

УДК 379.857

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AUGUSTOW CANAL AS THE MONUMENT OF HYDRAULICS AND THE OBJECTS OF HERITAGE TOURISM

Romanowa O. S., Szirokova W. A., Ozierowa N. A., Czesnow W. M., Sobisiewicz A. W. **Kanał Augustowski jako pomnik hydrotechniki i obiekt dziedzictwa turystycznego.** Przedstawiono historię budowy i eksploatacji Kanału Augustowskiego – pomnika hydrotechniki I połowy XIX wieku. Przeanalizowano społeczno-ekonomiczne przyczyny zmiany funkcji tego obiektu, decyzje inżyniersko-budowlane i hydrotechniczne wykorzystane podczas tworzenia jednego z europejskich systemów wodnych. Dokonano przeglądu współczesnego stanu białoruskiej części kanału (21 km w obwodzie grodzieńskim), przedstawiono jeden z możliwych wariantów muzeifikacji obiektu oraz jego potencjał rekreacyjno-turystyczny.

Романова О. С., Широкова В. А., Озерова Н. А., Чеснов В. М., Собисевич А. В. **Августовский канал как памятник гидротехники и объект культурного туризма.** Рассмотрена история создания и эксплуатации Августовского канала, памятника гидротехники первой половины XIX в. Проанализированы социально-экономические причины изменения функций сооружения, инженерно-строительные и гидротехнические решения, использовавшиеся при создании одной из европейских водных систем. Проведен обзор сегодняшнего состояния белорусской части канала (21 км в Гродненской области), показан один из вариантов возможной музеефикации объекта и его рекреационно-туристический потенциал.

Keywords: Augustow Canal, historic waterways, history of hydrotechnology, heritage tourism

Słowa kluczowe: Kanał Augustowski, historyczne drogi wodne, historia hydrotechniki, turystyka kulturowa

Ключевые слова: Августовский канал, исторические водные пути, история гидротехники, культурный туризм

Abstract

The article has devoted the history of Augustow canal's construction and exploitation, which is a monument of hydraulic engineering of the first half of the 19th century. The socio-economic reasons for the change in construction functions, engineering, and construction and hydraulic engineering solutions used to create one of the European water systems were analyzed. The current state of the Belarusian part of the channel (21 km in the Grodno region) was reviewed, one of the possible museumification options of the facility and its recreational and tourist potential is shown.

INTRODUCTION

Waterways are an important part of cultural and historic districts, which contains numerous nature and heritage objects. Historic and cultural objects are in close connection with the natural environment and many elements of folk culture. Visiting that objects are one of the most popular tourist activities today. According to the National Trust for historic preservation "heritage tourism helps make historic preservation economically viable by using historic structures and landscapes to attract and serve travelers" (HARGROVE, 2002).

Augustow Canal (fig. 1) has the great potential as the object of heritage tourism. Tourists are attracted by such objects as old moveable bridges, canal locks, and other retro-mechanisms. Now that waterway is divided between Poland and Belarus so that both countries are interested in using that object at heritage tourism. In the summer of 2013 the Com-

plex expedition for researching historical waterways, which was supported by S. I. Vavilov Institute for the History of Science and Technology (Russian Academy of Sciences, Moscow), made research about the influence of the Belarusian part of Augustow Canal for ecological, touristic and recreation situation (SOBSEVICH et al., 2015).



Fig. 1. The modern scheme of the Belarusian part of Augustow Canal (the source: <https://trofei.by/articles/stati-oturizme/otdyh-na-avgustovskom-kanale>)

Rys. 1. Współczesny schemat białoruskiej części Kanału Augustowskiego (źródło: <https://trofei.by/articles/stati-oturizme/otdyh-na-avgustovskom-kanale>)

Рис. 1. Современная схема белорусской части Августовского канала (источник: <https://trofei.by/articles/stati-oturizme/otdyh-na-avgustovskom-kanale>)

The Complex expedition for researching historical waterways includes specialists in the history of science, hydrology, landscape research and GIS-technology. That group of researchers having the experience of 13 years of field works on Russian waterways and inspired by the idea of its restoring as heritage and ecology objects. The new methods were created for researching, when the members of complex expedition introduced special forms of registration cards for hydromechanics, collected old maps, studied the influence of old and modern canals on the substantial development of ecosystems. As the result, the members of expedition created geo-information base and began filling it with the information about waterways on the European part of Russia (SNYTKO et al., 2015).

