Million-city site plan problems (Voronezh Case)

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Abstract. The paper elaborately explores the problems of a million-city site plan by the example of the city of Voronezh. This topic was selected due to the questioned expediency of today’s site plans of Russian major cities raised in political and professional communities in late 2018. The site plan’s role and place in the strategic territorial planning was defined, features and specifics of this document were specified. Using the case of the city of Voronezh, acute problems — that must be considered when designing urban planning documentation — are listed. Commonly, designing a site plan of a major city must be preceded by consideration of matters related to sustainable growth in the urbanized region, including ensuring environmental reliability of agglomeration development regulation solutions. The set of specific factors that (a) require deep examination and consideration in site plans of major cities, and (b) condition the feasibility of the land use a planning document in relation with other fundamental documents.

1. Purpose
The study facilitates the existing planning processes. Its purpose is in improving the process of making urban-environment decisions.

2. Rationale
Relevance of the study is determined by the necessity for establishing conditions for convenient accommodation across the entire territory of Russian major cities, including remote areas.

3. Input Data
The paper involves materials of the study carried out by the author of the present work in 2015, within the Fundamental Research Plan of the Russian Academy of Architecture and Construction Sciences of the Ministry of Construction Industry, Housing and Utilities Sector (Topic No. 3.1).

4. Methodology
The paper analyses the traditional urban planning methodology.

5. Results
The paper showed the following:
- current legislation does not allow using the full urban planning potential;
complex of problems identified that must be addressed within the framework of the site plan for the city of Voronezh

6. Innovative Capacity
The analysis may be beneficial for design of an urban planning policy of Russia. Theoretical developments of the paper may facilitate solving problems related to long-term (e.g. strategic, regional) planning and forecasting.

7. Historical Background
The master plan development methodology was developed by engineers, architects, and city planners over the years. Long ago, before the Revolution in Russia, urban planning became the individual aspect, separate from related fields. First, it caught interest of the graduates of the Nicholas I Institute of Civil Engineers. According to Pyotr Nikolaevich Manasein, who was awarded the title of a civil engineer in 1882, those who are interested in planning, will build their career in governorate (regional), county, and municipal service. In 1903, Manasein published the brochure named “Studying at the Institute of Civil Engineers” in which he considered urban planning one of the majors of civil engineering. [1,2].

In 1912, V. N. Semyonov published his book "Urban Redevelopment" — the first Russian-language publication devoted to urban planning and construction. For a decade from 1941, V.N. Semoyonov had been heading the Research Institute of Urban Planning of the USSR Academy of Architecture. Under his command, a team of researchers was formed that was concerned with developing theoretical basics of Soviet urban planning and practical recommendations for city and town planning and construction. Semoyonov has made grand efforts in developing the first project "Rules and Standards of Urban Planning" — the key-importance urban construction regulation document.

In his works, Vladimir Semyonov emphasized the city image, noting that each and every city must be individual. A project, as he said, is the image of the city — which is designed in three dimensions. This image considers near-term prospects, terrain, and natural conditions. [3] However, there were different opinions. In 1915, architect M.G. Dikanskiy, in his "City Construction, Planning, and Beauty", disclaimed the supremacy of esthetics over essential services of a city. [4]

The emergence of district planning was associated with the need for a comprehensive solution to the problems of the city in conjunction with the district. The master plan was a key link connecting the macro- (state), meso- (subjects of the state) and micro (municipality). Allegedly established by English town planner Patrick Abercrombie. By collating dates, however, it can be stated that the first plan of the Paris Region within Seine Department, was designed in 1919 by Léon Jaussely. [5]

After the 1917 Revolution in Russia, large scope of industrial and civil construction preconceived the necessity for planning not only separate localities, but also vast industrial, resort, and other regions. Spatial planning projects were headed by A.P. Ivanitskiy, V.N. Semyonov, M.Ya. Ginzburg, N.V. Pershin, V.N. Obraztsov, A.N. Sytin, D.I. Bogorad, and others. Theoretical basics were laid by V.N. Semyonov, N.A. Ladovskiy, L.M. Sabsovich, M.A. Okhitovich, L.A. Ilyin, A.V. Bunit, N.Kh. Plyakov, V.A. Shkvarkov, A. E. Gutnov, Yu.S. Lebedev, Z.N. Yargina, Yu.S. Lebedev, V.V. Vladimirov.

The system of design work on urban planning has developed and received distribution as a hierarchically organized set of design and planning documentation covering a wide range of territorial objects (from a residential area to the country as a whole).

