

Principles of forming a polycentric system in a metropolis based on the reorganization of historical industrial areas (a case study of the Vyborgskaya Side in Saint Petersburg)

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Abstract. The paper presents the analysis and methodological foundations related to the formation of new public centers in non-central districts of a city, integrated development of territories, balanced provision of the urban environment not only with service functions but with jobs as well. The historical industrial belt of Saint Petersburg has a unique potential in terms of the creation of new attraction places. Introduction of reorganized industrial areas into the polycentric development model and wise use of their features related to the location in the buffer zone between the historical center and dormitory districts will make it possible to shorten transport links, reduce daily labor migration, decrease the load on the city center in terms of selective cultural and social service.

1. Introduction

Until recently, the planning structure of Saint Petersburg has been developing according to the monocentric model. The established monocentric structure has resulted in daily pendular labor migration, heavy traffic load in the center of Saint Petersburg, intensive residential housing construction, and formation of dormitory districts at the border between the city and the region.

The reorganization of former industrial areas that became obsolete and stopped serving their functions is one of the pressing issues around the world. Such reorganization makes it possible to provide citizens with additional living areas, cultural facilities, and public amenities. It is also important to combine places of residence with places of employment. A new economy based on innovative principles does not require individual industrial areas — employment opportunities can be provided in close proximity to places of residence. The primary task is to work out methodological approaches to the formation of new city centers considered as attractive as historical ones.

2. Results and Discussion

The study is based on a comprehensive systemic approach to the formation of the polycentric system in Saint Petersburg — new attractive public centers in view of the reorganization of historical industrial areas:

- Systemic analysis of impact factors, aspects of the formation; analysis and systematization of global experience in design.
- Theoretical and design modeling of principles related to the organization of public centers.



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- Development of basic principles related to the formation of the polycentric system in the city based on the creation of public centers and spaces.

The formation of the polycentric system in the city based on the development and reconstruction of the historical industrial belt of Saint Petersburg can be successful. It is possible to create new public centers only if new quality urban-planning and architectural solutions, making such centers competitive with regard to the historical center, are available. It can be done following particular principles.

2.1 Principles of forming the polycentric system in the city and creating a system of public centers and spaces. Identity of a new poly-center (in particular, in terms of a place of its origin)

The identity of a place of origin is determined by the history of formation, historically established elements of the planning structure, distinguishing characteristics of natural, architectural and other objects, which shall be taken into account and used in architectural solutions for new poly-centers. The identity of a territory is a result of the historical process, during which particular identification characteristics form.

The purpose of studying the development of the Vyborgskaya Side and its existing key plan is to identify the main stages of territory formation and those distinguishing characteristics that can be elaborated within the project.

The Vyborgskaya Side is located in the north-eastern part of Saint Petersburg. The earliest knowledge of this part of the city dates back to the middle of the 17th century. Up to the 1920s, nine-tenths of the current Kalininsky District (the eastern part of the Vyborgskaya Side) was located outside the city. By the second half of the 19th century, an industrial district and Lesnoye settlement formed along the Bolshaya (Big) Nevka River. In 1811, the Forestry Institute (Forst-Institut) was founded in the area. Later, in 1887, it became a military school. At the beginning of the 20th century, the Polytechnic Institute was founded. In March–May 1917, the Vyborgsky District was formed among the first 15 districts in Petrograd. After the revolution, the abandoned buildings were populated by workers. On July 12, 1922, the Porokhovskoy District was attached to the Vyborgsky District. On April 9, 1936, the Krasnogvardeysky District was separated from the Vyborgsky District. In the first half of the 18th century, the entire bank of the Neva River (within the borders of the modern Kalininsky District) was occupied by settlements (slobodas). The coastal part of the district along the Neva embankment (former Bocharnaya and Kazachya, currently Arsenalnaya and Sverdlovskaya embankments) developed as commercial and industrial outskirts, and were built up with state and private houses. In 1873, the Polyustrovo estate was sold in plots, and new construction (including construction of industrial enterprises) started here. By 1895, 53 industrial enterprises were built in the territory of the Kalininsky District [1]. This defined the nature and structure of housing development in the entire district considered as industrial outskirts (Figure 1).

