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BASED ON THE BIOSPHERE COMPATIBILITY PARADIGM (PART 2)***Russian Academy of Architecture and Construction Sciences (RAACS) ¹**Moscow, Russia**Southwest State University, Russian Federation²**Kursk, Russia**Moscow State University of Civil Engineering ^{3,4}**Moscow, Russia*

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Statement of the problem. New challenges of our time significantly affect the methodology of urban planning. The development of new principles of city life, regulating the biosphere compatibility of cities and the development of human capital, should be considered an urgent scientific task that requires identifying the patterns of functioning of urban elements of planning structures (residential areas).

Results. The paper develops the methodological foundations of urban planning, design and evaluation of design options for residential planning units of the city (quarter, neighborhood, residential area) on the principles of the paradigm of biosphere compatibility of cities and settlements that develop people. A conceptual model of the functional and planning organization of the territory – the hierarchy of city functions – is proposed. An algorithm for evaluating variants of residential area planning projects based on the index of urban function provision has been developed. For each of the functions of the city, the necessary and sufficient composition of indicators for evaluating design decisions is identified. The article discusses the prospect of quantifying the social well-being of the population of residential areas of a biosphere-compatible city as an alternative condition for the formation of a comfortable urban environment.

Conclusion. The numerical evaluation of the design solution and a comparative analysis of the level of favorability of a residential neighborhood using the principles of the biosphere compatibility paradigm show what changes are required in the composition of urban planning solutions not only to achieve the quality of the material environment of life, but also human development in all respects.

Keywords: territorial planning; urban planning; evaluation of design solutions; methodology; project planning of the territory; paradigm of biosphere compatibility of cities and human-made settlements; favorable and comfortable urban environment.

Introduction. The public need to organize a favorable urban environment calls for a revision of the design paradigm of modern urban planning towards the self-sustaining development of

urbanized territories based on the unity of the settlement and the environment, consciousness and inseparability of humans from nature for the sake of achieving and maintaining the required standard of living for both current and future generations [15]. This calls for a new scientific approach to be developed which will provide urban development tools for physical, spiritual, social development [5]. From this perspective, it is obvious a special direction in urban planning science associated with the development of a fundamentally new methodology and principles for designing a comfortable and safe living environment is essential [10].

At present one of the effective tools for improving the quality of the urban environment and the transition of Russian cities to modern development models is the new article of the Civil Code of the Russian Federation introduced in December 2020 on the types of integrated development of territories¹. According to it, it should be considered that the legislative initiative will assist city planners in ameliorating the efficiency of improvement, development and reconstruction of the urban environment and will lay the foundation for improving the regulatory framework in urban regulation and architectural design. There is thus a narrower, but no less urgent task of improving the methodology of territorial planning and design of residential formations as the key element of the planning structure of the city [1]. These are residential areas that are central to the qualitative characteristics of the urban environment [12, 13].

The objective of the article is to develop the methodological foundations of urban planning, design and assessment of options for design solutions for residential planning units of the city (quarter, microdistrict, residential area) as part of territorial planning projects with the functions of a biosphere-compatible city.

1. Methodology and methods. The theoretical foundation of the study is a new paradigm of life, i.e., biosphere-compatible cities and human-made settlements developed in the RAASN [6]. The sequence of paradigm principles establishes the priorities and hierarchy of fundamental concepts of life, identifies problem areas in the organization of city life, enable one to calculate the level of symbiotic relations between the city and nature and quantify the opportunities offered by the city for the development its residents. The algorithm for the sequential implementation of the provisions of the paradigm of biosphere compatibility is described in detail in the first part of the paper and includes the following assessment blocks: environmental safety, resources of spatial and territorial support and structural and planning organization of a residential area/microdistrict [9].

¹ Civil Code of the Russian Federation Article 65. Types of complex development of the territory (introduced by the Federal Law of 30.12.2020 N 494-FZ).

One of the principles of the paradigm of biosphere compatibility is the principle governing the design of a favorable living environment with the urban functions and the formation of infrastructural conditions for the comprehensive human development.

