Complex construction: urban design principles and the basis of sustainable development

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Abstract. This article evaluates the basic principles of the spatial organization of complex development projects on the city’s territory and characteristics of some modern commercially successful projects. Today complex development projects are one of the main types of constructions, which can be a part of sustainable urban development. “The XXI century – time of the cities”, sounded in the decision of the congress of the International Union of architects of 1999 in Beijing. More than a half of the population of Earth lives in the urbanized territories, and this share will grow in the future only, at the expense of a proceeding "explosive" urbanization of developing countries. Basing on the analysis of several modern Russian examples, we made some conclusions about the most important strategic decisions in the areas of planning, zoning and architecture, which provide integrated development project creating a high quality urban environment.

1. Introduction

1.1. Problem

The term “complex development of the territories” (in Russian transcription) today is used to describe the projects that combine residential and public function, on the same territory, or share a common vision and planning solutions with common infrastructure (both technical and social) [1]. It could be an architectural complex of several houses, united by a common architectural idea, or it could be a complex of hundreds of acres for development that includes a variety of planning configurations of housing and landscape parks, large community centers, university campuses and business zones [2]. What kind of conceptions could be useful and more effective for the process of comfortable environment creation?

In General, the scale of projects of complex development is possible to distinguish on several groups: large – from 60 to 300 hectares, the average – from 20 to 60 hectares, and small – up to 20 hectares (Table 1). If we speak in terms of realization of full project, it takes (from the start point to final commissioning) the period of 2-3 years for small projects, medium and large can stretch up to 10 years or more. This indicator depends on the developer and its ability to organize contractors, create the consortium, the ability to arrange financing, on the composition of the master plan, and on structural characteristics of territory [3].

1.2. Hypothesis
What kind of strategies could be useful and more effective in complex development? If we talk about the relationship with the international practice, Russia now is beginning to implement projects of integrated development, which turn urban territories into self-contained "micro-cities" with the necessary infrastructure. That is typical for sustainable development and integrates the principles of building, bringing together economy, ecology and social well-being, with attention to energy efficiency and saving resources. On this kind of basis for architectural and urban development solutions, these projects could achieve the sustainability [4].

The phenomenon of a wave of creation of "the new cities" arose throughout all history of town planning and architecture at emergence of new prerequisites – geographical, political or social for ethnos and civilization development. If to consider modern urbanism and a phenomenon of emergence of the new cities in 21 centuries, we will see that these cities arise any more for ideological or political reasons as Sankt Petersburg or Brasilia, and under the influence of economic factors. The new cities of XXI century – the city with new technologies and that the most important, the new social and territorial and spatial device [5]. They aimed not in the present, and in the future.

The new urbanism which adherents there were new cities, treats city space not as a place for the population accommodation which main objective is work at the city-forming enterprises. Except uniqueness of spatial lines for modern cities much comfortable and attractive, there are general constants: ratio of total area of buildings and area of all city, or area of buildings and area of parks [6].

2. Methods
The density of the development is one of the main factors in the economics of a project, and, at the same time, the main indicator of comfort for the future urban environment [3]. Indicators of some example projects in different Russian cities presented on Table 1. As you can see, the average “net” density is located in the range from 0.28 to 3.75, and we can identify several factors that affect these characteristics of the complex (Table 1). There are some factors, helping to increase density:

- the large park of forest on the border of the plot, which removes the need to arrange an internal park in the project area,
- the ability to increase the average number of levels and to place multilevel car parks in locations, which are unsuitable for residential development,
- developed commercial infrastructure on surroundings, reducing the amount of commercial space on the site,
- the ability to use the terrain for zoning and use of underground space.