The identification characteristics of the areas include the planning structure of the district, a large number of industrial buildings (including historical ones). The territory of the Vyborgskaya Side has an established structure. The northern part is occupied by dormitory quarters and characterized by dense housing development established a long time ago and provided with social and transport infrastructure. In the southern part of the district, pre-revolutionary, pre-war, Stalin- and Khrushchev-era buildings prevail. The southern part of the territory is occupied by large industrial sites, some of which are not currently used as intended. Low-rise buildings, temporary structures, and warehouses are located on such sites. The territory is characterized by cultural heritage sites and view points with views of architecturally iconic buildings. Almost 50 scientific institutions (drawn to the south as the industrial core) are located on the Vyborgskaya Side. There are many old buildings in disrepair, requiring renovation or reconstruction, in the district. The density of housing development on the Vyborgskaya Side is rather high, and that limits the possibilities of new construction. In most cases, infill development is carried out. Prospects of territory development are first of all related to the redevelopment of industrial areas.

The current condition of the territory has the following disadvantages: monofunctionality and the strict division into business and residential areas that have no typological variety or shortest routes between each other. There is no system of public spaces, any unified pedestrian and bicycle routes. Industrial sites are the most promising in terms of further development of the district. However, they are not attractive and represent a buffer between business and residential areas, breaking pedestrian and transport links.

