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International Experience in Management of Urban Green Spaces and Water Bodies

Andrey Igorevich Nikiforov, Anna Eduardovna Semak, Ekaterina Vladimirovna Kazakova, Olga Yurievna Mironova, Alexey Dmitrievich Burykin

Abstract*: The article deals with the analysis of international practices in the management of urban green spaces and water bodies. It is noted that adapting significant international practices in creating an ecological framework of the city will undoubtedly multiply and enrich the domestic design practice of urban beautification, supplement national traditions with the original styles and effective methods of landscaping as well as creating artificial water bodies. It is proved that, despite the significant difference in the urban formation process, as well as the formation of the environmental framework objects, one can use international practices to optimize the landscaping of domestic cities and create artificial water bodies. However, in domestic practice, current rules of landscaping and creation of water bodies are designed for the populated locality in general. Althoughto determine the objective norms required for the formation of the ecological framework, it is more expedient to take into account the actual structure of the city, its cartographic distribution, population density, and distribution of industrial facilities.

Index Terms*: international practices, green spaces, water bodies, population, city, ecological framework, planning, industrial development, geospatial structure.

I. INTRODUCTION

Due to various conditions, as well as historical, physical, geographical, and economic prerequisites, all cities have different geospatial structure and urban planning and, accordingly, significant differences in the structure of green spaces and water bodies. However, a number of existing unique solutions for landscaping and expansion of water bodies can be borrowed to organize the ecological framework of cities. Many scientific works offer various green planting and water body design schemes. In this context, it is possible to use systems of green rings and green patches, the wedge-shaped scheme, according to which green wedges extend to the downtown and are united by external green and a water belt. Other schemes provide the central park core of the city, green lanes connecting residential areas, green centers of residential areas, green lanes dividing residential areas into neighborhoods; suburban green areas, as well as the presence of rationally located water bodies.

In the urban planning structure, one can locate green plantings in the form of extended arrays, united in a single system of green highways. River artificial reservoirs can be located in district parks. However, all schemes tend to the most optimal alternation of residential and industrial developments, as well as other urban areas with green spaces and reservoirs.

The study of issues related to the international practices of the urban green spaces' and water body management is reflected in the works of T.V. Averchenko [1], D.A. Kolevatykh [2], M.S. Lepekhova [3], N.E. Ryazanova [4], V.A. Shabanov [5], T.V. Shumikhina [6], and others. The literature review and analysis of the research topic allow identifying certain contradictions, proving the necessity of developing approaches to the urban green spaces' and water body management based on international practices.

II. METHODS

The major trends in the improvement and greening of populated localities in the Russian Federation and abroad consist in keeping an appropriate effective balance between urban green and water resources, and buildings and industrial areas. It can be noted that local solutions depend on natural conditions, the specifics of the projected area, social factors, and environmental and economic feasibility. Optimal landscaping and creation of artificial water bodies in the city create the conditions for comfortable living of the population, and by their compositional structure complete the aesthetic and artistic appearance of the cities.

On the example of cities of the Russian Federation, one can see that basically, when greening large cities, the emerging problems are quite similar regardless of the nature and conditions of urban growth. First of all, this concerns the uneven distribution of landscaping and the shortage of artificial water bodies in certain urban districts. In particular, important is landscaping around industrial sites of the city that is often neglected. Also, in addition to the territories of forest parks, urban parks and gardens, urban areas are not sufficiently provided with small landscape objects of green spaces and water bodies. The similar problem appears in the statistical and cartographic analysis of the ecological framework of the city.

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***** Correspondence Author
Andrey Igorevich Nikiforov*, Moscow State Institute of International Relations (MGIMO University), Moscow, Russia.
Anna Eduardovna Semak, Russian Timiryazev State Agrarian University (RSAU-MTAA), Moscow, Russia.
Ekaterina Vladimirovna Kazakova, Russian Timiryazev State Agrarian University (RSAU-MTAA), Moscow, Russia.
Anna Eduardovna Semak, His Department Name, University/ College/ Organization Name, City Name, Country Name.
Olga Yurievna Mironova, Lomonosov Moscow State University, Moscow, Russia.
Alexey Dmitrievich Burykin, Academy of Labor and Social Relations, Moscow, Russia.

