FUTURE OF THE OBVODNY CANAL — THE MAIN LINE OF THE SAINT PETERSBURG GREY BELT

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Abstract

The study looks at the issues of the development of territories in the Obvodny Canal area. These issues, which are of great interest as related to the planned transformation of the Grey Belt, become more aggravated due to the increase in traffic load after the Western High-Speed Diameter (WHSD) opening.

A significant decrease in the housing quality and cost of apartments facing embankments is observed, which can be explained by an extremely high level of noise and contamination with exhaust gases.

Options for the improvement of environmental conditions, based on the conversion of territories allocated for the canal water area, are proposed. It is being noted that the Obvodny Canal has lost its functional purpose and can be converted as dozens of (nowadays former) canals in the historic center of Saint Petersburg.

Keywords

Grey Belt, Saint Petersburg transport infrastructure, Obvodny Canal, ecology of living environment.

Introduction

The Obvodny Canal was constructed in 1803–1835. In 1766, a drainage ditch was dug from the Ligovsky Canal to the Ekateringofka River; the western part of the Obvodny Canal was developed along this ditch. The canal length is 8.08 km, its width is 21.3 m (in the eastern part — up to 42.6 m). The canal was designed to drain water from the Neva River in case of flooding, but mainly for transport needs of enterprises located along its banks. The canal was developed along the border of the city as of the first half of the 19th century and "enclosed" it from the south. From the second half of the 19th century till the mid-20th century, the Obvodny Canal was actually an open waste water sewers for wastes of industrial enterprises. In 1835, the first ship navigated the canal, but at the beginning of the 20th century the shipping traffic through the canal was closed.

The canal was abandoned and for a long time it served as a waste canal for local enterprises and residential blocks. In the 1960s, a proposal to fill up the canal was debated. Nowadays, its banks are one of the most significant transport routes distributing traffic flows in the central part of the city. Currently, the possibilities of canal conversion to ensure its use in modern conditions, solving urgent transport, environmental, architectural and planning issues facing the studied area of Saint Petersburg, are considered.

Materials and methods

The following research methods are used in the article: a historical analysis of the development of the Saint Petersburg system of waterways and canals, a comparative analysis of the experience in laying and operating of canals, and design modeling.

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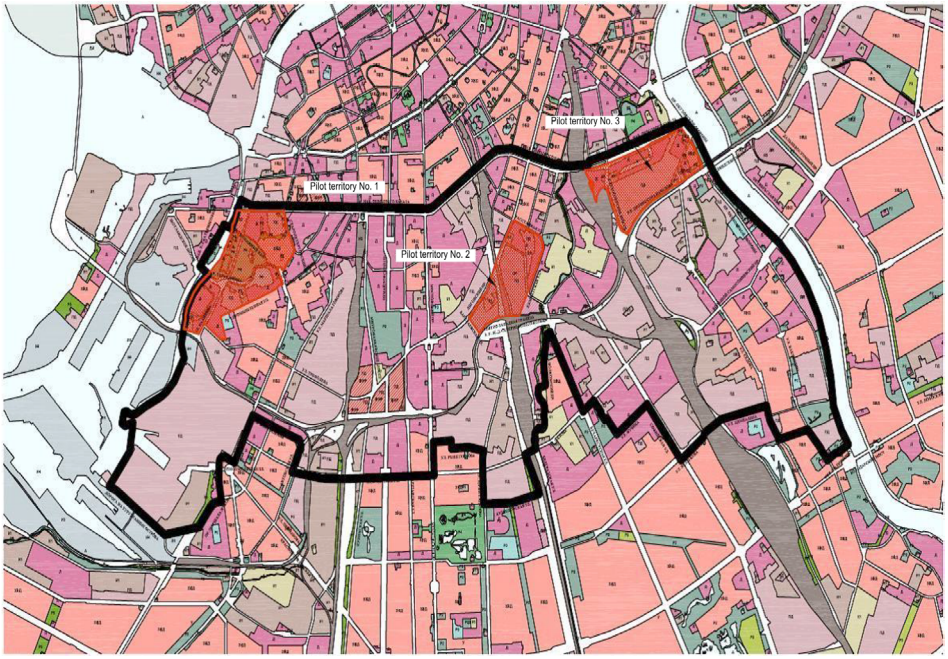

Figure 1. Territories along the southern bank of the canal, allocated for pilot designing

Results

When Saint Petersburg is compared to Venice, it is often pointed out that our city is located on 42 islands, crossed by approximately 90 rivers and canals with more than 500 bridges (Frolov, 2005). The historic part of Venice includes 118 islands, 398 bridges and 175 canals.