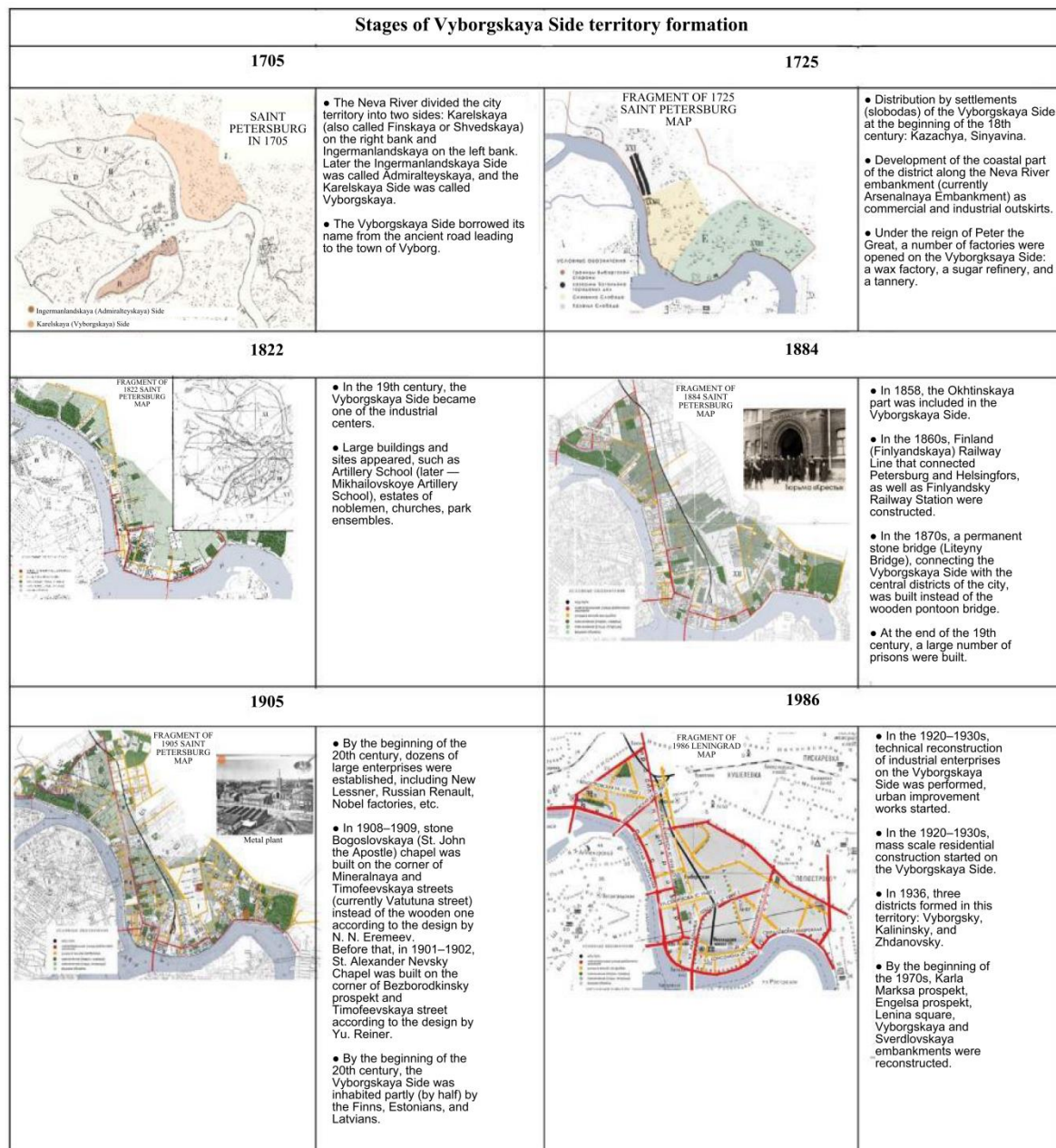


Figure 1. Stages of Vyborgskaya Side territory formation

For the purposes of territory transformation, a European model of renovating industrial areas is adopted. It is aimed at the organization of new construction with the partial introduction of existing buildings. This is the most efficient alternative preserving the historical value of the area. The node is characterized by a large percentage of industrial buildings, part of which can be considered in the

design structure with account for their reconstruction and re-purposing. Buildings in disrepair having no architectural merit shall give way to new construction.

2.2 Optimizing the process of choosing the poly-center location based on priority analysis regarding key factors

When choosing the poly-center location, it is necessary to consider its transport and economic potential, role in the city system [2]. Thus, a number of urban planning nodes (points where city links intersect, capable to evolve into poly-centers) were distinguished and analyzed in terms of spatial organization. Each node was analyzed in terms of its potential and existing issues. Most territories of the nodes under consideration are industrial. Those are depressed areas that do not correspond to the high level of urban life comfort (Figure 2).

The general concept for the development of the former industrial territory on the Vyborgskaya Side includes the following main solutions:

- Transforming Arsenalnaya Street into a city thoroughfare, joining it with the opposite bank of the Neva River, and creating a new bridge.
- Creating large urban planning nodes with public and residential facilities as well as an extensive network of pedestrian routes on the former territory of industrial buildings, warehouses and offices adjacent to such thoroughfares as Arsenalnaya Street, Kondratyevsky, Polyustrovsky and Metallistov avenues. Preserving the existing facilities to the maximum extent; reconstructing such facilities and creating new complexes using the facilities.
- Creating a large recreation area adjacent to the railway tracks from Mineralnaya Street to Chugunnaya Street.
- Creating another large urban planning node on Kantemirovskaya Street.

The renovation project for the Vyborgskaya Side territory involves the development of public spaces of various sizes with transport and pedestrian routes (available for various users) between them. The historical value, advantageous location in relation to thoroughfares, and formation of functional links between urban planning nodes could allow the territory to become one of the important urban planning centers and, thus, promote the development of the polycentric system in Saint Petersburg.