2. Proposals for developing the methodology of urban planning and design of residential formations of the city. The development of the design methodology of urban planning solutions involves application of the hierarchy of city functions — *life support, entertainment and emotions, power, mercy, knowledge acquisition, knowledge of the world (creativity), connection with nature* — as a conceptual model of the functional planning organization of a residential area [14]. This model enables us to consider the hierarchy of the above city functions as an analogy of the geometric projection of human needs on the planning and design solutions of residential areas of the city [11]. In this case, during territorial planning using the functional approach and the suggested model, justification of the compliance of the planned parameters, location and aim of objects with the standards of urban planning and the requirements of urban planning regulations established by the calculated indicators of the minimum permissible level of facilities of communal, transport, social infrastructures in the area and the calculated indicators the maximum permissible level of their accessibility by the population. According to the paradigm of a biosphere-compatible city, all of its functions are the major ones [8]. They can be implemented in compliance with the scheme of territorial levels of the planning structure of residential areas: built-up or reconstructed territory of a residential building, quarter, microdistrict, district and the entire city. Therefore in relation to the territory of a residential quarter, all the above city functions are planned in a minimum volume within walking distance. The implementation of all functions for the next level — a residential microdistrict — is ensured during the development of a territory planning project, design of residential buildings, courtyards of territorial infrastructure facilities and recreational spaces. At this level, the components of the district level are added to the structure of the functional planning organization. E.g., if the implementation of the «Connection with Nature» function at the level of a project of a specific residential building is ensured by landscaping the courtyard, at the microdistrict level it provides a wide range of recreational infrastructure for residents of the entire microdistrict — green recreational spaces (squares and other recreation areas) [7]. A similar example can be provided in relation to the «Life Support» function for the “Institutions, Organizations and Service Enterprises” component: at the microdistrict level, these facilities are not limited to stores with essential goods, but the construction of multidisciplinary shopping centers is being planned with further reconstruction in mind [3].

It should be particularly noted that in order for a living environment to be called not only a favorable, but also a comfortable one, urban infrastructure facilities in residential areas should be implemented for each resident individually tailored to their interests and physical capabilities, and for all residents at the same time with public interest in mind. In this case, while designing and assessing the structural, planning and architectural organization of a residential area/microdistrict, a special role is played by the formation of a socially significant infrastructure [4, 18], practical implementation of the principle of social planning [22] and priority of social values of the population [20], equality, opportunities [17], social health [23], participation in urban planning [19].

3. Assessment of residential areas with urban functions. The design method adopted in Russian urban planning practice predetermines the assessment procedures for the conditions of the urban environment that contribute to human development. A quantitative assessment of the quality of a residential area planning project is a process where the ability of an object to perform the functions prescribed by the designer, ensuring favorable conditions for residents is revealed. In this study, the methodology for assessing options and choosing a rational design solution in planning projects for the territory of residential formations relies on a system of integral indicators [2] obtained from the values of individual currently standardized parameters of the urban environment identified by statistical and expert methods.

The hierarchy of city functions is a conceptual model of the variant design assessment methodology. Using estimated indicators of the feasibility of city functions within the framework of qualimetry methods it is possible to assess the scale of order (ranks) which will allow one to rank residential areas (microdistricts/quarters), i.e. to arrange them in ascending order of quantitative assessment of their quality. For these purposes, a comprehensive indicator is set forth - the index of assessing the provision of urban functions which can be calculated based on a variety of indicators characterizing the compliance of the infrastructure of a residential area necessary for the implementation of all seven functions of the city, with regulatory requirements.

Let us consider the justification of the estimated indicators for the city functions in more detail.

The function «*Life Support*» is to be assessed in terms of material (physical) comfort and safe living conditions. This function is formed by a number of characteristics and normative parameters of the projected residential development of the district/microdistrict:

- the structure of the housing stock²; energy efficiency class; insolation, the level of greening of residential yards and others;

² SP 54.13330.2016 "Residential Apartment Buildings. Updated Edition of SNiP 31-01-2003".

- road network³;
- engineering equipment and engineering protection of the territory;
- integrated security.

