

Water Supply to the Small Cities in the Northern Region of the Russian Empire, 1890–1910s (Vologda, Staraya Russa and Cherepovets)*

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The article is devoted to the analysis of the process of the organization of centralized water supply systems in small Russian towns at the end of the nineteenth and the beginning of the twentieth century. The causes and the process of pipeline building in three small cities, each of which became significant transport hubs by 1914 and had populations of less than 50,000 people, are described in the research. The research interest in these towns is led by understanding how the transport position of small cities promoted the improvement of water supplies in them. It was essential due to the growth of the urban populations and increasing cases of cholera epidemics in transport-hub cities.

Keywords: Russian Cities. Russian Empire. Urban Environmental History. Urban Sanitation. Urban Water Supply. History of Technology.

Introduction

At the end of the nineteenth century centralized water supplies became one of the useful measures in the fight against cholera epidemics. Not only big Russian cities but also small and mid-sized towns needed water pipelines. The urban population used water from rivers, lakes or underground sources. As a rule, the cities had mixed types of water supply (well and river at the same time). The mix would be determined according to the natural conditions in a particular city and the quality of the water in these sources. Residents took river water from the rivers on their own or bought it from water carriers. Therefore, well water supplies were used by inhabitants who had groundwater sources with pure water or who lived far away from rivers or lakes. At the same time, the quality of river water was often unsatisfactory. Even in cities with water pipelines (St Petersburg, Tsaritsyn, Saratov, Astrakhan, Kyiv, Mogilev), the tap water stood cloudy after filtration.¹ Primarily quality water supply was necessary for the cities located near the main transport ways. There was regular immigration of permanent or temporary population (vacationers, seasonal workers). This factor, together with the poor quality of water supplies, threatened the emergence and rapid spread of epidemics. By the end of the nineteenth century, outbreaks of cholera epidemics were quite rare in Europe, which allows historians not to associate the victory over cholera with the emergence of centralized water supplies in cities.² Meanwhile in the Russian Empire, providing clean water was one of the main anti-epidemic measures. Moreover, state policy in this area had been changing significantly in the 1880s–1910s. In 1883,

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1 BELYAKOV, *Artezianskiye kolodtsy*, 13–14.

2 ABELLAN, *Water Supply*, 7–8. BROWN, *Coping with Crisis?*, 307–316. BRIGGS, *Cholera and Society*, 85–86. EVANS, *Epidemics and Revolutions*, 145. MORRIS, *Cholera*, 228.

the ministry of internal affairs ordered the local authorities to establish supervision over the quality of water used by the population. In the 1800s, the city administration could receive financing through a bond loan for the building of a water pipeline, which had to be approved by the state authorities. During the years of the economic crisis of 1900–1903 and the Russo-Japanese War, the implementation and financing of sanitary and anti-epidemic measures were entrusted entirely to local governments. Only in 1911 did the central government begin to provide systematic financial assistance to cities and zemstvos in the fight against epidemics and improve water supply sources. By the end of the nineteenth century, the population of most Russian cities (55 %) did not exceed 30 thousand people,³ and in 1913, only 219 out of 1,231 Russian cities had water pipelines (17.79 %).⁴ Sewerage was only present in 63 Russian cities (5.12 %).⁵ In the studied cities, sewerage was built during the Soviet era, and during the study period, urban waste was taken out by flushers to city dumps or by peasants to fertilize the fields. Surface runoff was released without treatment into local rivers from city streets through open channels. The aim of this research is the analysis of the process of the centralization of water supplies in small towns of the Russian Empire. The research is based on three cases. The first is Vologda, which was the administrative centre of Vologda province and one of the most populated cities in the northern regions of the Russian Empire. The second case is the water supply in Staraya Russa of Novgorod province. It was a resort town with a military settlement, where the first water pipeline was built in 1848. The third case is the building of a water pipeline in Cherepovets of Novgorod province. This town is located on the Mariinskaya waterway system and the Northern Railway (Figure 1). These three cases allow us to analyse the change in state policy regarding urban water supplies in small towns in the pre-crisis period (Vologda, 1898–1899), during and after the Russo-Japanese war (Staraya Russa, 1904–1909) and after the transition to financial assistance from the state (Cherepovets, 1911–1916). The article raises the questions of the need and conditions for the organizing of centralized water supplies in small Russian towns. Was water supply an objective necessity in small towns? How could city administrations provide a centralized water supply? What difficulties did city administrations encounter and how did they overcome them? How did city administrations interact with the central government?

3 MIRONOV, *Sotsial'naya istoriya*, 287.

4 *Territoriya i naseleniye*, 4–5.

5 *Territoriya i naseleniye*, 4–5.



Figure 1: Map of the northern region of European Russia⁶

The year of 1870 was the turning point in urban pollution and urban sanitation in the Russian Empire. After the reform of city self-government of 1870, the urban environment and its sanitary conditions became the object of the policy of local authorities, upon which fell the responsibility to address the economic issues of local importance. Moreover, Russia was a country with delayed modernization, where industrial development and population growth started in the last third of the nineteenth century. The Vologda and Novgorod regions had had an agrarian specialization; therefore, bacteriological pollution was the main environmental problem in the cities of both regions. This type of pollution has been an object of some historical research since the 1980s. Works by A. Corbin, D. S. Barnes and R. Evans allow us to follow the evolution of the perception of everyday odours in French society (A. Corbin), the role of the miasmatic and the bacteriological theories in the environmental measures of a government (D. S. Barnes) and the dramatic consequences of bacteriological pollution due to a misguided policy of sanitary protection (R. Evans).⁷

Hygienists were the first to study the problems of urban sanitation and water supply in pre-revolutionary Russia. Their essays and theses have described natural and sanitary conditions of cities or counties with characteristics of sources of water supplies in the USSR. N. I. Falkovsky researched the evolution of techniques and technologies

⁶ ILYIN, *Novyy uchebnyy geograficheskiy atlas*.

⁷ BARNES, *The Great Stink*. CORBIN, *The Foul and the Fragrant*. EVANS, *Death in Hamburg*.

of water supply in Russia from the tenth to the beginning of the twentieth century.⁸ K. G. Vasiliev and A. E. Segal analysed the influence of water quality on the incidence of intestinal infections in Russia from the eleventh to the early twentieth century.⁹ V. A. Nardova has been studied problems of water supply in St.-Petersburg through the development of municipal Government and urban beautification in the last third of the nineteenth century.¹⁰

Post-Soviet historiography continued to develop in the directions of Soviet historiography. At the same time, urban water supply has become the subject of research on the history of everyday life¹¹ and environmental history.¹² A. K. Smith and C. E. Henze studied bacteriological pollution in Russian cities and its influence on Russian society.¹³ Both researchers noted an authoritarian style of government as a limiting factor in the improvement of sanitary conditions in the country. Generally, in Russian studies, urban sanitation and water supply in small towns were not specific topics for environmental historians. This study complements existing research on the history of water supplies to cities in the Russian Empire, focusing on the importance of high-quality water supplies in small northern towns. The analysis is based on the methodology of urban environmental history. It highlights the problems of water supplies in small northern Russian cities with unfavourable sanitary conditions and changes in state policy regarding the water supply. The study used the method of comparative analysis, which made it possible to identify commonalities and differences in the conditions and policies of the administrations of three northern Russian cities concerning the organization of their centralized water supplies.