Such correlation does not take into account fundamental differences in architectural and planning designs of canals:

- in Venice, a lot of canals lack embankments, houses rise directly from the water, and only several areas have narrow passages for pedestrians;

- in Saint Petersburg, roads for urban transport are laid along the banks of all waterways. In the 18th–19th centuries, all main cargoes (food, firewood, hay for horses, raw materials for industrial use) were delivered by barges navigating in the water area of rivers and canals. Nowadays, embankments play the key role: the main routes of passenger and freight transport are laid along the Neva River and other waterways of the Neva Delta;

- only one Venetian canal — the Grand Canal — follows a natural channel, preserving its meanderings. In Saint Petersburg, rivers of the Neva Delta form the system of waterways. Their natural routing was fixed at the end of the 18th century, when the banks of the Moyka River, Fontanka River and Catherine Canal (the former Krivusha River) were stabilized with granite embankments and fenced with highly-artistic cast-iron grilles.

Local landscapes give the city a peculiar charm: granite embankments, green trees, water shine, gently sloping bridges, and austere facades of buildings merge together. This picture set an image of Saint Petersburg as the Northern Venice, although such comfortable promenades are not typical for Venice. The embankments became the favorite places of townspeople for walking and nowadays they attract lots of tourists.

The Obvodny Canal plays a special part in the system of large waterways of the Neva Delta. It has become a water main that can determine the appearance of new urban blocks which are planned to be constructed in the Grey Belt of the city (see http://spb-projects.ruzsdsch2.jpg). In particular, the territories along the southern bank of the canal are allocated for their pilot designing (Figure 1).

It is the longest waterway of the Neva Delta (its length is 8 km), unlike the Fontanka River, Griboyedov and Moyka Canals which were formed as a result of the sewage collection system development at the place of the existing rivers (see http://spb300.osis.ru/vek20/F20/1971-1980/1978.shtml). The Obvodny Canal is a 100% engineering structure, its routing and design were determined following pragmatic considerations. It was laid along the border of the city of those days and partially outside it.

At the first stage of development it was constructed as a part of the military fortification system on the southern approaches to the city. In 1769–1780, a sheet of water stretched from the Ekateringofka River to the Ligovsky Canal, and embankment protection was installed along the banks. To the north of the canal, the Izmaylovsky Guards Regiment compound was situated; and at the beginning of the 19th century, the Nikolai Cavalry School campus was built in the neighborhood. At the time the canal was extended to the Neva River, and in its eastern part near the Nevsky Monastery, the Alexander Military Parade Ground and barracks were built, where the Cossack and Ataman regiments, Don and Black Sea battalions were located. It was decided to use the waterway for the procurement

to these military units, and, therefore, to start cargo traffic through the canal (Sementsov, 2012). In 1819–1821, supply warehouses were built by outstanding architect V. P. Stasov on the northern bank (Administration of Saint Petersburg, 2003).

The second stage of the Obvodny Canal development is related to Saint Petersburg industrialization in the 19th century. At the time, shipbuilding in the center slowed down, the Particular Shipyard was closed, the Admiralty was transformed into a military chancellery. Canals that provided industrial communications and a protective canal around the Admiralty were filled up (see http://www.spb-guide.ru/page_465.htm).

The Obvodny Canal lost its value as a fortification, but it was not filled up at the time unlike numerous canals in the center of the city which became useless. It took on new significance as it was expected to be able to reduce the risk of flooding and become a new way for the transportation of bulky cargo round about the central part of the city. In 1835, shipping traffic was opened throughout the entire canal; barges with cargoes were transported to the internal elements of the city waterways along the Tarakanovka River and the Vvedensky Canal.

The established communication promoted the fast development of the entire southern part of Saint Petersburg of the time. In contrast to the central part of the city where residential areas prevailed, the landscape of the Obvodny Canal was determined by the housing and utilities infrastructure and industrial structures. Warehouses and factory buildings appeared on its banks. In some places they alternated with workers' barracks and manufacturers' mansions. In the eastern part of the canal, a terminal with the French boot basin for transfer of goods was constructed. Three railway stations were constructed along the route (Lisovskiy, 2004). According to the European urban-planning terminology, territories with such use of plots are defined as "areas of mixed-use development" (Mischgebiet), while in the modern domestic professional language they are designated as the Grey Belt.

