Environmental planning and management of waterway construction (historical experience of Russia in the 18th century and the beginning of the 19th century)

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Abstract. An interdisciplinary analysis of an ecological system of waterway includes several related environmental science fields. Environmental planning and management is an important component in the construction of waterways. The aim of the study was to analyze the legislative framework that forms the vertical of construction management of water communications in Russia. Research in this field allows us to look at current problems through the prism of the historical process, political and socio-economic reforms of society. As a result of the study, the historical experience of the development of water communication in Russia was analyzed. The base of the research was constituted by legislative standards issued in Russia in the period under review. At the same time considering the development of the legislative framework and the actual construction process, it was found that the legislative system had a direct impact on the waterway building practice. This made it possible to determine the extent of the impact of changes in state institutions and their structural components on the overall organization of management and regulation of construction and on the practice of creating a system of waterways in Russia. These studies make it possible to systematize the historical experience of the development of functional, methodological, and organizational forms of regulating the construction of water communications in the period under review.

1 Introduction

Development of waterway construction in Russia is considered in terms of the legal framework and management in this area. Such approach not only provides a broad view on the historical aspect of the matter of establishing effective economic ties, but also allows assessing present-day issues through the ages.

One of the most important topics in waterway construction during the period under review was the unification of river basins into a single system throughout the European part of Russia. Thus, the objective of this research is to consider the issues related to

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development of the legal framework and management issues in regard to improving waterways in the 18th and the first half of the 19th centuries. The objective determined the following tasks:

- defining the need for establishing waterways in each of the periods under consideration;
- defining the government's legislative initiatives in the matters of waterway construction in each period under consideration;
- defining the background for establishing managerial authorities, as well as the nature of management for construction and repair works in each period under consideration.

It is suggested to review three stages of establishing and developing the legislative framework and management issues in this area. It is apparent that this range of problems is directly related to the issues of developing the state system in Russia. Those periods of state system development accounted for the diversity in managing both the construction sector in general and its various segments.

The first stage embraces the time period from the 1690s to 1761 when the state saw the increased administrative centralization and monarch's power, when the higher state governance was strengthened, a new legal system was established, and public law governance principles were set.

Under Peter the Great's reign, waterway construction became a priority in national focus areas. The matters of managing this process and construction itself were regulated by central authorities and initiated by Peter the Great personally. Joining the Volga and Don Rivers, establishing a bypass route along Ladoga Lake and starting construction of water ties between the capital and central regions (Vyshny Volochyok Waterway) were not only of economic significance at the first stages; they rather served political and military objectives. Despite the significance of the industry for the nation, construction of waterways, however, had no proper governance.

The second stage is from 1761 to 1802. Under Catherine the Great's reign (1762–1796), when responsibilities were given to the provinces, it became possible to take a more active approach to implementing plans for construction of connecting waterways. In this regard, construction of the Vyshny Volochyok Waterway that tied Saint Petersburg and adjacent regions to central Volga districts was of paramount importance [1]. Cooperation of governors in the matters of constructing waterways with central authorities and with the Empress personally cast aside the issues of establishing a national governing board for this area. It was as late as in 1798, when the centralization of governance of economic branches was renewed under Paul's reign, when it became possible to establish a sound governing body for waterway management that had the status of a State Department.

The third stage, from 1802 to 1833, was the time when the concepts of a state of law started to be implemented in Russia. The result was the transformation of central and local authorities, the system of governorate and urban institutions, which had a significant impact on the structure of state authorities, including those in waterway construction. The reforms of central public authorities came with large-scale codification of the existing laws. It resulted in a set of documents regulating the relations in the construction sector. With regard to waterway construction in Russia, a need for cooperation between central and local district authorities was acknowledged.

2 Methods and Materials

The factual basis of the research included legislative instruments and regulations published during the 18th and the first half of the 19th centuries. Besides, sources of pre-revolutionary historiography and the 20th century historiography on waterway construction were studied

in detail. Development of the legal framework and the actual process of connecting Russian water basins were studied in parallel.