The sources for this research consist of materials from national archives, the press of the local government, reports of physicians and statistics. In the study were used contents of the Russian State Historical Archive (RSHA), the State Archive of the Vologda Region (SAVR) and the Cherepovets Documentation Storage Centre (ChDSC). The city regulations of 1870 were used to describe the structure and functions of the city administration. The data of the first general census of the population of the Russian Empire and statistical data of memorial books, statistical yearbooks of the Russian Empire and the analytical survey of the Russian Empire were used to analyse the socio-demographic processes and the economic structures of the towns people. The study also used the current documentation of state and local authorities from the funds 1288 – “Main Directorate for Local Economy of the Ministry of Internal Affairs”, 1298 – “Office of the Chief Medical Inspector of the Ministry of Internal Affairs” of RSHA, 475 – “Vologda City Government” and 911 – “Cherepovets City Government” of SAVR. These documents helped in reconstructing the history of urban water supply. The periodical press helped in understanding the attitudes of city authorities and citizens toward municipal water supplies.

8 FAL'KOVSKIY, *Istoriya vodosnabzheniya v Rossii*.

9 VASIL'YEV – SEGAL, *Istoriya epidemiy v Rossii*.

10 NARDOVA, *Gorodskoye samoupravleniye v Rossii v 60-kh – nachale 90-kh godov XIX veka*.

11 KOS, *Vodosnabzheniye provintsial'nogo goroda*, 50–55. POZNYAK, *Zhil'ye*, 103–111. SCHERBINA, *Sanitarnoe sostoyanie gorodov*, 37–42. SHAPKO, *Stroitel'stvo*, 37–39.

12 AKOL'ZINA – KANISHCHEV, *Izmeneniya okruzhayushchey sredy*, 64–69. DAVYDOV, *Vodosnabzheniya*, 60–79. KANISHCHEV, *Promyshlennoye zagryazneniye okruzhayushchey sredy*, 225–238. MAZANIK, *Sanitation*. OBERTEIS – MALINOVA-TZIAFETA, *Istoriya gorodov*, 173–201.

13 HENZE, *Disease, Health Care and Government*. SMITH, *Public Works*, 319–342.

Urban management, environment and economy

The City Reform of Alexander II established new organs of local government. Added were city electoral assemblies, dumas and city councils.¹⁴ The city electoral assembly included city inhabitants who were subjects of the Russian Empire of over 25 years, who had real estate in the city or who had paid fees to the city treasury for the previous two years and did not have arrears in city fees.¹⁵ The primary function of the assembly consisted of the election of city council members every four years. A city дума was elected every four years from persons who had suffrage.¹⁶ The head of the city was the head of the city дума, but the дума was directly subordinate to the governor, who could cancel the дума's decisions. The city дума established the size of city fees, appointed elected officials and approved resolutions on urban improvement. Also, the city дума elected members of the city council every four years. The city council compiled estimates of city revenues and expenses, collected information about the urban economy at the request of the дума, and resolved issues pertaining to municipal services.¹⁷

The city regulations of 1870 put responsibility for urban sanitation and urban improvement in the hands of city administrations. The scope of urban management included such issues related to the development of the city as street repairs, squares, bridge sidewalks, city public gardens, boulevards, water pipes, sewers, ponds, ditches and bridges, as well as city lighting. However, more importantly, issues regarding the protection of public health, including air cleanliness protection and measures against epidemic diseases, became the object of urban governance policy.¹⁸ It was under this remit that the centralization of water supplies was undertaken as a measure to limit the incidence of disease among the population, a responsibility which after 1870 fell under the jurisdiction of the city public administration.

The city дума had the right to levy fees on an assessment of real estate, on documents for the right to trade, from taverns, inns and snack bars, from transporters and from owners of private horses and dogs.¹⁹ Meanwhile, a city budget was intended for the maintenance of the city administration, police, officials, fire service, city buildings and monuments, educational and charitable institutions, streets, squares, roads, ponds, water pipes and sewers.²⁰ Therefore, city budgets were minimal, as has been proven by N. A. Nardova, who pointed out that funding sources limited the economic independence of a city administration.²¹

Vologda, Staraya Russa and Cherepovets were provincial cities of the Russian Empire. They are located in the north of European Russia. Vologda was an administrative centre of Vologda province, and Staraya Russa and Cherepovets were county towns of Novgorod province. Vologda is located downstream on the Vologda River. The eastern part of the city was marshy. Meanwhile, the average height of the city above sea level

14 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 8.

15 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 8–9.

16 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 19.

17 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 29–30.

18 *Gorodovoye polozheniye so vsemi otnosyashchimisya k nemu uzakoneniymi*, 4–5.

19 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 115.

20 *Gorodovoye polozheniye, vys. utv. 16 iyunya 1870 g.*, 156–158.

21 NARDOVA, *Gorodskoye samoupravleniye v Rossii vo vtoroy polovine XIX – nachale XX v.*, 49.

was 56–57 m.²² The Rivers Vologda and Zolotukha divided the city into three parts. They flowed slowly through the city, and the flow of the Vologda river could take the opposite direction sometimes. Also, at some places in the city centre there were lowlands where surface drainage accumulated.²³ Vologda was the biggest city among the cities of the Vologda and Novgorod regions. It had 50,000 persons by the beginning of the First World War.

Staraya Russa was a county town and the second most highly populated city in Novgorod province. The city was located on a plain, which was a part of the Valdai Hills.²⁴ The Rivers Polist, Porusje and Pererytitsa flowed through the city. However, their water could not be used for drinking due to the high concentration of salt. Inhabitants of Staraya Russa had been taking pure water from an underground source, which was located three versts (about 3.2 km) from the city. Moreover, Staraya Russa was a resort town due to an abundance of salt sources. This status contributed to the improvement of the city.²⁵

Cherepovets was located on elevated terrain at the confluence of the Yagorba River into the Sheksna River.²⁶ Before 1777 it was a settlement of the Cherepovets Resurrection Monastery and became a city on 4 November 1777.²⁷ The part of the city containing Resurrection Monastery was the highest. The north-western part of Cherepovets was located in the lowland. Therefore, some of the northern quarters did not become developed with houses due to boggy soil.²⁸ In spring, the dirt on some streets reached a height of 0.5 arshins (35.6 cm).²⁹

According to the classification of the Russian cities by V. P. Semenov-Tyan-Shansky, Vologda and Staraya Russa were mid-sized towns where less than 50,000 people lived, and Cherepovets was a small town with a population of 5,000–8,500.³⁰ By 1897, the Russian Empire had 655 towns and cities.³¹ There were 185 Russian towns (28.24 %), including Cherepovets, with populations of 5–9.9 thousand people, 129 cities (or 19.69 %), including Staraya Russa, with populations of 10–19.9 thousand people and 49 cities (or 7.48 %), including Vologda, with populations of 20–29.9 thousand people.³² The cities were situated at considerable distances from each other and larger cities, including the capital. The development of the railways favourably affected the growth of the urban population. This was most noticeable in Vologda, which became a large railway junction connected to St Petersburg, Arkhangelsk, Yaroslavl and Vyatka at the

22 PERFIL'YEV, *Kratkiy geograficheskiy ocherk*, 1–2.

23 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 223.

24 ROKHEL', *Starorusskiye mineral'nyye vody*, 3.

25 *D.R. Staraya Russa*, 438.

26 *Materialy po statistike Novgorodskoy gubernii za 1889 god*, 72.

27 *Materialy po statistike Novgorodskoy gubernii, 1887 god*, 143.

28 *Plan g. Cherepovtsa*.

29 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 106.

30 SEMENOV-TYAN-SHANSKIY, *Gorod i derevnya v yevropeyskoy Rossii*, 80–84.

31 excluding the Caucasus, Kingdom of Poland, Finland, and Central Asia.

