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THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF WEB MAPPING OF POST-MILITARY FACILITIES

Purpose of the research objective is to develop and substantiate the theoretical and methodological foundations of web mapping of post-military facilities, taking into account the most effective approaches and techniques for collecting, analyzing, processing, and visualizing spatial data. The methodology includes using modern technologies to create accurate and informative interactive maps that provide not only the physical location of the objects but also detailed information, including textual, illustrative materials, graphical data, and 3D models. Results. Based on a comprehensive approach to researching, documenting, and presenting post-military facilities, the article elaborates the theoretical and methodological foundations of their web mapping. The relevance of using innovative digital technologies for creating interactive maps is discussed. The research methodology based on the collection, analysis and visualization of spatial data is considered in detail. The main principles and approaches to web mapping are highlighted, including historicity, systemic integrity, reliability, modernity, coherence, informativeness, presentability, accessibility, technological sophistication, variability of geographic bases, and partnership for effective project implementation. A technological scheme of web mapping is proposed, covering the stages of data collection, processing, and actual web mapping, ensuring a multidisciplinary and integrative approach to solving the set task. Designing and implementing web maps considering historical, cultural, technical data, and the current state of post-military facilities requires the interaction of specialists from various fields of knowledge. Scientific novelty and practical significance. The theoretical and methodological principles of interdisciplinary web mapping of post-military objects were developed for the first time. The principles and approaches to it have been defined, a technological scheme for web mapping of post-military objects has been developed. The proposed methodology and technology determine the practical significance of the research. Based on them, interactive maps of post-military facilities of any territory will be used in various fields of activity: education, science, preservation of historical and cultural heritage, tourism, promotion of the region.

Key words: web mapping, interactive maps, post-military objects, spatial data, digital technologies.

Introduction

Nowadays, there is a great deal of interest in preserving and studying historical sites of great cultural and historical significance. However, there is a problem of adequate and effective presentation of spatial data about these objects. Traditional mapping methods are often unable to fully convey all the complexity and multifacetedness of the historical and cultural characteristics of such objects, as well as their interaction with the modern spatial environment.

Therefore, an important priority is the availability and ease of use of these data for a wide range of users, including researchers, historians, local historians, and tourists. Due to the rapid development of digital technologies, in particular in the field of geographic information systems (GIS) and 3D modelling, there is a need to develop a new, more efficient methodology for web mapping. The

methodology should not only be able to accurately reflect the geographical location and physical characteristics of objects, but also take into account their historical context and cultural features, as well as provide a high level of interactivity and accessibility for users.

The problem is also that many post-military sites have undergone changes over time, and their current state may differ significantly from their historical state. This creates a challenge in accurately documenting and interpreting their history and evolution. Therefore, there is a need to develop a flexible and adaptive methodology that would allow to adequately reflect both the historical state and the modern reality of these objects.

In addition, it is important to ensure the protection and confidentiality of sensitive information related to post-military facilities, especially in the areas of national security and protection of personal rights. Within this context, web mapping must

balance the need for access to information with the need for security and privacy.

It is important to integrate various data sources and combine them into a single, user-friendly platform. This involves the analysis, standardization and visualization of data from various sources, including historical archives, modern geospatial data and other types of information. Such a complex technique of web mapping should be flexible enough to adapt to different types of data and user needs [Dyshlyk, 2009], while ensuring high quality, accuracy, accessibility and clarity of informationher

Purpose

The purpose of the research is to develop and justify the theoretical and methodological foundations of web mapping of post-military objects, taking into account the most effective approaches and techniques for collecting, analyzing, processing and visualizing spatial data. For this purpose, it is necessary to establish the principles and approaches to web mapping of post-military objects, and to identify the features of post-military objects as mapping objects.

Methodology

Web mapping of post-military objects aims to use a complex of modern technologies to create accurate and informative interactive maps. Besides showing the physical location of objects, these maps also provide a variety of information, including text, illustrative and graphic materials, as well as 3D models. These are important not only for the research process, but also for presenting the results in an easy-to-understand manner. Web mapping opens up wide opportunities for comprehensive documentation and study of historical and cultural aspects of post-military objects, ensuring clarity and accessibility of information for a wide range of users. Particularly important as former military sites often attract visitors and become popular tourist attractions, although many of them are still little known and poorly understood.