2.1 Managing construction of connecting waterways in Russia in the first half of the 18th century

The Russian road network throughout the Empire (with wheeled transport roads), established by the end of the 17th century, was quite disparate. This was due to a number of economic and geographic factors, among which were the following: the historical order of populating Russian territories, locations of hunting, fishing and gathering areas, as well as the geographic location of Moscow — the political, administrative, trading and economic center of the then state. By the end of the 17th century it became apparent that the wheeled transport road network being of little use for large-scale and regular transportation slowed down the development of domestic market relations significantly. Waterways and inland water transport could facilitate the accomplishment of strategic and economic tasks set by Peter the Great. This is why the government took a decision to ensure operation of water transport through establishing waterways connecting the main centers of the Russian state.

The Azov campaigns of 1695–1696 resulted in another center of attraction for military and economic resources. The Don and Volga Rivers were meant to connect the Russian South with the central part of the country.

The task of travelling from Moscow to the Don and connecting the Caspian and Black Seas had required a solution for a long time. Relevant works started as early as in the second half of the 16th century, but they were not completed. This is why reclamation of cross-border and newly conquered regions of the South (the Azov and adjacent territories) led to continuing the construction works aimed to build a waterway between the rivers of the Volga–Don basin in the late 17th century.

At the time, any construction works were initiated by decrees worded by Peter the Great personally: he issued orders to works supervisors, coordinated designs, issued orders to authorities supplying materials and providing manpower to construction sites.

Detailed surveys of the region were the basis for the canal design. In 1695–1699, under personal supervision of Peter the Great, Vice Admiral Cornelius Cruys managed the survey works at the Don River and a part of the Sea of Azov. The result was the Sea Map of the Eastern Part of the Sea of Azov and the Don River Atlas.

The works on the construction of a canal between the Volga and the Don started in 1697 according to a design made by Mr. Cornelius Cruys [2]. Engineering of the design and supervision of the works were also assigned to foreign experts: at first, to Colonel Breckel, a German engineer, and then, to John Perry, an English hydraulic engineer. The design provided for connecting the Kamyshinka and Ilovlya (tributaries of the Volga and Don Rivers, respectively) in the narrowest neck of land between them of 4 Russian miles. Floodgates were required to be installed for navigation in small tributaries. Technical and financial difficulties related to the works performance, remote location of manpower — all these obstacles made it impossible to complete the works. Besides, under an order, the works had to be stopped due to the start of the Russo-Swedish war [3]. As Perry wrote later, by 1701, some floodgates were almost completed, and the canal was halfway trenched.

Since the canal construction in that place was of strategic importance, especially in case of a war against the Turks, Crimean Tatars, Persia, or against one of the Caspian Sea countries, Peter the Great came back to this idea as early as in the 18th century [4]. However, the direction of the canal changed. It was decided to connect the Volga with the upper reach of the Don. This canal, named Ivanovsky, was meant to connect the Volga, Oka, Upa, Shat Rivers and the Ivanovskoe Lake with the way to the Don. During the construction works, that continued from 1701 through to 1707, more than 20 stone

floodgates were built, the canal was trenched, and works to clear up and deepen the riverbeds were conducted. In historical sources, there are data that 300 ships "with major difficulties" passed through the canal at high water in the spring of 1707. However, the system did not operate as expected because of the scarcity of water and difficulties related to passing small rivers. Besides, the canal was not a priority anymore as the Azov was given over to Turkey under the Treaty of the Pruth. It should be noted that the idea to connect the Volga with the Don gave birth to many various projects, both in the 18th and the 19th centuries [5].