32 Also, two cities (0.31 %) had populations of over 1 million, 12 cities (1.83 %) had populations of 100–500 thousand people, 31 cities (4.73 %) had populations of 50–99.9 thousand people, 14 cities (2.14 %) had populations of 40–49.9 thousand people, 12 cities (1.83 %) had populations of 30–39.9 thousand people and 221 towns (33.74 %) had populations of less than 5 thousand people. Source: MIRONOV, *Sotsial'naya istoriya*, 287.

beginning of the twentieth century. Intensive railway construction provoked population growth in the city from 27.7 thousand people in 1897 to 50.2 thousand people in 1914.³³ At the same time, Staraya Russa and Cherepovets became significant transport hubs by the 1910s. Staraya Russa was located on the Moscow–Vindava–Rybinsk railway, which contributed to its economic development,³⁴ while Novgorod lost its economic status due to it being away from the main railway lines.³⁵ Due to the development of the Mariinsky water system and the Northern Railway, Cherepovets acquired the status of a major transportation hub at the beginning of the twentieth century. It was the nearest port for ships travelling from the Volga basin to St Petersburg.

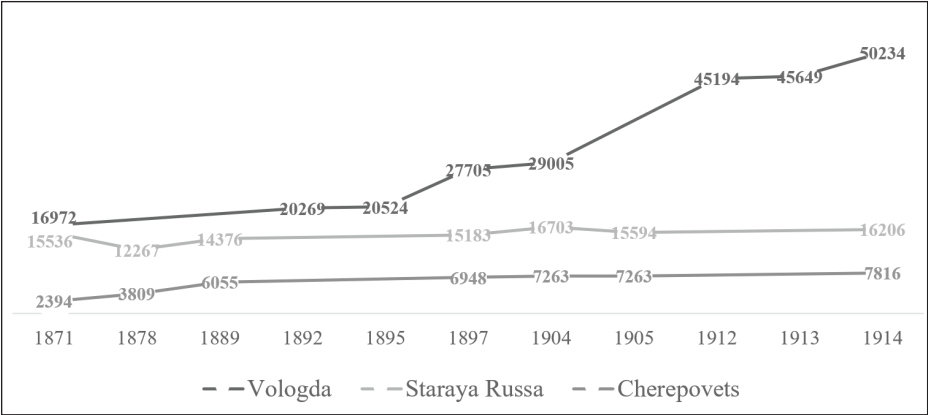


Figure 2: Dynamics of population growth in the cities, 1871–1914.³⁶

In general, the urban population increased from 4.31 % to 6.02 % in Vologda province, and it decreased from 6.89 to 5.33 % in Novgorod province.³⁷ This was less than the average for the Russian Empire, where the urban population increased from 11 to 14 % in the period 1870–1919.³⁸ In Vologda and Cherepovets, the population tripled between 1871 and 1915. In Staraya Russa, the population barely increased, but more than a thousand vacationers and sick annually came to the mineral water resort in

33 *Vedomost' o chisle zhiteley, 1914 god. Pervaya vseobshchaya perepis' naseleniya Rossiyskoy imperii, 1897. VII, 4–5.*

34 KURKUTOV, *V oblasti sanitarii, 2.*

35 SALONIKOV, *Promyshlennost' i promyshlenniki, 19–20.*

36 *Statisticheskiye materialy, 11. Statisticheskiy vremennik, 1893–1894, 48–49. Statisticheskiy vremennik, 1896–1897, 58. Vedomost' o chisle zhiteley, 1913 god. Vedomost' o chisle zhiteley, 1914 god. Statisticheskiy otdel, 3–13. Materialy po issledovaniyu, opisaniyu i statistike Novgorodskoy gubernii, 60–63. Materialy po statistike Novgorodskoy gubernii za 1889 god, 5–6. Materialy po statistike Novgorodskoy gubernii, 1907 god, 18–20. Materialy po statistike Novgorodskoy gubernii, 1916 god, 24–25. Pervaya vseobshchaya perepis' naseleniya Rossiyskoy imperii, 1897. VII, 4–5. Pervaya vseobshchaya perepis' naseleniya Rossiyskoy imperii, 1897. XXVI, 4–5. Goroda Rossii v 1904 godu, 5–9.*

37 The relative decline in the urban population of the Novgorod province was due to the increase in the rural population significantly outstripping the increase in the townspeople. Sources: *Statisticheskiy ocherk, 15. Vedomost' o chisle zhiteley, 1914 god. Statisticheskiy otdel, 3–13. Materialy po statistike Novgorodskoy gubernii, 1916 god, 24–25.*

38 LIVRON, *Statisticheskoye obozreniye Rossiyskoy imperii, 37. Territoriya i naseleniye, 57.*

the city. Accordingly, the administrations of all three cities should have been ensuring sanitary living conditions for the short-term and permanent populations.

Sanitary conditions and problems of water supply in the cities

In the period 1892–1897, the Medical Department of Interior Affairs was researching the sanitary conditions of Russian cities. The department collected statistics on 1,063 cities and published them in the volume "Sanitary condition of the Russian Empire cities in 1895". This source makes it possible to reconstruct the main problems of the urban areas in Vologda, Staraya Russa and Cherepovets on the eve of the building of a centralized water supply system. It describes the water supplies, sewage disposal systems and sanitary conditions of the streets. Vologda had 49 streets with cobblestone paving out of a total of 130 streets, Cherepovets had only three paved streets out of a total of 16 streets, and most parts of Staraya Russa streets were paved and cobbled.³⁹ However, 75 % of Vologda streets were paved only in the centre, and their roadsides accumulated dirt. Unpaved streets on the outskirts of Vologda were impassable in the spring.⁴⁰ The moving of household waste into landfills outside the city was the most common method of disposal. Usually, waste was transported in barrels on horse-drawn carts. In houses, waste disposal technologies were the most primitive of those in all the cities. Everywhere there were toilets with cesspools and garbage pits in the yards.⁴¹ Only 10–15 Vologda houses had water closets or backlash closets (*luftklosett*).⁴²

The water supply was one of the primary problems of urban sanitation in the Russian Empire in the last third of the nineteenth and the early twentieth century. According to K. G. Vasiliev and A. E. Segal, centralized water supply systems were lacking in most of the vast cities. Where they did exist, only 10 % of houses had access to them; that is, only wealthy homeowners had access to tap water at home. At the same time, the rest of the townspeople could take tap water from public taps located in different parts of the city. This was due to the high cost of installing water supply equipment in the homes of inhabitants.⁴³ Tap water was usually not filtered. In small cities, water was supplied to the city inhabitants by water-carriers, who delivered river, lake or well water to districts that were removed from water sources. In Staraya Russa, 15 men and some women had been delivering water to the city inhabitants.⁴⁴

Rivers and wells were primary sources of urban water supply in the Russian Empire during the second half of the nineteenth century. Inhabitants of Vologda and Cherepovets took water from local waterbodies. Staraya Russa was the only city of Vologda and Novgorod provinces where water plumbing was installed. The first water supply system of Staraya Russa was built in 1848. It was a public well that received water from an underground source in the village of Dubovitsy three versts from the city. The source was found in the winter of 1825–1826 and after 20 years it was connected to the well on Vvedenskaya square in Staraya Russa by wooden pipes. The sources water

39 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 105–107, 223–224.

40 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 223.

41 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 105–107, 223–224.

42 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 223.