THE HISTORY OF AUGUSTOW CANAL

According to Polish data, the first idea of building Augustow Canal was obtained in the second half of the 16th century at the time of Polish king Stefan Batory. However, that idea was forgotten for a long. That plan was updated by Jan Ferdynand Nax, who was the court architect of King Stanislaw August Poniatowski. According to Jan Nax's plan, the future canal should be the part of the waterway to Windau river and gave the possibility to deliver grain from Poland by passing Danzig and Memel ports, which were under control of Prussia (BATURA, 2006; BER et al., 2007).

That waterway should have its starting point in Poznan and be connected with Warta river (right tributary of Odra river) with Bzura river (left tri-

butary of Vistula river), and then walk along the Vistula river to Bug, Narew and Biebrza rivers. According to that plan, Biebrza river should be connected with Neman river, which made be possible to reach the mouth of Dubysa river and having access to the Baltic Sea. However, that plan remained unrealized because of Kościuszko Uprising in 1794, Napoleonic Wars and Russian annexation of Poland in 1815 (BER et al., 2007).

In 1815, as the results of the Congress of Vienna the biggest part of the Warsaw Grand Duchy, the former allies of Napoleon was annexed by Russian Empire and included into the Kingdom of Poland, which was also called as Russian Poland. In that time, Prussia, which also obtained the part of the territory of Poland, established extremely high taxes for delivery Polish goods to Danzig port. In August 1822 that high taxation forced Franciszek Ksawery Drucki-Lubecki, who was the Minister of Finance

of Russian Poland, make the order of planning a waterway from Narew and Biebrza rivers to Neman river and then to the mouth of Windau river at the Baltic Sea.

The field surveys to link the basins of the Neman and Vistula were begun with the permissions of the Russian Ministry of Communications in 1823. The Russian field party was led by lieutenant-colonel Reeze from the Corps of Transport Engineers and lieutenant-colonel Pradzynski from the General Quartermasters' Office of the Polish Army. Reeze and Pradzynski met in Grodno on 28 June 1823. Lieutenant-colonel Pradzynski and four officers from the engineering corps carried out the topographical survey on Polish territory concentrating mainly on the lakes near to Augustow and the river Chorna Gancha. In the same time, the Reeze's group worked on Biebrza river and the smaller river of Lososna, Tatarka and Polilia (POSTNIKOV, 1996).

