The history of the study of the water resources in the Smolensk province in the XVIII - early XX centuries

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Abstract. Natural wealth is one of the foundations for the cultural development and economic prosperity of all countries and peoples. In Russia, great importance has always been attached to the study of water resources. It was the rivers that served as the backbone for the entire transport system of Russia since the founding of the early Russian state. In the geographical works by various scientists, researchers and statesmen, particular attention was always given to riverheads, portages, possibility of connecting different river systems by canals, and navigational conditions. In the XIX – early XX centuries, watershed areas received the status of specially protected territories. The study of the history of the development and exploration of natural resources in the Smolensk province, as a unique territory located on the western borders of Russia and along the watershed of the Dnieper, Volga and Western Dvina rivers, made it possible to compile existing data and provided an opportunity to enhance knowledge on the region’s environmental conditions and natural resources. It also allowed one to trace the connection between geographical study and the processes of territory development and exploration, and to determine the contribution of the authorities, government departments, scientific institutions, and individual researchers to the understanding and knowledge of the geography of the region. Since the beginning of the XVIII century, the territory of the Smolensk province became a testing ground for numerous cartographic and geographical research activities, which later served to shape the scientific understanding of natural resources and several academic (geographic) disciplines. It was in the province of Smolensk where the work carried out by V.V. Dokuchaev, D.N. Anuchin, A.A. Tillo, and P.P. Semenov-Tyan-Shansky for the first time acquired comprehensive nature and consequent major importance for the formation of modern physical geography.

1. Introduction
The province of Smolensk is a vast natural watershed junction of three major rivers: the Volga, the Dnieper and the Western Dvina. There are no other watershed areas where these rivers meet. In this respect, this area is unique. Over an area of just a few square kilometers, the Dnieper and several of its smaller tributaries rise: the Obsha River is one of the largest tributaries of the Western Dvina, and the Vazuza, Gzhat, Vorya, and Ugra rivers are tributaries of the Volga [1].

The unique geographical location of the Smolensk region at the watershed of the Volga, Dnieper and Western Dvina rivers contributed to the intensified settlement and economic exploration and development of this area. Since the Smolensk province was a border territory in the west of the Russian Empire, occupied a unique geographical position and possessed rich natural resources, it constantly attracted the attention of the authorities and researchers.
The use and study of the natural resources of the Smolensk province began from the moment it was first settled. At that time and now the earth, soil cover, water, minerals and other resources were and are a major source of human well-being and prosperity. A necessary condition for the rational use of natural resources is the study of changes in the natural environment that have occurred in the course of its economic exploration and development, as well as the identification and analysis of various historical written and cartographic data.

2. Materials and methods
In carrying out this research, mainly the following primary source materials were used: holdings of the State Archives of the Smolensk Region, the Russian State Military Historical Archive, the Russian State Historical Archive, the Russian State Archive of Ancient Deeds, the Archive of the Russian Academy of Sciences, and stock materials of the cartography department of the State Historical Museum. Special focus was placed on the study of the scientific works by A.A. Tillo, S.N. Nikitin and D.N. Anuchin. They contained exploration and survey of rivers and lakes of the Smolensk province, as well as the statistical descriptions of the Smolensk region by Ya.A. Solovyov and K.I. Stiernskants.

The methodological framework for the research is the collection, processing, systematization and analysis of published and archival sources. The comparative historical-geographical method was used for systemizing and classifying the historical material reviewed, as well as for identifying and singling out the most significant sources under study, assessing the contribution by various researchers to the study of the region and the frequency of research developments in different chronological sections.

3. Results
From the very beginning of the settlement of the territory under consideration, a variety of information began to be collected, primarily about its natural resources. In the XVII century, the Smolensk region was a poorly populated area, completely covered with forest, which means that any human alterations to it were insignificant [1]. In the XVIII century, intensive exploitation of local natural resources began, and the need for a scientifically organized study of the environmental conditions and natural resources of the Smolensk province arose.

The study of the water resources of the Smolensk province in the XVII century was closely related to the opening of transport waterways for trade and communication along the Dnieper, Western Dvina and Volga, and the emergence of new cities and wharfs. In 1705, the city of Gzhatsk was founded; first it served as a wharf and later became an important trade center, which various goods and products (mainly grain) passed through on their way from the southern provinces to St. Petersburg and Moscow. A map of the Gzhatsk Wharf was also produced; it shows the wharf, various commercial buildings and the Gzhat River [2].

