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POSSIBILITIES OF VIRTUAL MUSEUM PRESERVATION OF OBJECTS OF CULTURAL HERITAGE OF RUSSIA (BASED ON THE EXAMPLE OF ANCIENT WATERWAYS)

Abstract

Museums most effectively create the conditions for the preservation and presentation of unique documentary records of historical and cultural and natural heritage of our country. A virtual museum of ancient waterways is a combination of a traditional atlas and geographic information system (GIS) and includes cartographic materials collected by the authors in field expeditions, archives and libraries, as well as vector original maps that are GIS with large databases. The virtual museum will allow a wide range of users to obtain comprehensive information about the ancient waterways and their separate parts, human settlements, cultural and historical landscapes, their constituents.

Keywords: a virtual museum, ancient waterways, historical and cultural and natural heritage

INTRODUCTION

Complex historical and scientific researches of ancient waterways have been carried out by the Department of the History of Earth Sciences of the Institute for the History of Science and Technology of the Russian Academy of Sciences since 2003. During this period they have studied the Mariinskaya and North-Dvina water systems, the Ladoga and Onega channels, the lake-channel system of the Great Solovetsky Island, the Belozersky-Onega waterway, the Vyshnevolotskaya and Tikhvinskaya water systems, the upper reaches and the middle part of the historical waterway "From the Varangians to the Greeks" and the upper part of the Great Volga route. On the basis of collected expeditionary and archival materials, monographs were published: *Historical waterways of the North of Russia (XVII-XX centuries) and their role in changing the ecological situation, expeditionary research: state, results, prospects*, 2009, *Vyshnevolotskaya water system: a retrospective and the present*, 2011, *Tikhvinskaya water system: a retrospective and the present. Hydrological and ecological situation and landscape changes in the area of the waterway*, 2013¹²³. They reflect the results of historical and geographical, landscape and hydrologic and hydrochemical, ecological and tourist-recreational studies of ancient water systems. The history of creation and the current state of waterways in the north and north-west of Russia is set out, the landscape structure of the environment of waterways and data on their hydrologic and hydrochemical regime is shown. An important part of the studies that were carried out was the compilation of passports and information maps of monuments, schemes and plans for hydrotechnical construction sites. These works served as a basis for creating an information resource – a virtual museum of historical waterways.

Ancient waterways played a crucial role in the historical development of the vast territory of the Russian Plain and the formation of the Old Russian state. In ancient times they were rivers and portages linking them, and later - man-made water systems. The oldest water "roads" were "from the Vikings to the Greeks" and "From the Varangians to the Arabs" (the Volga-Caspian route), as well as: North Dvina, Mariinsky, Tikhvinsky and Vyshnevolotsky waterways of the Russian North, which were lake and river systems, connected by channels, with preserved monuments of hydraulic engineering.

1 Viacheslav Nizovtsev, Alexey Postnikov, Valerian Snytko, Natalia Frolova, Vasilii Chesnov, Roy Shirokov, Vera Shirokova, *Historic waterways of the North of Russia (XVII-XX centuries.) and their role in changing environmental conditions*. (Moscow, Paradise, 2009), 298

2 Vera Shirokova, Valerian Snytko, Vasilii Chesnov, Natalia Frolova, Viacheslav Nizovtsev, Natalia Dmitruk, Roy Shirokov, *Vyshnevolotsk Water System: past and present. Hydrological and ecological conditions and the landscape changes in the region of the waterway. Expedition research: status, results and prospects*. (Moscow, KUNA, 2011), 248

3 Vera Shirokova, Valerian Snytko, Viacheslav Nizovtsev, Natalia Frolova, Natalia Dmitruk, Vasilii Chesnov, Nadezhda Ozerova, Roy Shirokov, *Tikhvin water system: past and present. Hydrological and ecological conditions and the landscape changes in the region of the waterway*. (Moscow, Akkolit, 2013), 376.

Historic water communications are landscape basis for the unique cultural and historical complexes. They include many of the most valuable natural, historical and cultural objects that reflect the typical natural environment and traditional culture, which makes them extremely important monuments (territories) of natural and cultural heritage of Russia.