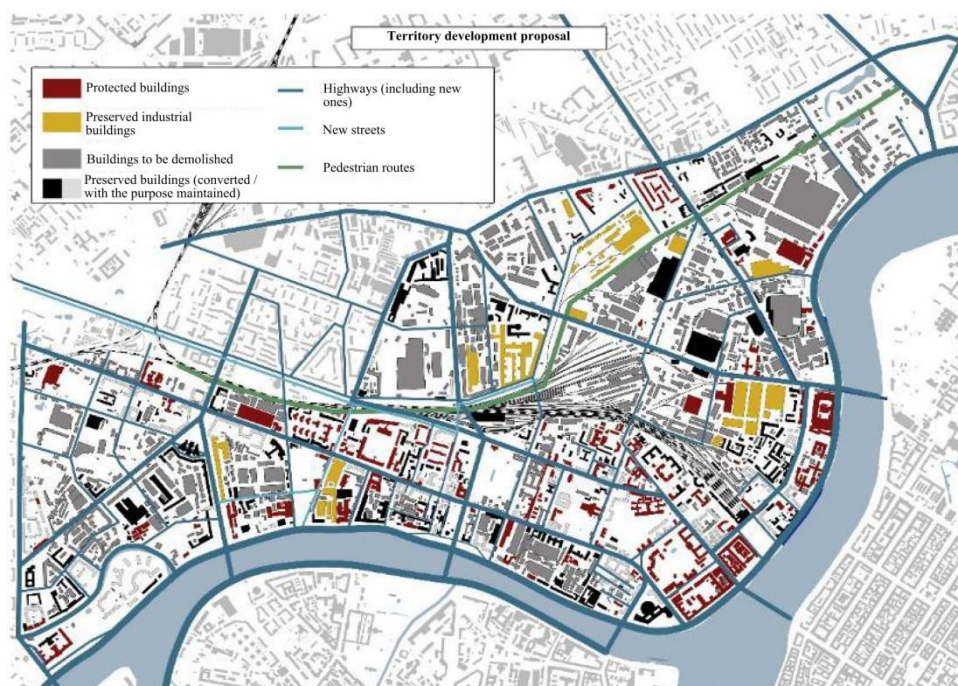


Figure 2. Analysis of the Vyborgskaya Side key plan

2.3 Ensuring the connectedness of the city center designed with other districts as well as the connectedness of individual parts of the territory between each other

The main idea of the Vyborgskaya Side development concept is to transform its territories into centers of social and business activity, having various functions and connected with a system of transport and pedestrian routes.

The concept development implies that it is required to form a basic planning framework around the territories having particular identified characteristics (Figure 3):

- Routing of potential internal links within the district and links with the adjacent territories, "green frameworks".
- Ranking of links and formation of a system of central places with a focus on the identity, public transport nodes.
- Establishment of a continuous and diverse network of water and green spaces.

The introduced pedestrian routes shall link centers of social attraction. Through the system of public spaces, connected with the main pedestrian and transport routes, the territories can attract both visitors and investors [3]. In addition to the transport and pedestrian links as well as the bicycle route, a "green framework" system is developed, which provides new and existing development territories with required recreation areas [4].

It is planned to create a system of pedestrian routes (with the organization of public spaces) from the Polyustrovsky Avenue metro station being designed along Mendelevskaya Street to the Vyborgskaya metro station, and then — through the designed complexes in the former industrial territories — to Lenina Square. As a result, the main pedestrian and transport routes are linked with designed poly-centers included in the structure of the Vyborgskaya Side. The designs of facilities with various functional purposes are developed for sections of the node under consideration. Basically, each such facility is multi-functional. All of them are closely linked to the main pedestrian routes and included in the system of public spaces.