With Saint Petersburg being founded and declared the capital, centers of attraction of materials and manpower changed, and, therefore, Peter the Great issued a new decree intended to connect the provinces with the North-Western part of the country. Besides, routes through Vyborg and Finnish lands to the Swedish border, through Narva to the Western border; to the North to Olonets, Petrozavodsk and Arkhangelsk, became priorities.

During the first quarter of the 18th century, works at some areas of the Vyshny Volochyok Waterway started. It was meant to ensure convenient inland water routes between Saint Petersburg and the central regions of Russia.

Once the Baltic Sea coast was annexed to Russia, Peter the Great turned his attention to an old portage between the Volga basin and the rivers flowing into Ladoga and Onega Lakes, viz. to a water divide between the Tsna and Tvertsa Rivers where goods were shipped by land. It was decided that this passage should be crossed by a canal, with the construction works starting in 1703. The works were supervised by the Gagarin Princes and were completed in 1708. Later, this canal became a part of the Vyshny Volochyok Waterway. The next stage of the works at the sectors of the Vyshny Volochyok Waterway was conducted during 1719–1723. Those works were preceded by major survey activities. Connecting the Msta and Syas Rivers, as well the Sheksna and Vytegra was under consideration.

A project found the most successful was later implemented. It included directing the Shlina River through lakes to the Tsna River, thus making it possible to maintain the water level required for navigation during summertime in the Tvertsa River and the lower Tsna. Due to the implementation of this project, the Borovitsky rapids were improved, a dam at the Shlina River was built, the Tsna Canal was built, as well as a canal from the Shlina River to Klyuchevoe Lake, and other hydraulic structures.

Construction of the Ladoga Canal started in 1718. It was of high economic and strategic importance for the new capital. This waterway was needed because of the intense development of the Russian North-Western areas: founding the cities of Saint Petersburg, Kronstadt, other centers of that region, as well as the development of the Baltic fleet. Dangerous navigation in Ladoga Lake made it impossible, in some cases, to deliver goods from the central Russian districts to Saint Petersburg, including supplies of foodstuffs.

Preparatory works started in 1718, which is evidenced by relevant decrees: "On appointing workers for the Ladoga Canal according to the number of households and allocating works to them" (a Senate's decree); "On continuing works on the Ladoga Canal by engaging contractors and initiating fund-raising for those purposes" (a Senate's decree); "On calling contractors for tendering the works on the Ladoga Canal" (a decree signed by Peter the Great, declared by the Senate); "On attendance of those willing to be contractors for the works on the Ladoga Canal and on formulating the declared conditions in the Senate Chancellery" (a decree signed by Peter the Great, declared by the Senate), and some others.

A study of the Complete Collection of Laws makes it possible to assess Peter the Great's focused attention to the construction of the canal. It is evident that he was constantly concerned about manpower recruitment. For example, in 1721, 14,000 service men were sent to increase the number of workers at the construction site. A special "canal fee" was

also established. The end date of the construction is arguably March 19, 1731, which is evidenced by the issuance and declaration of a relevant Decree.

The implementation of the Peter the Great's idea to connect a number of water basins included development of construction projects for the Mariinskaya and Tikhvin water systems [6]. Those initiative were, however, implemented as late as in the end of the 18th century.

It should be noted that under Peter the Great's reign, a process of training Russian hydraulic engineers was established. Foreign literature on engineering was ordered and translated, viz. Treatise on Bridges (Traité des ponts), Treatise on Ways to Develop Navigable Rivers (Traité des moyens de rendre les rivieres navigables), etc.

After Peter the Great's reign and before the 1760s, there were no significant projects to improve the river network (except for the construction of a seaway canal and docking facilities in Kronstadt).

Despite the progress in developing the network of inland water transport during the first half of the 18th century, no institution was established that would manage all transport operations in Russia and supervise construction activities in this sector. Supervision over navigation in rivers and lakes was delegated to the provinces, i.e. it was managed mainly by governorate authorities, which made it impossible, to some extent, to conduct overall supervision over construction, repair and operation of transport routes.