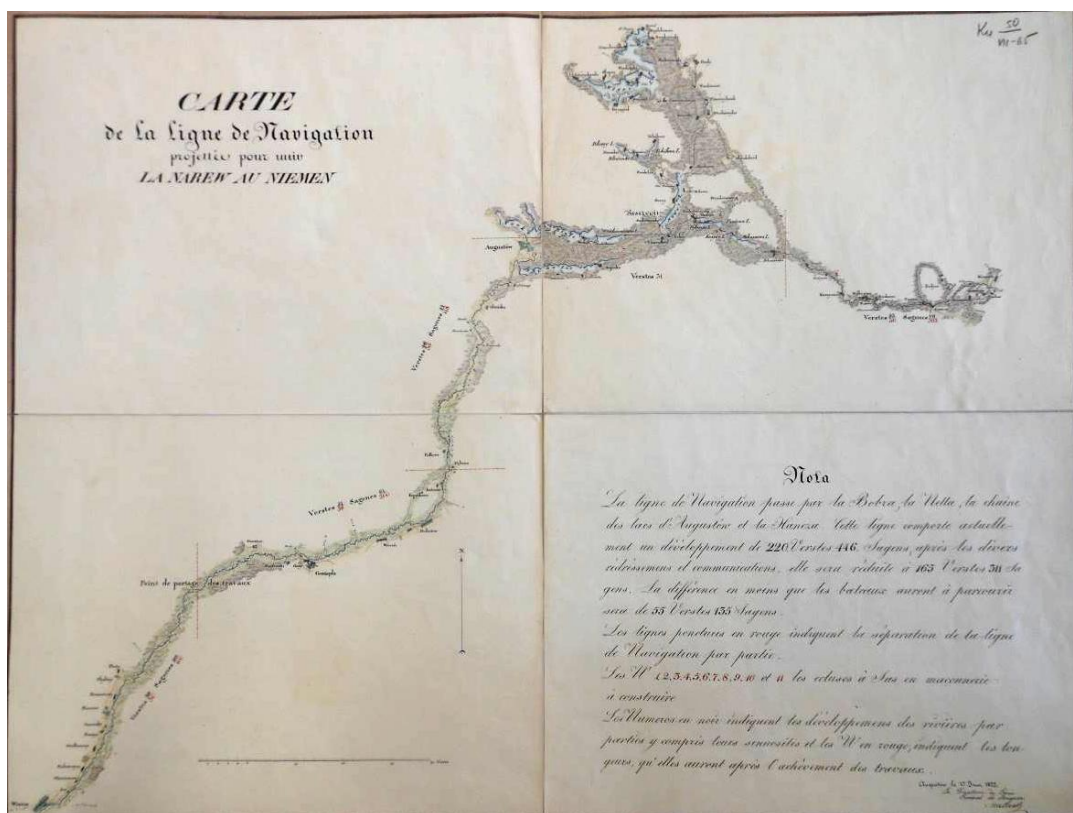


Fig. 2. "Carte de la ligne de navigation projetee pour unir la Narew au Neimen" (Moscow, Russian State Library, Departments of maps, Storage cipher Ки 50/VII - 65. Firstly published in the book of POSTNIKOV, 1996)

Rys. 2. "Carte de la ligne de navigation projetee pour unir la Narew au Neimen" (Moskwa, Rosyjska Biblioteka Państwowa, Dział kartograficzny, Kod zbioru Ки 50/VII - 65. Po raz pierwszy opublikowana przez: POSTNIKOV, 1996)

Рис. 2. "Carte de la ligne de navigation projetee pour unir la Narew au Neimen" (Москва, Российская государственная библиотека, Отдел картографических изданий, Шифр хранения Ки 50/VII - 65. Впервые опубликована в кн.: POSTNIKOV, 1996)

The review of cartographic materials about the construction of the Augustow Canal was made by Alexey V. POSTNIKOV (1996), who is an internationally known specialist on the history of cartography. He found in the cartographic archives of the Russian State Library two maps. The first map “Carte de la ligne de navigation projetee pour unir la Narew au Neimen” (fig. 2), was made in 1825 to

the 4 verst/inch (1 : 168 000) scale. The map described the beds and flood plans of the rivers Narew and Nemen and their tributaries in watercolors, detailing the meandering of the river beds, marshy banks, lakes and settlements on river banks. Prof. Postnikov suggested that that map was made on the report of the survey parties of Reeze and Pradzynski.

