The problems of formation and conservation of the green frame (green carcass) of the satellite city (on the example of Zelenodolsk)

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Abstract. The article is devoted to the study of the problems of formation and conservation of the green frame (green carcass) of a satellite city of a monocentric city agglomeration. Nowadays the green spaces fulfill not only ecological, but also social and economic functions. This is especially important for mono-industrial and satellite cities. Zelenodolsk is satellite city of Kazan agglomeration. This city has significant natural, geographical, industrial aspects. The article shows the possibilities of forming the green frame of the city and its socio-economic use.

1. Introduction

Urban landscaping is considered not only in the context of environmental problems of cities, but also closely penetrate into the social and economic challenges of modern times.

Geographically, the urban green areas are made up of urban parks or forests, parks of historical buildings, natural heritage, yards of schools and kindergartens, hospital gardens, community sport parks and stadiums, green areas of residential territories, landscaping of beaches, graveyards, linear plantings of streets, alleys, paths, along rivers, roads and other objects, green buffer zones.

Green spaces, parks and banks of a rivers and green frame (green carcass) at whole play significant role in formation of comfort city life [1-3].

At the same time, a significant proportion of urban green spaces carry or accompany social functions; therefore, the terms natural-recreational or ecological framework of urbanized territories are the closest and fully reflective of the concept of “green frame” (“green carcass”).

2. The problem statement

At present, for the city administration the problems of the formation and preservation of the green frame come to the fore in the conditions of constant competition of municipalities for human resources. As practice shows, today it is largely true for small towns, where the industrial nature of the socio-economic development still remains in priority and consequently environmental issues are very acute.

The formation of a green frame plays a special role in creating comfortable conditions for satellite cities, especially in monocentric agglomerations. The topic of agglomeration has been actively discussed in the scientific literature in recent years, including the case-study [4-7].

The city of Zelenodolsk belongs to the category of medium cities. The population currently stands at 98,763 people, the area of the city is 37.73 square km. The city of Zelenodolsk has been performing the functions of the administrative center of Zelenodolsk district since 1958. According to its socio-demographic characteristics, the city is young.
The key characteristics of the city, which describe, have an influence and determine its socio-economic and, as a consequence, a spatial development, are two aspects. The first – Zelenodolsk is a classic satellite city of the monocentric Kazan agglomeration, what imposes certain risks and at the same time the opportunities for the development of the city.

The second aspect – Zelenodolsk included in the list of monoindustry cities of the Russian Federation with the most difficult socio-economic situation.

The Zelenodolsky Municipal District occupies a landscape and geographical position unique for the Republic of Tatarstan - on two banks of the Volga river (total area - 1396 square km) and has significant potential from the point of view of natural and ecological resources - the Volga-Kamsky Biosphere Reserve, the historical monument of nature "The Raifa Ensemble Desert", Sviyazhsky historical-architectural and natural-landscape complex. According to the Territorial Development Plan ("Tatinvestgrazhdanproekt", 2010) in the Zelenodolsky Municipal District, the area of forests performing forestry and forest park functions is 25048 hectares, of which 13152 hectares are forest parks, which is 27% of all forest park forests of the suburban zone Kazan. The entire forest-park part of the green zones of cities is concentrated in the northern part of the district, around the city of Zelenodolsk, the village of Vasilyevo and the city of Kazan, forming a kind of green belt.

The undeniable advantage of the city itself is a combination of a coastal position on the Volga river (according to the "Strategy RT-2030" a significant part of the Zelenodolsky municipal district and the city of Zelenodolsk itself are included in the eco-zone "Volga-Kama Stream") and the preserved green frame and significant areas of greenery. According to the General plan of the city, the current supply of green spaces in the territory of Zelenodolsk is 329.64 hectares, of which:
- green areas of common use - 129.98 hectares;
- green territory for special purposes - 173.88 hectares;
- green area of limited use - 25.78 hectares.

Currently, the area of green common areas is 13.1 m2 / person, which corresponds to the established requirements of at least 7 m2 / person for medium-sized cities. After the implementation of the activities of the general plan of Zelenodolsk woodland and park areas in the city should be more than 340 hectares.

However, there are some limitations in terms of urban planning structure: exits to the banks of the Volga largely blocked by city-forming and related industrial enterprises as well as communal and warehouse areas.

Just like in other Volga cities, river navigation is practically absent in Zelenodolsk compared to the period of the USSR, when active river navigation of both cargo and passenger traffic allowed the city to maintain active communication with the territory on the opposite shore region. Also a small shipping is at a very low level, yachting is not developed. Currently, despite the fact that the Zelenodolsky District is the only one in Tatarstan located on the two banks of the Volga, a connection with the opposite shore by means of navigation is not carried out. All these factors are potential areas of active development of the city, both economical and social, which are currently unrevealed. With an involvement of young people to the water sports (nowadays the "School of Young Sailors" functions in the city, figure 1), yachting can become a highlight of the city and an attractive touristic and recreational area.