2.2 Managing construction of connecting waterways in the second half of the 18th century

In the second half of the 18th century, researches and design studies according to the Peter the Great's plans to build waterways connecting various Russian regions were continued. Those projects dealt with constructing the Syas Canal (as extension of the Ladoga waterway); establishing the Tikhvin and Mariinskaya water systems connecting the Caspian and the White Seas; connecting the Dnieper and the Western Dvina, etc. However, all the way up to the late 1790s, the implementation of large-scale projects to build waterways never started. Works to maintain the existing waterways were mainly conducted during this period. Largely, that was due to the priority of other governmental programs, as well as the Russo-Turkish war that broke out in 1788. At the time, all governmental construction projects were dismantled.

Hydraulic works in the second half of the 18th century were conducted for the Vyshny Volochyok Waterway where the construction works were renewed and continued all the way through to the early 19th century. Those works were related to the construction of floodgates at the Msta and Dubrovka Rivers, clearing-up of canals and rapids at the Tvertsa and Msta rivers, arrangement of towpaths, etc. The Vyshny Volochyok Waterway became one of the most important state waterways in the late 18th and the early 19th centuries. Due to the construction of this waterway, expenses for deliveries from Rybinsk to Saint Petersburg reduced in half. In 1785, Catherine the Great visited the Vyshny Volochyok Waterway and overviewed navigation.

Introduction of state regulation of construction and repair works at connecting waterways determined the great importance of the Vyshny Volochyok Waterway for Russia. In 1773, the position of the Chief Director for Waterways was introduced. Acting Governor of the Novgorod, Tver and Pskov governorates, Lieutenant General J.J. Sievers supervised the inland water communications. He suggested to divide the management of the Vyshny Volochyok Waterway into three parts: from Tver to the Msta floodgate, then — to Novgorod, and from Novgorod to the Ladoga Canal. This suggestion was accepted, and a relevant Imperial Edict was issued on October 9, 1778. At the same time, staff of the

Vyshny Volochyok Waterway was approved. This management system was applied in the early 19th century, with district waterway offices established throughout Russia.

In general, throughout the Russian Empire, the centralization of the management of waterway construction and repair works took place as late as in the end of the 18th century, on February 28, 1798. Emperor Paul I established a central office for management of waterway construction in Russia, viz. the Department for Waterway Construction and Management in the Empire, with the works conducted under the regulations of the Collegias. The Senate's Decree "On Establishment of the Department of Waterways" followed in March of the same year.

The Department was under direct supervision of the Senate. The issue of establishing this special institution was solved as early as in 1797, when according to the Decree of the Governing Senate, its Head — the Director of the Department of Waterways — was appointed. It was Actual Privy Councillor J.J. Sievers who held the position until 1800. The Emperor assigned him with developing "general regulation on arranging better organization". At the same time, a commission considering waterway establishment projects was in operation.

Establishing a state authority to oversee water management contributed both to reasonable planning of waterway construction works and allocation of materials and manpower by construction sites.

Several design proposals were suggested to connect the Dnieper and Western Dvina basins. In this regard, the connecting canal, named Berezinsky, between the Berezina and Ulla Rivers, was given precedence. In 1797, the Commission for Inland Shipping ordered to start high-priority works in this sector. On February 23, 1797, the Regulation of the Commission approved by the Emperor followed. This regulation also assigned Count Sievers with supervision over the construction works. The works were preceded by levelling and surveys, and a corresponding design was developed. Major General Freigang was appointed to manage the project. By the beginning of 1801, 14 floodgates and 4 dams, as well as the required number of personnel facilities were built.

Follow-up construction works at the Vilievsky Canal, included in the Oginski Waterway System, were of high priority. Construction of the Oginski system was started by Vilnius voivode Michal Oginski at his own expense even before the Western and Privislyansky regions were annexed by Russia in 1768. During the construction works in 1799–1804, the Yaselda River, a Pripyat tributary, the connecting Oginski Canal crossing Vygonoschanskoye Lake, and the Shchara River falling into the Neman were included in the Oginski system. Cargoes from the Pripyat and Dnieper were shipped abroad using this waterway.