Web mapping of post-military objects

Web cartography (eng. - web mapping or online mapping) is a field or stream of the cartography using computer technologies related to the transfer of

geospatial data to the end user using the Internet. In a broad sense, it is a set of technologies related to the creation of various maps, their placement, processing and use in the web space.

The main tasks of web cartography are visualization of existing information and spatial presentation of data and facilitating work with spatial information on the web (Internet), search, routing and other services that use information about the location of objects.

Web mapping is the process of designing, implementing, creating and providing maps on the World Wide Web [Neumann, 2007]. Although web mapping focuses primarily on technological issues, web mapping additionally explores theoretical aspects: use of web maps, assessment and optimization of techniques and work processes, adaptation of visual means of traditional maps to Internet requirements, user-friendliness of web maps, social aspects, etc [Fu and Sun, 2011]. Web GIS or Internet GIS is related to web mapping, but with an emphasis on analysis, processing of project-specific geodata, as well as research features. Often, the terms web GIS and web mapping are used interchangeably, even though they do not mean the same thing. In reality, the line between web maps and web GIS is blurred. Web maps are often a presentation medium in web GIS, and web maps are increasingly gaining analytical capabilities.

Web mapping is a technique of using maps that are obtained using an information system for spatial and geographic data. Web mapping goes far beyond its literal meaning and is considered both from the perspective of the service provider and from the perspective of the consumer. Maps available on the World Wide Web serve different purposes depending on the type of user to whom they are provided; interactive web mapping software can manipulate online maps at the user's end [Rouse, 2015].

From the above definitions, we can offer our generalized definition of the term "Web mapping". *Web mapping* is a branch of science, technology, and production that combines computer technology and cartography to create, implement, visualize, and deliver geospatial data over the Internet. It covers not only the technological aspects of creating and placing interactive maps, but also theoretical issues, such as the use of web maps, their user-friendliness, visual means of web maps, evaluation and

optimization of techniques and work processes, social aspects of web cartography. It is closely related to web GIS, and focuses on the analysis and processing of project-specific geodata, as well as the exploration of spatial data.

Post-military facilities - military facilities of various purposes (defense lines, fortifications, air defense facilities, etc.), which over time lost their strategic importance and were liquidated or abandoned (Fig. 1.) [Sulyk].



Fig. 1. Fort "Pleshevychi", Part of the Przemysl Fortress, Siedliska group (1882–1886), Lviv region, Yavoriv District, near the village of Popovychi

Based on these definitions, the following definition of the term can be proposed "web mapping of post-military objects": is the process of using cartographical approaches and online technologies to create, analyze and present maps that visualize the historical and modern characteristics of objects that were previously used for military purposes, but today have lost their purpose or have been eliminated (Fig. 2).

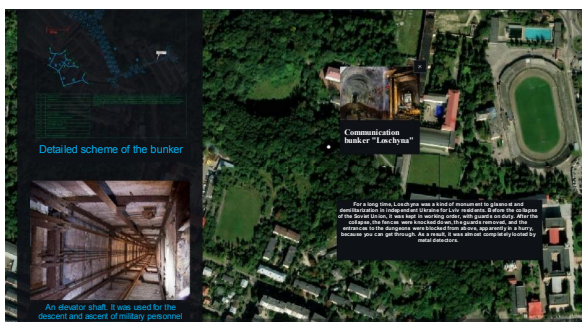


Fig. 2. Presentation on the interactive map of the bunker "Loshchyna", object was built in the 1950s–1960s of the 20th century, Lviv

This expanded definition illuminates the essence of web mapping of post-military objects, emphasizing its importance in preserving historical

memory, scientific value, and the tourist component. A feature of this process is the integration of various data sources, including historical records, photos, plans and modern geospatial data, and their visualization in the form of interactive maps accessible to the general public via the Internet.