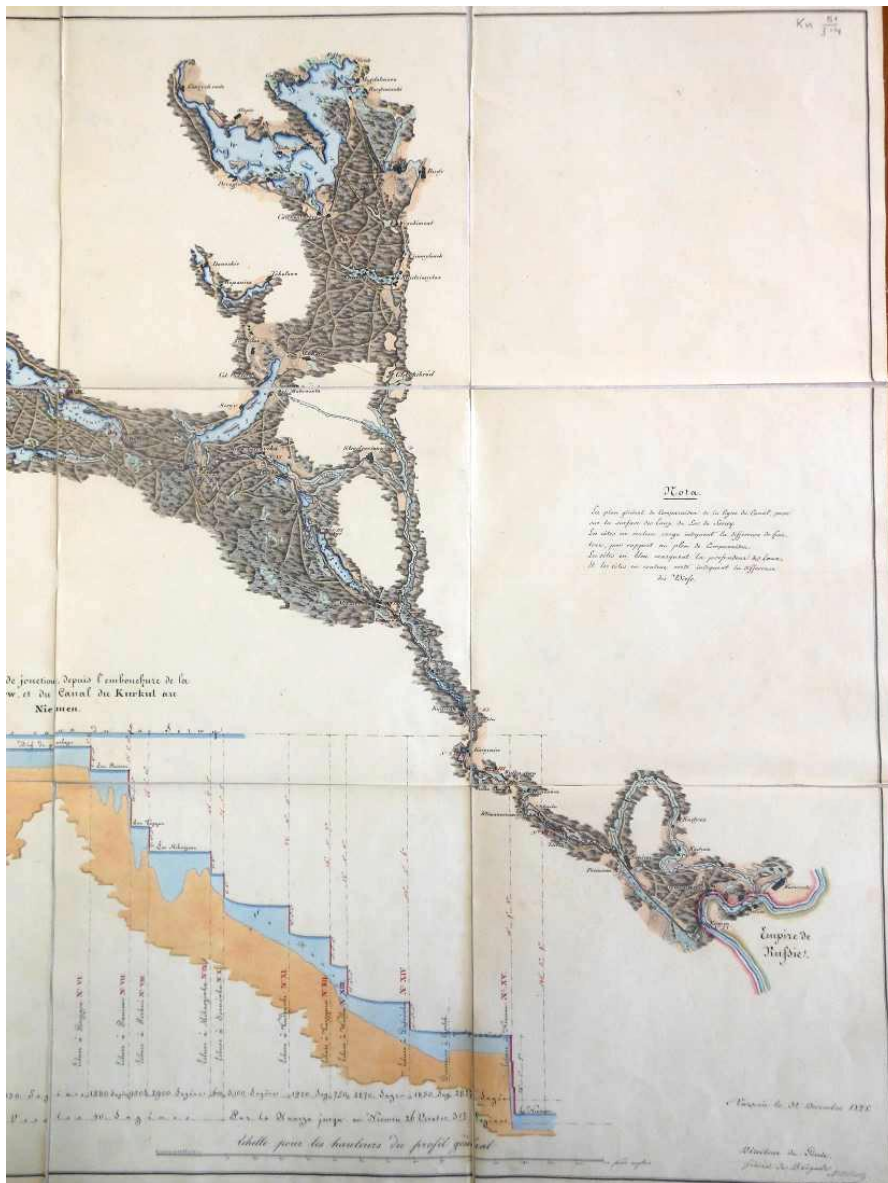


Fig. 3. Fragment of the map “Carte de ligne de junction entre la Narew et le Niemen, passant par la Biedrza, la Netta, la chaine de lacs d’Augustow et la Nanczu” (Moscow, Russian State Library, Departments of maps, Storage cipher Ки 50/VII - 65. Firstly published in the book of POSTNIKOV, 1996)

Rys. 3. Fragment mapy “Carte de ligne de junction entre la Narew et le Niemen, passant par la Biedrza, la Netta, la chaine de lacs d’Augustow et la Nanczu” (Rosyjska Biblioteka Państwowa, Dział kartograficzny, Kod zbioru Ки 50/VII - 65. Po raz pierwszy opublikowana przez: POSTNIKOV, 1996)

Рис. 3. Фрагмент карты “Carte de ligne de junction entre la Narew et le Niemen, passant par la Biedrza, la Netta, la chaine de lacs d’Augustow et la Nanczu” (Москва, Российская государственная библиотека, отдел картографических изданий, Шифр хранения Ки 50/VII - 65. Впервые опубликована в кн.: ПОСТНИКОВ, 1996)

The second map «Carte de ligne de junction entre la Narew et le Niemen, passant par la Biedrza, la Netta, la chaine de lacs d'Augustow et la Nanczu» (fig. 3) done in the great details. That a large-scale, hand-drawn map of the floodplains of the rivers Narew and Nemen with their tributaries. The Augustow Canal was 98 verst (over 85 kilometers) long and has 28 locks. POSTNIKOV (1996) supposed that that map could be based on the surveys of the planned Augustow Canal with the use of geodesic instruments, carried out in 1828.