In the late 18th century, attention was turned to the Peter the Great's plan to build the Mariinskaya water system. He tried to find ways to construct a waterway that would meet the navigation safety requirements and the required deadweight of ships. In 1797, Chief Director of the Department of Waterways J.J. Sievers, having read the general plan for waterway construction and having personally inspected the location, submitted a report on construction of hydraulic structures of the future Mariinskaya water system. The report was made for the Commission for Inland Shipping. After this, on January 20, 1799, a decree signed by the Emperor himself for Count Sievers, the Chief Director for Waterways, concerning contruction ofa new waterway, followed. The Decree determined the source of funding, and stated: "hereby we order you to submit for our approval the plan and estimate regarding this construction, with great hope that you will be eager to complete this plan promptly, which will henceforth be named Mariinsky, as a remembrance for our descendants". Major General Sainte-de-Wollant was assigned with supervision over the works. This waterway included the Sheksna River, from the influx to the Volga to the origin from Beloye Lake, Beloye Lake, the Kovsha River with two floodgates, the

connecting waterway between the Kovsha and Vytegra Rivers, the Vytegra River, that had to have floodgates throughout, Onega Lake, the Svir River, the Svir Canal (to bypass a part of Ladoga Lake) between the mouths of the Svir and Syas, as well as the Syas Canal (its construction between the mouth of the Syas River and Volkhov started as early as in the 1760s), and, finally, the Peter the Great's Canal. The works were conducted at fast pace, and by 1801, 8 floodgates were built, and a connecting canal between the Kovsha and Vytegra Rivers was trenched.

2.3 Managing construction of connecting waterways in the first half of the 19th century

The first half of the 19th century was determinative in terms of creating the legal framework and establishinh operation of the state system for management of water systems' construction. This process laid the basis for the efficient work of central and local authorities in this industry throughout the 19th century.

The Department of Waterways was the second most important (alongside with the Ministry of Internal Affairs) institution in Russia that implemented public contracts in the construction sector in the early 19th century. In 1802, for efficient solution of tasks in the field of transportation management, according to a report of Count Rumyantsev (the Chief Director of the Department), approved by the Emperor, the local management board of the Department was divided into individual authorities on an area basis. At first, those authorities managed three sectors. The first one included river basins of the Western part of Russia, the second one covered the Eastern territories and European center, while the third one included river basins of the Northern and North-Western lands.

Design of hydraulic structures were also reviewed at the Department. After design review and approval, representatives of the Department supervised the corresponding works. Foremen (engineers and technicians) managed the works in situ. In the early 19th century, most of those specialists were invited from abroad — Spain, France, Holland. Local offices (e.g., offices at the Vyshny Volochyok and Borovitsky rapids) or forwarding services (e.g., at the Ladoga Canal) supervised navigation at Department sites. Operation of hydraulic structures and proper navigation in other rivers and canals were overseen by Chief Supervisors, their assistants, floodgate experts, and military teams assigned to them.

Throughout the lifetime of the Department from 1798 to 1809, a sufficient number of waterway construction works were implemented. Many of those were started as early as during Peter the Great's reign. Among those were Berezinsky, Ivanovsky, Velievski, Oginski, Mariinsky, Siversky, Svir, Syas, Northern Ekaterininsky, and Tikhvin Canals. Not only artificial waterways but rivers as well were taken care of: navigable passes were cleared up and deepened to improve navigation. Significant works were conducted in the capitals as well. In Moscow, the Moskva River, and in Saint Petersburg, the Moyka, Fontanka, Tarakanovka, Pryazhka and Catherine Canals were cleared up.