To save and show the documents and monuments of this unique Russian heritage a virtual natural history museum of ancient waterways of the European part of Russia has been created, which can be accessed via the Internet and will be available as a standalone application on the basis of the web-site <http://waterways.ru/> "Historical Waterways of Russia".

METHODOLOGY AND METHODS OF TURNING CULTURAL HERITAGE SITES INTO VIRTUAL MUSEUMS

Currently, virtual museums are widespread and are created on the basis of the largest state museum institutions, specially protected natural areas and even schools. The main feature of the created web museum is that the vast majority of them are realized on the basis of really existing museum expositions and exhibitions. At the same time, there are very few virtual museums that do not have actual permanent expositions. A virtual museum is a special kind of museum that is not tied to a specific tourist-recreational and scientific structure, it forms part of a virtual scientific and cultural-information space located on the Internet⁴.

The scientific and educational environment of the web museum of ancient waterways contributes to the preservation of unique documents and monuments, and the virtual location on the base of the site <http://waterways.ru/> gives an opportunity for a wide range of users to get more information about a historical waterway, its part, a separate settlement, independently choose the most interesting objects, build a route for the waterway and take an excursion. Therefore, it is important to create a special virtual-real environment – a virtual museum of historical waterways.

The combination of field methods (landscape, hydrological and hydrochemical, historical, historical and geographical), and cameral (analysis of archival, cartographic, stock materials using GIS technologies) is the basis of the methodology for creating an information resource (virtual museum of historical waterways), which makes it possible to compile the most complete picture of the economic development and functioning of the waterway at the regional, district and local levels at specific key sites⁵.

4 Natalia Erman, Viacheslav Nizovtsev, Vera Shirokova, Valerian Snytko, Roy Shirokov, "On the creation of a virtual museum of historical waterways", *Bulletin of the Academy of Sciences of the Chechen Republic*, 35, № 2 (2017): 121-124.

5 Viacheslav Nizovtsev, "Toward the theory of anthropogenic landscape genesis", *Geography and natural resources*, 2 (2010): 5-10.

The objects of the virtual museum preservation are: a combination of real natural, social, technological images and images generated in the GIS system, combining the characteristics of a print, map, computer animation and three-dimensional model with the interactive control that creates the illusion of presence in the real location and enables interaction with the user.

Much attention was paid to the selection of key sites or strong points as the main objects of museum preservation. These objects are characterized by: 1) historical significance, 2) a special strategic position on each historical waterway, 3) being typical for a certain length of the route, 4) a characteristic structure of nature use, and 5) a wide variety of natural conditions with a full set of landscape complexes. At the same time, many of them are distinguished by their uniqueness. For example, one of the most important and key strong points is a section of the Dnipro valley from Smolensk and Gnezdovo on the water route “from the Varangians to the Greeks”. Unique points are characterized by a peculiar landscape structure with distinctive nature use and the presence of monuments of natural, historical and cultural heritage. An amazing natural historical and cultural monument “Diakonovskaya Polyana” can serve as an example. The basis and compositional core of this monument is the so-called glade, where on a relatively small area local residents put fifteen large boulders with inscriptions and images of saints and disappeared villages of one of their local parishes⁶.

STRUCTURE AND FEATURES OF THE VIRTUAL MUSEUM.

Field research, the collection of stock and published materials, and the turning of an entire waterway and key areas into a museum of virtual reality occur at three hierarchical levels (regional, district and local).

The regional level includes small-scale cartographic and textual materials covering the waterway as a whole or a part of it. For example, the North-Dvina waterway includes both natural landscapes of diverse nature and structure, as well as cultural and historical landscapes of the oldest cities of Russia – Belozersk, Kargopol, Totma, Veliky Ustyug and Solvychegodsk, “architectural pearls” of the North, the cultural and historical landscapes of Kirillo-Belozersky, Feropontov, Goritsky, Trinity-Gledensky Monasteries and the Nile-Sorsk hermitage, a unique gated water system with the former canal of the Duke Alexander of Wirtemberg⁷⁸.

6 Natalia Erman, Viacheslav Nizovtsev, Vera Shirokova, Alexey Postnikov, Valerian Snytko, Nadezhda Ozerova, Roy Shirokov, “Method of creating an electronic historical and geographical atlas of ancient waterways of Russia”, *Izvestia vuzov. Geodesy and aerophotosurveying*, 60 №5, (2016): 88–91.

