Landscape and recreational framework of railway stations areas (topical trends analysis)

A N Teryagova¹, E A Akhmedova¹, I V Kuznetsov¹ and M S Doskovskaya¹²
¹Samara State Technical University, 194, Molodogvardeyskaya Street, Samara, 443001, Russia
²Samara State University of Social Sciences and Education, 65/67, Maxima Gor’kogo Street, Samara, 443099, Russia

E-mail: ter_a_n@list.ru

Abstract. The article reviews the problems faced by the railway station areas of the largest cities in their development process. Such concepts as the landscape and recreational framework of the territory, its functions, the search for possible reserves for spatial development and improving the quality of urban environment ecological compatibility are revealed. Natural and anthropogenic factors affecting the formation and functioning of the framework elements are analyzed.

1. Introduction
The historical stratification of urban planning transformations, subordinated to the topical trends of various periods of the urban areas formation, does not provide a wide field for transformation. Railway stations areas of cities “with history” are often highly urbanized territories with their established framework of transport and engineering infrastructure. The counterpoint of modern urban planning and architecture is the vector for sustainable urban development. The provisions of this initiative are directly related to the formation and maintenance of an efficient landscape and recreational framework of urbanized areas. Nowadays the process of formation of the landscape and recreational framework is being replaced by the trends of urban areas “greening”, but nevertheless one is not equal to the other. The landscape and recreational framework (LRF) is an important part of the city's life support system, along with the components of the technogenic framework. Like any other basis of the urban fabric, the landscape and recreational framework tends to be continuous, in connection with external elements, to develop in space and time without damage to the elements already formed. The formation and running of a landscape and recreational framework is a strategy that includes local tools: greening, gentrification, and the “green routes” creation.

One of the aspects in which it is important to consider the railway stations areas development and the formation of their comfortable environment is the landscape and recreational framework. The framework includes not only the natural, ecological and landscape characteristics of the territory, but also the recreational zones that have developed in these areas. The landscape and recreational framework of the station areas (as well as the city as a whole) is associated with its planning structure of the territory with a high level of biochemical activity of the landscape [1], aimed at the implementation of compensatory functions [2]. The main elements of LRF are parks, gardens, squares, green areas, boulevards, alleys, residential yards, etc. [2].
The reserves for the development of the landscape and recreational framework of the railway stations areas are free green city zones. These zones include undeveloped post-industrial spaces, often adjacent to railway station areas, overgrown unused railway tracks, coastal zones of water bodies not included in the framework due to the urban fabric ruptures. Often these elements are not perceived as full-fledged elements of the urban landscape. However, such vegetation contributes to increasing of the urban ecosystem diversity, sometimes partially satisfying the citizens need for outdoor recreation [3].

The railway stations areas need to search for nature and recreation resources, which will help to minimize serious problems associated with the need for economic growth of transport hubs (railway stations) and reducing their negative impact on the environment and the quality of the urban environment due to the expansion and in order to maintain the high quality of residential areas nearby.

The railway station areas are areas of the urban environment with a localized gravity center - a transport hub, which is the target destination point for a variety of traffic and pedestrian flows. The railway stations as elements of the transport system of a larger territorial entity - a region or even a country - must have maximum availability. At present, the spatial and social mobility of people at the regional level depends on the infrastructure of railway stations and near-stations areas. The environment of the railway station areas should be accessible, safe, informative and comfortable, and the approaches to the formation of the LRF should be environmentally friendly.

Design in accordance with these requirements is an topical trend in the modern architectural and urban planning complex.

The purpose of this study is to identify the main topical trends in the formation and development of the landscape and recreational framework of the railway stations areas.

To achieve the purpose, it was necessary to solve the following tasks:

- To study the world experience in the development of the landscape and recreational framework of the railway stations areas of the largest cities;
- To identify the main trends and features of the formation of the landscape and recreational framework in the near-station urban areas.

The object of the study is the railway stations areas of cities, the subject is the landscape and recreational framework of these areas. The spatial boundaries of the study cover the urban environment of the near-station urban areas (on the example of the city of Samara), while the time frame of the study covers the period from the end of the 20th century to the beginning of the 21st century.

2. Materials and methods

In the process of study, to solve the set tasks and to achieve the purpose, the authors resorted to landscape and recreational analysis of the territory (within the previously defined spatial boundaries). In addition, the article used materials from a sociological study, which was conducted in the form of a questionnaire survey of experts with various competencies. The survey results helped to consider the problem in more details.