New transformations in the governance structure were started from 1809. In November 1809, the document "Institution for Managing Waterways and Overland Transportation" [15] declared principles of new governance in this area, established the structure of the department, and described a plan for establishing a training center. The central authority for managing waterways and overland transportation was named the Transportation Department and headed by the Chief Director who chaired the established Council consisting of three members — Managing Inspectors General of the Transportation Engineering Corps. According to those regulations, a Forwarding Service was attached to the Chief Director. Initially, this office was located in Tver, since "it was most important for the capital". Later, in 1816, the office was relocated to Saint Petersburg, because it was necessary to "establish closer relations with other Departments and Ministries".

The Forwarding Service was divided into three groups headed by directors. The first group included the waterways office, the second one included the overland transportation office, and the third one was for commercial ports.

General management in situ was conducted by District Boards. To comply with the transformations in the Transportation Department, the whole system of waterways and overland transportation was divided into 10 districts covering all Russian governorates.

The first district included the Saint Petersburg, Novgorod, and Tver Governorates.

The second district included the Olonets Governorate and parts of the Saint Petersburg, Novgorod, and Tver Governorates.

As for the third district: the first department of the district covered the Moscow, Yaroslavl, Kostroma, Vladimir, Ryazan Governorates, and parts of the Tver, Tombov, Penza, Oryol Governorates; the second department included the Kazan, Perm, Vyatka, Orenburg, Simbirsk, Saratov, Astrakhan Governorates, and parts of the Nizhny Novgorod and Penza Governorates.

As for the fourth district: the first department of the district included the Azov and Black Sea ports, as well as the Don River basin, together will all its tributaries from the origin to Ivan Lake; the second department supervised transport routes in Georgia and the Caucasus from the Terek River.

The fifth district included most parts of the Smolensk, Mogilev, Oryol and Kursk Governorates, the Chernigov, Kiev, Poltava, Kherson and Podolsk Governorates, parts of the Kharkov and Yekaterinoslav Governorates.

The sixth district included the Volhynian and Minsk Governorates, and a part of the Kiev Governorate.

The seventh district included the Vitebsk, Courland, Livonia and Estonia Governorates, parts of the Minsk, Mogilev and Vilna Governorates.

The eighth district covered navigation in Finland.

The ninth district included the Vologda, Arkhangelsk, and Perm Governorates, and parts of the Vitebsk and Olonets Governorates.

The tenth district supervised navigation and road traffic in Siberian Governorates.

Each district was headed by a district superintendent who managed 15 executives, 20 managing directors, engineers of various categories (categories 1, 2, 3), and a craftsmen brigade. Direct supervision over the condition of waterway and road facilities was performed by a police team. It ensured "that roads, bridges, ditches, etc. were not damaged, lateral canals were not blocked, and the very roads were not narrowed by buildings, fences and ploughlands".

While the Chief Director managed the entire Department, the process of reporting at the authority remained the same. The Chief Director reported directly to the Emperor about those issued that required the Emperor's approval, and submitted annual reports on management activities. District superintendents who were responsible for construction, as well as improvement and maintenance of the existing structures submitted local reports to the Chief Director monthly; twice a year, they also inspected their respective districts and reported correspondingly to the management.

The newly established authority (according to the document "Institution for Managing Waterways and Overland Transportation" approved in November 1809) faced a number of difficulties due to the lack of qualified staff for work performance, on the one hand, and due to the neglected state of Russian roads, on the other hand. Initially, the office got down to solving the issue of restoring the Ladoga Canal and the Tvertsa towpath to proper condition. By that time, they had become totally neglected. The office also started "arranging in order" the navigation in the Mariinskaya water system.

Since the Mariinskaya water system was of great importance for connecting the Volga basin with the North-Western territories, a project to improve it was developed. After the

project was considered at an "interdepartmental" meeting in the State Council (which was attended by representatives of the Department of Laws and the Department of State Economy), it was approved by the Emperor, and then, on October 29, 1810, a Manifesto "On Approval of Navigation Offices for the Water System of the Volga River through the Vyshny Volochyok Canal to Saint Petersburg, with the Navigation Court and the Staff for Such Court" was issued.