Figure 1. View of the Volga (photo by Yu.A. Zakirova).
Actual aspects of the formation of the green framework are the needs of the city's population in the conservation of green spaces, a clear imbalance in the provision of recreational and public spaces of central and eastern residential areas, as well as recreational opportunities in natural conditions.

Zelenodolsk can become a city "host" for the weekend residents of the agglomeration center - Kazan, experiencing a significant limitation of green areas, subject to the appropriate organization of leisure and services for leisure time.

Tourists can become another segment of consumers of recreational and natural services of the green frame of Zelenodolsk, because one of the most popular destinations for travel can be called "tourist ray" from Kazan to Raifa, Vasilyevo, town-island Sviyazhsk. The green frame (green carcass) of the city is formed on the basis of the existing structural and planning organization of the city as well as natural and landscape factors. The city is planned to consist of two residential areas (mainly medium and multi-storey buildings), an array of individual residential buildings and a production zone linearly along the bank of the Volga river.

With respect to the water area, the city is located on two terraces, the difference in the marks is 56 m, with a rather steep forested slope (pine, mixed forests). On the lower terrace (the first terrace above the floodplain, 1-2 km wide) there is an extensive production area, the railway station "Zeleni Dol", a railway, a small area of individual development, gardens and a children's recreation camp "Chaika". On the upper terrace (the second terrace above the floodplain, located 2 km from the shore of the Volga) is the main array of residential buildings.

Forests adjacent to the city boundary belong to the Zelenodolsky, Vasilievsky, and Aishinsky forest ranges - these are forests of a forest-park and green zones. Surface water bodies are represented by the river Volga (Kuibyshev reservoir), small watercourses and several lakes (a city lake in the central part of the city, Lake Nadezhda, a system of lakes on the western and northern outskirts of the city in a forest massif, etc.).

Residential areas of the city - Central ("old" city) and Eastern (generally accepted among the population name "Mirny"), significantly differ both in the territorial planning plan, and in their natural and social saturation.

The central residential area was actively formed and built in the period from the 30th to the 90s. XX century in accordance with the norms and principles of Soviet urban development. The territory is a quarter building with a complete "set" of social and cultural objects, recreation and leisure facilities, which currently have different degrees of depreciation and improvement. Due to the fact that the area is "clamped" in planning communications (the railroad from the east side), the adjacent territory of the state forest fund (from the north and the west side), steep terrain and industrial zone (from the south), its territory did not "spread out", which allowed preserving the territorial and social balance. The eastern residential area began to be built in the late 80's. XX century. Here, as a planning unit, is adopted a microdistrict. Currently, there are 4 microdistricts built in the period of the 80's - the 90's XX century (Sectional 5-10 storey building) and the territory built up already in the XXI century. It continues to actively build up now (housing construction).

From the point of view of sustainable development the East part of city is currently not in the best condition. There is a lack of social facilities - schools, polyclinics, well-maintained green spaces, recreational and leisure open public spaces.

This difference in the planning organization of the territory and the nature of landscaping today also determine the difference in approaches and techniques in the formation of elements of the green framework and their linkage in the residential areas, as well as in the structure of individual residential areas and industrial zones.

On the territory of the Central Residential District, the elements of the green framework are formed and linked, so here the direction of activity can be defined as the reconstruction of the city nucleus (the urban forest park and the city lake, the sports and recreation center "Mayak", the central city park), the local green spaces and linear elements of the green frame, for the restoration of "green logistics" by instruments of tactical urbanism and landscape design.

The project is proposed the formation of Large and Small boulevards, on which major public objects, green cores and local green zones are being piled. Green links go from the boulevards to the north towards the forest range and southwards to the forest zone, forming outcrops to the coastal zone.
On the territory of the Eastern residential area, there is no green frame, no green cores, no linear connections, no local green spaces, therefore, reconstruction and purposeful urban policy on the formation of a green frame are required, taking into account existing natural landscape features and the existing planning structure. Now this is the most urgent issue for the city administration, since the quality of the environment, the quality of the urban social infrastructure, is one of the determining factors in the competition of cities for human capital and the retention of the population from migration to the nearest large city. Here the main "green" directions are the Stolichnaya street and Komarov str., on which squares are formed. These connections lead to the main green core - the sports park "Maidan".

It should also be noted that the forests of the green and forest park zones outside the city are regularly and intensively used as recreation for residents of the city (both in the Central residential area and the Northeast). The purposeful formation of the green framework of the city, in particular the creation of discrete buffer recreational zones on the border of the residential zone will reduce the anthropogenic load on the natural complex in the suburban area.