Principles and approaches of web mapping of post-military objects

Research methodology is a set of principles, means, methods and forms of organizing and carrying out scientific knowledge of the given problem [Yurynets, 2011]. The methodology is endowed with a research apparatus, which includes:

- principles of organization and conduct of scientific research;
- various methods of scientific research and ways of conducting it;
- the conceptual and categorical basis of scientific research, in particular: topicality, issues, object, subject, goal, task, scientific novelty, heuristic value, theoretical and practical significance.

The research method is an approach, means or technique of theoretical and experimental research or practical implementation of a phenomenon or process. Depending on the degree of complexity of the research problem, the methods of its conduct and types of experiment change. The methods used in scientific research depend not only on the subject itself, but also on the level of research. Empirical and theoretical levels are distinguished. The empirical level of research is characterized by methods: observation, experiment, description, statistics, etc. For the theoretical level of research, methods of analysis-synthesis, induction-deduction, analogy, etc. are used [Yurynets, 2011].

Principles in science are the main starting point of scientific theory, which acts as the first and most abstract definition of an idea as the initial form of systematization of knowledge [Savvova, 2019].

Approaches in science are a fundamental, basic point of view, a system of views, principles that form the main directions of perception, understanding of a phenomenon, event, object and determine the choice of justifications for understanding, classification, evaluation and methods of cognition.

The approach is closely related to the strategy, as it determines the focus and specifics of long-term

plans and forecasts, goals and means of achieving them, and resources. The methodology also determines the perception of the object, its correlation with the class, species, genus, and field of scientific knowledge that, in the subject's opinion, are applicable to the study of the object. The choice of the approach is carried out by the researcher - a subject who relies on his erudition, competences, preferences, hypotheses, attitudes and many other subjective factors.

The following approaches have been proposed for web mapping of post-military objects:

- *strategic approach*: planning long-term research goals and identifying necessary resources. Developing comprehensive strategies for data collection, analysis, and visualization that facilitate a deeper understanding of the historical and cultural aspects of post-military objects;

- *interdisciplinary approach*: integrating knowledge from various scientific disciplines, including history, architecture, military science, and geography, for a comprehensive analysis of post-military objects. Utilizing this approach allows for considering diverse perspectives and enhancing research quality;

- *geoinformation approach*: using modern GIS technologies for processing and visualizing spatial data. Ensuring the capability to determine spatial placement and development dynamics of post-military objects;

- *visualization approach*: developing interactive web maps that integrate various information and display it in a user-friendly format. Using advanced visualization methods to improve the accessibility and clarity of the presented information;

- *development of theoretical and methodological foundations for web mapping*: determining key elements and the structure of the research to ensure scientific validity and efficiency of cartographic projects;

- *methodology for building interactive maps for web services*: implementing web maps that allow deeper interaction with geospatial information;

- *improvement of data collection methods*: using modern technologies, such as ground laser scanning, to create accurate 3D models that expand the presented data.

These approaches collectively form a comprehensive strategy for effective web mapping of post-military objects, ensuring high-quality data and its presentation through interactive web platforms.

Particularly high requirements are placed on researchers, first of all, in the selection of post-military objects, high-quality preparation of information about them and creation of illustrative material. The scientific and methodological principles of web mapping research of post-military objects are based on general and specific scientific principles. The process of web mapping includes the collection, analysis, evaluation, generalization, spatial localization of information and the creation of web maps that systematize, integrate and display various information [Muehlenhaus, 2013]. These stages are aimed at creating web maps that systematize, integrate and present various information about post-military objects.

The methodological justification of web mapping of post-military objects is based on the following principles [Repekhovych and Sossa, 2022]:

- *historicism*, which involves demonstrating the development of historical events and processes in chronological order. This principle has a decisive influence on the concept and implementation of the project, distributing the objects according to the chronological framework and showing the changes of the military infrastructure over time;

- *systematicity*, which recognizes post-military objects as structural elements of former military infrastructures, which today are a component of the region's attractions. This principle provides a systematic approach to the classification and historical periodization of objects;

- *reliability and modernity*. It requires the use of verified information, including the analysis of literary, engineering, technical and cartographic sources, as well as field research to determine the current state of the facilities;

- *consistency*, which takes into account the historical component of the region and Ukraine as a whole, defining key historical events and periods. Web maps of different territorial levels require separate coordination;

