Optimization Problems of Open Spaces in Industrial Cities on the Example of Togliatti

N Barsukova¹, E Fomina²

¹Moscow International University, Leningradsky prospect, 17, Moscow, 125040, Russian Federation
²Department of Design and Arts, Volga Region State University of Service, Gagarin Street, 4, Togliatti, 445017, Russian Federation

E-mail: bars_natali@mail.ru, fomina2004@rambler.ru

Abstract. The article reveals the modern problems of the industrial cities urban environment of the period of "great buildings" in the USSR on the example of Togliatti. The authors analyze the approaches and methods of their optimization that exist today. The role of open spaces in modern industrial cities is revealed. The compositional features and functional processes of Togliatti are studied. The authors propose a comprehensive system of measures to optimize the open spaces of the city. For the first time it is based on the methodology of design, which includes environmental, ecological, axiological approaches. The article emphasizes the need to organize open spaces taking into account the human being as an active component of the urban environment.

1. Introduction

In the era of socialist industrialization there was a special request for the construction of model cities-plant. Such a typical example of a Soviet industrial city is Togliatti. The development of a general program for the implementation of conceptual tasks in the new Togliatti began from scratch. The plant and the city were built at the same time. The main feature of Togliatti was that such a city-cell had versatility and was ready for implementation in the general system of settlement of the Soviet state or even beyond.

The city of Togliatti is located along the Volga River, covers an area of over 284 sq km on the opposite side of the Zhiguli Mountains, near Samara. The emergence of the modern Togliatti is due to two industrial projects – "The Volga Hydroelectric Power Station named after V.I. Lenin" and AVTOVAZ. This fact has caused the need for housing to Stavropol residents in the new place and those who came to the construction site. Thus, in the 1950s there was developed the urban structure basis of Togliatti: three districts separated from each other by forests and industrial zones located near each district.

The AVTOVAZ played an urban planning role and greatly influenced the development of the city infrastructure. The city-forming enterprises carried a large social burden in Soviet times, supporting the development of the local infrastructure. Since the mid-60s till present the life of the city has been closely associated with the industrial giant. Thanks to the advent of AVTOVAZ, it was decided to create almost a new city – Avtozavodsky district (the largest district in Tolyatti). The construction of the Avtozavodsky district took a very short time, from 1968 to 1973. The fast pace was
ensured by thoughtful planning, by using the technology of prefabricated construction of residential buildings and by using typical projects. Several types of experimental housing were developed specially for Togliatti. The Soviet peculiarity lies in the fact that due to the planned economy there have been built many one-industry towns in a short period [3, 9]. Ecological problems began to arise in cities with the development of industry. These problems have not been so felt before [6, 10, 19, 20].

2. Problem definition
The problems of life quality and comfort in the urban environment are very acute in industrial cities today [4, 18]. The issues of open spaces optimization in the urban environment of industrial cities deserve a separate study. Open spaces grow old morally and physically, differ in low level of improvement, ill-considered gardening. Improvement of citywide importance territories and residential areas is carried out pointwise, as a rule. Optimization of the urban environment is understood in most cases very narrowly – only as gardening [12, 14]. The organization of open spaces is carried without a whole design concept, without taking into account social, cultural and natural factors. Thus, there is no comprehensive approach to solving of the urban environment optimizing problem.

The active transformation process of the urban environment begins in different parts of the world in the 90s of the XX century and continues to the present time. The environment of large and small cities is reorganized on the principle of harmonization. The deteriorating ecological situation, unfavorable social climate have become the main reasons for the transformation of the urban environment. The need of discrepancy overcoming between the level of urban spaces to the needs of a rapidly developing society arose. Humanistic values set the vector of the urban environment development. Now the city is open to all residents [16, 17]. More and more urban spaces are becoming spaces for recreation. Former industrial facilities and areas that are located within the city are transformed into cultural and recreational facilities. The city is actively landscaped. Priority is given to public transport [4, 8, 11, 12, 13, 22]. The content of urban lifestyles is changing. Everyday life becomes a priority for a person: leisure, rest, personal come to the fore.