At the beginning of the 20th century, the Obvodny Canal became narrow for vessels with increased draft, and navigation through the canal basically ceased. The canal changed its function; it became an open waste water sewers for wastes of industrial enterprises located in the neighborhood. Its unattractive banks were formed by earth slopes with wooden reinforcements at the water edge (see http://polypipe.info/history/93-drainagehistory-ofstpetersburg.html).

The 1937 master plan of Leningrad was meant to reverse the situation. It was offered to convert the Obvodny Canal following the example of canals and rivers of the historic center (Kamenskiy, Naumov, 1973). However, those great plans were not fulfilled. The plan was implemented only partially. Permanent embankments and several new bridges were constructed, and old bridges were reconstructed in two stages (in 1930s and after World War II).

The current stage of situation development along the Obvodny Canal route is characterized by the deindustrialization of the area. All former industrial enterprises located along the banks stopped their production. Their buildings are being spontaneously converted into shopping and office centers. The area development becomes chaotic, causing understandable concerns raised by specialists and the city administration.

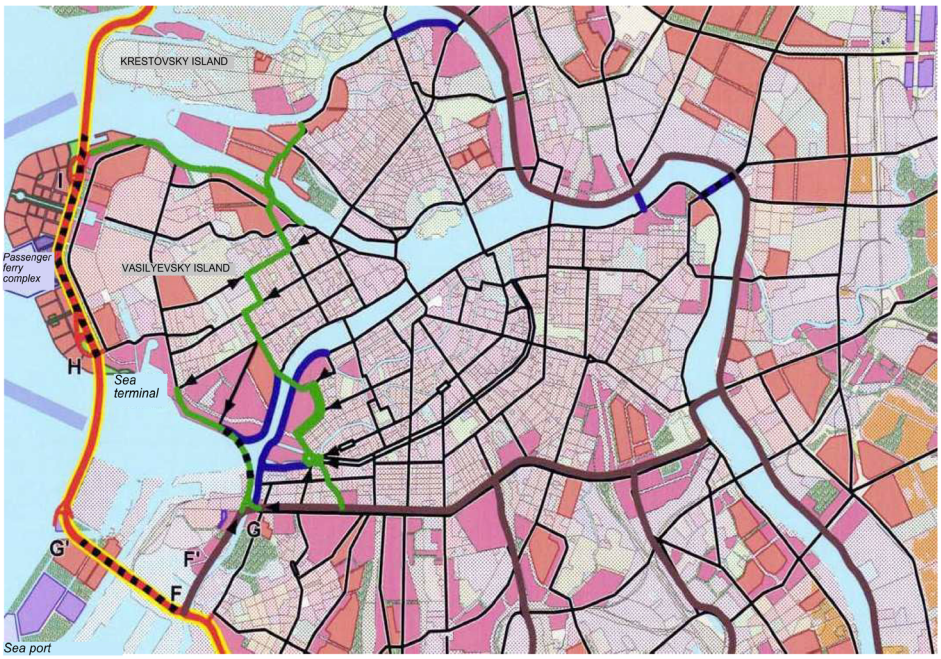

Figure 2. Saint Petersburg traffic diagram with the Obvodny Canal highlighted as a latitudinal link between the Western High-Speed Diameter, the city center and the embankments of the Neva River in the Okhta River area

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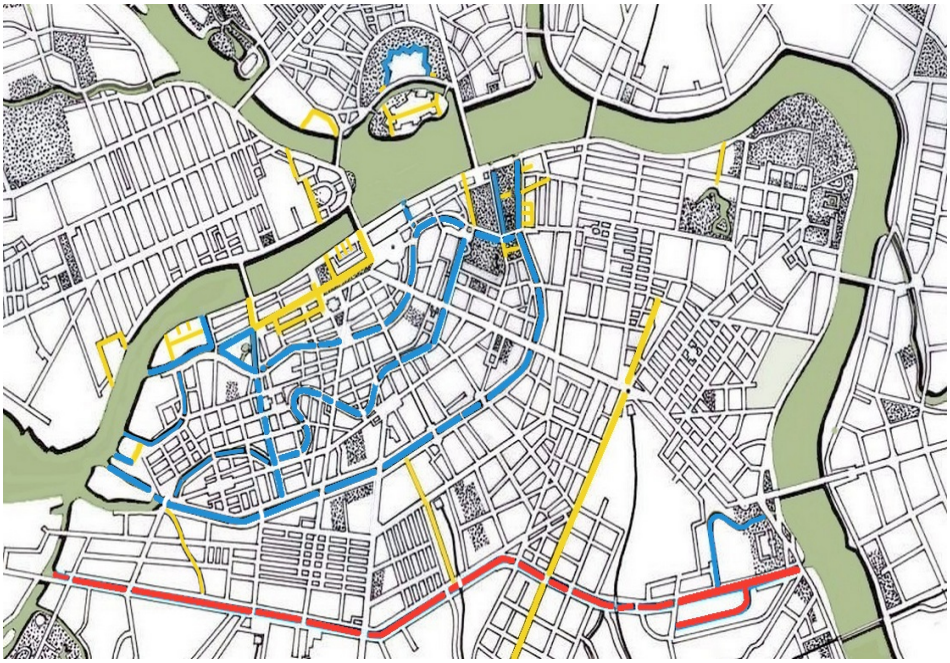