- *informativeness*: designed to provide a complete display of information about each object. It

is important to include concise but most meaningful information and to use historical documents, diagrams and links to websites [Cartwright, et al., 2007];

– *presentability and accessibility*: the final web mapping project should be distinguished by an attractive design, ensuring easy and clear perception of information by users. The key elements here are visual appeal and an intuitive interface. Maps need to be not only informative, but also aesthetically pleasing to attract attention and provide ease of use;

– *manufacturability*: creating effective web maps requires the use of advanced technologies and methods. This includes software such as ArcGIS Online, ArcGis StoryMaps (Figure 3), OpenStreet Map, and Google Maps, which allow you to create interactive maps with multi-layered geographic data.

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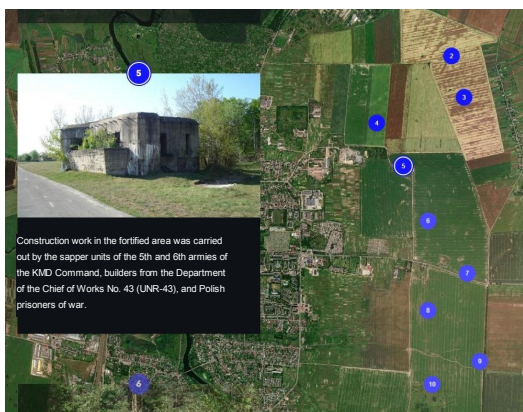


Fig. 3. Interactive map with FPVs of the Strumyliv fortification, built in 1940–1941 as part of the "Molotov Line", Lviv region, Chervonograd District

These technologies contribute to the effective display, storage and processing of geographic information;

– *multivariate geographical bases*: to ensure flexibility and adaptability of web maps, it is important to use a variety of geographic bases. This may include space imagery, aerial photography, topographic maps of various scales, OpenStreetMap and other types of geographic data. The use of different geographical bases allows you to diversify the project, providing greater informativeness and visual appeal of the maps;

– *partnerships*: effective web mapping requires the involvement of various stakeholders and establishing partnerships. This may include cooperation with government bodies, scientific institutions,

public organizations, local historians, and other specialists. Such a partnership facilitates the exchange of knowledge, resources and experience, which is essential for the creation of quality and informative web maps. Partnership relations also increase the efficiency of work on the project and contribute to the achievement of the set goals.

These aspects together form the basis for creating high-quality, informative, and user-friendly web maps that meet the needs and interests of different user groups.

Results

During the research aimed at collecting and analyzing information about inactive military facilities, we faced the need to organize and systematize the collected data. Our goal was the need to group and classify these objects, information about which we managed to find.

This stage of the research is important because the correct grouping of data is key to further in-depth analysis and understanding of trends related to military facilities and their historical and functional significance. We focused on two main factors for classification: the functional purpose of the object (type) and the time frames of its existence. This allowed us not only to systematize information, but also to identify possible patterns and features of the development of military facilities in different historical periods.

For a complete the picture of the use and placement of post-military facilities, it is also necessary to conduct a separate study of military operations in the selected territory. These allow for a more holistic study of the context and historical circumstances in which these objects were formed. Therefore, we have also included in our review military conflicts of the past, in particular the two world wars, which had a decisive impact on the development and location of post-military facilities.

To ensure a detailed and systematic approach in the research, each type of post-military object requires a clear definition and formulation [Repekhovych and Sossa, 2021] We will consider each type of object in more detail:

- *forts*: large defensive structures, usually constructed of concrete or stone, used to protect strategic areas. Forts are often located on frontiers or important routes and may include artillery

emplacements, casemates, minefields, and other defensive elements;

- *PFVs (permanent fire position)*: usually separately located defensive structures intended for long-term use. These include firing points, places to store weapons and supplies, and can be equipped to accommodate a small number of military personnel;

- *military units*: complexes of buildings and structures that were used to accommodate military personnel, command posts and logistics centers. They may include barracks, weapons depots, training fields, as well as administrative buildings;

- *bunkers*: underground or semi-underground fortifications designed to protect against artillery fire or air attacks. Bunkers can be used as military shelters, command centers, or storage locations for critical resources.