The relationship "man–artificial environment–nature" is harmonized. The city is understood as an organism that is capable of self-development and self-organization. The result is the emergence of cities that preserve their historical and cultural identity, open and safe for residents and visitors, with a large area of green space [1,7,12,14].

The organization of the urban environment is becoming more complicated. The environment is formed on the principles of diversity, multifunctionality, universality [1,12]. Strict zoning is replaced by a space multi-purpose. There is a reorganization of the former industrial territories and objects located in the city center. The environment of industrial cities needs to be modernized and humanized [2, 21].

Special attention is paid to the ecological problem in industrial cities. Air pollution, changes in the natural landscape worsen the environment. Solving of the issue of the urban environment quality improving from the ecological point of view includes several necessary steps. This is movement of functioning industrial facilities outside the city. This is separation of industrial areas from urban spaces by significant belt of green spaces. This is increasing the area of green areas within the city. The residing environment gardening is of particular importance. This is increasing the number of pedestrian spaces [6, 19, 20].

All of the above highlights the need for a comprehensive approach to optimizing the urban environment.

3. Theoretical part
Each type of building reflects the value world of its time: the attitude to man, society, attitude to nature, history and culture of the region, etc. The Soviet period urban environment demonstrates the priority of the public. Public spaces have impressive dimensions. In Soviet times the significance of the public was emphasized by the construction of a large number of facilities for various types of mass
entertainment, public meetings: squares, stadiums, parks, concert halls, large shopping centers, libraries, cinemas, etc. [3, 9, 15, 18, 23].

Open spaces of the Soviet period have obvious positive characteristics from the point of view of modern requirements of comfort and from the point of view of design:
- large area;
- simple plan configuration;
- the required number of green spaces.

Modern construction, which is conducted in Togliatti since the mid-90s of the XX century, is based on completely different principles than the construction of the Soviet period. Modern construction demonstrates the priority of personal and commercial over public. Developers do not think about the long-term existence of the urban environment formed today. Questions of architecture, aesthetics are not considered in most projects. There is no due attention to ecological environment. A very primitive environment is being created. There are new residential areas without proper infrastructure for cultural and leisure purposes, with minimal gardening. It is believed that residents can relax in cultural and entertainment centers and outside the city. The basic principles of a viable urban environment (ecological compatibility, diversity, accessibility, etc.) are not applied in the modern construction of Togliatti [1, 22].

Design analysis of urban open spaces in Togliatti revealed that designers must solve the following tasks to improve the quality of the urban environment:
1. ecological problems have an impact on the quality of the urban environment. There are air pollution, hot dry air heated with asphalt and surfaces of concrete walls of houses in summer, deterioration of soil quality;
2. functional mismatch of open spaces to the needs of citizens;
3. moral and physical aging of equipment. Outdoor furniture, children's play complexes, sports facilities are outdated;
4. personal vehicles are located in areas not intended for this purpose: in courtyards, pedestrian areas;
5. poor gardening;
6. visual components of the environment are monotonicity, gray or flashy color.

To date, the urban environment has a number of resource characteristics for design. First, this is the stylistic neutrality of the environment. Typical projects of residential districts are a "blank sheet" for the experiments of modern architects and designers. There are simplified geometry of architectural volumes and spaces, gray and white as the main colors of the environment [5]. All this allows the designer to choose the style and composition of the space freely. Secondly, this is the absence of the "face" of the city, its identity. Model Togliatti is a city without attractions, a city with a very short history, a city of migrants. Only the last two or three generations of residents can call Togliatti their hometown. Togliatti is "a city without baggage". Therefore, architects and designers create projects that are not ideologically limited by cultural or historical context. Togliatti can become what it wants in search of his "face". Third, this is uneven development: different concentrations of cultural, leisure, commercial purposes in different parts of the city. Therefore, designers and architects create zones in the city that are rich in functionality, in which a large number of people interact, and spaces where a person is in greater privacy. Both types of spaces should have the necessary degree of comfort.