It is necessary also to pay attention to the process of canal building. The construction work at the territory of canal lasted from 1824 till 1839, as a result the canal became the part of Vistula-Neman waterway, which was held on West Bug, Narew, Beaver (Biebrza) and Neter rivers and then to Neman river with the usage of small rivers and lakes, which were connected into a one water system. The starting of construction works forced Prussian government significantly reduce customs duties in 1825 (ZHITKOV, 1900).

Clay, sandstone and limestone for construction works were obtained directly near the area of building: sandstone was delivered from the vicinity of Opoczno city and limestone (chalk) from the banks of Gancia river. The clay for cement production was brought from the quarries, which were located at a distance of 50 km. The new technology with the use of the hydraulic system of the French engineer Louis Vicat has been applied for the production of the artificial line. Manufactures had its enterprises in Bialobrzegi, Gorczyca and Stara Wolka villages. It was the largest production of highest quality cement in Europe. It was different from the famous Portland cement only in a few details and provided the same durability of walls. Many experiments had been conducted to determine the required proportions of lime and clay and finally obtain the required properties of cement. As a result, it was found that 80 parts of lime and 20 parts of clay were better for the creation of hydraulic lime (KRAFT, 1838).

The substructure of the canal was made from concrete or wood, that choice was depended on the type of soil. The weak soil was reinforced with wooden piles, clay was used for hydro isolation bottom of the canal. All shiplocks on the canal were made of brick and cobblestone. Every shiplock had a stone tablet (photo 1) on the wall with the date and the name of the construction manager. Shiplocks were

located parallel to the stream and wooden water-supply dam was built to normalize hydrological conditions. Oak wood and iron cramps were used for making locks on gates. Engineers also paid attention to hardening coastline, so where it consisted mostly of sandy rocks the banks of rivers were strengthened by sands mixed with clay, and in some places, turf was used for that purpose. Trees for hardening of coast and protection from local winds were planted along the canal. Dirt roads were created for towing when boats needed to pull against the flow of the river. Seven thousands of people were occupied during the most intensive work on the canal. Local peasants obtained liberation from serfdom after participation in construction works, so one shiplock was even named as "Swoboda", which means freedom by Russian (KRAFT, 1838).



Photo 1. A stone block on the canal wall with the name of its engineer (phot. by A. V. Sobisevich, 2013)

Fot. 1. Kamienna tablica na ścianie kanału z nazwiskiem inżyniera-budowniczego (fot. A. W. Sobisiewicz, 2013)

Фот. 1. Каменный блок на стене канала с именем инженера-строителя (фото А. В. Собисевича, 2013)

To finish work it was necessary to build a three-chamber lock in Niemnowo village and dig a part of the canal on the south of Augustow city between the villages Polkowo and Bialobrzegi. In total it was made 29 dams for water outlet, 18 shiplocks, 21 lock chambers, 14 drawbridges and 24 objects for technical maintenance of canal. Shiplocks and locks for regulations water level were constructed to compensate height difference about 54 meters from beginning to the final point of the canal. Currently, the total length of the canal is 101 km, 21 km are within the boundaries of Belarus. The territory of canal includes 35 km of riverbeds, 22 km of distance on such lakes as Necko, Orel, Panev and Mikashevo, sections of 46 km length were dug under

control of Russian military engineers. Outside of Russian Empire, only Gota Canal in Sweden and Caledonian Canal in Great Britain have similar characteristics. However, the sizes of those canals can't be compared with Augustow canal.