Table 1. Indicators in some examples of complex development for territories in the Russian cities.

| Name of the project (location) | Category | Area (km²) | Apartment area | Commercial area | Numbr. of apart | Population | Floors (levels) | Parking \ for 1 apart. | Density (net) |
|-------------------------------|----------|------------|----------------|----------------|---------------|------------|-----------------|-------------------|---------------|
| River park (Moscow)           | comfort  | 29         | 224500         | 180000         | 3000          | 6100       | 9-19            | 0,667             | 0,77          |
| Yarkiy (Ufa)                 | economy  | 143        | 400000         | 100000         | 8000          | 25000      | 4-22            | -                 | 0,28          |
| Tushino 2018 (Moscow)        | comfort  | 160        | 500000         | 175000         | 10000         | 40000      | 9-10            | 0,800             | 0,31          |
| Domashniy (Moscow)           | comfort  | 27         | 336500         | 18000          | 4000          | 6000       | 6-32            | 1,000             | 1,25          |
| Solnechniy (Ekaterinburg)    | economy  | 362        | 1750000        | 350000         | 25000         | 85000      | 4-23            | -                 | 0,48          |
| Microgorod Vlesu (Moscow)    | comfort  | 100        | 400000         | 50000          | 8000          | 35000      | 7-14            | -                 | 0,40          |
At the same time, there are some factors, which support the optimal value between limiting density and increasing density:

- it is impossible to reduce comfort,
- it is impossible to reduce area of yards, and
- it is impossible to reduce social services and landscaped areas.

If we talk about the relationship with the international practice, Russia now is beginning to implement projects of integrated development, which turn urban territories into self-contained "micro-cities" with the necessary infrastructure. That is typical for sustainable development and integrates the principles of building, bringing together economy, ecology and social well-being, with attention to energy efficiency and saving resources. On this kind of basis for architectural and urban development solution, these projects could achieve the sustainability [7].

3. Results

3.1. Architectural and urban planning principles for sustainable development in urban complex construction

Every quality project is looking to emphasize its own uniqueness, and to organize a composition around the concept that emphasizes this feature of the project [8]. Most common examples could be found in using the unique features of the area location and unique landscape characteristics (water, parks, forests, etc.) , or giving the project unique features by creating an outstanding architectural \ social object, in the unique spatial organization of neighborhoods or buildings, creating specific landscaping and internal environment [9].

We have identified several important principles. Now we propose to consider them:

1. The unique object as a driver for the development

This may be an object with regional and even federal value (as in the project “Tushino-2018”, where the unique stadium became anchor object). Also, “star names”, famous architects and construction companies are often used as the basis of the concept creating and its special features (school and kindergarten, developed by famous design enterprises in the Microgorod “V lesu” project, or R. Boffin in “Novokraskovo”) [10]. It could be also a socially significant natural feature: a park, a pond, etc.

2. Bright facades and varied image of buildings

Active bright graphics on the facades supports the brands of the area. For example, the concept of Microgorod “V lesu” by SPEECH arch. The facades of the first phase of construction were developed by LANGHOF (Germany), "TPO Rezerv (Russia), and others: 30 sections they divided among
themselves. As the result, they received a several subtypes of facades, in different colors, or rhythm of architectural elements, which gives the necessary variety of model building (Figure 1).

Figure 1. Microgorod ‘V lesu’ project (Moscow). The image diversity was achieved by using of different patterns on the facades.

3. The availability of public spaces of different scale
It could be a promenade, a central public street as the axis of the master plan (projects Yarkiy and Domashniy), central park or square (Solnechniy project), transport node, etc. The identity of comfort space based not only on local forms or decorations but also on scape and configurations of spaces and their correlations with citizens. Also, this quest is undertaken within the context of a search for strategies for different regions. Future social urban structure is dependent on new forms of social organization relying on more flexible architectural urban spaces and mixed functions [11].

4. Thoughtful landscaping of the yards and living spaces
Not just the creation of a private space, but the development of modern landscape design, including elements of stone arts, playgrounds, lightings, etc. It is important to combine the original planning decisions with creating of space for everybody, the active use of open plan and modern minimalist architecture with high quality materials. We assume that many people would prefer to live in unique space with a national character, which creates individuality [12]. A contemporary city, which brings both cultural historical identity and modern technologies into urban life, would be more attractive for people and more stable. Accordingly, instead of globalization we should create a different approach to the traditional urban structures using their new functional and technical possibilities.

5. The preservation of the unique natural water bodies and green areas: forest and parks
In general, if nearby territory has an existing forest (park), architecture and urban planning concept should be based on maximum use of its potential, beginning with spatial orientation and ending with an accomplishment of territories, not formally included in the project, but bordering it, which can be used as recreation for residents [13].