The estimated indicators are primarily formed according to the standards of urban planning SP (CII) 42.13330.2016 2016 «Urban Planning. Planning and Development of Urban and Rural Settlements. Updated Edition of SNIIP (CHIIIP) 2.07.01-89*» based on which the construction of service sector facilities (trade, public catering, household production and housing and communal services, mini-production, healthcare, etc.), transport infrastructure and their availability in accordance with the population of the residential area/microdistrict. Among the objects of service, it is suggested in the design not all of their nomenclature presented are considered by the joint venture but related to the system of primary/daily maintenance and life support. These days institutions and public service enterprises in a modern city form a single system covering residential areas and places of employment. The current urban planning trend and architectural practice is designed to combine service facilities and living quarters into community centers located on the lower floors of residential buildings.

An important factor in the composition of the life-supporting function is the improvement of the territory⁴, which is currently part of the program activities of the national and federal projects «Housing and Urban Environment» and «Formation of a Comfortable Urban Environment». In connection with the priority direction of urban planning activities in the field of improvement of the territory of residential areas, it is suggested that the list of estimated indicators is supplemented with the indicators that are important for analyzing the quality of the modern urban environment such as:

- proportion of playgrounds in the total area of the design site (%);
- proportion of sites for adults and the elderly in the total area of the design site (%);
- proportion of outdoor sports grounds in the total area of the design site (%);
- proportion of dog walking areas in the total area of the design site (%);
- proportion of parking lots per apartment.

The «*Entertainment and Leisure*» function at the city level is implemented by objects that are part of cultural and art institutions (cinemas, museums, etc.), objects that are part of the group of catering enterprises (cafes, restaurants) as well as physical culture and sporting institutions. Depending on the level of the element of the planning structure of a residential area, the im-

³ SP 396.1325800.2018 “Streets and Roads of Settlements. Urban Planning Rules”.

⁴ SP 82.13330.2016 Land Improvement. Updated edition of SNIIP III-10-75.

plementation of the components of this function of the city can be either limited to built-in premises in residential buildings, e.g., for a chess club or premises for hobby groups, or needs for entertainment and recreation.

The guidelines for the design of urban environment objects related to the above function of the city are contained in SP (CII) 118.13330.2012* Public Buildings and Structures. Updated edition of SNiP (CHiP) 31-06-2009 (with Amendments N1,2) and SP (CII) 160.1325800.2014 «Buildings and Complexes are Multifunctional. Design Guidelines» as well as in other normative documents regulating mass occupance.

The function «*Power*» can be represented in the urban environment by organizations and institutions of authorities and administration of districts of municipalities, cities and rural settlements: courts, notary offices, police stations and others. In relation to urban planning objects that meet the functional purpose of the function of power, the rules of architectural and construction design apply containing the requirements for public and multifunctional buildings and complexes. To assess this function to the city, two indicators of compliance with the urban design standards will be used: accessibility and security.

It is somewhat not customary to include the function of the city «*Mercy*» in the system of town-planning terms, but this is a natural need for human development and can be considered as a city-forming one. In design practice, the «*Mercy*» function is implemented by urban infrastructure facilities which are designed taking into account the requirements of accessibility for people with limited mobility. In foreign urban planning activities, this approach is the direction of "universal design". The definition of "*universal design*" or "*inclusive design*" was introduced by architect Ronald L. Mace to describe the concept of designing objects and human-transformed environments to make them aesthetic and usable by all categories of populations of different social status [21]. Regardless of population age, disability, etc., universal or inclusive design principles are designed to ensure that items, services and programs are accessible.

While assessing the security in the composition of the «*Mercy*» function, it is suggested that the objects and institutions of the social security system are considered that personify and perform the functions of helping those in need: large families, the elderly, the disabled, families with foster children, etc. E.g., the proportion of special dwellings for veterans and disabled people from the total number of residential units (%) as a function of helping those in need as part of the institutions of the social security system will transform cities into humane civilized entities. The emphasis on ensuring personal accessibility to certain categories of the popula-

tion especially the most socially vulnerable category — the low-mobile group of the population — is made in SP (СП) 59.13330.2012 «Accessibility of Buildings and Structures for Low-Mobile Groups of the Population. Updated edition of SNiP (СНИП) 35-01-2001». The requirements and recommendations of this guideline document on the criterion of «accessibility» are aimed at designing a full-fledged architectural environment providing a necessary level of accessibility of buildings and structures for all categories of low-mobility groups and their unobstructed use.

