The Use of Post-Industrial Areas in the Formation of the Recreational Environment of the City

V Dormidontova¹, A Belkin²

¹Dormidontova V, Bauman Moscow State Technical University, 2 Bauman Str., 5/1, Moscow, 105005, Russia
²Belkin A, Moscow State University of Civil Engineering, Yaroslavskoye Shosse, 26, Moscow, 129337, Russia

E-mail: v.dormidontova@mail.ru

Abstract. At the turn of the 20th and 21st centuries, a typologically new object of architectural and landscape design appeared - a post-industrial park or a park created on the former industrial territory. In the process of deindustrialization, first of all, of city centers significant areas are liberated that can be used to increase the recreational areas of the city. Especially valuable are the coastal areas, which allow to form a complete system of open green spaces of the city. In addition, the previous industrial use undoubtedly affects the compositional features of the park spaces to be formed. At present, an interesting, mainly foreign, experience of such transformations has been accumulated. The work shows the economic and philosophical origins of this new phenomenon, an attempt has been made to define it and give general characteristics. The modern practice of using post-industrial territories is considered. Analysis of modern practice of design and implementation of post-industrial parks took into account the urban context, the nature of the initial use and its plastic features, the availability of the preserved elements (structures), the functional orientation of the projected object and its role in the recreational system of the city. The analysis made it possible to identify some common features and characteristic methods of the architectural and landscape organization, to classify post-industrial parks.

1. Introduction

The emergence and development of cities has always been associated with production. Settlements were formed around the production zones, gradually expanding. Over time, the development of science and technology has equipped production with increasingly powerful machines and mechanisms, increasingly sophisticated technologies. The improvement of technologies and mechanisms caused the need for technical re-equipment and reconstruction, and the increase in production - the territorial growth of enterprises. At the same time, the areas occupied by railroads and roads connected with production increased. The extractive industry developed more and more territories, leaving hectares of disturbed territories and an increasing amount of industrial waste.

Already in the 19th century large industrial cities of the world faced the problem of pollution and the need to improve the urban environment. One of the ways was recultivation and planting of greenery in post-industrial areas. So, created in the XIX century on-site quarry, the parks of Byut-Chaumont and Monsuri in Paris were called to solve this particular problem. In the XX century, pollution of the urban environment became critical. At the turn of XX-XXI centuries, a steady trend has been determined for the removal of industry from the center outside the city and even to other regions. The practice of landscape development of liberated, often vast territories, preserving expressive relief, industrial structures or buildings led to the formation of a new typological object of landscape architecture - Post-industrial Park. Over the past 30 years, more than 70 such objects have been created in the cities of the world [1].

In the largest cities of developed countries, currently actively reduce the area of industrial development. In New York, industrial areas occupy 10-13% of the area, in Berlin and Tokyo less
than 10%, in Moscow the same - about 20% of the city. According to the General scheme of planting of greenery in Moscow in 1975, the indicator of specific provision with green plantations was to be about 30 square meters by 1996, however, since 1985, the total area of plantings has been steadily declining. At the same time, Moscow's industrial zones form an array of unused areas, which are the most important resource for the development of green spaces as an ecological framework of the city by creating post-industrial parks [2-5].

Thus, the relevance of the work is conditioned by: the need for new areas for the development of a system of green areas; presence of unused and degrading post-industrial territories of considerable area; active development of a new typological object of landscape architecture - post-industrial park; the presence of accumulated foreign experience - a number of realized objects that provide material for compositional analysis.

The purpose of the work was to identify the compositional methods of architectural and landscape organization of post-industrial territories that could be useful in designing post-industrial parks in Moscow. The research method included the study of theoretical and project materials, compositional and landscape-visual analysis of research objects.

2. Theoretical part
In the philosophical, socio-economic and architectural-artistic aspects can be identified factors that caused the emergence of postindustrial park:
- approval of a new natural science picture of the world - a synergetic-evolutionary one, describing the self-regulation of the living and non-living and introducing the concept of deterministic chaos;
- an increase in the segment of information technology, the predominance in the economy of the postindustrial society of the innovation sector with a high-performing industry and the knowledge industry;
- parallel coexistence and development of postmodernism and "minimalism" in architecture;
- development of the environmental approach in the general principles of urban development;
- appearance of the methodic of complex formation of the urban environment through the means of landscape art [6-11].

The identification of the principles and techniques of the architectural and landscape organization of the post-industrial territories was carried out on the basis of a study of 40 objects: 20 enterprises, 5 dumps, 9 sections of railways, 3 quarries, 1 water tank, 1 shipyard, 1 channel. Plans, aerial photographs, photographic materials were studied. The objects of the study were systematized according to the type of previous use, in urban context (urban and suburban parks), the destination of the post-industrial park area, the size.

