tourist, nature conservation, etc.), as well as complex maps - the results of the additional, economic assessment of agricultural land and the normative and expert monetary assessment of land and synthesis maps presented zoning parameters for the value of land.

Conclusions and Prospects.

Thus, at present, there are well-developed web mapping technologies in the world that allow to visualize the indicators and parameters of land and their value by means of geo-information mapping using various methods of their display to the user. Currently, the main means are open source MapServer and commercial platform ArcGIS Server.

The priority directions of web-mapping are about expanding of visualization tools palette and improving ways to display

complex attribute, including time extent, information in combination with mapping images, and developing client-server technologies to implement OGC standards based on web 3.0 and web 4.0.

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ПОТЕНЦІАЛ ВЕБ-КАРТОГРАФУВАННЯ ТА ЙОГО ВИКОРИСТАННЯ ПРИ КАРТОГРАФУВАННІ ПАРАМЕТРІВ ОЦІНКИ ЗЕМЕЛЬ

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Анотація. Век-картографування є потужним засобом візуалізації геопросторової інформації про ті властивості земельних ресурсів, які визначають параметри їх оцінювання, а також вплив природних та антропогенних факторів. Вирішення завдання картографічної візуалізації параметрів оцінки земель можливе за допомогою сервісів MapServer. Іншою проблемою при век-картографуванні параметрів оцінки земель є питання якісних та кількісних характеристик самих даних, які будуть використовуватися для створення картографічних матеріалів. На поточний момент у світі існують добре розвинуті технології век-картографування, які дозволяють візуалізувати показники

та параметри оцінки земель та їх стану засобами картографічного відображення геоінформації із застосуванням найрізноманітніших прийомів їх виведення на екран користувача. Головними на даний момент є засоби відкритого типу Map Server та комерційна платформа ArcGIS Server. Пріоритетним напрямком розвитку веб-картографування залишаються розширення палітри зображувальних засобів та удосконалення способів відображення комплексної атрибутивної, у тому числі різночасової, інформації в поєднанні з картографічними зображеннями, із одночасним розвитком технологій "клієнт-сервер" для реалізації поставлених завдань з використанням стандартів OGC на базі служб web 3.0 та web 4.0.

Ключові слова: веб-картографування, земельні ресурси, параметри оцінки земель, облік якості земель.

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ПОТЕНЦИАЛ ВЕБ-КАРТОГРАФИРОВАНИЯ И ЕГО ИСПОЛЬЗОВАНИЕ ПРИ КАРТОГРАФИРОВАНИИ ПАРАМЕТРОВ ОЦЕНКИ ЗЕМЕЛЬ

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Аннотація. Веб-картографирование является мощным средством визуализации геопространственной информации о тех свойствах земельных ресурсов, которые определяют параметры оценки их

стоимости, а также влияние природных и антропогенных факторов. Решение задачи картографической визуализации параметров оценки земель возможно с помощью сервисов MapServer. Другой проблемой при веб-картографировании параметров оценки земель вопрос качественных и количественных характеристик самих данных, которые будут использоваться для создания картографических материалов. На текущий момент в мире существуют хорошо развитые технологии веб-картографирования, которые позволяют визуализировать показатели и параметры оценки земель и их состояния средствами картографического отображения геоинформации с применением самых приемов их вывода на экран пользователя. Главными сейчас есть средства открытого типа Map Server и коммерческая платформа ArcGIS Server. Приоритетным направлением развития веб-картографирования остаются расширение палитры изображительных средств и усовершенствование способов отображения комплексной атрибутивной, в том числе разновременных, информации в сочетании с картографическими изображениями, с одновременным развитием технологий «клиент-сервер» для реализации поставленных задач с использованием стандартов OGC на базе служб web 3.0 и web 4.0.

Ключевые слова: веб-картографирование, земельные ресурсы, параметры оценки земель, учет качества земель.