43 VASIL'YEV – SEGAL, *Istoriya epidemiy v Rossii*, 218–219.

44 Rossijskij gosudarstvennyj istoricheskij arkhiv [Russian State Historical Archive] (hereinafter RSHA), O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 8b.

was clear, and it consisted of very little organic matter and only traces of ammonia and nitric acid.⁴⁵

However, the water quality in most local water bodies was unsatisfactory. Industrial and domestic sewage were discharged into the nearest open ditches or ponds, as was widespread almost everywhere at that time and considered not only permissible but almost mandatory. Rivers had become receivers of domestic sewage and the discharges of brewing, tanning, dyeing and other factories, laundries, baths and hospitals, along with surface runoff from the city, which further contained waste that did not fall into cesspools.⁴⁶

In the 1880s, the engineer N. Zimin made the first chemical analysis of well water in Vologda. The result showed that this water was unsuitable for cooking and drinking due to the high content of organic impurities and significant hardness. It turned out that water in two of the eight springs flowed through the territory of the cemetery before it came to the point of water intake.⁴⁷ A chemical analysis of the Vologda river water showed its quality and allowed sources of pollution to be identified. In the first half of the 1880s, the Pervushin distillery contributed significantly to river pollution by organic substances and nitrates. Meanwhile, the Zolotukha River flowed into the Vologda River, polluting it with organic waste, chlorides, nitrates and ammonium ions. Sidorovsky's public baths polluted river water with easily soluble organic substances and chlorides.⁴⁸

The water of the Vologda River significantly changed in its chemical properties within the city limits. In the lower reaches of the river, the concentration of suspended solids was eight times, and that of chlorides was 13 times higher than in the upper reaches outside the city. This put the Vologda River on a par with the Rhine and the Thames, leaving behind the Neva, Dnieper, Don, Seine, Danube and Desna, according to the content in its waters of solid residues.⁴⁹ According to research conducted by Dr A. A. Snyatkov in December 1884, the river water contained micrococci, hay bacillus, ciliates and helminth eggs below the confluence of the River Zolotukha into the Vologda River.⁵⁰ Another chemical analysis of water from the Vologda River was carried out on the eve of the construction of the city water supply in February 1897. Its results showed that the water was utterly unsuitable for drinking and cooking due to the high content of dissolved salts, chlorine and sulfuric acid.⁵¹

Moreover, according to the engineer N. Zimin, the water from this river could not be cleaned entirely even by filtration, since it was extremely polluted with wastewater

45 POLYANSKIY, *Illyustrirovannyi istoriko-statisticheskiy ocherk*, 244–245.

46 KURKUTOV, *V oblasti sanitaria*, 10. ORNATSKIY, *Medikotopografiya*, 60–62. POLYANSKIY, *Illyustrirovannyi istoriko-statisticheskiy ocherk*, 244. Gosudarstvennyj arkhiv Vologodskoj oblasti [State Archive of Vologda Region] (hereinafter SAVR), *Zhurnaly Vologodskoy gorodskoy sanitarnoy ispolnitel'noy komissii*, F. 475, Op. 1, D. 363, pp. 63–63b.

47 ZIMIN, *O vodosnabzhenii g. Vologdy*, 2.

48 ORNATSKIY, *Medikotopografiya*, 60–62. Medikotopography was a type of medico-geographical research that had been done at the initiative of state authorities since the eighteenth century. These studies described the natural, geographical and economic features of regions of the Russian Empire. The goal of this research consisted in the analysing and summarizing of information about diseases of the population, and the systematization of economic, geographical and other information by the Russian regions.

49 ORNATSKIY, *Medikotopografiya*, 62–63.

50 ORNATSKIY, *Medikotopografiya*, 64.

51 BELYAKOV, *Artezianskiye kolodtsy*, 3–4.

from sewers, the distillery, bathhouses, rafts for rinsing clothes and other sources of pollution.⁵² A senior doctor of the hospital of the provincial zemstvo, which was situated on the lower reaches of the river Vologda, noted that due to the use of river water in cooking, patients were vomiting and suffering diarrhoea. According to "The sanitary condition of the Russian Empire cities in 1895", the water in the Vologda River was muddy and contained mucus and litter.⁵³ In the summer, the water stagnated and had an unpleasant odour.

In Staraya Russa, the river water was not suitable for use due to its organoleptic and chemical properties. The water of the Polist River contained impurities of organic substances and salts from effluents of the salt works. The water of the Porusje and the Pererytitsa rivers could not be used for drinking due to high concentrations of organic substances that got into these rivers with wastewater from many villages upstream.⁵⁴

Before the centralized water supply system was devised, residents of Cherepovets, like most residents of the county, used well water. Only a few inhabitants used water from the Sheksna River; for most people, the river was too far away from the city to be using its water. Water from the wells was clean, but it had very high hardness.⁵⁵

The quality of drinking water influenced the spread of the cholera epidemic in cities. At the same time, the frequency of outbreaks depended on the intensity of transport links between cities. So, cholera came to Vologda most often from the Moscow, Yaroslavl, Vyatka and Kostroma provinces,⁵⁶ and to Novgorod province from St Petersburg. Among the studied cities, cholera more often appeared in Vologda. In particular, in that city in the years of 1866 and 1871 respectively, 352 and 183 persons died from cholera.⁵⁷ In 1909, cholera killed 98 out of 155 cholera patients in the city,⁵⁸ and another 79 out of 141 patients died the next year.⁵⁹ Meanwhile in 1909 in Staraya Russa, 25 died out of 33 patients with cholera, and in Cherepovets, five out of seven cases did not survive.⁶⁰ The incidence rate of cholera amounted to 5.36 cases per 10,000 people, taking into account clinically confirmed cases in Cherepovets in 1908, and it was 12.06 cases per 10,000 population taking into account cases of cholera disease not confirmed by laboratory tests. Similar indicators amounted to 0.31 for Novgorod province and 14.71 cases per 10,000 population for the Russian Empire.⁶¹ In the epidemic of 1909, the incidence was kept at 9.3 cases per 10,000 people in Cherepovets, and 20.95 cases in Staraya Russa,⁶² while this indicator was 4.9 in the province and 11.21 cases per 10,000 population in Russia. In Vologda, the incidence rate of cholera was 31.38 cases per 10,000 people in 1910.⁶³

52 ZIMIN, *O vodosnabzhenii g. Vologdy*, 4.

53 *Doklad № 3. Po voprosu o prisoyedinenii k gorodskomu vodoprovodu zdaniy Gubernskogo Zemstva*, 12–19.

54 POLYANSKIY, *Illyustrirovannyi istoriko-statisticheskiy ocherk*, 244.

55 *Sanitarnoye sostoyaniye gorodov Rossiyskoy imperii v 1895 godu*, 105.

56 KUDRYAVTSEV, *O meropriyatnykh*, 39.

57 KUDRYAVTSEV, *O meropriyatnykh*, 37.

58 KUDRYAVTSEV, *O meropriyatnykh*, 52.

59 KUDRYAVTSEV, *O meropriyatnykh*, 63.

60 KUDRYAVTSEV, *O meropriyatnykh*, 50.

61 AGAFONOVA, *Sanitarnaya i epidemiologicheskaya obstanovka*, 82.

62 *Vedomost' o estestvennom priroste*, 34–35.

63 *Spravochnyye svedeniya*, 111.

Thus, the urban environments' pollution and unsanitary conditions were significant problems of Vologda, Staraya Russa and Cherepovets. They affected the water quality and made fertile ground for the spread of cholera, which came to the cities by waterways and railways.