Since the beginning of the XVIII century, the rivers were the focus of attention of the Russian government, which was due to the development of shipping and commerce. Peter the Great prioritized the development of the new capital and strove to diverse trade cargo flows to St. Petersburg. For that purpose, surveyors V. Leushinsky and M. Isupov were sent to the Smolensk province. They carried out work on mapping out the Vyazemsky uyezd and designed a project for a canal between the riverheads of the Gzhat (a tributary of the Vazuza that flows into the Volga) and the Vorya (a tributary of the Ugra, which flows into the Oka). This was done with the purpose to improve navigation along the Gzhat and shorten the waterway from St. Petersburg to Moscow. The canal was not constructed in the end; but the materials and findings of the study of the hydrographic network of the region remained: a map of the rivers Gzhat, Vorya, Vazuza, and Ugra was created. The map shows the riverbeds and their tributaries, along the banks of which settlements, ferriages and mills are marked; and the canal route is marked with letters A and B. There is also an explanation on the project for connecting the Vorya River with the Gzhat. The library of the Academy of Sciences also contains a copy of this map, created at the beginning of the XIX century.

In the middle of the XVIII century, the Smolensk province water resources were the subject of intensive investigation and mapping. As a result, unique cartographic works were produced: a general
map of the entire Dnieper, created in 1741; and a land map of the Smolensk province, its cities and Belsky, Vyazemsky, Dorogobuzhsky, Roslavlsky, Smolensky uyezds, of the survey and description of its forests, rivers and lakes, compiled in 1755 by S. Putilov [2]. Also, a boundary map of the Smolensk province was created. It shows the boundary line between the province of Smolensk and Poland; villages, fortresses, roads, and rivers on both sides of the border are marked. In the center of the map, the riverbed of the Dnieper is marked, and the city of Smolensk is depicted. The map was compiled by V. Fermor, and copied by F. Chernoy, surveyor. In 1766 V.V. Fermor created a map of the water communications of the Russian Empire. The map shows the territory of the Smolensk province in more detail, displaying the following cities: Smolensk, Bely, Dorogobuzh, Vyazma, Roslavl, border fortresses, the course of the Dnieper River across the Smolensk province and other river routes.

Also, this period is associated with the work carried out by M.V. Lomonosov and Academic Expeditions. We can learn about the expedition led by I.I. Lepekhin from the works by V.P. Taranovich, who traced ‘I.I. Lepekhin’s actual routes through his unpublished reports’ [3]. The route of I.I. Lepekhin’s expedition passed through Belarus and the Smolensk province. V.P. Taranovich created a map of I.I. Lepekhin’s expedition route. He visited Smolensk, Dukhovshchina and the areas around the sources of the Dnieper, Volga and Western Dvina rivers [3].

In the last third of the XVIII century, general land surveying helped to clarify the hydrography of rivers, lakes and other water bodies. The first atlases of general land surveys were created for the entire territory of the Smolensk province, showing all its natural features and objects. One of such unique editions is the Russian Atlas by A.M. Wildbrecht, released in 1792. It contains a map of the Smolensk namestnichestvo (region ruled by governor general), which contains not only the settlements, river network, uyezd borders and roads, but an artistic image of the specific characteristics of the area (richness of water resources: a jug spilling a stream of water – the source of the Dnieper and the watershed of the three rivers) [2].

The research in the early XIX century in the territory of the Smolensk province was linked with the military operations of 1812. As a result, a semitopographic map was created, which contained information on the accessibility and passability of the territory: its forests, meadows, rivers, lakes, marshes were all shown in color. The atlas of the Smolensk province by I.F. Blankenhorn (now kept in the cartographic department of the Russian State Library) was produced in 1811. It is a colorful manuscript atlas, consisting of 25 sheets of city plans and uyezd maps, as well as 1 sheet with a general map of the Smolensk province, bearing a description of the rivers flowing in the Smolensk province. N. Ya. Ozeretskovsky, during his academic expeditions, explored the watershed area of the Volga, Dnieper and Western Dvina basins. He described the system of shipping and wharfs, mostly focusing on the Gzhat wharf. N. Ya. Ozeretskovsky was one of the first scientists who drew attention to the study of rivers and lakes, and played an important role in the development of land hydrology and geomorphology. He developed a methodology for the study and survey of lakes. Later, those theories and areas of research were intensively developed by Russian scientists, including D.N. Anuchin [4].

In the middle of the XIX century, one of the major works on regional natural history was the Agricultural statistics of the Smolensk province, by Ya. A. Solovyov, which provided the first introduction to the study of natural resources and their economic use [5]. In 1857, PD Shestakov, the principal and teacher of the Smolensk gymnasium, published an interesting work: Geography of the Smolensk Province, which included a detailed description of the hydrography of the region, and a list of all rivers and lakes in the province, as well as the first physical map of the Smolensk province [6].