Figure 3. Urban-planning layout of former canals

CONDUCTED COMPETITION

The future of the Grey Belt territories, their use for housing are increasingly debated. These areas are attractive as they are located directly at the border of the historic center. The conducted contest revealed the ways of using the potential of the areas located to the south of the Obvodny Canal, but the future of the buildings stretching along this city main was not discussed. The issue becomes more aggravated due to the planned increase in Obvodny Canal traffic load. According to the strategy of the Saint Petersburg transport infrastructure development, this route has an outstanding value. It should become the main and the only latitudinal link between the Western High-Speed Diameter, the city center and the embankments of the Neva River in the Okhta River area (Figure 2).

It is well known that the ecological state of the Obvodny Canal area is of great concern. The noise level in this area reaches 70–75 dB; the level of contamination with exhaust gases is very high. These negative factors directly affect the area development. It is indicative that authors of the article with the dramatic headline "Apartment buyers are least of all concerned with the district ecology" acknowledge that "the apartments facing the Obvodny Canal are 30% cheaper than the similar apartments at a distance from the embankment" (see https://www.dp.ru/a/2010/06/10/Pokupatelej_kvartir_mensh).

It is obvious that the further planned increase in transport load along the Obvodny Canal will have negative consequences for the ecology of the local development. However, this aspect goes entirely unnoticed. It is indicative that this issue was only touched upon in 2011, when fundamental problems of the Obvodny Canal future were discussed. During that meeting, the focus was on the possibility to fill up the canal and construct additional lanes in the obtained area. B.M. Murashov, the Chairman of the Saint Petersburg Committee on Transport Infrastructure Development viewed this idea negatively and noted possible consequences: "We should understand that we develop not a traffic environment, but a living environment. Indeed, Obvodny Canal filling-up would be efficient in terms of traffic capacity. But in terms of the city center value this cannot be done, of course." Newspapers carried the following report: "The reconstruction of the Obvodny Canal will not affect its water function. The filling-up of one of the Saint Petersburg waterways is not anticipated (see http://www.ntv.ru/novosti/245219/).

However, it is not clear which "water function" of the Obvodny Canal was meant. Cargo shipping stopped long ago, tourist and water sport boats prefer not to enter local waters. Obviously, the transport function is prevalent: large-tonnage trucks and thousands of cars move on the embankments day and night.

A fundamental decision is required to ensure the compliance with the environmental requirements to residential areas near the Obvodny Canal. The canal has ceased to perform its function as an engineering structure, and the issue regarding its future shall be resolved taking into account urban-planning considerations. There are three possible ways of the situation development:

- minimization of the vehicle traffic on the embankments. This option can be considered unrealistic in the nearest future;
- transformation of the Obvodny Canal into a landscaped waterway similar to those that give a particular charm to our city, to attract tourists;

- development of the Obvodny Canal as a modern traffic artery.

To implement the second option, it is necessary to minimize traffic flows along the banks and transform the development along the embankments fundamentally, find places for green areas and pedestrian alleys. Otherwise, local reconstruction will be meaningless: the embankment lining with beautiful stones or metal lattices of exquisite design will remain unnoticed. However, the attempts to reduce the vehicle traffic on all city embankments (including the Obvodny Canal embankments) have been unsuccessful so far.

The third option is aimed to ensure the functioning of the Obvodny Canal as one of the most important elements of the city transport system, as well as improve environmental conditions and protect adjacent buildings from noise and exhausts. To begin with, it shall be admitted that the waterway has lost its functional significance and therefore can be liquidated. Hundreds of examples when unnecessary canals ceased to exist can be found in the world practice of urban development.