Spatial solutions (compactness, planning structure laid in the era of Soviet urban planning) and a high degree of gardening allow its inhabitants to consider their city as convenient space for children life. The driving culture and the features of intraurban traffic allow people to feel safe and comfortable in the streets of the city, unlike in Kazan.

However, in the course of discussions with residents, a rather significant problem is emerging: the city does not provide opportunities for free time and self-expression for teens. At the same time, landscape features allow the city to create conditions for fashionable and popular sports, even for so-called extreme sports. Moreover, in the abandoned territories, young people independently created similar sports grounds (Figure 2), which can be the basis for creating a city of an extreme park, attractive for teenagers and young people from Kazan. The creation of sports grounds will allow attract tourists and help the townspeople to lead an active lifestyle [8-10].

![Figure 2. Species points on the ravine "Maidan", the place of Sabantuy, as well as the place of spontaneous recreation of residents (author of photographs by Yu.A. Zakirova).](image)

Special attention should be given to the youth environment, its requests and opportunities to the city, because Kazan is a magnet for young, ambitious, active people, both because of their university environment, and the diversity of places for young people - coffee shops, time-cafes, parks, bike parkings, etc. Zelenodolsk practically does not have branches of universities (the Branch of the Kazan State Technical University named after A.N. Tupolev, Zelenodolsk branch of Kazan Innovational University named after V.G. Timiryasov), which also has a negative effect on its attractiveness for senior school pupils and students.
Another very important task for the general successful development of the city, and in particular for the formation of a full-fledged green frame is the formation of exits to a large water area and the creation of recreational infrastructure in coastal areas.

The provision of access to water (the Volga) was one of the main objectives of the master plan of 1975, which was solved by organizing a city center at the site of removal from the coastal territories of an old manufacturing plant. This project solution has not been implemented. Full-scale analysis of the coastal zone (conducted in the period June-August 2017) showed that there are territorial resources for the organization of various recreational areas (wastelands, wetlands, outlets to municipal land). The existing planning structure makes it possible to ensure the availability of these potential recreational areas by public transport, bicycle traffic, and the development of residential and public (entertainment, sports) functions by redeveloping the territories of some industrial enterprises in the coastal zone, which will also lead to the development of river navigation.

3. Results and discussion

Thus, in the course of current study and project work we made a research on the topic "Green Frame Zelenodolsk". On the basis of a full-scale survey of the territory and analysis of city-planning, strategic documentation, problems and resources of the formation of the natural and recreational frame in the city were revealed the two different territorial part of the city. A model of the green frame (green carcass) of Zelenodolsk was formed, with the allocation of the order of development, the reconstruction and the creation of its elements.

In general, the formation of a green frame in the city will help to save and partially restore lost components of the natural environment, increase the biodiversity of the urban environment, improve the quality of the environment, attract private investment for the development of urban infrastructure (sports facilities, recreation and recreation areas), increase a tourist flow.

Based on full-scale conducting of the territory, analysis of town-planning, strategic documentation, problems and resources of forming a natural and recreational framework on the territory of the city were revealed. A sociological study was realized by using the method of mental maps. A model of the green frame of the city of Zelenodolsk has been formed, with the allocation of the order of development, the reconstruction and the creation of its elements.

As the design measures of citywide importance, the following is identified: the formation of natural and recreational zones in the river side and linear exits to the Volga River.

As a project for the implementation of the concept of the Green Frame formation in Zelenodolsk Central District, the following is highlighted: the reconstruction of existing natural and recreational cores, reconstruction and improvement of the central city park "Avangard", reconstruction and development of the recreational and sports base "Mayak", the formation of linear links between recreational cores, the project "Urban boulevards", the formation of buffer zones on the border between urban development and forest area in order to reduce the anthropogenic load on the natural complex.

As the project activities on the territory of the Eastern region, the following was identified: the formation of local recreational spaces in the existing building, the formation of a sports and recreational core and linear links-boulevards leading to it, the project of the sports park "Maidan", the boulevard on the Stolichnaya str. and Komarova str..

The developed concept or model of a green framework of a city gives the basis for actualization of the General plan of a city, updating of Rules of land use and building, becomes the basis for development of Rules of complex accomplishment of territories of a city and their acceptance as the local normative certificate.

Thus, the project will be used a) by the management bodies of municipal entities (cities) in the planning, development of urban projects; b) will be in demand by public organizations and municipal services, whose goals are related to the current state and improvement of the urban environment, the comfort of citizens living; c) will be used by commercial organizations for long-term planning of their activities and placement of enterprises, taking into account the specific urban environment of a particular city territory.

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