- *hiding places*: secret shelters used by partisans or underground organizations during military conflicts. Hideouts were usually small, well hidden, and often equipped for long stays;

- *resorts*: specialized areas used for take-off, landing and maintenance of military aircraft. These can include runways, hangars, aircraft maintenance facilities, and control points;

- *missile regiments*: a military formation that is equipped with missile technology and is designed to conduct military operations with the help of missiles. Such units can be equipped with various types of missiles: from short-range tactical missiles to strategic intercontinental ballistic missiles, depending on their purpose and tasks.

Each of these types of objects has unique architectural and functional features that reflect their historical purpose and role in military conflicts. Recognizing these features is key to an in-depth analysis of their history and impact on regional security and cultural heritage.

The classification is fundamental to our approach to the study of post-military objects, as it not only provides a grouping of similar objects, but also greatly facilitates the process of identifying and searching for them on web maps. This becomes especially important in the context of the availability of digital technologies and geographic information systems, which play a key role in modern research. Interactivity and visualization on web maps will allow not only effective navigation among these objects, but also provide a broader understanding of their location and relationship with other important geographic objects.

The distribution of the studied objects by time frames allows not only to group post-military objects according to the time of their creation and use, but also to reveal patterns of changes in military architecture and strategies in different historical periods. This approach opens up opportunities for analyzing how historical events, political decisions, and technological developments have influenced the design and placement of military facilities. It also allows you to trace the evolution of military concepts and tactics through the visual representation of these objects.

Chronologically, we divided the post-military objects into the following periods:

- *The end of the XIX century. - the beginning of the 20th century.*: The period is characterized by industrialization and the growth of militarization, which was reflected in the types of defense structures;

- *1914-1918, World War I*: The era brought significant changes in military techniques and tactics, which affected the types of defensive structures and their locations;

- *1918-1939*: The interwar period was a time of recovery and development of new military strategies and technologies;

- *1939-1945, World War II*: The era caused significant changes in military technology and tactics, which affected the design and location of military facilities;

- *1945-1991*: The period of the Cold War (since 1947) was marked by a high level of militarization and an arms race, which led to the creation of new types of military facilities;

- *1991 - today*: The modern period is characterized by the transformation of military strategy and adaptation to new global challenges and technologies.

In order to achieve the integrity and depth of our project, a simple classification of post-military objects by type and time period is not sufficient. It is necessary to collect detailed information about each object in order to determine their historical, cultural and strategic significance. The following are the key points of the detailed information collected:

- *description of the post-military facility (historical reference)*: includes the history of creation and use of the object, its role in military conflicts or other historical events. It is also important to mention the key figures who were

involved with the site and any important historical moments associated with them;

- *location*: exact geographical location of the object, including its coordinates. It is also important to describe the geographical features of the area, for example, proximity to populated areas, important transport routes or strategic objects;

- *plans and maps*: detailed schemes and plans of objects, if they exist, which will allow a better understanding of their structure and the location of internal premises and elements;

- *photo materials*: images of the property, which may include historical photographs and contemporary images. This will help visualize the object and reflect the changes that have occurred over time;

- *preservation status*: a description of the current state of the object, including information about any preserved elements, the degree of destruction or reconstruction, and other factors that affect its preservation;

- *geodetic data*: measurements and other technical parameters of the object, which may include its dimensions, geodetic characteristics of the terrain and other data important for a complete understanding of its location and structure.

Collection of this information will allow us not only to provide a comprehensive view of each site, but also to make our project more meaningful and informative, contributing to a deeper understanding of the history, culture and military heritage of the region.

While searching for information, we paid attention to the above criteria and tried to find as much detailed and reliable information as possible, which would also include interesting material for potential users. A significant part of the objects was visited personally, since the information we collected was simply not enough, and we supplemented it with our observations and photographs.

Several factors are decisive for the technical and technological implementation of the project, namely: ease of use, informativeness, the possibility of adding data, general accessibility [Bandrova, Konecny, & Zlatanova, 2014].