As a result of the analysis, two basic compositional principles were revealed in the creation of parks in post-industrial territories:

1 - revealing the previous use by preserving, functional and aesthetic comprehension of the elements left from the previous function (industrial structures, buildings, relief).

In accordance with this principle, the following projects have been created: projects for the reconstruction of industrial districts in the Dutch city of Aalborg [12,13] and Zurich [12,14], Goods Line Boulevard in Sidney [12,15], Zollhallen Plaza in Freiburg [12], Rosa Luxemburg Garden in Paris [12], Haute Deûle River Waterfronts in Lille [12,16], Midland railway Square in Pert [12,17], GENK C-m!ne square in Genk [12], Sands Bethlehem and Steel Yard public centers in Pennsylvania and Providence [12], the Louvre branch territory in Lance [12], the Paddington Reservoir in Sidney [12,18], multifunctional Park Fundidora in Monterrey [12,19], Ballast Point park in Sidney [12], Schöneberger Südgelände Park in Berlin [12] and Zollverein Park in Essen [12], Shipyard Park in Zhongshan [12,20], the Vall d'en Joan natural terraced park in Garraf in Spain [12], Millenium Park in Chicago[12], Westergasfabriek Park in Amsterdam [12,21], the botanical garden branch in China, designed in a quarry [12], Strijp S bouquet in Eindhoven [12], Pirrama Park in Sidney[12], Parc des Iles, Drocourt Rouvroy, Henin-Beumont [12], Presqu’île Rollet Waterfronts in Petit-Quévilly, Rouen [12], play area Play Landscape be- MINE on the spillway in Belgium [12], Liupanshui
Minghu Wetland Park in Guangzhou [12], Foundries Garden in Nantes [12], WuWey private garden in Kortrijk [12], Landschaftspark in Duisburg [12,22], MFO park in Zürich [12], Dora park in Turin [12,23];

2 - complete transformation of the territory with the transformation into a multifunctional park (industrial elements are dismantled, the relief is transformed, a new space is created). This principle formed the basis of the park Moerenuma in Sapporo [12, 24], Severn Valley Country park in Shropshire [12], Zsolnay Factory in Pécs [12], Oerliker Park in Zürich [12], Louis-Hängiger-Park in Zürich [12].

It was also found that the compositional methods of post-industrial parks organizing can be divided into two groups - general and special. Common techniques of composition are typical for many modern objects of landscape architecture, for example, asymmetry, dynamism, polycentricity, multifunctionality. These techniques are traced in all selected objects. These methods include interleaving of open and closed spaces, the combination of elements of regular and landscape planning, the use of proportional spaces, the resemblance of forms and their characteristics, the use of contrast in textures, colors, shapes and sizes.

Special techniques are the differences of post-industrial parks, due to the peculiarities of the urban and architectural context of the post-industrial territory that was used, its filling, historical aspects. These methods include the use of existing structures and their fragments, buildings or parts thereof, relief, other artifacts that emphasize the connection with the previous use of the territory; as well as styling, for example, creating an image of abandonment. Special techniques are by definition related to the previous use of the territory.

In dumps, due to the specificity of their relief and location, mainly multifunctional and natural parks are created. To special methods here it is necessary to refer the geo-plastic, defined by the relief formed by the previous use (waste, scrap heap). In the park Vall d'en Joan, debris filled a deep gorge, which led to the use of terraces and the creation of a serpentine road. In the Play Landscape be-MINE park, the heap is turned into a children's playground - climbing wall, where the remaining driveway, rising in a spiral, is used as a level separator. In Moerenuma and Energy Hill parks, garbage is formed into hills with observation platforms. Thus, it is the unique relief and geo-plasticity that are the main formative factor in these parks and subordinate the planning decision to themselves.

The territories of the former railways are also used to build multi-functional parks, but more often linear (boulevards) and small (squares) green spaces. They can be located at the sites of railway depots, workshops, large railway junctions or on a separate railway branch. As a rule, the historical context is preserved, and individual elements are included in the composition and museumed. The preserved railroad tracks are used as a planning basis for the road-tropic network, which forms walking alleys and zoning territory (Zollverein); existing rails are included in paving, lawn, flower beds (Presqu'le Rollet park, Goods line boulevard, park at the Louvre branch); separate the pedestrian areas from flower beds and rest areas (Midland Railway, Zollhallen Plaza, residential quarter in Aalborg). On the avenue Goods Line methods of contrast and stylization are used - the preserved fragments of rails are laid in flower beds, while the planning structure of the boulevard itself is not subject to strict linearity of the railroad track, but, on the contrary, "pulsates". The theme is highlighted by small architectural forms that create a sensation of the platform, the station.