The assessment of the function of the city «Knowledge» is performed based on identifying the relationship between the objects of upbringing and education (preschool institutions, secondary schools as well as libraries whose nomenclature must correspond to the size of planning education (the population of the district/microdistrict) and the standards for the availability of these objects depending on the element of the planning structure. E.g., preschool and school educational institutions can be designed within a residential microdistrict, but for the entire city the function of the «Knowledge» city is additionally provided by secondary vocational and higher educational institutions. For objects of educational institutions of all levels, guidelines of architectural and construction design have been developed⁵.

The structure of the objects that implement the function of the city «Creativity» includes objects related to out-of-school institutions (art schools, studios), as well as objects related to cultural and art institutions (clubs, philharmonic societies, concert institutions, etc.). In creative activity, a kind of emotionally fulfilling environment for the life of the city is designed where a creative personality is formed in various fields of sports, art, science, technology. Creative activities are organized at various planning levels, and in order to cater for creativity needs of the urban population, the development of cities is accompanied by quantitative and qualitative changes in the already existing planning structure, and thus by the search for justified locations and planning forms of new urban elements, e.g., public spaces, in relation to which there are no urban planning standards. These facilities are designed within the walking distance and transport accessibility of the population.

Recreational areas and specially protected natural areas (SPNA) are used as objects that perform the function of «*Connection with Nature*» in the city. In the territory adjacent to residential areas, these can be urban forests, national parks, gardens, coastal areas of water

⁵ SP 252.1325800.2016 Buildings of Preschool Educational Organizations. Design Rules; SP 251.1325800.2016 Buildings of Educational Institutions. Design Rules (with Amendment N 1); SP 279.1325800.2016 Buildings of Professional Educational Organizations. Design Rules; SP 278.1325800.2016 Buildings of Educational Institutions of Higher Education.

reservoirs as well as specially protected natural landscapes. SP (CII) 42.13330.2016 does not include a standard for the presence and parameters of protected areas within residential areas. However, while developing planning solutions for residential areas, the standards of clause 9.8 (see table 9.2) SP (CII) 42.13330.2016 should be adopted to determine the provision of green areas for public use in residential areas of different types of cities. The availability of natural landscaped objects is determined in accordance with clause 9.9. SP (CII) 42.13330.2016.

With the urban planning of residential areas, the recreational load on natural and landscaped objects increases. The load on a natural area can be calculated given the proximity of residential buildings to the natural area, road accessibility and the level of recreational attractiveness as well as the level of improvement and equipment of recreation areas. From this standpoint, it is suggested that e.g., the following into the composition of indicators of the favorableness of the urban environment are introduced:

- proportion of natural/green areas of common use in the total area of residential education (%) and the provision of the population with such territories (m^2/person) as well as
- recreational load (person/hectar) given the proximity to residential buildings, the level of recreational attractiveness, etc.

Using the indicator of recreational loads, landscape plans of the residential area can be developed, the analysis of which will allow one to examine the spatial localization of loads, assess their admissibility and come up with the recommendations for organizing the planning structure of the territory designed to improve the environmental state and increase the recreational capacity of natural areas.

According to the indicators of this group, it is advisable that urban planning zoning of the territory of residential areas is performed in order to highlight the most considerable recreational formations which can be three groups of objects: 1) objects to ensure the recreational function of the house and the adjacent territory (greening of roofs of buildings, the use of vertical landscaping of facades, lawns); 2) objects to ensure the recreational function of the quarter (gardens, squares and boulevards); 3) objects to ensure the recreational function of the city (forests, parks).

To evaluate design solutions for residential areas (quarters, microdistricts, districts) in compliance with SP (CII) 42.13330.2016 2016 «Urban Planning. Planning and Development of Urban and Rural Settlements» the following elements have been identified and systematized as part of the seven functions of the city (Table 1).