Vital ones for the organization and management of geographical research in the XIX century were the activities of military forces. It was the military who, often for the first time, participated in the study of the nature in Russia in general and the Smolensk province in particular. Under the leadership of Colonel of the General Staff K.I. Stiernskants, a description of the Smolensk province was created: Military-Statistical Review of the Smolensk Province. It contains data on the nature of river valleys, lakes, swamps, and rivers (with the identification of their length, width and depth) [7].
The Materials for Geography and Statistics of Russia, collected by the officers of the General Staff and published by M. Tsebrikov in 1862, were a consolidated geographical and statistical work. The paper provides the physical-geographical and economic-geographical characteristics of the Smolensk province (its climate, industries, population, education, statistical description of cities). The information on the hydrography of the region, including its differences in the northwestern and southeastern parts of the region, is particularly detailed. A description of all the river systems of the Smolensk province is provided, and so is a map of the Smolensk province [8].

From the middle of the XIX to the beginning of the XX century, complex expeditionary research of the natural resources of European Russia began. Through the efforts of various ministries (of agriculture and state property, internal affairs, communications) and various departments (of land survey, forestry, and mining), an in-depth study of environmental conditions and natural resources began [9]. A special place in the study of natural resources – rivers and lakes – belongs to the Expedition to Study the Sources of the Main Rivers of European Russia, led by A.A. Tillo [10, 11]. Scientists of various specialties participated in the research as members of the expedition: S.N. Nikitin, a hydrogeologist [12], M.K. Tursky, a forester [13], F.G. Zbrozhek, a hydraulic engineer, A.A. Fock, a cartographer, D.N. Anuchin, a geographer [14], N.I. Kuznetsov, a botanist, E.A. Heinz, a meteorologist. The study area included the territory of the upper reaches of the Volga, Dnieper and Western Dvina rivers. The purpose of the expedition was to identify the reasons for the shallowing of European rivers. The expedition carried out a detailed physical and geographical description of the Volga, Dnieper, and Western Dvina basins, determined the exact coordinates of the sources of the main rivers of European Russia; and for the first time, large-scale maps showing the watershed area between the upper reaches of these rivers were created.

The result of the complex work carried out was a new understanding of the issue of the shallowing of the rivers of European Russia. The factors influencing the fluctuations in river discharges and levels were determined. Thus, the following scientific conclusions were made: 1. Marshes are in some way a regulator of the water flows, as ‘the significant draining of marshland in the upper reaches of the Dnieper, given the impermeability of the prevailing subsoil, would mean destruction of the water content of the Dnieper system’ [12]. 2. Forests and marshland affect the water content of the rivers in the basin of the upper Dnieper, and serve as water level regulators for the Dnieper, Volga and Western Dvina. 3. Drainage of this almost impassable area (a spongy reservoir) in order to maintain the water content is highly undesirable [15]. The expedition proposed measures to ensure ‘a regular rate of stream flow of the rivers’ and to protect the water, land and forests from irrational use. Such measures would be regular monitoring of the amount of atmospheric precipitation across the entire basin area, the establishment of hydrometric stations, water level and rainfall gauges, the formulation and enactment of a water act which would regulate the private use of water resources.

In the XX century, various monographs devoted to hydrological research were published. For example, The Dnieper and Its Basin, by N.I. Maksimovich. The monograph describes in detail the history of the Dnieper exploration, as well as the future of the Dnieper as a waterway. The monograph is accompanied by maps of the administrative division of the area in the Dnieper river basin, showing all the provinces of the Russian Empire located in the Dnieper basin [16].

In 1925, the following collection was compiled and published: Essay on the Natural History of the Smolensk Province. A.V. Kostyukevich, L.V. Abutkov, V.G. Khimenkov, A.I. Kaigorodov, Ya. Ya. Alekseev, V.V. Stanchinsky gave a detailed description of the geographical location, relief, hydrology, geological structure, mineral resources, soil cover, climate, vegetation, and fauna of the Smolensk province. And the following maps were also created: hypsometric, geological, a map of minerals, and a soil map [17]. When working on this major scientific work, the authors relied on their great predecessors, V.V. Dokuchaev, D.N. Anuchin, and P.P. Semenov.

4. Conclusion
As can be seen from the above, this paper presents the history of the study of natural resources and identifies 3 main periods, which differ by the systematic character of observations, the complexity of
research, the specific features of the historical epoch, and the solution of practical tasks. The characteristic features of the research carried out in the XVIII and early XX centuries are identified. At the beginning of the XVIII century, the study of the nature of the region under consideration was fragmented and conducted mainly in order to solve various practical problems in individual territories. In the XIX century, the study of the territory, economy and nature became more in-depth, detailed and consistent. This stage is associated with conducting complex expeditionary research. By the end of the XIX and the beginning of the XX centuries, the study of individual components of nature, which were associated with the solution of economic problems and the country’s needs, became common and popular. That research became the foundation for the emergence of generalizing fundamental works, which laid the grounds for rational use of natural resources.

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