4. Practical relevance and project proposals
Various approaches and methods have been applied in the design of open spaces and the study of the initial situation, which allowed to create the most optimal design solutions. Axiological approach becomes an integral part of design.

Immersion method has become one of the methods of pre-project analysis. The peculiarity of the method is that the start situation was studied from the position of the participant immersed in the environment. The method is used to identify the environmental impact on humans, to study the spirit of the area. Immersion method helps to feel the environmental impact on humans. The method of
environmental harmonization was applied in the design. Method of harmonization is a method of adjusting the current situation, the creation of a harmonious whole, from the point of view of the composition, from the point of view of life processes that will occur in the environment.

It was revealed that the obligatory characteristic of the modern open space is its integration into the city environment. The integration takes place under specific conditions:
- first, the space should have a special spatial solution, which is organically connected with other urban spaces and architectural objects;
- second, optimal functionality. Space should not duplicate the functions of nearby objects and spaces.

Another necessary characteristic of modern open space is multifunctionality. Today, urban open space has a wider range of functions than has been proposed in the past. Multifunctionality is due to two reasons. First, the underdeveloped infrastructure of the surrounding areas forces designers to place several functions in one space. For example, the courtyard of a residential complex may include a quiet recreation area, a children's playground, a zone with sports equipment, etc. Secondly, the modern urban environment is becoming more diverse. It includes trade, business, recreational functions. Open spaces connect with offices, cinemas, libraries, shops, sports grounds. Architects and designers offer solutions in which social and personal functions are placed on different levels. Such solutions allow to harmonize the coexistence of all these functions in one space.

We have proposed several concepts for the organization of open spaces. The purpose of the concepts is to improve the quality of citizen's life. This is achieved through increasing the level of ecological friendliness of the environment (increase of the green space areas, use of eco-materials), aesthetics (imagery of space, compositional finality), through the individualization of the environment (unique equipment, objects of decorative and monumental art, space organization), through the architectural framework and the proposed forms of leisure).

As a result of the experiment, open spaces were designed with the following characteristics:
1. they made on individual projects;
2. they combine the interests of different groups harmoniously;
3. they can be multilevel;
4. the composition fits into the urban space organically;
5. the space is integrated into the city environment;
6. the space is designed for year-round use;
7. equipment (lighting, outdoor furniture, equipment for children's playgrounds and for sports grounds) both mass production and unique (objects for children's games, sculpture);
8. projects take into account the natural landscape of the area, local plant species are used for their gardening of territories;
9. the space is equipped for disabled citizens;
10. the space can be monofunctional or multifunctional;
11. car parks are located outside of open spaces.

The system of measures to optimize of Togliatti’s open spaces was the result of a project experiment that is a series of design projects to the organization of city spaces. The key provision of open space design was the understanding of man as an active component of the urban environment. Environment and people interact. The environment includes many interactive objects. The equipment of open spaces is variable. Residents use the equipment at their discretion. There is no hard-coded scenario of human behavior in the environment.
The project experiment proved that the open urban spaces optimization is a system of measures that includes:

1. A comprehensive approach to the design object.
2. The category of "comfort" is the main category in the formation of the urban environment for a person.
3. Environmental improvement. Increase of the green space area, the use of ecologically friendly materials and technologies.
4. The details and the whole are interrelated and well worked at the project stage.
5. Functional and artistic tasks are solved in unity.

Today, it is clear that the necessary measures for the accomplishment of territory and repair of facilities are insufficient to improve of the urban environment. We need to revise the formation principles of the urban environment.

5. Conclusions
A comprehensive approach was applied in the study of the problem of open spaces optimization. Methods of design analysis allowed to identify the problems that need to be solved during the design of open spaces in the industrial city on the example of Togliatti. The characteristics of modern urban space for recreation are formulated. The main characteristics are the integration of open spaces into the urban environment and their multifunctional. As a result, a comprehensive system of measures to optimize of the open spaces of the city was proposed. It is based on the methodology of design which includes environmental, ecological, axiological approaches. Areas of industrial city Togliatti were designed. Areas meet modern requirements of comfort, ecological friendliness, content, aesthetics.