Table 1

Block 3. Indicators for assessing the urban functions

Urban function	Component of an urban function	Indicators
Φ_1 : Life Support	«C ₁ ^{Φ_1} — residential buildings»	«Level of comfort of the premises» «Level of personal accessibility housing» «Level of comfort of living on the territory»
	«C ₂ ^{Φ_1} — Institutions, organizations, service enterprises	«Level of provision with objects of primary/daily service» «Level of accessibility by primary/daily service facilities»
	«C ₃ ^{Φ_1} — Engineering training and territory protection»	«Level of engineering protection of the territory and the level of environmental security»
	«C ₄ ^{Φ_1} — Transport and road network. Road transport enterprises: service stations and gas stations»	«Level of provision of transport and engineering infrastructure facilities» «Level of territorial accessibility of transport infrastructure objects»
	«C ₅ ^{Φ_1} — Engineering networks»	«Level of provision of engineering infrastructure»
	«C ₆ ^{Φ_1} — Improvement»	«Improvement level»: <ul style="list-style-type: none"> – number of parking lots per apartment – level of greening of residential yards; – proportion of the insulated territory from the total area of the district / microdistrict; – proportion of residential buildings with insufficient insulation of apartments in the total area of the district's housing stock; – proportion of playgrounds in the total area of the design site; the proportion of playgrounds for adults and the elderly in the total area of the design site; – proportion of sports grounds in the total area of the design site; – proportion of dog walking areas in the total area of the design site
	«C ₇ ^{Φ_1} — Waste handling»	«Waste handling level»: <ul style="list-style-type: none"> – the number of removed MSW per capita
Φ_2 : Entertainment and Leisure	«C ₈ ^{Φ_1} — Mini-productions that do not have a harmful effect on the environment outside the established boundaries of the sites of these objects»	«Level provision of mini-productions» «Level availability of mini-productions»
	«C ₁ ^{Φ_2} — Institutions, organizations, service enterprises»	«Level of provision with objects that are part of cultural and art institutions (cinemas, museums, etc.), objects that are part of the group of catering enterprises (cafes, restaurants), sports institutions as well as other recreation institutions»; «Level of accessibility of objects entertainment and recreation»
	«C ₂ ^{Φ_2} — Sporting structures	«Level of provision» «Level of accessibility»
	«C ₃ ^{Φ_2} — Areas of public short-term entertainment»	«Level of provision» «Level of accessibility»
	«C ₄ ^{Φ_2} — Areas of resort recreation»	«Level of provision» «Level of accessibility»

Enf of the Table 1

Urban function	Component of an urban function	Indicators
Φ_3 : Power	«C ₁ ³ — Public and business facilities»	«Level of provision of organizations and management institutions, courts, notary offices, police stations»; «Level of accessibility of organizations and management institutions, courts, notary offices, police stations»
	«C ₂ ³ — Financial and business institutions»	«Level of provision» «Level of accessibility»
Φ_4 : Mercy	«C ₁ ⁴ — Mercy objects»	«Level of accessibility»
	«C ₂ ⁴ — Ensuring livelihood and spatial accessibility for groups with limited mobility	«Level of provision with medical facilities, institutions of the social security system as well as facilities of the infrastructure for groups with limited mobility; proportion of special dwellings for veterans and invalids of the total number of residential units (%); level of accessibility of medical facilities, institutions of the social security system as well as the level of personal accessibility of infrastructure facilities of groups with limited mobility»
Φ_5 : Knowledge	«C ₁ ⁵ — Objects of preschool, secondary vocational and higher professional education»	«Level of provision with objects of upbringing and education (preschool institutions, general education schools and objects of other levels related to education) as well as libraries level of accessibility of upbringing and education facilities (preschool institutions, general education schools and facilities of other levels related to education) as well as libraries»
	«C ₂ ⁵ — Public libraries»	
Φ_6 : Creativity	«C ₁ ⁶ — Additional education institutions»	Level of provision with objects related to out-of-school institutions; level of provision of institutions related to cultural and art institutions; level of accessibility of objects related to out-of-school institutions; level of accessibility of institutions related to cultural and art institutions
	«C ₂ ⁶ — Research and invention organizations»	«Level of provision» «Level of accessibility»
	«C ₃ ⁶ — Museums, theatres, exhibitions»	«Level of provision» «Level of accessibility»
Φ_7 : Connection with Nature	«C ₁ ⁷ — Recreational facilities, recreational and environmental purposes: natural and artificial natural landscapes and recreation areas»	«Proportion of green areas of common use»; «Level of provision with green areas of common use»; «Level of accessibility of landscaped common areas»; «Recreational load level»
	«C ₂ ⁷ — Natural conservation zones»	«Level of provision» «Level of accessibility»