Organization of the centralized water supply in Vologda

For the organization of the centralized water supply, the city administration had to find funds for construction work, select a contractor and a water source, and expand the water supply network to keep pace with the town's growth.

The city дума recognized a need to supply Vologda residents with pure water in 1874. Given the unsuitability of polluted river water for consumption, members of the дума regularly discussed building a water pipeline over the next 20 years. However, these discussions had no result due to the lack of sufficient funds in the city budget to construct a water supply system. Budgetary constraints prevented the city administration from carrying out large urban improvement projects without the attraction of loans. In the late nineteenth century, provincial towns' administrations began to use city bond loans⁶⁴ to resolve such issues.⁶⁵ The possibility of issuing a bonded loan with the permission of the government of the Russian Empire allowed the city дума and the city council to back the provision of the water supply in October 1895. In late 1896–early 1897, the city дума applied to the government for permission to issue bonds. The government allowed the city to issue bonds for 200 thousand roubles on 24 December 1898.

In pre-revolutionary Russia, the design and construction of water supply and sewerage systems were carried out by several Russian and foreign firms (the partnership of engineers "N. P. Zimin and Company", the firm "K. Siegel", the construction and technical office "Drzhevetsky and Ezioransky", the Moscow partnership "Widespread artesian water supply to B. I. Von Wangel", "The Bromley Brothers Mechanical Works Society",⁶⁶ joint-stock company "The Gustav List" and others).⁶⁷ In Vologda, the water supply project was prepared by the engineer M. I. Alutkhov, and the Bromley Brothers Mechanical Works Society⁶⁸ won the tender for the construction of the water pipeline in April 1898.

The choosing of a source for the water supply was a primary step in the plumbing project. The most thorough selection of natural springs was made in Vologda. The engineer N.P. Zimin carried out the first research and survey of levels of the urban territory in 1882. These surveys revealed the unsuitability of using well water for the water supply. The Vologda River, with water intake from upstream of the city, was reported as the only possible source of water for the Vologda inhabitants.⁶⁹ The issue of choosing the source was raised again on the eve of the building of the plumbing.

64 City bond loans were first issued by St Petersburg in 1875 and Moscow in 1886. Bonded loans became widespread in provincial cities at the turn of the twentieth century. S. Z. Moshenskiy pointed out that the spread of this practice had long been constrained by the prejudice that existed in society that only private individuals could engage in commercial activities, and that it was inappropriate for city authorities to do so.

65 MOSHENSKIY, *Rynok tsennykh bymag Rossijskoj imperii*, 146–147.

66 The Bromley Brothers Mechanical Works Company was a Russian Company that was founded in Moscow in 1896. Its founders, Edward and Frederick Bromley were Russian subjects from Hanover.

67 ZALESOV, *Inzhenerno-stroitelnye firmy*, 6.

68 The engineers Alutkhov, Shcherbakov and Kamenev also participated in the tender.

69 ZIMIN, *O vodosnabzhenii g. Vologdy*, 1–3.

In April 1895, Vologda physicians and members of the medical department of the provincial government summarized all the information about the quality of the local river water. They concluded that it was necessary to build a city water supply system because the pollution sources of the Vologda River were numerous; they could not be eliminated. Disinfectants were not available to most of the inhabitants. Besides, 10 % of the patients of the city hospital had gastrointestinal diseases from river-water consumption.⁷⁰ On 20 December 1896, the Vologda city дума instructed the city council with the assistance of a specially organized water commission to collect complete information on possible water. The Shogrash, Vologda and Toshnya rivers, as well as artesian wells that belonged to N. A. Volkov and I. A. Pervushin, were potential sources of water. Each of the selected water samples was sent for tests to the laboratory of the Hygiene Institute of Moscow University. The results of the analysis showed that the river waters were not suitable due to the content of organic substances in them. At the same time, the Hygiene Institute recommended the use of artesian water, since it was softer than the river water and contained half as much organic material. On 17 July 1897, the water commission recognized the possibility of supplying the city only with water from artesian wells, and the дума approved this proposal on 11 September.⁷¹

For funding of the construction, the Vologda city дума applied to the government for permission to issue bonds for 200 thousand roubles to cover the associated costs. This permission was received only on 24 December 1898, when the Bromley Brothers Mechanical Works Company completed the construction of a network of street water pipes in Vologda. In this regard, the mayor applied to the ministry of internal affairs for the release of a short-term loan of 100,000 roubles. It was intended to cover the costs of the contractor. The credit was issued to the city in August 1898 with the condition that it be repaid within a year from funds of the bonded loan with charges of 4.5 % per annum.⁷² The construction of the water pipeline was completed in November 1899. The cost of construction work was 147.5 thousand roubles, and another 15 thousand roubles was allocated by the city to the Bromley Brothers Company to maintain the plumbing for the next three years. Water for the system was supplied from two wells by two steam pumps, was filtered, flowed into a reservoir with a capacity of 10 thousand buckets,⁷³ and then was distributed to eight public taps.⁷⁴

Meanwhile, the expansion of water supply networks became the subject of discussions between local governments. So, on 17 November 1898, at an extraordinary assembly of the provincial zemstvo, Vologda provincial council made a report on the issue of connecting the buildings of the provincial zemstvo to the city water supply. The report described a need to join the main building of the hospital of the provincial zemstvo, a medical school and the house of a senior doctor and interns, as well as almshouses, to the water supply. The costs amounted to 700 roubles for these purposes, and the water charge was set at a quarter of a kopeck per bucket. The issue of connecting the buildings of the provincial zemstvo was decided on at an extraordinary meeting of the provincial zemstvo in June 1898, where there were discussions on the financial and economic aspects of this issue. First was discussed the cost of water supplied. Since the

70 *Postanovlenie Soveschatelnogo Prisutstviya Vrachebnogo Otdeleniya.*

71 BELYAKOV, *Artezianskiye kolodtsy*, 1–5.

72 NEPEIN, *Vologda prezhde i teper'.*

73 One bucket was approximately equal to 12.3 litres of water.

74 NEPEIN, *Vologda prezhde i teper'.*

provincial zemstvo was a large consumer of water, its member V. M. Vasiliev proposed to lower the price for a bucket of water to 1/10 kopecks. However, the city water commission and the consultative meeting of the provincial zemstvo administration and the audit commission decided that the price of water would be 1/8 kopecks. Moreover, the provincial zemstvo should pay the cost of laying the water pipes to its building (2,300 roubles) should it refuse to use a minimum of 365 thousand buckets of tap water per year due to unsatisfactory quality of the water.⁷⁵ V. M. Vasiliev did not agree with this decision. As a result of further discussions, the water commission decided to oblige the provincial zemstvo to reimburse the costs of laying the mains water pipes in case of refusal to use tap water, as this pipe was arranged to meet the zemstvo's needs. Also, the commission obligated the provincial zemstvo to pay the full amount for 365 thousand buckets of water per year (456 roubles and 25 kopecks) both in the case of the total consumption of this volume and in case of its underutilization. Water consumed in excess of 365 thousand buckets was costed at 1/8 kopecks per bucket. Due to the subsequent disagreement of the provincial zemstvo council with these conditions, the Vologda дума with the water commission decided to abandon the construction of the main water supply line for the provincial zemstvo.⁷⁶ After that, the provincial zemsky administration had to make concessions and agree to the proposed conditions.

Accordingly, at the turn from the nineteenth to the twentieth century, local governments of provincial towns did not discuss the issue of the need for water pipelines as a way to improve their water supplies and reduce the incidence of disease in their populations. Only financial and economic aspects of these problems were discussed. At the same time, in this particular case, the city administration, as the owner of the city water pipeline, was in a more advantageous position than the provincial zemstvo administration, which was forced to agree to unfavourable financial conditions in the absence of worthy alternatives for the supply of good quality water.