If this system were designed in the form of a pyramid would be site plans of cities and other localities; detailed planning of city centers, residential districts, industrial areas, and other zones; residential district and urban development complex construction projects [6].
8. The place of a site plan in the modern strategic planning system.
A site plan is the design document that determines planning, construction, reconstruction, and other area works. Site plan's key feature is the cartography-based scale representation of the area: district layout, mapping, layer stacking, 3D modeling and structuring (framing), zoning, graphical and analytical and urban planning standardization, identification of focuses.

As consistent with the Article 19.1. of the Town Planning Code of the Russian Federation No. 190-FZ dd. December 29, 2004 [7], site plans of localities and city districts are municipal-entity planning documents. According to the Article 11 of the Federal Law No. 172-FZ dd. June 28, 2014 "On strategic planning in the Russian Federation", constituent-level planning documents are part of the strategic planning documentation system. Both in Russian and most Western states, site plans are provisional and do not constitute the source of urban planning law, being not part of the strategic planning documentation system. With the country transition to the market economy, site plan validity terms shrink, and its regulative role decreases in favor of lower-level documents (e.g. planning and demarcation projects), while execution of these projects is nothing more than a formal requirement of the Town Planning Code.

City site plan design is preceded by strategic development studies, which must be gradual — from the development strategy of the state, macro region, constituent, and constituent land use planning, to consideration of changes in higher-level strategies on the city level. The consequence of designing and approving the strategic planning documentation is prescribed by the Federal Law No. 172-FZ dd. June 28, 2014 "On strategic planning in the Russian Federation". [8] In each region, laws on strategic planning dictate main development areas, strategic goals, purposes and priorities (followed, in particular, by means of land use planning). Some of the tasks within any social and economic growth strategy have the clear planning nature.

Sustainable long-term city growth that ensures not only economic development but favorable conditions and preservation of environment for future generations, is the strategic goal that must be stipulated by the city plan — a special document responsible for land use planning. It follows that, for any city development scenario, one of the site plan's objectives is identification of areas that must be preserved for environmental and recreational functions.

A site plan is the tool that empowers implementation of the city social and economic growth strategy. This document implies elaborate examination of the considered area, borders of which are to be clarified and expanded with consideration of the entire city-affected area (industrial and cultural and general relations, settlement, environmental impact), suburban area, and borders of the forming agglomerations. Current legislation does not allow using a site plan as the tool for coordination of all industrial facilities and interests (corporate, industrial, corporate, private) within the area, and determination of the land use form based on studying all processes and harmonizing all industrial solutions affecting the area development. [9]

9. Site Plan of the City of Voronezh
In late 2018, the tender for design of the 2021-2041 Site Plan of the City of Voronezh took place. Two years were given to design and approve the document. The Project Statement of the tender contains paragraphs concerning exploration of the city agglomeration. Therefore, it must be a research work that goes beyond the city and current legislation that does not stipulates such a term as agglomeration. As part of the work on the preparation of proposals for the site plan, we considered a number of issues related to the development of the city of Voronezh. The author has already carried out such a work in the study within the 2015-2016 Fundamental Research Plan of the Russian Academy of Architecture and Construction Sciences of the Ministry of Construction Industry, Housing and Utilities Sector; then, the work was continued in exploring materials for justifying the land-use planning of the Voronezh Region. [10]

Some of the tasks of Strategies for advanced development of the Voronezh region have the pronounced planning nature. These include forming and developing the innovation system, participation of Voronezh-based enterprises in advanced scientific-and-manufacturing associations
(clusters, technoparks, technology and innovation zones, industrial districts), gaining the Federal University status by the Voronezh State University, modernization of the university, and more efficient application of its potential for innovative upgrading of the regional economy and social environment.

Land conditions of implementing the city social and economic development strategy imply elaborate examination of the considered area, borders of which are to be clarified and expanded with consideration of the entire city-affected area (industrial and cultural and general relations, settlement, environmental impact), suburban area, and borders of the forming agglomerations.

Strategic land use mission, which must be prescribed by the site plan, is sustainable long-term development of the region, that ensures not only economic development but favorable conditions and preservation of environment for future generations. In this regard, for any city development scenario, one of the site plan's objectives is identification of areas that must be preserved for environmental and recreational functions.