In the eastern part of Venice (Castello district), straight-line Via Garibaldi stands out among numerous narrow streets due to its width. For several centuries, waters of a large canal had splashed here; timber was delivered to the shipyards of the Arsenal and new large galleys rode over it. However, in the beginning of the 19th century, when the construction of large ships started, this shallow canal became useless. It was filled up and converted into a boulevard. Venice also has other streets laid along former canals. In the Venetian dialect, they are usually called Rio tera, which can be translated as an "earth canal" or a "canal filled with earth" (e.g. a large segment of Via Garibaldi is called Rio Santa Anna).

Industrial canals of the Admiralty and Particular Shipyard are analogous to the canals of the Venetian Arsenal. They were developed in the beginning of the 18th century, and for about a century they were used as a part of the shipbuilding production chain. When production conditions changed, they were abandoned in the early 19th century. The principle of engineering expediency contributed to the disappearance of the defensive canal of the Admiralty Fortress, the running Ligovsky Canal in the late 19th and early 20th centuries, the transport routes of the Tarakanovka River and the Vvedensky Canal in the middle of the 20th century (Lindley, 1884).

The history of Saint Petersburg also reminds of a system of similar transformations: if a canal ceased to perform its main function, and its very existence created problems for urban life, the canal was filled up, while its territory was repurposed (Enakiyev, 1912). The Vvedensky Canal was dug in 1807–1810 following the project developed by engineer F. I. Gerard in 1804. It flowed out of the Obvodny Canal, passed between the former barracks of the Jaeger Regiment on the left bank and the Vitebsk Railway on the right bank, then crossed the Zagorodny Prospect near the Vitebsk Railway Station and flowed into the Fontanka River near the Obukhov Bridge. It was used for the needs of navigation, water intake, and then as a waste water sewers (see http://opeterburge.ru/history/pervyj-vodoprovod-v-peterburge.html).

The Vvedensky Canal was arched over by four bridges. Since 1836, the embankment along the canal had been called the Embankment of the Vvedensky Canal and was renamed the Embankment of the Vitebsk Canal on September 10, 1935 after the canal renaming.

In 1967, after the canal filling-up, the street which replaced it was called the Street of the Vitebsk Canal. Since December 29, 1980 it has been called the Vvedensky canal (alternatively, the Street of the Vvedensky Canal) (Sementsov, Margolis, 2004).

The list of the most famous former canals of Saint Petersburg is quite broad (Nikitenko, Sobol, 2002, Nikitenko, Privalov, 2009) (Table 1).

Table 1. List of the most famous former canals

Main function of the canal	Name, location	Period of existence
Water draining, drying	Lines of Vasilyevsky Island	1720–1760
	Canal in front of the Twelve Colleges building	18th century
	Krasny Canal of the Field of Mars	1711–1770s
	Poperechny Canal of the Summer Garden	1719–1777
Water feeding	Ligovsky Canal	1721–1892, 1926
Industrial transportation	Admiralty Shipyard complex	1706–1840s
	New Holland complex	1717–1842
	Particular Shipyard Complex	1726–1780s
	Kosoy Dementiev Canal and "Gavanets" of the Sytniy (Zapasnoy) Courtyard	1719–1790
Protective dykes	Admiralty Fortress	1704–1817
	Peter and Paul Fortress	1703–1900s
	Engineers' Castle	1800–1819
	Salnobuyansky Canal	1804–1915
	Maslobuyansky Canal	1870s, 1930s
In-city transportation	Canal by the Stary Gostiny Dvor at the Birzhevaya line of Vasilyevsky Island	1720–1760s
	Vvedensky Canal	1807–1971
Municipal domestic services	Canal in the Peter and Paul Fortress courtyard	1706–1800s
	Canals of the Pracheshny Courtyard	18th century

The urban-planning layout of former canals represents their location within the structure of Saint Petersburg (Figure 3).