According to the Vologda city public administration, the water pipeline met its expectations. It made it possible to solve the problems of fire safety and of supplying the city inhabitants with clean water. In the period 1905–1908, there was an increase in water consumption of 31 % with the expansion of the water supply network by only 682 linear meters. It testified to the high demand for the tap water that was distributed among inhabitants via eight public taps. While in 1905, 3.98 million buckets of water were released from them, in 1908, this volume increased to 4.78 million buckets of tap water. In the 1910s, the Vologda water pipeline daily released 80 thousand buckets of water, which amounted to about 29.2 million buckets per year.⁷⁷ At the same time, there were about two buckets of water per person daily, which was not enough. The volumes of free tap water for city institutions, military units and low-income inhabitants were increasing. The city дума provided issuance of 3,000 buckets of tap water daily through priests and district trustees. Although the actual consumption of this water was below the established norm, in 1908 there were 52,500 buckets of water allocated to the poor townspeople. In total, that year 310 thousand buckets of tap water were provided free of charge, which amounted to 2.17 % of the total annual consumption.⁷⁸

75 *Doklad № 3. Po voprosu o prisoyedinenii k gorodskomu vodoprovodu zdaniy Gubernskogo Zemstva*, 14–16.

76 *Doklad № 3. Po voprosu o prisoyedinenii k gorodskomu vodoprovodu zdaniy Gubernskogo Zemstva*, 16–17.

77 ZHBANKOV, *Sbornik po gorodskomu vrachebno-sanitarnomu delu v Rossii*, 340.

78 *Vologodskoye Gorodskoye Obshchestvennoye Upravleniye*, 61–62.

Thus, polluted river water was the main reason for the construction of a water pipeline in Vologda. Local physicians did not consider cholera as a reason for the improving of the water supply, but they did highlight the high incidence of gastrointestinal infections in general. Accordingly, the city objectively needed pure water, and the city administration recognized it. However, the city budget deficit had prevented the construction of a water supply system from starting for two decades; the proliferation of urban bond loans solved this problem within 3 to 4 years. The main burden of organizing the water supply was assigned to the city administration. Simultaneously, the participation of the state authorities was limited only to the issuance of permission to issue bonds.

Reconstructing the water pipeline in Staraya Russa

In Staraya Russa, the first water pipeline was built in 1848. It was a wooden pipe through which water flowed by gravity from an underground spring of the Dubovitsy village into a well in the town square. The village was located three versts from the city. The population of Staraya Russa grew from 9,453 people in 1861 to 16,283 people in 1915.⁷⁹ At the same time, the underground source could not provide sufficient pure water for all inhabitants and resort visitors. In 1848 the source gave 9,600 buckets of water every day, and one year later, when another well was built, the city took 12,000 buckets of water every day. Then, in 1854, the performance of the central well was reduced to 5,400 buckets of water, and in the 1880s, the second well stopped functioning.⁸⁰ At the turn of the century, no more than 3,500 to 4,000 buckets of water were delivered to the city each day.⁸¹ The regular decrease in water volumes was attributed to the deterioration of the wooden pipes. Also, the peasants of the surrounding villages had been making additional holes in the pipe for their own water use that additionally caused water pollution. In 1893, Dr Malchevskiy made a chemical analysis of the spring water in the five sections of the pipeline, comparing it with the results of an analysis of 1890. He concluded a significant deterioration in the quality of water in the urban water intake, caused by a four-fold increase in the concentration of organic matter and a doubling of ammonia levels.⁸²

The lack of pure drinking water was a significant problem for the city, one that the city council tried to solve repeatedly. Meanwhile, the problem's solution was complicated by the fact that the wooden pipes were partly located under the Novgorod railway; therefore, they could not be replaced. In this regard, the city дума decided to build new plumbing for the centralized water supply of Staraya Russa.⁸³ The дума appealed to the engineer-technologist M. I. Altukhov to determine the cost of this new water supply, and he estimated its price at 150,000 roubles.⁸⁴ The city council planned to get the money by the issue of city bonds in 1898 because this amount was

79 *Materialy po statistike Novgorodskoy gubernii, 1916 god*, 25. *Ekonomicheskoye sostoyaniye gorodskikh poseleniy Evropeyskoy Rossii v 1861–1862 gg*, 23.

80 POLYANSKIY, *Illyustrirovannyi istoriko-statisticheskiy ocherk*, 245–246.

81 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 8.

82 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 12.

83 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, pp. 2a, 8.

84 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 8b.

not available in the city budget. Therefore, the mayor applied to the government for permission to issue these bonds, but his application was rejected. After that, the city дума petitioned the ministry of agriculture and state property for the issuance of a government loan for the construction of a water supply system of 150,000 roubles. This loan was planned to provide urban real estate and to be repaid over 50 years. A decision on this question was passed to the ministry of finance, which agreed with the necessity of building the water supply system in Staraya Russa. Nevertheless, due to the beginning of the Russo-Japanese War and related state budget savings, the ministry rejected this petition.⁸⁵

At the same time, the quality of the spring water had been deteriorating year by year, which was causing increasing morbidity from intestinal infections. In 1909 cholera took 25 lives of the city's inhabitants, and typhoid fever was in the city regularly.⁸⁶ The spread of diseases caused damage to the resort city and the city government renewed petitions for the construction of the water supply. The government approved one of these petitions, and 50,000 roubles were allocated from the state treasury on 31 August 1908. At the same time, the maturity of the loan was reduced to 15 years, and it was planned to give the other 100,000 roubles to Staraya Russa over the next two years in equal shares.⁸⁷ The water pipeline was built and began to work on 8 November 1909.⁸⁸ At the early stage of plumbing exploitation, less than 5 % of houses were connected to the water supply network. One year later, total annual water consumption was about 9 million buckets, including about 4 million buckets of water that were released free of charge.⁸⁹

Thus, Staraya Russa, like Vologda, needed pure water due to the deterioration of the old water pipeline. The city dumas of both cities submitted their first applications for the issue of a bond loan at almost the same time. However, the government refused to issue consent to the administration of Staraya Russa. Even in the pre-crisis period, the government was not ready to issue permits for the issuing of bonds to the county towns, even though these bonds were not government securities.⁹⁰ At the end of the nineteenth century, Vologda, unlike Staraya Russa, was the administrative centre of the province, had a railway connection with Moscow, Yaroslavl and Arkhangelsk, and its population was almost twice that of Staraya Russa. Accordingly, the government prioritized the provincial centre and saved money on the small county town, given that the old water supply system was still functioning. The economic crisis and the Russo-Japanese War forced the government to resort to even more significant saving of money, including to the detriment of public health in provincial cities. The persistence of the city administration, regular epidemics of typhoid fever and the threat of cholera allowed the city to obtain a loan for the construction of a water supply system. Accordingly, the lack of funding was the main problem in improving the water supply in Staraya Russa.

85 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, pp. 2a–2ab, 17.

86 *Otchet o sostoyanii narodnogo zdравиya*, 50. RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 2a.

87 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 36.

88 RSHA, O vydache gorodu Staroy Russe iz kazny ssudy v 150000 rub. na predmet ustroystva vodoprovoda, F. 1288, Op. 4, D. 216, p. 44.

89 "Vek vody". Accessed October 22, 2013. <http://gkh.nov.ru/about/history/vekvody/>.