In today's world of digital technologies and quick access to information, the importance of detailed and comprehensive documentation of post-military facilities should not be underestimated. As a modern approach to the presentation of spatial data,

web mapping opens new horizons for historians, researchers, tourists and a wide range of interested parties, providing them with unique interactive tools for research and interaction with geographic information. Web mapping of post-military objects combines historical context with modern technological capabilities, allowing us to immerse ourselves in the history of regions and assess the contribution of these objects to the formation of historical memory.

The development of a technological scheme for web mapping of post-military objects is of great importance from a scientific point of view for several reasons:

- multidisciplinary analysis: providing a framework for analysis combining surveying, geography, history, architecture, military science, and information technology. This allows for a deeper understanding of the meaning and role of post-military objects in the socio-cultural and historical context;

- promoting the development of geoinformation technologies: the development of advanced methods of web mapping contributes to the further development of geoinformation technologies, including the latest approaches to the processing, analysis and visualization of spatial data;

- preservation and archiving of data: creation of technological capabilities for conservation and archiving of large data sets on post-military objects, ensuring their preservation for future generations of researchers;

- decision support: the technological scheme will facilitate the adoption of informed decisions at the level of policy and planning, especially in the context of the preservation of historical sites, tourism development and educational initiatives;

- ensuring accessibility and interactivity: the development of interactive web maps improves the availability of information for a wide audience, including scientists, students, historians, general public interest;

- promotion of international cooperation: the technological scheme of web mapping can serve as a platform for international scientific and cultural cooperation, ensuring the exchange of knowledge and experience between different countries.

- innovative research methods: encourages the development and application of innovative tools, such as 3D modeling, virtual and augmented reality,

which opens new perspectives for the study and presentation of post-military objects.

Thus, the development of a technological scheme of web mapping is not only a tool for documenting and presenting historical objects, but also a contribution to the development of scientific knowledge and technologies.

The figure shows a technological scheme (Fig. 4), which demonstrates the sequence and relationships in the process of web mapping, organized hierarchically from data collection to the final publication of interactive maps.

The diagram shows three main stages of work:

- data collection;
- data processing;
- web mapping.

Data collection covers a wide range of activities aimed at identifying, documenting and archiving information about objects of historical, cultural or strategic importance. This stage includes:

- geodetic searches;
- satellite images;
- photo fixation;
- terrestrial photogrammetry;