References
[1] Barsukova N 2007 Design of the environment in the project culture of postmodernism (Moscow: Moscow agricultural Academy named after K. A. Timiryazev) 242 p
[2] Barsukova N and Vishnevskaya E 2014 Design of the Togliatti urban environment – statement of the problem University science school: development paradigm (VRSUS) 1(11) pp 44-47
[3] Bella F 2014 Togliatti The birth of a new city (Ekaterinburg: TATLIN) 144 p
[4] Boltaevskii A 2015 A city for life: elements Urbanistics 1 pp 1-9
[5] Buraya I 2017 The coloristic solution of the urban space in the era of Soviet modernism (the example of Togliatti) Innovative science 2 (part 2) pp 227-232
[6] Chiara Cortinovis, Dagmar Haase, Bruno Zanon and Davide Geneletti 2019 Is urban spatial development on the right track? Comparing strategies and trends in the European Union Landscape and Urban Planning 181 pp 22-37
[7] Ellard C 2017 *Places of the heart: the Psychogeography of Everyday Life* Transl. from English E Koryukina, A Vasilyeva Editor L. Lubavina Second edition (Moscow: Alpina Publisher) 288 p

[8] Gehl J 2012 *Cities for people* Transl. from English A Toktonov Editor V Ionov (Moscow: Alpina Publisher, Concern "KROST") 276 p

[9] Khan-Magomedov S 1975 Architecture of residential buildings 1917-1932 General history of architecture 12 Book one *The architecture of the USSR* Editor Baranov N (Moscow: Stroyizdat)

[10] Korosteleva N and Rastyapina O 2018 Assessment of Urbanized Area Architectural Environment *IOP Conference Series: Materials Science and Engineering* **463** 022010

[11] Krase J and Shortell T 2011 On the Spatial Semiotics of Vernacular Landscapes in Global Cities *Visual Communication* pp 367 – 400

[12] Mikhailov S 2011 The Design of the modern city: the complex organization of subject-spatial environment (theoretical and methodological concept) *The dissertation in support of candidature for the scientific degree of Doctor of Art History* (VNIITE)

[13] Nefedov V 2015 How to bring the city people (Moscow: The Art of XXI century)

[14] Nefedov V 2005 Architectural and landscape reconstruction as a means of urban environment optimization *The dissertation in support of candidature for the scientific degree of Doctor of Architecture* (St. Petersburg)

[15] Rubanenko B, Obraztsov A and Savelyev M 1971 *New Togliatti* (Moscow: Znanie)

[16] Russell B 2001 *History of Western philosophy in 3 volumes* (Novosibirsk: Publishing house of Novosibirsk University)

[17] Shabatura L 2018 Socio-Cultural Problems of Sustainable Urban Environment *IOP Conference Series: Materials Science and Engineering* **463** 022009

[18] Slabuha A 2016 Urban image of Soviet Siberia: a few pages in retrospect violent forms of development of the territory *Urbanistics* **3** pp 17-28

[19] Sokolova E 2008 Assessment of the ecological state of the city for the purposes of urban planning regulation: on the example of Moscow *The dissertation in support of candidature for the scientific degree of Candidate of geographical Sciences* (MSU named after M. V. Lomonosov)

[20] Ugarova N 2011 Ecological and economic optimization of territorial planning structure of large cities *The dissertation in support of candidature for the scientific degree of Candidate of geographical Sciences* (MSU named after M. V. Lomonosov)

[21] Vladychina E 1987 The City of dreams and the real city: the architecture of Togliatti The problems of structure of the urban environment in the Autograd *Technical aesthetics* **11** pp 6-9

[22] Wirth L 2016 *Urbanism as a way of life* Transl. from English V Nikolaev Editor V Babitskaya (Moscow: Strelka Press) 108 p

[23] Skorikov D S, Solovev D B 2018 Consideration of an Ecosystem From the Standpoint of Theory and Practice of Managing Production Systems *IOP Conference Series: Materials Science and Engineering* **463** paper № 022003. [Online]. Available: https://doi.org/10.1088/1757-899X/463/2/022003