It is reasonable to cover the following substantial topics in the site plan:
1. Exploration of resources and restrictions of the city area development, with due regard to its position in the system of surrounding areas;
2. Voronezh is located in the forest-steppe zone and is the center of development of a large agrarian region. In this regard, one of the tasks of the site plan is to create a system of natural territories that would ensure the ecological balance and the need of the population in recreational areas.
3. Transport framework of the city, in the light of the agglomeration, and identification of highest-priority focuses in high-speed transportation;
4. Spatial development of the urban agglomeration, including rationalization of agglomeration borders;
5. The city growth forecast, based on demographic predictions and analysis of production development scales (considering that the demographic forecast is made within the social and economic growth strategy, it is clarified by scenarios and settlements);
6. Environmental framework;
7. Scope of suburban-area residential construction, forecast, land reserves, and related restrictions;
8. Identification of troubled areas and conflict of interests in the farsighted use of the area;
9. Statement of tasks on deploying suburban-area assets essential for city development (transport, industrial facilities, engineering facilities, cemeteries, waste landfills, etc.); Establishing the environment favorable for the federal university development (potential scenario of creating new planning formations).

10. The level of agglomeration
Though Russian legislation does not stipulate the term of a urban agglomeration, this term exists and was described in scientific works as early as in 1970s — in the USSR General Settlement Plan (head organization was the Central Institute for Research and Design of the Ministry of Construction Industry, Housing and Utilities Sector). The agglomerations were listed, classified, etc. The principles of systematic settlement organization were applied in the urban and spatial planning methodology [11-12]

Urban agglomerations are function-concentrating areas, settlement forms, innovation drivers, and territories of deeply modified nature. To compensate the excessive human influence, vast natural areas are required, which could be larger than the territories of settlements and their restrictions. [13-14] Urban agglomeration design is a complex and difficult problem.

Theoretical basics of managing urban agglomerations were given by A.V. Kochetkov, F.M. Listengurt, I.A. Portyanskiy, G.A. Maloyan, N.I. Naymark, V.V. Vladimirov, A.M. Lola, L.F. Buchev, G.M. Lappo, E.N. Pertsik, and others. Agglomerations and classification thereof, identified in the
USSR General Settlement Plan, are the reference material for determining parameters of future development of urban agglomerations.

In the Agglomeration List of the Institute (former Central Institute for Research and Design of the Ministry of Construction Industry, Housing and Utilities Sector), Voronezh Agglomeration had the following parameters as of January 1, 1970: agglomeration area — 3,200 km². From 1959 to 1970, population density had increased from 156 people per km², to 234 people per km². There were 8 outbound railways and highways (Table 1). Population of the major city, Voronezh, came to 660,000 people. 8 urban localities in the outer agglomeration area were identified. The largest of them, Semiluki, was the industrial center with the population of 18,200 people (Table 2).

General characteristic of the Voronezh Agglomeration in 1970: large, evolving, with rapidly developing outer area, with higher industrial personnel index, with social and cultural potential of the major city. Environmental conditions are close to normal.

In studies that we carried out in 2015, it was found out that 1.3M people lived within the Voronezh Agglomeration, which comes to 56% of the total population of the region. A structural feature of the Voronezh Agglomeration is a high share of the remote areas which include such cities as: Novovoronezh and Semiluki, and five industrial settlements: Ramon, Latnaya, Strelitsa, Khokholsky, Davydovka. All these localities have their own historical backgrounds, economical basics, scientific and educational complex, and well-developed infrastructure. [15] (Figure 1) Currently, according to American scientists, Voronezh Agglomeration takes the 581th place in the global agglomeration rating. [16]

Table 1. Voronezh Agglomeration in 1970.

| Agglomeration Planning | 1959 | 1970 |
|------------------------|------|------|
| Planning form          | radial |      |
| Structure              | monocentric |      |
| Transport framework    | ea 8  |      |
| Outbound railways and highways | km/100 km² 18 |      |
| Transport framework density | x 1,000 km² 3.2 |      |
| Area                   | 3.2  |      |
| Population density     | 156  | 234  |
| urban                  | 205  | 363  |
| total (urban and suburban) | people per km² 2.5 | 2.8  |
| Urban locality density | localities/1000 km² 2.5 | 2.8  |
| Average shortest distance between urban localities | km 6.4 | 7.6  |
| Agglomerativity factor | 0.39 | 0.37 |
| Agglomerativity index  | 9.5  | 10.9 |

| Economical Portrait | a) machine engineering, b) light food production, c) chemical industry |
|---------------------|---------------------------------------------------------------------|
| Industrial personnel index | % | 25.8 |

| Social and Cultural Potential of the Major City |
|------------------------------------------------|
| Universities (incl. branches) | ea | 10 |
| Unique cultural assets | ea | 8 |
| Diversity of universities and cultural assets | bit | 59 |
| Water resources | coef. | 2.1/0.55 |
| Environmental status | |
| Air basin | coef. | 1.3 |
| Water basin | coef. |      |
| Open spaces | coef. |      |
| Recreational capability | degree | P |
Table 2. Localities and Population of the Voronezh Agglomeration in 1970.