The main functions of the landscape and recreational framework of the railway stations areas can be divided into internal and external ones in reference to the portal - that is, the station as an entrance to the city.

The internal functions are inseparable from the value of the city landscape and recreational framework taken as a whole. They are aimed at residents and intracity users of railway stations. These include:

- Increasing the level of environment comfort;
- Achievement of the established parameters of the meso- and microclimate of the city, determined on the basis of medical indicators of public health through the production and
transportation of oxygen-enriched, cooled, humidified, purified from harmful impurities air in the required volumes [4-5]:

- Preservation of the territory landscape and ecological potential by including the formed frame into the existing ecosystem.

The external functions of the landscape and recreational framework are aimed at guests of the city arriving from outside to the area under study. These functions are focused on the image and aesthetic character of the urban environment, that means:

- Increasing the city tourist potential by including cultural heritage objects and comfortable recreational areas in the landscape and recreational framework;
- Creating a comfortable transit environment for city guests;
- Ensuring the information content of the landscape and recreational framework as the basis of the pedestrian environment.

Smart planning and versatility of the use of green urban areas by a wide range of users, both for recreational and special purposes (for example, cemeteries), is important for many parts of the city, including for the railway stations areas, which are the first to open to guests arriving at the railway station [6], and therefore have great tourism potential [7].

The carried out landscape and recreational analysis of the territory revealed the limitations and reserves for the existing framework development. The railway station areas of the city (adjacent to the railway station of the city of Samara) are formed by buildings of various storeys belonging to different time periods. However, these areas were partially included in the design of the boundaries of the historical settlement due to the large number of cultural heritage sites located on them. The system of dominants was formed in the 70-80s of the 20th century, and the main dominant - the railway station complex - was built in the 90s to replace the lost historical building. Nowadays, the station building is the compositional completion of the perspectives of Lev Tolstoy and Sportivnaya streets, as well as the only circular viewpoint on this territory. The station building is involved in the formation of the external panorama of the city from the Samara and Volga rivers, as well as the internal panorama of Komsomolskaya Square.

The territories belonging to the railway station are located in the city on the distinctive relief of the left bank of the Volga river. The landscape and recreational potential is based on:

- “Cape” city location on the bank at the confluence of the Volga and Samara rivers;
- Water areas: the Volga river water area and the Samara river water area;
- Active relief;
- The regular planning structure of the central part of the city, formed in the 19th - first half of the 20th centuries (partially).

The street planning framework is a continuation of the regular system of the city historical core. The same streets form the basis of the landscape and recreational framework, since their axes are directed strictly perpendicular to the coastlines of the Volga and Samara rivers - the powerful natural basis of the city. The nodes of the landscape and recreational framework are formed by places and squares. The territory includes Shchorsa Park and a vast special-purpose area in the east - the city cemetery. The eastern and northeastern parts of the railway station area are being built up very actively, while, unfortunately, the needs for the development of the landscape and recreational framework are ignored. The new development is being formed on the basis of the existing nodes and axes of the LRF. Linear elements of the landscape and recreational framework of the near-station areas cannot be characterized as continuous. This confirms the lack of comfortable pedestrian reach of the transport hub, intermittency and discomfort of pedestrian traffic in the area. There are large reserves for the development of the LRF, since in the industrial period the areas near the railway were occupied
by industrial and warehouse facilities that lost their original functions and were partially ruined. These territories, together with the railroad tracks, create a major gap in the landscape and recreational framework, hindering its development towards the naturally attractive bank of the Samara river. At the same time, these zones could organically integrate into the idea of a continuous LRF.

3. Results

In order to identify typical situations of the modern stage of territory urban development, related to the formation of a landscape and recreational framework of the railway stations areas of the largest cities, in this work, the world experience was considered. In many large European cities, there are projects aimed at developing and maintaining the natural component of the railway stations areas. In addition, similar trends are followed in China, Korea, and America. Transformations of the existing transport hubs and adjacent territories are carried out with the preservation of their natural and recreational components.

Bari (Italy).

In 2013 Masimiliano Fuksas' architectural workshop in collaboration with a team of architects led by Jordi Henrich, won the competition for the urban transformation of the Baricentrale near-station area in the port town of Bari in the southern Italy. By this project it was proposed to reconstruct an area of about 78 hectares, through which the railway passes. Since its construction and over the years, it has been breaking the urban fabric of the city. The most important criterion for evaluating the project was not only overcoming the urban development gap in the form of a railway and increasing the existing building density, but also the widespread use of urban greening, as well as increasing the level of this area environmental sustainability. The project provides for the deepening of railway tracks under the ground and the arrangement of a large green city park with a developed pedestrian and cycling infrastructure as well as the creation of a large public cultural city center [8].