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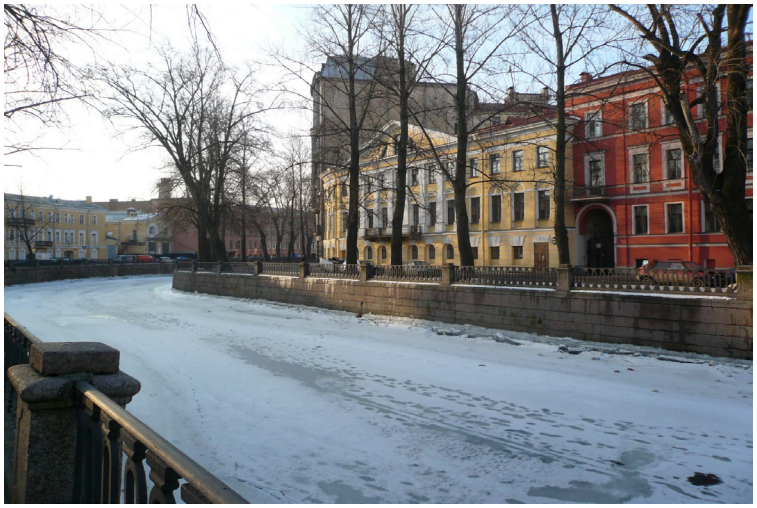

Figure 4. Development at the Griboyedov Canal embankment in Saint Petersburg

Yellow lines on the layout represent routes of canals which were liquidated when they became useless, the red line is the Obvodny Canal. Waterways of the Fontanka River, Griboyedov and Moyka Canals, and some other canals in the center were preserved and granted a second chance due to their unique landscape characteristics. They became symbols of the city image, representing the city spirit (Figure 4).

Their unique landscapes attract landscape painters, and serve as a model for modern architects. The great emotional and artistic potential helped to resist proposals on the filling-up of the Kryukov Canal and a part of the Catherine Canal, which were submitted in the second half of the 19th and early 20th centuries. Unfortunately, the Obvodny Canal has too few chances to fit into this attractive picture.

Local landscapes are not marked by artistic merits. During White Nights, when citizens and tourists gather on the banks of the Moyka or Griboyedov Canals, and holiday cruisers ride on water, the Obvodny Canal embankments are filled with flows of heavy-duty container vehicles (Figure 5).

To make room for intense traffic flows, starting from the 1960s it has been proposed to fill up the canal and convert it into a street. The analysis of the project proposals makes it possible to determine advantages and disadvantages of several possible options for the Obvodny Canal conversion (Figure 6).

The proposed options for the conversion of the Obvodny Canal embankment have their advantages and disadvantages.

Option a. This option implies the filling-up of the canal (and soil compaction), translocation of transport routes to the center of the main road and installation of protective walls that would reduce the effect of noise and exhaust gases (Mangushev, Osokin, 2010). Unfortunately, it would not be easy to achieve the desired architectural and artistic quality in this case;

Option b. This option resembles the project of Konnogvardeyskiy boulevard which appeared on the site of the

Figure 5. Transport flows on the Obvodny Canal embankments

Figure 7. Translucent roofing in the Petuel Tunnel (Munich)

Admiralty Canal filled up in 1842. Tall trees in the center of the main road can give it an attractive look, but local residents will hardly reach them. The ecological potential of the green area is used only to a small extent;

Option c. It would be practical to use the canal bed as a main road below the ground level. This option involves water draining. In this case, it would be possible to allow main-line traffic along the bottom of the former canal. Its walls will provide protection from noise and exhaust gases contamination, and the upper section will provide places for local access and green areas;

Option d. The option implies that the canal flow will be stopped and the canal will be converted into a transport tunnel with a pedestrian zone on its roof. In some areas, it will be possible to use translucent roofs. The main road can isolated from the residential area if required (Figure 7). This option opens unique prospects for the joint conversion of the development on the former northern and southern banks of the canal.

Conclusions

1. Throughout its history, the Obvodny canal played acritical role in the system of large waterways of the Neva Delta and was a water traffic artery of the industrial belt of the city. Nowadays, it can determine characteristics of architecture and appearance of new urban blocks, which will be developed in the Grey Belt of Saint Petersburg, to a large extent.

2. The Obvodny Canal has few opportunities to become an attractive urban landscape and architectural landmark for citizens and tourists. Local landscapes are not marked by artistic merits. The Obvodny Canal is a traffic artery. The Obvodny Canal embankments are permanently occupied with freight and public transport.

3. The analysis of the project proposals makes it possible to determine advantages and disadvantages of several possible options for the Obvodny Canal conversion.

The most preferable are the option with the canal bed used as a main road below the ground level (in this case, it would be possible to allow main-line traffic along the bottom of the former canal) and the option to stop the canal flow and convert the canal into a transport tunnel with a pedestrian zone on its roof. These options open unique prospects for the joint conversion of the development on the former northern and southern banks of the canal.

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