|       | 1959 Population (thousand people) | 1970 Population (thousand people) |
|-------|-----------------------------------|-----------------------------------|
| A     | Voronezh                          | 447                               | 660                               |
| B     | Outer area                        |                                   |                                   |
| 1     | Semiluki                          | 11.5                              | 18.2                              |
| 2     | Somovo                            | 7.2                               | 14.4                              |
| 3     | Krasnoleny                        | 9.5                               | 9.1                               |
| 4     | Latnaya                           | 5.6                               | 7.5                               |
| 5     | Ramon                             | 5.8                               | 7.2                               |
| 6     | Khokholsky                         | 6.2                               |                                   |
| 7     | Strelitsa                          | 4.8                               | 5.2                               |
| 8     | Novovoronezhsky                   | 3                                 | 12.7                              |
| Total for B |                                   | 47                               | 81                                |
| Total for A+B |                                   | 494                              | 741                               |
| C. Suburban population |                                   | 165                              | 166                               |
| Total (A+B+C) |                                   | 659                              | 907                               |

Practically, urban agglomerations have been considered as the subject to regulation and spatial planning, particularly in works of the scientists of the Central Institute for Research and Design of the Ministry of Construction Industry, Housing and Utilities Sector, and in pilot projects developed curated by the Ministry of Economic Development of the Russian Federation (the work was started in the Ministry of Spatial Development, and the corresponding interministerial group was formed). In the annual message to the Federal Assembly, the President of the Russian Federation stated the main spatial planning tasks and described the key spatial environment establishment activities, "Major cities must translate their energy, being the support for the balanced and harmonized spatial development of Russia."

The legal basis for designing the agglomeration area as a consistent asset (usually falling into several municipal formations) may be the Article 27 of the Town Planning of the Russian Federation "Coordinated design of spatial planning documentation by federal executive authorities, executive authorities of the constituents of the Russian Federation, and local governments".

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Tasks regarding spatial planning of the urban agglomeration, which must be taken into account in the site plan of the city of Voronezh:

1. Lessening the burden of the city center; streamlining the spatial development of the agglomeration; restricting growth of the central core and close towns.
2. Ensuring capturing of shuttle migrants within the borders of the remote area and close towns.
3. Establishing counterweights in the middle and remote areas.
4. Lessening the load on inbound transport flows; isolating transit communication corridors from the city-center transport system, and relocating them to the bypass road area.
5. Providing new and improving the existing transport infrastructures.
6. Establishing a high-grade hierarchical transport infrastructure within the design territory, which could ensure high-speed connection across the agglomeration, particularly with the existing centers; creating the international and regional highway entries; founding the logistics center.
7. Establishing high environmental quality and living conditions, which could support the city's role of an administrative and economic center and unlock its social and cultural potential.
8. Creating the full-fledged environment for educational, innovative, and recreational, and sports functions; providing the tourism and leisure infrastructure.

11. Design tasks and events that must be taken into account when designing the site plan of the city of Voronezh.

Design tasks include preparation of proposals on establishing the single agglomeration infrastructure. In this regard, design of the site plan must result in a balanced solution for all the infrastructures, namely: industrial (technological and industrial relations, HR), transport, social, settlement-interconnected utility, environment-protecting, natural-framework, recreation, and infrastructure for protection of the cultural and historical heritage.

The priority focus must be made on the city-center transport network structure. One of the key problems of the existing transport network of the city of Voronezh and generally Voronezh...
Agglomeration, is high load of main transport axis due to rapid residential construction. For instance, Moskovsky Prospekt Street (Figure 2) is one of the most loaded through streets of the city of Voronezh, which is the artery passing along the M4 Don highway. In future, the transport load on this street is likely to grow due to residents of the new settlements founded along the M4 Don highway — Aydarovskoe, Novozhivotinnovskoye, Russkogvozdevskoye, Yamenskoye. After exploring the perspective residential area sites, the population will increase by 66,000 people to the north of the city. Besides, close to Moskovsky Prospekt Street, there are ten residential construction sites with total output of 1,655 thousand m²; the population of this district is to gain 25,000 people. Moskovsky Prospekt Street is adjoined by Shishkova Street, where seven more residential construction sites with total output of more than 578 thousand m² and population of 19,000 people, are located.