Munich (Germany).

The Petuelpark linear park is located on the border of the Schwabing-West and Milbertshofen-Am Hart districts (figure 1). It was designed by Otto A. Bertram, Kiessler + Partner and opened in 2004. The park is located above the Petuetunnel car tunnel. At the western end the park is adjoined by the perpendicular axis of another linear park. This element connects the Petuelpark with the railway, passing under a tunnel, and further with the low-rise buildings of the Milbertshofen-Am Hart area. After Rathenaustraße, the axis of the park shifts to the east. All this area is in close proximity to the industrial zone of the BMW Research Center, however, the deepening of the motorway underground and the creation of a green park at ground level indicates an improvement of the urban environment quality.

![Figure 1. General Plan of the Petuelpark in Munich (Germany); image source: juehling.net.](image-url)
The Seoullo 7017 Skygarden became an important element of Seoul's landscape and recreational framework in 2017. Its project was developed by the architectural studio MVRDV. The park represents a public space on the constructive base of the former automobile high line built in the 1970s. These high lines encircle the city's main railway station, which is located in the city center on the border of Yongsan-gu and Jung-gu counties. The Seoul Central Train Station is one of the largest transport hubs in the city and throughout the South Korea, and the emergence of a green park next to it has added biodiversity to the high-density railway station area of the South Korea capital. Buildings here are mainly multi-storey and high-rise. Urban development is separated from the railroad by wide multi-lane carriageways of the streets and urban green areas.

New York (USA).

High Line Park in New York represents a renovated railway high line that was not destroyed, but turned into a green linear park. A surface railway line was laid for transport links between the industrial area and a residential suburb. However, by the middle of the 20th century, businesses fell into decay, and surrounding areas began to degrade, and crime rates increased. The revival of the transport infrastructure facility in the form of a large public space gave the district an impetus to the development and formation of a comfortable and safe urban environment. The linear park concentrated around itself culture, entrepreneurship, trade, politics and became the city hallmark. Rich greening has a beneficial effect on the ecological situation of the former industrial area. More than two hundred species of plants, including many shrubs, flowers and grasses, were used for high line greening. The idea of the High Line green park spread around the world and became a source of inspiration for architects from Rotterdam, Singapore, Hong Kong and many other cities [9].

Vienna (Austria).

As in many European cities, in Vienna the railway passes through historic areas. The Wien Spittelau Bahnhof railway station is located in and around Althangrund and the surrounding areas. It is a large multilevel transport hub. Next to it there is the famous Spittelau waste incineration plant, built in 1988-1997. The Spittelau Viaducts residential complex is located on a strip along the Danube Canal, it was designes and built in 1994-2006 by the architect Zaha Hadid. The object is located on a viaduct that is not in use today, but previously it was intended for the surface line of the city metro. The strip is located between the existing underground metro line and the canal embankment. 200 meters west of this place the Währing Jewish cemetery (German: Jüdischer Friedhof Währing) is located, and next to it is the Währinger Park, a railroad car shed and a surface metro station.

Bern (Switzerland).

Two important components of the landscape and recreational framework of the Bern railway station area are the partially buried railway near the central station and the Bremgarten cemetery a couple of kilometers from it. It is located in the north of the Mattenhof-Weissenbühl district and has in the plan a shape close to a triangle. From the north, it is bounded by the railway, from the other sides by civil buildings: residential and public buildings of medium storey. In particular, a complex of buildings of the university hospital is located in the southeast side of the cemetery. Deeper into the blocks the buildings height increases. Facing the railway is the Bern Museum of Medicine. The Bremgarten Cemetery is located on the edge of the Bern cityscape. To the north lies the large forest and parkland zone of Glasbrunnen. On its southern border there are industrial and scientific enterprises, such as a recycling center and a university buildings complex. Currently, the cemetery is a park zone in a densely populated area of the city.

Chattanooga (USA).