Construction of the Shlisselburg floodgates was also important for the capital. With regard to these hydraulic works, the Commission for Shlisselburg Floodgates was established in 1824, which operated until 1834.

In 1818, the Transportation Department was renamed the Main Transportation Department, and the position of the Head of the Department was renamed the Chief Executive Officer. The structure of the Department was similar to the general structure of ministries and the General Staff. In 1829, the Headquarters of the Transportation Corps was established as a part of the Department. Construction brigades affiliated with the Corps to work at construction sites were formed. They were allocated to districts and had a military structure.

Moreover, in the 1820s, Economic Committees were established to divide the local management of basic works into artificial and economic sections. They were established for continuous operation at the Ladoga Canal, Vyshny Volochyok System, Vytegra and Moskva Rivers. While the District Boards performed administrative functions, the Economic Committees conducted fund-raising activities, ensured preparation for tender procedures, supply and storage of materials, and staffing of construction sites.

The efficiency of waterway construction works in the 19th century was conditioned by the introduction of regulations ("Building Regulations for All Works near Fortresses, Hydraulic Structures and Civil Buildings"). This document was prepared by the Main Transportation Department.

The Building Regulations determined the headcount and materials for each kind of construction works. It described construction techniques, basic design concepts peculiar to that period, nature of manpower and quality of supplies used in construction works.

The next significant reform of the Department was conducted in the 1830–1840s. In 1833, the construction section of the state-owned authority was transferred to the Main Department from the Ministry of Internal Affairs. A new authority, named the Main Department of Transportation and Civil Buildings, was meant to develop a single system of road and civil construction management in Russia. The nature of this Department remained the same up until new reforms in 1865.

Its structure was extended according to new tasks. In the transformed department, two out of four bureaus of the First Office of the Department for Designs and Estimates were engaged in road works (construction of highways, waterways, bridges, etc.). For example, the second bureau of the Department was tasked with organizing the works on arrangement and conditioning of waterways; draining adjacent territories, deepening and clearing up canals; reviewing projects on waterway arrangement. The third bureau dealt with the matters of "repairing and maintaining waterways along with the corresponding structures".

To solve issues related to construction of highly sophisticated structures, temporary committees and commissions were established as part of the central or governorate management. Such offices dealt with a wide range of tasks which included direct management of construction, supply of materials to construction sites, hiring manpower, etc.

When railway transport emerged and then developed in the second half of the 19th century, the share of cargo turnover attributed to waterways did not reduce. Waterways were still a high priority in the Empire's economy.

This is evidenced by the fact that in the early 1830s, one of the large-scale analytical works was compilation of a Water Engineering Map of Russia that was meant to designate the existing and new transport routes. The Water Engineering Map was issued by the Commission of Designs and Estimates in 1833. However, it had some deficiencies and required improvement in the early 1840s. A new Hydrographic Map of Russia was issued in 1842. It featured all waterways, as well as the existing rivers, lakes, etc. To clarify all data in the map, the map was sent to the districts to be amended as necessary.

At the same time, at the Administration of the Interdepartmental Committee for Mapping the General Plan of Water and Overland Transport Routes, a map of all existing roads that required construction was compiled. The accuracy of the information in the map and timely reflection of all changes made it possible to use it up until 1870 as the main source of qualifying rivers as waterways.