However, another problem appears to be associated with the fact that in the cities built densely and long ago, there are simply not enough areas, especially in the central part and residential districts, to create new green zones and artificial reservoirs. In this case, the practices of European cities, which are characterized by the latest methods of landscaping and creating artificial water bodies, will be quite useful. In general, there is a tendency to increase the area of green spaces and artificial reservoirs in the cities of the Russian Federation. However, often the restoration of old and the creation of new territories occupied by green spaces and artificial water bodies is carried out thoughtlessly and not systematically.

Studies show that the appearance of cities reflects the country's socio-economic development level. In the advanced countries of Europe, urban improvement and greening are among the priority tasks. Currently, considerable experience has accumulated in this area, and a significant range of plants for landscaping is formed, as well as technology to create artificial water bodies is developed. Due to modern achievements in the urban planning methods and the formation of the ecological framework of urban areas, large European cities manage to maintain a balance between the built-up areas and the number of environmental facilities within the city.For example, a successful and well thought-out system of green spaces and artificial reservoirs is in Leipzig. This system is characterized by differentiated green areas and reservoirs in different city districts depending on the density of development and environmental standards (Table 1). The analysis of the architectural and space-planning design of the city allowed identifying four zones, different in density of development, population, size of territory, and an area of environmental objects. These are the downtown, which is the first zone, the central district – the second zone, the inner city district – the third zone, and the new residential areas under construction – the fourth zone.

Table 1. Characteristics of the ecological zones of Leipzig

Zones	Average distance to the downtown, m	Population, thousandpeople	Area of green plantings and reservoirs, ha	Zone area, ha
I	500	10	15	200
II	3,000	225	450	2,500
III	5,000	265	1,700	7,500
IV	7,000	55	1,300	4,100

All elements of the urban ecological framework are interconnected and integrated into a continuous system. It should be noted that the landscaping of German cities is distinguished by very widely used well-groomed lawns, often having a geometric configuration, sometimes quite simple, while sometimes in combination with flowers, ornamental shrubs, and artificial ponds.

In the context of the developed infrastructure and interesting urban designs, one can also consider the city of London, which in terms of the number and quality of green spaces and artificial ponds holds one of the first places among European capitals. Large landscaped public areas in the form of individual green patches are located in the city center among the development. One of the major park complexes with an area of about 400 ha, extended to almost 5 km, can be considered a green wedge, penetrating into the heart of the city to the Parliament Building. It is formed by St. James Park, Hyde Park, and Kensington Gardens. Most of the parks are located in the aristocratic western part of London, while the eastern part of the city is landscaped rather modestly.

The city has a rather wide belt consisting of large arrays on the outskirts, such as Richmond Park (943 ha). The green protective belt of London or rather a strict observance of its borders allows protecting city against chaotic use of land, water bodies, and picturesque surrounding landscape. The development is just outside the outer boundary of the green belt that does not expand the city. The formation of the ecological framework in London is mainly carried out by the residents and private companies rather than by the city authorities. Each of the 73 districts of greater London has its district municipal council responsible for greening their territories.It is the commissions of these councils, rather than the city hall that have the right to allocate sites for development. They are also involved in the improvement of their area, including the arrangement of parks, embankments, and other common areas. London municipal councils are guided by autonomy unprecedented in other countries. Without their consent, neither the city hall nor even the government can implement their construction projects. According to the latest data of the master plan defining the infrastructure development of the London green zone, all green spaces and artificial reservoirs in 11 districts were structured to ensure more comprehensive and focused relationship.In this context, it is impossible not to mention Vienna, the capital of Austria, which is one of the greenest cities-millionaires in the world. According to aerial photography, 51% of the urban area is covered by green spaces and ponds. Thus, according to statistics, 120 m2 of green space and water bodies is attributed per each inhabitant. The proportion of green space and artificial reservoirs is constantly growing due to new tree plantations in the alleys and the creation of artificial reservoirs in the respective areas.However, measures that stimulate landscaping of courtyards and facades of buildings are aimed at further increase of green areas. Vienna is a green city. Part of the west and south of the city is occupied by the Viennese forest. Lancer Zoological Garden is the largest reserve, the size of which can be compared with the Viennese part of the Donau-Auen National Park (both the areas amount to 5.5 % of the city area). The reserve of Lancer Zoological Garden includes preserved untouched Vienna forest stand of beeches and oaks. Here, in the wild, one can see wild boars, roes, and deers. Numerous rare and endangered species of flora and fauna are preserved in the untouched nature. In general, 35.4% of the territory of Vienna consists of protected areas of different levels. Vienna has national parks, artificial water bodies, conservation areas, ecological development zones, protected biotopes, and 429 natural monuments.