Furthermore, a very important objective is preserving the essentially agricultural profile of the areas surrounding the city of Voronezh, as the valuable agricultural region; also, it is important to provide for sectoral zoning of the agglomeration area, and identify the specific functions of individual sectors. Providing conditions for establishing a natural framework, with ensuring protection of the most valuable elements thereof.

It is required to close construction gaps along the main routes.

Territory use modes must be applied along the service corridors; these modes are called to tighten regulations regarding natural preservation of areas.

12. Level of the city

Beginning from the first site plan of Voronezh (approved in 1774), the city had been evolving following the three-ray planning system — with the Mitrophan Monastery in the center and three alleys stemming from it: Platonova and 9 Yanvarya (Bolshaya Devitskaya), Plekhanovskaya (Bolshaya Moskovskaya), and Volodarskogo (Meshchanskaya). The three-ray planning of the center
was complemented by the rectangular-straight planning of the new part, with separation of main highways and symmetrical trade and administrative squares.

The modern planning structure of the city of Voronezh is typical for major cities, constituting a multifunctional structure that combines production, science, culture, education, residential area, social, utility, and transport service. Such multifunctionality is mostly intrinsic to the central district of the city. Its assets are not compactly deployed (as if in a small or medium-size town), but disseminated.

Compliance with the procedures provided by law (public hearings and public discussions of master plans), residents are barely involved in architectural and spatial planning and evolution of Russian cities — particularly, Voronezh. L.B. Kogan told about this in his works, "Urban civil conscience and thinking is based on the evolution of the surrounding spatial environment. This, of course, does not and cannot mean that every citizen turns into a specialist or scientist. The matter is the inborn, urban-hereditary responsibility for the place where you live." [17]

Preservation and development of valuable ensembles in the central part of Voronezh, with the involvement of citizens, will lead to improved comfort of the city environment, as well as higher economical efficiency of the existing enterprises and organizations. This may facilitate enhancement of the positive image of city life, namely: increase investment and tourist appeal of the city; improve city competitiveness in raising investments, attracting professionals, tourists, and students. Development of the surrounding-area infrastructure will improve the economical potential of the city and entire region. [18]

Federal Law No. 73-FZ dd. June 25, 2002 (edited on July 29, 2017) "On cultural and historical heritage assets of the nations and the Russian Federation" [19-20] is focused on preserving the cultural heritage and establishing the cultural space in cities of historic value. Voronezh has a plethora of historical and architectural assets, valuable monuments, but it lacks a regulatory framework to stipulate construction in historical centers; there are no programs dedicated to governmental protection and preservation of cultural heritage assets. Cultural sphere. Every cultural tradition in the modern world is experiencing external influences that can pose a threat to its functioning and development. So, in the post-Soviet period, Russian culture turned out to be completely open to world space and domestic criticism from representatives of individual national cultures.

Due to chaotic construction and building of high-rise houses in the city centers, post-war ensembles were leveled down. As a result of multi-storey construction, the historical panorama toward the Voronezh River, was lost. In the past, the panorama had two levels. The spatial ensemble system must be developed in modern conditions, based on the principals adequate to the new scale of the city. In such conditions, the new system of focuses must be created, as consistent with the new rhythmic patterns. Spreading the city toward the river must be one of the tasks considered in the site plan.

13. Conclusion
When designing the land use planning documents, it is important to consider issues related to objective agglomeration processes in Russian major cities. Centripetal trends of city development in Russia had not been overcome for long, and the settlement processes had not been regulated due to a lack of the urban development policy. The centripetal urban development trends were not overcome and the resettlement processes were not regulated for a long time due to the lack of a resettlement policy for a long time. Questions need to be considered by the higher settlement system in the modern site plans of cities. Development of the concept is necessary at the first stage (spatial development strategy), which would determine the principal directions of development of the city.

The issues that need to be considered in the site plan of the city of Voronezh it is essential to pay attention to issues directly linked to land design or most heavily influencing the spatial development of the city, namely:
1. adequacy of the natural resource management to natural conditions;
2. progress of the role of settlement forms in ensuring economical development, social evolution, and innovative development;
3. environmental load, the approximation or crossing the threshold of human influence, beyond which the environment quality deterioration may lead to worse living conditions and eventually unsuitability and inefficiency of settlement forms.

4. Preservation of the historically-formed planning, as well as of historical and cultural heritage assets, are highly valuable for consistency of the urban structure development at level of the city. These components are unique as they preserve the originality of the urban environment. Formation of ensembles, unlocking of the landscape potential, composition, and the city outline are not direct objectives of a site plan within the current legislation. However, they are implied tasks when designing the future planning structure of the city on the terrain and in zoning, so they must be provided during future standardization.

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