In the 1830–1840s, works on improvement of navigation along the existing rivers and canals, and construction of new hydraulic structures were conducted. The Belozersky Canal was constructed in the Mariinskaya water system during the period from 1843 to 1846. Construction of this waterway was due to the dangers in passing Beloye Lake. The Belozersky Canal connected the Sheksna and Kovsha Rivers. The following canals were built as well: a bypass canal from the mouth of the Vytegra to Onega Lake; the Dnieper-Bug Canal (between the Dnieper and the Vistula along the Priapyat and the Bug); the Volga-Moskva Canal. The construction of the Volga-Moskva Canal was of national importance not only with regard to regional trading connections, but also with regard to deliveries of construction materials for the construction of the Cathedral of Christ the Saviour in Moscow, built in honour of the victory over Napoleon.

The first half of the 19th century was very important for various economic activities carried out in the Russian Empire, and the foundation for this was a new approach to establishing the legal framework for the state structure. Further centralization and bureaucratization of the administrative apparatus became the result of the transformation. Besides, during this time, efficient management techniques with regard to the economy of the Russian Empire improved. Those processes directly affected the organization of the management system for waterway construction and repair works.

3 Results

1. Despite the progress in developing the network of inland water transport during the first half of the 18th century, no institution was established that would manage all transport operations in Russia and supervise construction activities in this sector in a centralized manner. Supervision over navigation in rivers and lakes was delegated to the provinces, i.e. it was managed mainly by governorate authorities, which made it impossible, to some extent, to conduct overall supervision over construction, repair and operation of waterways.
2. The laws made under Peter the Great's reign consisted of acts of state, as well as oral and written orders of the Emperor, that were of statutory nature. Despite the fact that the law-making under Peter the Great's reign sought to fully regulate all aspects of public life, the law-maker's decrees and regulations were aimed at expedited solution of specific issues, which made it impossible to map a general strategy in waterway construction.
3. In the second half of the 18th century until the 1790s, there still were no central regulating and managing authorities for waterway construction. However, powers of local and governorate management under Catherine the Great's reign contributed to efficient construction of the most important waterways: Vyshny Volochyok, Mariinskaya, Tikhvin and other systems.
4. The Main Transportation Department (the Main Department of Transportation and Civil Buildings starting from 1833) was established in the first half of the 19th century for

managing the road industry. In the first half of the 19th century, management of the Transportation Department showed the trend typical for management in other industries. This was expressed in the development of a strongly coordinated hierarchy in the industrial management (from the center to the provinces) with intermediate regulatory bodies.

5. In the 19th century, the nature of centralization in road authority management contributed to the scheduled organization of waterway construction. This resulted in compiling the Water Engineering Map of Russia, as well as the general plan of water and overland transport routes that required construction.

4 Conclusion

The study has made it possible to track the process of development of the waterway construction management system in the 18th and the first half of the 19th centuries. Development of laws in this area progressed from the uncodified law system of Peter the Great aimed at solving specific practical tasks to the legal framework with the strongly coordinated hierarchy of management that allowed planning and addressing waterway construction issues in coordination with the Russian road network.

The idea of centralizing waterway management did not go any further in the first half of the 18th century. Nevertheless, the period of Peter the Great's reign left abundant regulatory materials concerning specific aspects of organizing construction of hydraulic systems: connecting the Volga–Don basin rivers, making a bypass canal along Ladoga Lake, conducting works at sectors of the Vyshny Volochyok waterway.

Monumental urban planning programs of Catherine the Great set the task of connecting the capital located in the North-Western region of the Empire with governorates located in the central part of Russia. This is why the construction of the Vyshny Volochyok Waterway became the main task of that period. Waterway construction and maintenance works showed the need for central management regarding those activities. Therefore, in the late 18th century, the central authority for waterway management, the Department for Waterway Construction and Management, was established.

The central administrative apparatus for waterway construction and repair, established in the 19th century, made it possible to create an efficient organizational model in the field of regulating and overseeing waterway construction works in Russia. This was facilitated by division of the local management board into individual authorities on an area basis, which allowed for timely communication with the center. This resulted in scheduled waterway construction and repair works. At that time, introduction of the legal framework for construction allowed for more efficient construction and repair works.

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