It is also worth noting that all modern cities use advanced methods to solve the problems related to the formation of the ecological framework of the city, as well as long-known, but unfortunately not so widespread in the Russian Federation. First of all, this concerns vertical gardening, i.e. growing ornamental plants on different structures in the vertical direction. This type of improvement carries several functions, such as creating a sense of security, both physical and psychological; protecting from the excessive sun due to the natural screen; creating a background through which the park and urban recreation areas are perceived more effectively; organizing a small space by creating a vertical garden. Also, climbing plants help to hide holes in the structures of buildings and decorate unsightly buildings. They accumulate dust and reduce noise.Recently, the fashion for gardening roofs of public buildings and private houses has again come to Europe. For example, according to the project of landscape architects, gardens were arranged on the roofs of buildings located at different levels of the Saint Cloud Hill in Paris. In Copenhagen, the garden with a total area of 7,000 m2 is located on the roof of one of the hospitals. In the center of Hanover, various parts of the building roof were planted as well. In Brno, gardens are laid on the roof of a Small City Administration building, on the terraces of a Large City Administration building, and landscaped terraces of two parliamentary buildings of the Swiss Confederation. In London, on the roof of a 23-storey building grows about 100 species of flowers and shrubs, which is the only example of growing plants at this height.Among the contemporary methods of urban areas landscaping, we should also mention planting in containers, hedges, and eco-parks with lawns for cars. However, particularly relevant is the so-called protective landscaping, in which in order to protect residents against the harmful effects of noise, gas, wind, and dust, specific plants are planted. Thus, the international practices of the last decades have demonstrated the transition to the optimal structuring of urban spaces and, as far as possible, to the rational use of landscape resources that ultimately leads to the sustainability of the environment and providing comfortable living in cities.

III. DISCUSSION

The reliability of the presented approaches is confirmed by the fact that the conducted systematization concerns combined urban greening schemes, which include features of ring-radial, linear, and wedge-shaped greening [7, 8, 9].

The main distinctive feature and advantage of green zones and artificial reservoirs in European cities compared to the Russian practices, is that European landscaping is concentrated on creation in the cities of a uniform ecological framework, where large objects, such as parks and forest parks are united by smaller and small green areas such as miniparks, boulevards, and artificial reservoirs that allows forming almost inseparable ecosystem of an urban green zone. The smallest fragmentation of the green zone is very important because of the fact that it significantly increases the resistance of the whole green area against external impacts, as well as allows better providing the urban territory with green spaces and artificial reservoirs.

In addition, one cannot say that the area covered by green spaces and water bodies in European cities is more than that in Russia. The indicator, such as the provision of green space and water body per capita is not very relevant in this comparison, because an important determining factor is also the quality of these plants and water bodies. Given the scarcity of territory that in urbanized cities of Europe is an urgent problem, special attention of the authorities and the public is given to the most effective use of existing and promising objects of the ecological framework.Improving the quality of green spaces and artificial water bodies, their maximally efficient location, as well as the use of compact new methods is exactly the main trend of urban environmental objects' development in European cities. As for the Russian Federation, despite the similar lack of area for territorial expansion of the ecological zone, the problem concerns first of all the optimization of existing green areas and artificial water bodies, as well as the creation of small objects of urban greening.

IV. CONCLUSION

Summing up, it can be concluded that the use of significant experience in creating an ecological framework of the European cities will undoubtedly multiply and enrich the domestic improvement design practice, allow making original styles and effective methods of landscaping and creation of artificial water bodies a national tradition when optimizing landscape improvement of cities of the Russian Federation. Moreover, in the international practice, the role of the human factor in the consistent consumption of a potential environmental resource arouses much interest.

Despite the significant difference in the urban development process, as well as the creation of the environmental framework objects, one can and should use the practices of European cities to optimize the landscaping of domestic cities. In domestic practice, rules of landscaping and creation of artificial water bodies are used mainly for the populated locality in general without consideration of the particular urban structure. However, to determine the objectively necessary standards of landscaping in different parts of the city, it is more expedient to take into account the actual structure of the city, its cartographic distribution, population density, as well as the distribution of industrial facilities.

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