Landscape design often involves a comprehensive plan for different types of plants and design of landscaping for the different changing seasons. The unique design of courtyards and public spaces and their composition may become a basis of concept for a project [14]. Important condition is existence of big projects of development of the space, the developed structure of public transport, balance of green and open territories, and natural "horizons". The city, which landscape possesses a variety, chamber and open spaces, even in adverse climatic conditions, will be able to keep unique and inherent in it "spirit of a place".

4. Discussion
The international architecture cleared of cultural symbolic, not always is able to make what the ideal model of the city seeks – to create comfortable habitat. Reminiscences of architectural postmodernism on a scale of architectural paradigms became only not clear attempts to return the lost symbolism to the modern city – touching and fascinating but often unpromising [4]. Practically all global cities go on the way of an embodiment of the idea of "international" space of the city as the basis of the image. If we take New York City and Hong Kong, we will find in its separate lines more than the general, than differences. Paris, for example, opposite, after surgeries on the medieval fabric, performed by the baron Osmann, preserved "the most expensive in the world" today, shape of city fabric (if to take
number of tourists into account), and was made of it by a brand which will hardly manage to be bypassed soon any of the new cities [15]. It is a brand, which only rises in price over time.

In front of the critic of a campaign of globalization in urbanism and to city development, without local features of the territory, the approach based on traditional for this territory of structures looks the most logical, at a new stage, with new functionality and technological improvements. Identity is covered not only in traditional architectural forms but in space configurations, its scale, in aspects of interaction of citizens with this space [16].

5. The “return” of urban blocks

Public and business zone may be located at the composite center of the area or “gravitate” to transport nodes, public transport connections, border areas, natural places of attraction (parks, ponds, etc.). The sport zone includes different types of objects (of local, city, regional value). Recreation area project is often combined with public space, park area, or sports area. “Educational area”, area of schools, kindergartens are placed on territories with absence of risk factors. With regard to the composition and orientation of the buildings of different zones, we can identify three main principles:

- the strategy of blocks. The buildings are located in blocks with courtyards,
- the strategy of a single internal “focus” space surrounded by urban fabric,
- the strategy of individual high-rise buildings forming the space structure [17].

Block construction is one of the most popular types of building. Quarter development with correct space orientation has the effect of semi-enclosed courtyards facing the public space. Blocks around common public space forms a huge courtyard are unique dense layout, but with solutions for insulation of private yard spaces. Benefits of quarterly development are obvious [9]. It is so familiar to all classical Western European city image, with very vibrant and active streets providing cafes, restaurants and shops on the ground level. The size of a block (or quarter, about one hundred by one hundred meters) and height of buildings inside the 5-9 floors are comfortable for people. The quarter scheme defines separation of public space (streets, boulevards, squares) and private (courtyards). Private space is located deep in the quarter and is available only for its residents. In general, this is traditional scheme of European cities, practiced for millennia [12], but there should be a balance of height and width in the interior of blocks [18].

Strategy for the levels: variable number of floors is more popular than unified. It allows creating an expressive composition. Many apartments of high-rise buildings are significantly above the level of the surrounding buildings, that allows to provide special characteristics of the project, to enrich the panorama of the city, etc. Often the urban fabric includes different types of building: medium height and accent towers over than 20 floors (Figure 2).

Figure 2. The Domashniy project (Moscow). Different height of buildings creates a dynamic image.

6. Summary

After the analysis of some current projects, we can formulate several architectural spatial principles, which are important for complex development projects based on the ideas of sustainability:

- need for unique development drivers, natural and social,
- social infrastructure, network of public spaces,
• block composition of housing,
• closed courtyards without transport, underground car parks,
• “free plan” of apartments, the variety of facades,
• landscaping of yard areas.

It is impossible to think up a common formula of modern urbanism. What is the modern city, comfortable for the accommodation, attractive from the point of view of everyday life? But the modern city with the qualitative environment, keeping lines of the cultural identity, and combining them with modern technologies of the organization of life, has the greatest chance to become an attractive place for human life, and to win in competitive fight for the best contingent of citizens [19]. The practice of complex development for urban territory shows that it is necessary to abandon the typical and mono-functional projects and provide the highest diversity of the urban environment [20].

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