There are several large green areas along the railway in Chattanooga, Tennessee. These are Montague Park and Jefferson Heights Park, as well as the city zoo and the national cemetery, opened in the middle of the 19th century like a military one. On the one hand, its large territory with an area of just under 50 hectares, together with other vast areas adjacent to the railway, cannot overcome the problem of edges and bordervacuum. On the other hand, the functional-spatial solution of these zones avoids their complete isolation from the main urban space and gives them the properties of so-called unitingseams [10]. Chattanooga National Cemetery is in plan a square with one corner cut off by the
railroad. It is located a kilometer east of the station and represents a park area. The cemetery is surrounded by low-rise civil buildings. From the east, these are mainly two-storey and three-storey manor-type residential buildings. And directly to the border with the cemetery, mainly public buildings and tall-trunked greening go out.

4. Discussion
This urban planning study is complemented by the materials of an expert survey, which showed that the identification of the ecological potential of the territory and the formation of a landscape and recreational framework is one of the most important requirements for architectural and urban planning activities and product design within the boundaries of the railway stations areas of cities. Based on the results of the survey, the main components of the functioning of the landscape and recreational framework of the railway stations areas were identified.

The ecological component is the creation of buffer zones protecting urban areas from harmful effects: noise, vibration, changes in the air chemical composition.

The communication component - the nodes and axes of the LRF are the most comfortable part of the intracity pedestrian traffic system, capable of providing a minimum associated service and short-term rest.

The differentiating component - a structurally and consistently distinguished element of the LRF is able not only to differentiate the functional zones of the railway stations areas, but also to restrain the unwanted expansion of inharmoniously developing urban areas [11].

Recreational, the most obvious component of the LRF, is the railway stations areas as a place for the location of city recreation zones, sports and cultural spaces.

The aesthetic component - due to the congestion of transport, various related services, large crowds of people, the aesthetic perception of the railway stations areas is often negative. Natural landscape, improvement of the environment ecological qualities contribute to the creation of a positive image of such areas. The elements of the LRF allow to preserve the emphasis on valuable historical objects, participate in the formation of external and internal urban panoramas.

Alternative use is a functional component of the LRF, identified on the basis of the analysis of world experience and the survey results. It consists of the possibility of placing additional energy sources, as well as «urban farms» for growing food, greening elements, raw materials.

According to the survey results the expert community suggested the following streets as the basis for a large recreational green pedestrian zone:

- First priority: complex of Karl Marx avenue and Uritsky square;
- Second priority: Vladimirskaaya, Sportivnaya and Dachnaya streets.

Most of the respondents saw a need to fill the gap in the urban fabric created by railways (figure 2). This can be realized through bicycle pedestrian bridges, included in the general recreational greening system of the area and the city. However, such a decision will be appropriate only if the coastline of the Samara River is improved, but at the moment the embankment is not arranged [12].

5. Conclusion
Based on the experience presented above, we can conclude that the areas adjacent to railways and railway stations have their own specifics and not all public spaces and civil buildings can function effectively if they are located in such areas.

As a result of the world experience analysis, one can see that a significant proportion of the elements of the landscape and recreational framework (parks, squares, cemeteries, etc.) gravitate towards the railway. Their location is due to the fact that they perfectly play the role of a sanitary protection zone, which is necessary for the railway to compensate for its negative impact on urban development. Green areas cope well with noise, vibration and other types of physical impact on the environment [8].
For a balanced development of free areas around the transport hubs of the largest cities, constraining factors are needed. Such a factor can be the creation and preservation of the natural framework of the territory, enshrined in a separate development strategy and territorial planning documents. The creation of a rational landscape and recreational framework for the railway stations areas can lead to a rational ecological development of reserve territories with opportunities for their alternative use in order to improve their meso- and microclimate [11].

The analysis of international experience has shown that the formation of the landscape and recreational framework of the station areas is advisable to carry out at all accessible spatial levels (ground, underground and surface) in order to delimit transport and pedestrian flows and fill gaps in the urban fabric.

In many of the world's largest cities great attention is paid to the harmonious formation of recreational zones in the urban planning of railway stations areas. Special attention is paid to such parameters as availability, safety, information content, comfort and ecological compatibility [13]. Sustainable development of these territories has real prospects only if these requirements are met within the framework of the universal design concept.

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Figure 2. Situational diagram of Samara (Russia) and the railway station area of Samara (Russia): the red line - the boundaries of the historical settlement of regional significance «City District of Samara», the blue line - the approximate boundaries of the railway station area, the green paint - reserves for the development of the landscape and recreational framework (including planning connections with the historical center and the embankment of the Volga river and the Samara river), the black paint - the zone of the railway and engineering infrastructure; image source: authors schema.
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