7 Viacheslav Nizovtsev, Valerian Snytko, Natalia Frolova, Vasilii Chesnov, Vera Shirokova, “A complex historical expedition on the waterways of the Russian North”, *Questions of the history of science and technology*, 2 (2009): 220–229.

8 Nizovtsev V.A., Snytko V.A., Shirokova V.A. Tourist and recreational resources of the Russian North historic waterways // *Tourism and regional development: journal*. Issue 7. – Smolensk: Universum, 2014. P. 133–138.

The natural conditions of this waterway are very diverse due to the complex landscape structure of the territory. The region is located on the territory of seven natural landscapes of the southern taiga and middle-level taiga subzones of the Sukhono-Dvinsko-Mezenskaya region. The basis of the hydrological network is the White Lake (the area of the water mirror is 1130 km²) with the river Sheksna flowing from it, lake Kubenskoe, Borodaevskoe, Ferapontovskoe and other lakes and the river Sukhona.

North Dvina water system -is a united lake-river system, consisting of seven lakes, four rivers, and five channels. Overall length is 135 km, currently it includes 6 flood gates and 8 dams. Nowadays, it is mainly used for local transportation of timber and building materials.

Another vivid example is the Vyshnevolotsky historic waterway that connected the Volga river with the Baltic Sea. Vyshnevolotsk water system is the oldest artificial waterway in Russia, which connected Petersburg with the Volga river basin that was the supplier of raw materials and food for the Russian capital built in 1703-1709. The system includes: inflow of the Volga - river Tvertsa, Vyshnevolotsk channel - river Tsna, Lake Mstino, river Msta, Siversov and Visherskiy channels (bypassing lake Ilmen), river Volhov, Ladoga bypass channel and river Neva.

The reconstruction of this way in the 1719–1722 was performed by self-taught hydrotechnician Mikhail Serdyukov to eliminate the aridity of the rivers through the construction of a water reservoir at the watershed. Later, navigation conditions of the Tvertsy river were improved, rifts of the river Msta were cleared, the bypass Siversov channel from the river Msta to the river Volhov was built (bypassing lake Ilmen) and up to Novgorod.

Along with numerous monuments of hydrotechnical construction, this cultural and historical region comprises cultural and historical landscapes of such first Russian cities as Staraya Ladoga and Novgorod the Great, towns and villages serving the segments of the Vyshnevolotskaya system such as Vyshny Volochek, Volkhov, Borovichi, Opechensky Posad and others. Here there are countless archeological monuments: neolithic sites, burial mounds, numerous fortifications and settlements of iron and ancient Russian periods, including the famous Ryurikovo ancient settlement - the site of ancient Novgorod.

The district level is represented by maps and diagrams of individual sections of the waterway (river, canal, canal-lake systems). A good example may be the section of the Msta river from Opechensky Posad to Borovichi, which is one of the most complex and dangerous for shipping in this system. This whole area, known far beyond the Novgorod region as the "Mountain Msta", has unique natural features and a rich history.

The most important feature of this territory in terms of landscape is its border position at the junction of two natural zones: a zone of mixed forests and a taiga zone. Within the Mstinskaya vug between Opechensky Posad and Borovichi

town, the Msta river cuts through Carboniferous deposits and forms a canyon-like valley and many rapids in the channel. In general, this section of the river has over 50 rapids, a lot of rolling and stone stairs. Features of this amazing river are the mountain character of the river bed, its tortuosity, high speed of flow, many noisy rapids-watercourses, multi-meter rock coast outcrops. The valley of the Msta river and its rapids are extremely “photogenic” and attract numerous tourists. “Mountain Msta” serves as a place where various types of water tourism develop.

At the local level, description and mapping is performed for a number of points, stations or strong points⁹. An example may be the valley of the Poneretka river on the left bank of the Msta river, where there is an amazing concentration on a small area of a variety of karst forms, developed in the limestones of Carboniferous age. The largest craters reach 50 m in diameter and 15 m in depth. The unique underground Karst river Poneretka disappears for 2 km in the lower part of its current under the ground. It has a well-defined dry bed and a dead river valley with three levels of former waterfalls of 1 m, 1.5 m and 3 m in height. Quite unexpectedly, the river comes to the surface with a small waterfall through two cave exits directly in the coastal naked slope of the Msta river itself.