Augustow Canal served as transport artery for vessels passing from Vistula to Neman rivers and then into the Baltic Sea (using Vistula-Neman waterway). In addition, canal played a bridging role for a way to the Baltic and the Black seas through the water system on Berezina, Dvina and Dnieper rivers and Oginski canal. However, soon after the finishing of construction works canal lost its importance as transport and economic object. From the middle of 19th century development of railways system had a great success and trains were much faster than ships. It was the reason why Augustow Canal became a local transport way, which was used in the economy of Polish countryside and neighboring Lithuanian and Belarusian lands. The canal was used mainly for transportation timber and various building materials, not for the transit of agricultural products, as it was planned originally. That fact saved the original style of the canal from substantial modernization and it could obtain the status of the monument of hydraulic engineering (ROMANOVA et al., 2014).

During its nearly two-century history of the canal passed several stages. From its originally planned transport function, through the rebellion and destructive wars, to complete oblivion, and, finally, to the rebirth of its new quality as the object of tourists attraction and the monuments of hydraulic engineering. In 1968, the most well-preserved part of the canal (from Augustow town in Poland to the border with Belarus) with a set of associated facilities was included in the register of monuments of European art. Shiplocks with water-lifting objects, part of rivers in canals and landscape at the distance of 300 meters from the coast were recognized as protected objects. Belarusian part of canal long time was in ruins, only in 2004–2006 restoration works were carried out. The canal was recovered with the wide usage of archival materials with project documents, drawings and diagrams. Those materials gave all necessary information to designers and builders, so they can restore that water object with all authenticity.

THE FIELD RESEARCH AT AUGUSTOW CANAL

At the time of Complex expedition for researching historical waterways in 2013, its members researched the Belarusian part of Augustow Canal. That district contains three shiplocks (Volkushek, Dombrovka and unique four-chamber lock Nemново) and five distribution locks (Kuzhinets, Volkushek, Dombrovka, Chertok and Curkool). Shiplock Kuzhinets is located directly on the Belarus–Poland border and the border runs through the middle of the shipping lock chamber.

Dombrovka shiplock (photo 2) is located 5 km north of the village Sopotskin, was the starting point of Belorussian part of the canal. That shiplock, which was built in 1829 by the guiding of captain Arnold, is located next to the distribution lock, forming one hydrology object. The difference in water levels is 3.10 m. After the restoration that shiplock obtain the large recreation potential, because of such recreation resources as beach and water were supported by the infrastructure made to tourists. The area of Dombrovka shiplock became the favorite place of rest for people from Belarusian city of Grodno (ROMANOVA et al., 2014).



Photo 2. Dombrovka shiplock (photo by V. A. Shirokova, 2013)

Fot. 2. Śluza Dombrowka (fot. W. A. Szirokowa, 2013)
Фот. 2. Шлюз Домбровка (фот. В. А. Широковой, 2013)

The moveable bridge (photo 3) in front of the shiplock, connecting the banks of the canal, rises and falls with the help of a hand winch. The wooden gates of the shiplock, which design was developed almost two hundred years ago, open and close also manually, providing a 25-minute process of ship locking. The territory of Dombrovka shiplock is used

at the time of annual Festival "Augustow Canal in the culture of three nations – Belarusians, Poles and Lithuanians". At the time of a festival, tourists are crossing 18 km across the most picturesque pla-

ces of the Augustow Canal. The guests are taking part in the game performances and open-air dancing, which is accompanied by famous folk bands, tastings of national dishes and sports competitions.



Photo 3. Moveable bridge in the front of Dombrovka shiplock (phot. by A. V. Sobisevich, 2013)

Fot. 3. Most zwodzony przed śluzą Dombrowska (fot. A. W. Sobiesiewicz, 2013)

Фот. 3. Разводной мост перед шлюзом Домбровка (фот. А. В. Собисевича, 2013)

Another fore-chamber lock (photo 4), which is the largest one is located near Nemново village. Initially, in 1829, the lock at Nemново village was created under the supervision of Lieutenant Colonel John Paul Lelewel as a two-chamber, then in 1833 that two-chamber shiplock was converted into a three-chamber. The third chamber was made by Ignatius Prondzinsky, who understood that hot summer and freshet at spring could change radically the water level in canal. All that things could have a negative impact to navigation. In the years since the beginning of operation, the water level in Neman had dropped significantly, so after that reduction in 2004–2006, the shiplock "Nemново" appeared new fourth chamber. In addition, the river changed course and the channel became longer by 1.8 km, which had to dig old river bed. The difference in water level in that four-chamber lock is 9.6 meters and that level is the largest in the whole water system. The whole process of locking takes 1 hour 20 minutes.