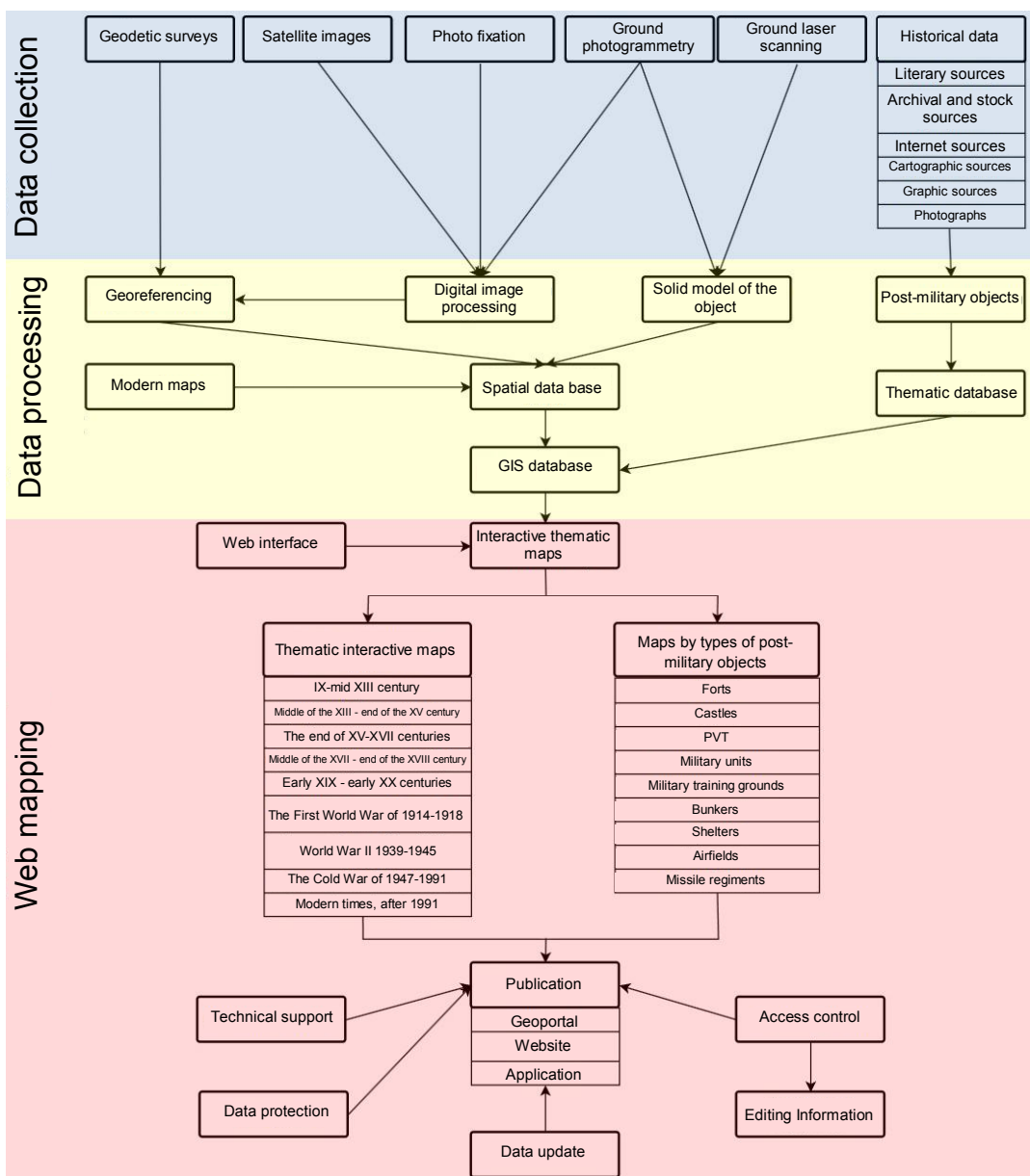


Fig. 4. Technological scheme of web mapping of post-military objects

- terrestrial laser scanning;
- historical data (literary sources, archival and stock sources, Internet sources, cartographic and graphic sources, photographs).

Once the data is collected, it must be systematized, analyzed and converted into appropriate formats to create an electronic database containing all the collected information, easy to find and use when creating interactive maps. This is primarily the organization of collected data into a logical structure, according to the types of objects, historical periods, geographical location, etc. The stage includes:

- georeferencing;
- digital image processing;
- solid object model;
- modern maps;
- database of thematic data;
- spatial database;
- GIS database.

The final stage consists in using processed data from the GIS database to create interactive web maps that provide a visual representation of information about post-military objects. The web mapping stage includes:

- web interface;
- interactive thematic maps;
- maps with historical periods (from the 9th to the beginning of the 21st century);
- maps by types of permanent objects (forts, castles, DOTs, military units, military ranges, bunkers, hideouts, airfields, missile regiments);
- publication (geoportal, website, application);

In addition, supporting processes are highlighted on the diagram:

- support;
- data protection;
- access control;
- editing information;
- data update.

The process from data collection to web mapping is undoubtedly complex and multi-step, requiring the integration of various techniques, tools and relevant subject knowledge. Each step in this process plays an important role in transforming primary data into a visual information product that is accessible and understandable to a wide audience.

On the basis of the developed principles, approaches and methods, a web mapping project of post-military objects of the Lviv region was implemented.

Scientific novelty and practical significance

The scientific novelty of the study is that the theoretical and methodological principles of interdisciplinary web mapping of post-military objects have been worked out for the first time. The principles and approaches to it have been defined, a technological scheme for web mapping of post-military objects has been developed. The use of innovative digital technologies allows to ensure not only the visibility of data presentation, but also a deeper understanding in the complex of historical, cultural and technical aspects of objects.

The proposed methodology and technology determine the practical significance of the research. Based on them, interactive maps of post-military facilities of any territory will be used in various fields of activity: education, science, preservation of historical and cultural heritage, tourism, promotion of the region.