All information collections of the web museum of historical waterways comprise three interconnected blocks: natural, historical and economic and applied (educational), each of which contains cartographic, verbal and graphic information at all three hierarchical levels¹⁰.

The natural block includes stock and published materials, field descriptions and a number of industry maps (hydrological, hydrochemical, geological and geomorphological, soil-vegetative, landscape), drawings, pictures and diagrams, hydrochemical analysis data, diagrams representing natural characteristics of waterways and adjacent landscapes. The materials of this block are represented by complex descriptions of cultural and historical landscapes of waterway sections with preserved (to different degrees) hydraulic structures and canal-lake systems with adjacent landscape complexes: Izborsk-Malsk valley, Verkhnevolzhsky beyslot, Porkhovskaya hydroelectric station, etc.; cultural and historical landscapes of the most ancient cities of Russia – Smolensk, Tver, Torzhok, Ostashkov, Zubtsov, Rzhev, Staritsy, Volokolamsk, Pskov, Izborsk, Ostrov, Porkhov, etc.; monuments of nature, for example, the source of the Volga, the Okovetsky spring, lake Seliger, Slovenian springs and many others.

The historical and economic block includes historical maps, scheme maps and text materials reflecting the history of settlement on, and economic development of,

9 Natalia Erman, Viacheslav Nizovtsev, Vera Shirokova, et al., “Method of creating an electronic historical and geographical atlas of ancient waterways of Russia”, *Izvestia vuzov. Geodesy and aerophotosurveying*, 60 №5, (2016): 88–91

10 Natalia Erman, Viacheslav Nizovtsev, Vera Shirokova, et al., “On the creation of a virtual museum of historical waterways”, *Bulletin of the Academy of Sciences of the Chechen Republic*, 35, № 2 (2017): 121–124.

waterway areas, the history of their functioning as a whole. On several hierarchical levels, in the form of sections, maps of trade routes published in historical sources, schemes of ancient drafts, military historical maps, materials, maps and descriptions of the functioning of hydrosystems and their changes in time and space are included. A special place is occupied by unpublished archival materials, for example: General map of the rivers: Syashi, Tikhvinke, Volkhov, Msta and Tveritsa (1764), plans, drawings, maps of rivers, overland roads, water systems and structures on and along them (1765–1914), Hydrographic atlas of the Russian Empire (1832), General map of the shipping route from Tver to Novaya Ladoga, maps and plans for improving navigation (1840–1918) and others.

The applied block consists of maps and materials intended for educational, scientific, nature-protective, excursion, etc. goals. This geo-information block at the regional and district level includes maps of specially protected areas, valuable natural territories and objects in need of special protection (geological, hydrological, geographic, soil and complex nature monuments). For the local level, a special section on integrated geo-ecological monitoring is proposed, which aims to provide reliable information on important objects at key sites. Applied research includes the development of virtual tours on historical waterways and the compilation of maps of sightseeing and tourist routes for educational and scientific purposes at three hierarchical levels: regional, district and local. Registration maps and questionnaires on hydrotechnical monuments, proposals for the rational use of natural resources on this territory are presented.

All the primary sources collected in archives and libraries (general survey maps, dachas and homestead maps, military topographic maps, etc.) are processed and contained in the collections of the virtual museum as raster images.

It is proposed to create original integral maps using modern GIS technology and interactive three-dimensional models of historic waterways and their main areas with marked natural, hydro-technical and historical and cultural objects. This provides a complete and diverse view of the historical waterway.

It is important to note that separate information blocks can serve as scientific and reference, local history and teaching aids for teachers, university students, researchers and workers in the spheres of tourism and business.

CONCLUSION

A virtual location of a museum allows a wide range of users to get more information about a historic waterway, its area, particular settlement, cultural and historical landscape, to determine the intensity of historical and cultural sites around the waterway, to build their own route of the waterway and take a tour at any time.

Virtual museum preservation will allow us to constantly replenish the information base and “expositions” with new cartographic products and materials that can be used for the rational organization of the territory, evaluation of its tourism potential and will help to improve the measures for the recording, preservation and proper use of objects of natural and historical and cultural heritage of ancient waterways.