The basis for the concept of the Midland Railway square is the interpretation of the railway (Live Line - active road, Social Line - communication site, Water Line - history of steam engines development, Lost Line - decline in 1990's). In some cases, the planning structure is based on the linearity of the tracks, but the rails are not preserved (Rosa Luxemburg, Klyde Warren Park), the drawing of convergent and divergent "branches" is used as a pattern - which obeys everything: flower beds, paths, recreation areas, playgrounds, alleys and group plantings.

In parks in quarries located outside the city, as in the case of landfills, the basis of the compositional solution are the quarries themselves - the branch of the Botanical Garden in Shanghai uses the surviving quarry as a secret garden hidden from prying eyes. Here, the surviving sheer walls
are being watched as a traditional rocky landscape and, at the same time, architecture. Another way was the authors of Severn Valley Country Park, created in 1992. The mine and quarry were remediated and turned into a nature reserve in the river valley.

The most numerous group of objects is that on the site of former enterprises. It includes landscaped urban areas adjacent to the buildings (Sands Bethlehem, GENK C-m!ne, Steel Yard, Zholnai Factory, Strijp S, Casalis inner yard, Millenium), embankments (Haute Deûle), multifunctional parks (Pirrama park, Ballast Point, Westergasfabriek, Parc des Iles). Special techniques include the use of structures and the existing relief as the basis for a compositional and spatial solution: trusses in the Steel Yard, observation towers in GENK C-m!ne, the elevated narrow-gauge railroad in the Sands Bethlehem, water tanks in the Ballast Point and the Westergasfabriek, cleaning fields and existing geo-plastic forms in the Parc des Iles.

Industrial elements are used as an exposition or as game objects (Millenium Park). In a number of objects nothing reminds of the previous use - the Oerliker Park square is a completely paved area with a grove, planted in the “kenkons” and “matrix” way. The Louis-Häfliger park is a space of three zones, including a sports area, a lawn with geo-plastic shapes and a garden with rest areas. In a number of cases, there is a “revival” of architecture: the plants are located inside the building, creating a greenhouse (Foundries Garden, MFO-Park, Strijp S).

In addition, a number of special techniques can be identified in the organization of objects that are not included in the above groups. The Paddington Reservoir garden, arranged in underground water tanks, follows the principle of a secret garden - the upper part is turned into a square with a recreation area, while the lower one uses existing rooms and architectural elements of the 19th century to create a chamber space with a rectangular pond, ornamental plantations and raised lawn. The Chinese park on the swamp uses the existing fish pond system, which creates a terraced water filtration system.

The pedestrian bridge called the "Steel Rainbow" crosses the park, it demonstrates the city's long history as an important industrial base for the production of coal and steel. In the multifunctional park in place of the old Chinese shipyard, one can single out the use of the existing railway access road as a planning axis for the formation of space and a walking alley. The preserved constructions of hangars, docks, quays and other structures are painted in monochrome contrasting colors and turned into open pavilions, galleries, places for bathing. Some instruments used in the shipyard are also included in the landscape as small architectural forms.

**Practical significance.** The revealed principles and compositional methods can be used in the practice of architectural and landscape design of post-industrial territories.

3. **Suggestions and recommendations**

In Moscow industrial territories that are subject to reorganization constitute an impressive list, among them ZIL and Serp i Molot plants, House-building-factory No. 3, Research-and-production association “Vzlyot”, Moscow mirror factory, “Mosstroysnab”, Tushino airfields and many others. Design and construction work carried out at these sites, deals with the architectural development of the territories, but not with the creation of post-industrial parks, squares, boulevards. Other former industrial enterprises were turned into business centers and places of leisure and artistic activity, after the fragmentary reconstruction [2].

The transformation of industrial enterprises territories in Moscow has the character of making situational decisions aimed at extracting quick profits from the building of "liberated" plots. However, their true value consists in the rare possibility of forming a complete system of open landscaped spaces in a large historical city. Especially it concerns the landscaping of riverside areas, the creation of a water-green diameter along the Moskva River and other linear elements of the ecological framework of the city along the Yauza, Setun and other small rivers.

Such an opportunity is provided by the reconstruction of enterprises whose territories are narrated to water: the Badaevsky Brewery and Kristall factories, the ZIL plant, the enterprises of the Nagatinsky backwater, the Ochakovo industrial zone, the enterprises at Yuzhnoportovaya Street, the
Berezhkovskaya Embankment, the Krasnopresnensky Plant of Reinforced Concrete Structures and many other post-industrial territories.