Conclusions

The definition of the term "web mapping of post-military objects" is proposed, the methodological principles are substantiated web mapping of post-military objects: historicism, systematicity, reliability, modernity, consistency and informativeness, which serve as the foundation for the development of web mapping techniques. The developed methodology contributes to the effective presentation of spatial information, reflects a comprehensive approach to the documentation and analysis of post-military objects, taking into account their historical context and modern significance.

The classification of post-military objects, based on their functional purpose and time frames of existence, revealed the complexity and diversity of this category of objects. At the same time, the integration of military actions in the context of research allows for a deeper understanding of the impact of historical events on the development and evolution of post-military objects.

The proposed technological scheme of web mapping, which covers the stages of data collection, processing and actual web mapping, provides a multidisciplinary and integrative approach to solving the given task. This approach not only facilitates the preservation and archiving of data, but also ensures its availability and ease of use for a wide range of interested parties. The development of web mapping opens up new possibilities for the visualization of historical objects, turning static data into interactive resources that can be effectively integrated into educational programs, scientific research, tourism and other applications.

The importance of the developed methodology lies not only in the preservation of heritage, but also in its role in the formation of social consciousness and identity. Web mapping allows you to rethink historical events, opening new perspectives and forgotten historical buildings through visual and interactive presentation. It also encourages interdisciplinary collaboration between historians, cartographers, programmers, designers, and other specialists who join forces to create comprehensive and multifaceted web maps.

In addition, web mapping is becoming an important tool in protecting and raising awareness of vulnerable or forgotten post-military sites, providing a platform for studying them, assessing their conservation status, and planning conservation or adaptation measures. The interactivity of web maps helps to involve the public and increases its interest in historical heritage, which, in turn, can encourage more active actions for the protection and use of these objects in modern cultural and educational contexts.

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ТЕОРЕТИКО-МЕТОДИЧНІ ЗАСАДИ ВЕБКАРТОГРАФУВАННЯ ПОСТМІЛІТАРНИХ ОБ'ЄКТІВ

Мета дослідження полягає у розробленні та обґрунтуванні теоретико-методичних засад вебкартографування постмілітарних об'єктів з врахуванням найбільш ефективних підходів та технік для збору, аналізу, опрацювання та візуалізації просторових даних. Методика включає використання сучасних технологій для створення точних та інформативних інтерактивних карт, які забезпечують не тільки відображення фізичного розташування об'єктів, але й детальну інформацію, включаючи текстові, ілюстративні матеріали, графічні дані та 3D-моделі. Результати. На основі комплексного підходу до дослідження, документування та презентації постмілітарних об'єктів у статті опрацьовано теоретико-методичні засади їх вебкартографування. Розглянуто актуальність використання інноваційних цифрових технологій для створення інтерактивних карт. Докладно розглянуто методологію дослідження, оснований на зборі, аналізі та візуалізації просторових даних. Висвітлено основні принципи та підходи до вебкартографування, які включають історизм, системність, достовірність та сучасність, узгодженість, інформативність, презентабельність та доступність, технологічність, багатоваріантність географічних основ, а також партнерство для ефективної реалізації проєктів. Запропоновано технологічну схему вебкартографування, яка охоплює етапи збору, опрацювання даних та власне вебкартографування, забезпечує мультидисциплінарний та інтегративний підхід до вирішення поставленої задачі. Прокстування та реалізація вебкарт з урахуванням історичних, культурних, технічних даних та сучасного стану постмілітарних об'єктів вимагає взаємодії спеціалістів різних галузей знань. Наукова новизна та практична значущість. Уперше опрацьовано теоретико-методичні засади міждисциплінарного вебкартографування постмілітарних об'єктів. Визначено принципи та підходи до нього, розроблено технологічну схему вебкартографування постмілітарних об'єктів. Запропоновані методика та технологія виконання робіт визначають практичну значущість дослідження. Створені на їх основі інтерактивні карти постмілітарних об'єктів будь-яких територій матимуть застосування у різних сферах діяльності: освіті, науці, збереженні історичної та культурної спадщини, туризмі, промоції регіону.

Ключові слова: вебкартографування, інтерактивні карти, постмілітарні об'єкти, просторові дані, цифрові технології.

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