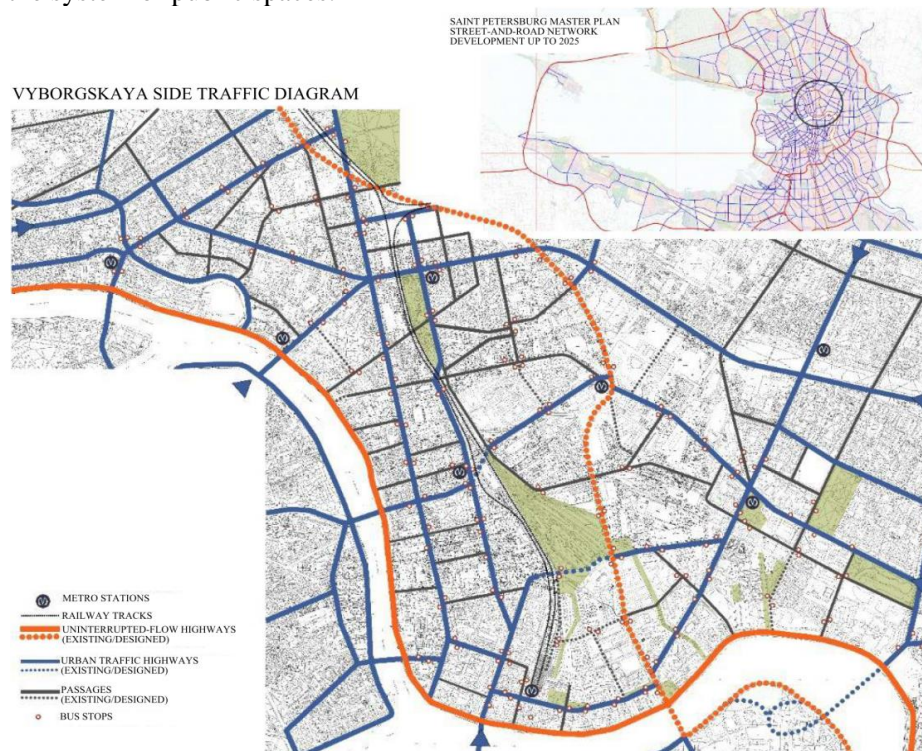


Figure 3. Basic transport and planning framework of the Vyborgskaya Side

2.4 Forming the concept of building development based on the system of central places forming as public spaces with the introduction of public facilities with memorable architectural solutions

The concept of housing development requires the formation of urban planning ensembles, organization of locating central places. It is very important to make the design modern by introducing new elements, facilities, spaces that can become a symbol of the present and future of the territory. Ideally, such public spaces shall have publicly recognized names.

Some functions attracting heavy flows of consumers and covering both daily requirements (in employment, education) and cultural-and-entertainment requirements shall be transferred from the historical center to the districts of the industrial belt. New centers shall be organized in such a way so that they are functional and linked with each other. Such a system can become a new place of attraction relieving the historical part of the city and creating a multi-functional harmonious structure [5]. The concept for the development of the land plot located on the Vyborgskaya Side is proposed with a polycentric development model. It is the most logical and efficient way to form a new attractive district.

During the urban planning analysis, main intersecting transport and pedestrian links were identified. It was decided to create there new district centers due to their advantageous location and high throughput capacity.

In the most territory, ruined and depressed areas causing discomfort for residents and visitors pose the main problem. It is possible to solve this problem through transformation, enrichment with new functions, convenient transport links, bicycle paths, green spaces. The "green framework" becomes an integral part of a new district and provides the building development with required recreation areas. Full transfer of industrial and business functions is impractical as it results in the creation of new dormitory districts, loss of the historical context and "place spirit" necessary to identify the district and its characteristics that were laid in the past.

The design solution involves not only new construction but the reconstruction of existing facilities, their enrichment with new functions, and the introduction of existing buildings in the general concept of the node being developed (Figure 4).



Figure 4. Urban planning node based on formed public spaces.

Each node being designed has functions covering daily requirements (related to housing, employment, rest, and entertainment). The concept proposes to create such facilities as business,

scientific, cultural and educational centers, comfortable dwelling. It is not necessary to move all industrial assets from the territory. The concept proposes to introduce environmental standards (including standards for transport) making residential and industrial territories adjacent and, thus, providing jobs for the residents [6].

The concept provides the urban planning node with some autonomy in terms of distributing functions, areas of social activity, and public spaces. The idea is in maximum proximity of different functional areas, their diversity and mutual penetration, forming a multi-functional environment. Due to the mixing of functions, such citywide problems as pendular migration, investment unattractiveness, and desolation of territories can be solved.

3. Conclusion

Basic principles related to the formation of the polycentric system in the city based on the creation of public centers and spaces include:

- Identification of the node role in the urban system.
- Determination of node capacities in relation to the transport infrastructure; development of local connectedness.
- Determination of characteristic features of the territory, characteristic existing facilities that can be used in the design.
- Introduction of new elements, facilities, spaces that can become a symbol of the present and future of the territory in the design.
- Formation of a basic planning framework with account for the specifics of the territory and new potentially important places.
- Routing of potential internal links within the district and links with the adjacent territories, "green frameworks".
- Formation of urban planning ensembles locating central places.

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