The empty railway branches and depots look promising. Being a linear objects, the territories can be turned into landscaped connections in the ecological framework of Moscow. For example, the railway in the reserve "Losiny Ostrov" can be integrated into the road-pathways network, equipped with rest places, full of recreational functions. Perovo-Slaughterhouse-Simonovo branch, 8 km long, passing through several districts and facing the embankment, can also be turned into a comfortable modern multifunctional boulevard. The abandoned depot in Khovrino is located among the buildings and has a small stream on the territory. The nearby Grachevsky park could make up a single greenery complex with the territory of the former depot. The railway tracks along Zelenogradskaya Street would be advisable to turn into an avenue or boulevard, and in the place of the depot itself, to create the square, a new comfortable space.

Landscaping of these areas and the reconstruction of many more industrial enterprises should be aimed not only at the solution of local problems, but on the formation of a complex coherent system of open green city spaces. A compositionally expressive and functionally meaningful post-industrial park will arise in the course of this formation.

4. Conclusions
Within the framework of the research, a new typological object of landscape architecture - Post-industrial Park - was studied; the sources and tendencies of its formation are shown. The features of the architectural and landscape organization of such territories are analyzed on the examples of foreign objects, the revealed principles and special methods for creating compositions are systematized. On the example of Moscow, proposals and recommendations are given aimed at forming the ecological framework of the city - a system of green spaces in the process of post-industrial parks creation.

5. References
[1] Demidova E V 2013 Reabilitation of industrial territories as a part of town space Akademicheskij vestnik UralNIIProekt RAASN vol. 1 pp. 8-13.
[2] Complex of town-planning and building policy in Moscow https://ru-pp.livejournal.com
[3] Belkin A N 1987 Town Landscape (Moscow: Vysshaya shkola) p. 111.
[4] Belkin A N 2015 The perspective direction of urban planning culture development in Russia Forestry Bulletin vol. 19 (5) pp. 17-22.
[5] Belkin A N 2018 What is «Promenade plantée» for Paris? Forestry Bulletin vol. 22(1) pp. 58-63
[6] Dormidontova V V 2015 Dissipative space of a modern garden as a reflection of the evolutionary-synergetic picture of the world Proc. Int. Conf. Regional architectural schools (Novosibirsk) №1 (Novosibirsk State Architectural-Artistic Academy) pp. 237-243.
[7] Dormidontova V V Belkina T L 2010 Garden space as an artistic interpretation of a scientific picture of the world Vestnik kостромского государственного педагогического института vol. 3 p. 81.
[8] Dormidontova V V 2012 The stages of a XXI century garden formation (Electronic Materials) Architekton; izvestiya vuzov vol. 1(37) http://archvuz.ru/2012_1/19
[9] Dormidontova V V 2015 Postmodernism as the eclectics of our time Forestry Bulletin vol. 19 (5) p. 51-57.
[10] Dormidontova V V 2012 Minimalism in the art of gardening в садово-парковом искусстве (Electronic Materials) Architekton; izvestiya vuzov vol. 2(38) http://archvuz.ru/2012_2/17
[11] Emelin V A 1999 Postindustrial society and culture of postmodernism Social philosophy and modernity (Moscow: Institute of social sciences of Russian Academy of Science)
[12] Landscape Architecture Works Landezine (Electronic Materials) landezine.com
[13] Martovitskaya A Wonderful transformations of a port (Electronic Materials) www.archi.ru
[14] Verticals in the modern park of Zürich (Electronic Materials) http://yari-design.ru/ideas/2012/vertikali-sovremennom-parke-cyuriha

[15] The Goods Line in Sydney (Electronic Materials) https://www.e-architect.co.uk/Sydney/the-goods-line-in-sydney

[16] Haute Deûle River Banks sustainable district in Lille (Electronic Materials) http://www.brueldelmar.fr/en/project/17/banck-of-the-haute-deule-sustainable-district

[17] Midland Railway Square (Electronic Materials) www.landeszine.com/index.php/2017/06/midland-railway-square-by-place-laboratory

[18] Paddington Reservoir in Sidney (Electronic Materials) www.redeveloper.ru

[19] Parque Fundidora (Electronic Materials) www.parquefundidora.org

[20] Trees instead of rails: best examples of railways transformation into parks (Electronic Materials) http://archspeech.com/article/derevya-vmesto-relsov

[21] New life: Westergasfabriek From gas fabric to cultural park (Electronic Materials) http://urbanurban.ru/blog/space/207/Novaya-zhizn-Westergasfabriek--ot-gazovoy-fabriki-k-kulturnomu-parku

[22] Overview // Leisure Facilities | Landscape Park Duisburg - Nord (Electronic Materials) https://landschaftspark.de/freizeitangebote/uebersicht

[23] Postindustrial Dora Park in Turin (Electronic Materials) http://toitaly.info/park-dora-v-turine

[24] Moerenuma Park–Urban Park in Sapporo (Electronic Materials) http://www.thousandwonders.net