Photo 4. Nemново shiplock (phot. by V. A. Shirokova, 2013)

Fot. 4. Śluza Niemnowo (fot. W. A. Szirokowa, 2013)

Фот. 4. Шлюз Немново (фото В. А. Широковой, 2013)

In the center of village Nemново preserved a red brick house (photo 5), which belonged to the master of shiplock. Now, here is a unique private Augustow Canal museum. Ivan Luksha was the last master of shiplock "Nemново" and his grandson Tadeusz Urbanyuk all his life collected materials about the channel and people those who were worked on it. Those materials are the essential part for the private museum, which occupies the part of the house of Alexander Zazhetsky, whose relati-

ves were workers on Augustow Canal. The main part of materials was collected by Tadeusz Urbanyuk, who is the grandson of the late sluice master Ivan Luksha. The museum collection contains old documents, hydrometric books, photos, the lock mechanisms and household items of XIX–XX centuries (ROMANOVA et al., 2014).

CONCLUSION

At the time of its creation, Augustow Canal was a very advanced hydraulics object, which provides to Polish goods access to Russian and European markets. However, very soon the creation of railways

made the transport function of the canal less important. Augustow Canal was for a long time in the process of its converting from transport object to the objects of tourist's attraction.

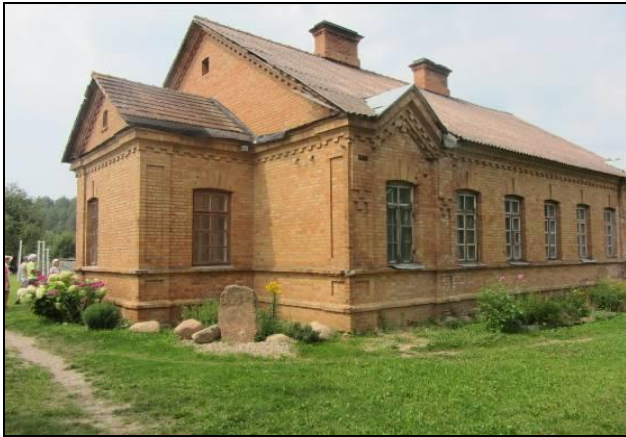


Photo 5. The house, where the private museum of the Augustow Canal is located (phot. by V. A. Shirokova, 2013)

Fot. 5. Dom mieszczący prywatne muzeum Kanału Augustowskiego (fot. W. A. Szirokova, 2013)

Фот. 5. Дом, в котором расположен частный музей Августовского канала (фото В. А. Широковой, 2013)

In 1858 Alexander Polyansky had the idea of making recreation zone at the territory of the canal. That idea was realized in the time of Polish independence, when from 1920 till 1939 Augustow Canal was used for recreation purposes. In that time the water route between Grodno and Augustow cities was established and paddle steamers were used for moving tourists. The Polish part of Augustow Canal, which was reconstructed in the 1960th, has the great significance for heritage tourism (LENART, ZELENKOV, 2008; MARIN, 2011).

Nowadays Augustow Canal currently is using for recreational purposes. The government in the Belarus turns the Augustow Canal into the object of tourists' attraction. For that purpose, the "Sea Festival" at Dombrovka shiplock was established. The question of heritage tourism at Augustow Canal became the start point for the cooperation between Belarus and Poland.

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<https://trofei.by/articles/stati-o-turizme/otdyh-na-avgustovskom-kanale>

Received: 15 June 2018

Wpłynął do redakcji: 15 czerwca 2018

Поступила в редакцию: 15 июня 2018