90 EDRONOVA, *Istoricheskiy opyt*, 57.

The city administration spent almost ten years on its solution, regularly soliciting loans from the state authorities.

Building the water pipeline in Cherepovets: problems with funding and technological decisions

After a series of cholera pandemics and the signing of international conventions for the control of plague and cholera by the Russian Empire, the state power began regularly funding cities and zemstvos for sanitary improvements and the fight against epidemics in cities and provinces. In 1911, the law "On the giving of funds on anticholera and anti-plague events from the state treasury" reflected these measures.⁹¹ As a result of the adoption of this law, city and zemstvo authorities could receive state funds through a specially created anti-plague commission for the improving of water sources. These funds were often spent on improving water supplies due to most cities having deficits both of quality drinking water and budgetary funds for water improvement. In 1911, the governor of Novgorod province, V. A. Lopukhin, recommended Cherepovets city administration to apply to the ministry of internal affairs for a loan of 50 thousand roubles from the government anti-plague commission to improve the city water supply.⁹² This application of the Cherepovets city administration was granted on 9 November 1911, and the funds were provided on the security of urban land.⁹³ At the same time, after getting funds, the city administration faced two more significant problems. They were the choice of a water source and the most suitable technical and technological solutions for the construction of the water pipelines. As in most Russian cities, especially small ones, Cherepovets had no specialists in water supply construction. The city construction commission decided that Cherepovets should be supplied by water from an artesian well. This choice would turn out to be an unjustified waste of seven thousand roubles for the city in the absence of a positive result:

The city construction commission presented the results of its research at a meeting of the city дума on 15 May 1912. The commission reported on the absence of sources of good water. Also, it excluded the possibility of a system supplying water from the Sheksna river due to its remoteness from the city. As a result, the city construction commission decided to dig an artesian well in the town, the depth of which would be greater than those of other city wells. It was assumed that an artesian aquifer would contain cleaner water. The Moscow company "Oskar Shlikht" was the contractor for the artesian well, and the city administration allocated four thousand roubles for these works.⁹⁴

Meanwhile, the decision of the construction commission was not proven by preliminary research on artesian water sources in Cherepovets. The drilling of the artesian well was such an exploration. Obviously, the widespread using of wells as sources of water supply for the Cherepovets inhabitants and the experience of neighbouring cities in using artesian wells for water pipelines influenced this decision.

91 RSHA, O merakh bor'by s zabolevaniyem kholeroy i obshchikh raskhodakh na bor'bu s epidemiyey po guberniyam, F. 1298, Op. 1, D. 2336, p. 3b.

92 ANONIM 1, *Cherepovets 5 yanvarya 1914 g.*

93 RSHA, O merakh bor'by s zabolevaniyem kholeroy i obshchikh raskhodakh na bor'bu s epidemiyey po guberniyam, F. 1298, Op. 1, D. 2336, p. 6.

94 K voprosu o gorodskom vodoprovode. In: *Severnnyy torgovjy posrednik*, 1912, no. 2.

The construction of the artesian well began on 1 July 1912, with the drilling of a test well on Sennaya Square behind the building of the First City School.⁹⁵ The city construction commission chose the place for the well. After four months of work, a 362-foot-deep well had been drilled, and the same number of pipes with a diameter of 6–10 inches was laid in it. The total cost of the work was 7,057 roubles.⁹⁶ However, water was not found. Such results caused a lively discussion at a meeting of the city *duma* on 11 and 12 November 1912, which was chaired by Mayor A. I. Milyutin. At the same time, opponents were divided into two camps. The first of them criticized the decision of the city council to conduct exploration work to find artesian water. They believed that the *duma* had embarked on a "risky path", spending a large sum of money and not receiving positive results. As a solution, they proposed to stop drilling the well and to conduct water from the Sheksna river. However, most of the *duma* members and the mayor argued for the need for a water supply only from an artesian source.

During the debate, the majority position was adopted. The decision was to continue drilling the well to a depth of 400 feet. Also, the *duma* petitioned Governor V. A. Lopukhin to allocate 50 thousand roubles for the construction of the water supply in Cherepovets, which was given by the government anti-plague commission.⁹⁷ The governor granted the application of the *duma* and reimbursed half of the costs of trial drilling from the funds allocated to the city by the government anti-plague commission.⁹⁸ At the same time, Mayor A. I. Milyutin invited Mr Pogrebov, a geological engineer, to join the research of aquifers and rocks composing them. Pogrebov reported to the meeting of the city construction commission on 22 November 1912 that the nearest aquifer with good drinking water was located at a depth of 900 feet.⁹⁹ After that, drilling operations were temporarily suspended because deepening a 382-foot well to a depth of 900 feet was very expensive.

Once again, the question of the water supply was raised by individual members of the city *duma* in February–March 1913. Their position was argued by the need to use 50 thousand roubles allocated by the government because a time limit for the using of these funds was to end on 1 January 1914.¹⁰⁰ Members of the mutual fire insurance company joined the members of the *duma*, fearing the loss of the government appropriation due to the slowness of the decision on the installation of the water supply. At their meeting on 31 March 1913, they decided to allocate 25 thousand roubles for the installation of fire hydrants in several places along the pipeline.¹⁰¹

The inability to solve the technological problems of water construction by local specialists forced the city public administration to turn to outside experts. One of them was a process engineer, a member of the state *duma* of the 4th convocation, nephew of I. A. Milyutin, Vasily V. Milyutin. He, after consultation with the specialist in hydraulic engineering Professor I. G. Esman and a member of Brothers Bromley Company, presented three options for the location of the source of water intake from the Sheksna River at a meeting of the Cherepovets city council. The water intake could

95 Mestnaya khronika. In: *Severnnyy torgovyy posrednik*, 1912, no. 7.

96 Zasedaniye Dumy. In: *Severnnyy torgovyy posrednik*, 1912, no. 26.

97 Zasedaniye Dumy. In: *Severnnyy torgovyy posrednik*, 1912, no. 26.

98 Gorodskaya zhizn'. In: *Severnnyy torgovyy posrednik*, 1913, no. 3.

99 K voprosu ob ustroystve Gorodskogo vodoprovoda. In: *Severnnyy torgovyy posrednik*, 1912, no. 27.

100 Gorodskaya zhizn'. In: *Severnnyy torgovyy posrednik*, 1913, no. 10.

101 Gorodskaya zhizn'. In: *Severnnyy torgovyy posrednik*, 1913, no. 13.

be located on an island on the south of the technical school, or near the steamboat pier or in the upper stream before the city harbour.¹⁰² V. V. Milyutin recommended choosing a place for the water intake above the Cherepovets harbour, in a place where passing ships would not excessively pollute the river water.

The city water supply project, developed by the company "Bromley Brothers Mechanical Works Partnership", was discussed and adopted at the city council meeting. The cost of the water supply amounted to 150 thousand roubles. After that, it was submitted to the Novgorod provincial assembly for zemstvo, and urban affairs, where the project was approved on 22 June 1913, and agreement between the Cherepovets administration and the Bromley Brotherhood Partnership was signed.¹⁰³ This document was sent to the minister of internal affairs for approval. At the ministry of internal affairs, the project of the Cherepovets water supply system was submitted to the ministry's technical and construction committee. On 22 August 1913, the committee made a decision, but with the condition of deepening and protection from mechanical shocks of the suction pipe of the water supply system, as well as an increase in the filter area.¹⁰⁴

The construction of the city water supply system began in September 1913.¹⁰⁵ By 26 June 1914, about 1,600 linear meters of water pipes had been laid.¹⁰⁶ However, financial problems meant completion of the construction of the city water supply system was not possible by mid-September 1914. A shortage of funds was discovered even before the start of construction when the city budget was found to contain 145,696 roubles and 38 kopecks instead of 150,000 roubles.¹⁰⁷ The missing amount, as well as 35,000 for additional work on the installation and final equipment of the water supply system, were obtained by new loans.¹⁰⁸ The building of the city water pipeline was completed in 1916.

The water supply had two water lifting stations. Water from the Sheksna River flowed by gravity through cast-iron pipes to a concrete water intake well. From here, by two electric pumps the water was fed into a tank at the first water lifting station through suction pipes, the length of which were 135 m. The capacity of the electric pumps was four thousand buckets of water per hour. Further, water was pumped to a second lift station located in the city.¹⁰⁹ At the station of the second rise, water entered for sedimentation to a reservoir of volume 6,000 buckets. After settling, the

102 Gorodskaya zhizn'. In: *Severnnyy torgovyy posrednik*, 1913, no. 15.

103 RSHA, Ob ustroystve vodoprovoda v gor. Cherepovtse Novgorodskoy gubernii, F. 1288, Op. 9, Razdel 1913, D. 35, p. 3.

104 RSHA, Ob ustroystve vodoprovoda v gor. Cherepovtse Novgorodskoy gubernii, F. 1288, Op. 9, Razdel 1913, D. 35, pp. 17–18.

105 Sentyabr' 1913. In: *Severnnyy torgovyy posrednik*, 1913, no. 38.

106 Gorodskaya zhizn'. In: *Golos Cherepovtse*, 1914, no. 39.

107 SAVR, Doklady gorodskogo golovy o finansovom polozhenii goroda, ob izyskanii sredstv na stroitel'stvo v gorode, F. 911, Op. 1, D. 103, pp. 9b–10.

108 SAVR, Doklady gorodskogo golovy o finansovom polozhenii goroda, ob izyskanii sredstv na stroitel'stvo v gorode, F. 911, Op. 1, D. 103, pp. 10–11.

109 Cherepovetskij tsentr hraneniya dokumentatsii [Cherepovets Documentation Storage Center] (hereinafter ChDSC), Smety, pojasnitel'naya zapiska k smetam po rasshireniyu vodoprovoda v g. Cherepovtse, F. 702, Op. 1, D. 4, p. 13.

water was filtered and fed into the city water supply network.¹¹⁰ The network of water pipes had a ring system that covered all residential quarters of the small city. There were few users of the water supply network. Even in the mid-1920s, only 36 users had access to the water pipeline. There were seven residential buildings and 29 industrial enterprises, state institutions and hospitals, as well as the Cherepovets station of the Northern Railway, which was the largest consumer of the tap water.¹¹¹ Meanwhile, most of the city inhabitants took water through five public water taps.

Thus, the state policy in the field of water supply had changed drastically in 1911. The state had moved from passive monitoring of the sanitary problems of small towns to providing regular financial assistance to them. In general, it was a decisive turn in the history of urban water supply, which allowed more settlements in the Russian Empire to solve water quality problems. However, the case of Cherepovets showed the other side of this policy. The haste in choosing a water supply source in the absence of local hydraulic engineers led to unnecessary wasting of money and a slowdown in water pipeline construction for several years. At the same time, it cannot be said that the water supply was a whim of the city administration and an attempt to get government funding quickly. Cherepovets needed pure water due to the growing urban population and the regular introduction of cholera into the city by waterways and railways.

Conclusion

Thus, by the end of the nineteenth century, centralized water supplies were in demand in small Russian cities as a means of improving the sanitary and epidemiological situation. The solution of two essential tasks accompanied the organization of centralized water supplies: the searches for sources of financing and sources of water. The problem of financial support for water construction was common to almost all Russian cities due to the high cost of work and limited budgetary funds. Also, a significant slowdown in the pace of, or the postponement of, their construction was a typical feature of the arrangement of water pipelines with the involvement of state capital due to the state budgetary policy of saving financial resources which was associated with the wars of the early twentieth century.¹¹²

The lack of pure water was the main reason for the improvement of the water supplies in Vologda and Staraya Russa. Cholera was an additional argument in the issue of obtaining a bonded loan. However, the threat of cholera outbreaks was high due to the location and population growth in all three cities. Nevertheless, the townspeople had often been falling ill with other intestinal infections due to the use of contaminated water.

Unlike St Petersburg and Moscow, small towns everywhere faced a lack of experts and budget deficits. Specialists in hydraulic engineering, physicians and hygienists were educated in the capital's institutes. Therefore, their number was significantly higher in St Petersburg and Moscow than in the provinces, where 1–2 doctors might serve an entire city's needs. Accordingly, as noted by A. Mazanik,¹¹³ J. Obertreis, and O. Yu. Malinova-

110 I ChDSC, Smety, poyasnitel'naya zapiska k smetam po rasshireniyu vodoprovoda v g. Cherepovtse, F. 702, Op. 1, D. 4, p. 13b.

111 ChDSC, Smety, poyasnitel'naya zapiska k smetam po rasshireniyu vodoprovoda v g. Cherepovtse, F. 702, Op. 1, D. 4, p. 14.

112 NASIBULIN, *K istorii gorodskogo samoupravleniya*, 100.

113 MAZANIK, *Sanitation*.

Tziafeta,¹¹⁴ experts and institutes played a significant role in drawing attention to the sanitary problems in the capitals. Hygiene experts initiated public discussions and entered into disputes with the authorities. Even though this confrontation was not permanent, in Vologda, Staraya Russa and Cherepovets, the confrontation between the city administration and local physicians was not clean. In the provinces, they cooperated in solving sanitary problems more often, since both sides were interested in overcoming the main obstacle – lack of funds. In the regions, city administrations were the main social actors in solving water supply problems. They were responsible for obtaining funding, attracting experts, making technological decisions and expanding water supply networks.

The study showed that until 1911 the government did not solve the water supply problems of small towns. As the case of Staraya Russa showed, the county town had difficulties in obtaining permission to issue bonds in the pre-crisis period but no longer faced impossibility in getting funding during the economic crisis and war. In this context, it is worth agreeing with C. Henze and A. Smith¹¹⁵ that state power was a deterrent factor in solving Russian cities' sanitary problems. At the same time, the choice of ways by which to solve the problems of centralized water supplies was caused by economic factors, in spite of the alleged multi-variance. However, one cannot fail to note that the administrations of these cities approached the problem thoroughly, persistently seeking financial support from the government for years and bringing about results with the construction of water pipelines. A gradual increase in the number of water supply network subscribers was the efficiency indicator for the solving of the water supply problem. It reflected the population's need for this service and the quality of water delivered to the townspeople. Also, public taps helped streamline water withdrawal by city inhabitants, who no longer had to draw water in random places where it could be of poor quality.

As noted by J. Oberteis and O. Yu. Malinova-Tziafeta, the pre-revolutionary urban environmental history, hygiene and urban infrastructures currently remain insufficiently studied. In modern historiography, there are practically no comparative studies on the history of Russian cities.¹¹⁶ It is believed that this article will contribute to this research area and expand discussions on the problems of water supply in small Russian towns and changes in state policy on urban water supplies.

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114 OBERTEIS – MALINOVA-TZIAFETA, *Istoriya gorodov*, 182.

115 HENZE, *Disease, Health Care and Government*. SMITH, *Public Works*.

116 OBERTEIS – MALINOVA-TZIAFETA, *Istoriya gorodov*, 183.

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