Hence the suggested methodology for assessing the compliance of design solutions in residential areas with the regulatory requirements for the urban functions entails the following stages.

- 1) Allocation of components in the city functions — an element or a group of objects of the i -th function of the city necessary for its implementation and serving to cater for the population's rational needs.

The analysis of the building structure showed that the project gave preference to residential buildings and commercial real estate: according to the proposed solution, 35 residential buildings are planned with the total area of apartments of 335.000 m² (Fig. 2). 63 % of the total area of the land plot is allocated for the development of real estate objects, 22 % for the area of green spaces and the recreation area, and 15 % for the transport infrastructure. To cater for the needs of the population of the microdistrict for socially significant objects, the project provides for the construction of preschool institutions and schools, a sports complex, a polyclinic for 750 visits per day.

Fig. 2. 3D-plan of Microdistrict «Zarechensky»

The level of favorableness of the living environment of Microdistrict Zarechensky was identified according to the developed and above algorithm for assessing the provision of urban functions and the methodology for the formation of the urban environment quality index⁶ developed by Strelka KB by calculating and assigning the corresponding integrated index.

The comparative analysis of the calculated values showed that the level of environmental friendliness revealed by the above Methodology was 68%, and the same indicator according to the estimated algorithm for the provision of the urban functions was only 48% (Table 2).

Table 2

Ratio of the values of the level of favorableness of the urban environment for Microdistrict «Zarechensky» in the city of Oryol

Urban functions	Improvement level, %	
	According to the algorithm for assessing security urban functions	According to the Assessment Method urban environment index (points)
Spatial-territorial support assessment unit		
Population density	-	100 (8)
Construction coefficient K_1	-	100 (8)
Construction density coefficient K_2	-	100 (8)

⁶ Decree of the Government of the Russian Federation of March 23, 2019 No. 510-r "Methodology for the Formation of the Urban Environment Quality Index" (as amended on December 30, 2020).

End of the Table 2

Urban functions	Improvement level, %	
	According to the algorithm for assessing security urban functions	According to the Assessment Method urban environment index (points)
Assessment unit for structural planning and architectural organization		
The level of development of public and business infrastructure	-	70 (7)
Proportion of public and business infrastructure	-	35 (6)
Density of the road network	-	100 (8)
Proportion of pedestrianized spaces	-	14.6 (5)
Accessibility of public transportation	-	100 (8)
Diversity of construction	-	21 (6)
Proportion of green areas	-	21.1 (6)
Assessment unit for provision of the urban functions		
Φ1: Life Support	81	68 (185)
Φ2: Entertainment and Leisure	58	70 (42)
Φ3: Power	44	57 (23)
Φ4: Mercy	12	66 (20)
Φ5: Knowledge	36	64 (32)
Φ6: Creativity	33	70 (21)
Φ7: Connection with Nature	55	70 (21)
Total in the block (average percentage / total of points):	45.6 %	67.5 % (344 points)
Total	46 %	68 % (414 points)

Urban planning analysis of the territory, including assessments of spatial and territorial support, structural, planning and architectural organization and provision of urban functions, shows how the urban environment caters for the citizens' needs and what changes have to be made to achieve not only the quality of the material environment of life, but also multi-faceted human development. It is obvious that the methodology of forming the index for assessing the urban environment index designed to determine the quality level of the urban environment of cities does not completely reflect the citizens' needs and the mechanism for catering for them.

5. Social welfare of the population. An urban environment can be considered not only favorable, but also comfortable if it implements physical safety conditions (Position 1 of the paradigm of biosphere compatibility), caters for material needs for all categories of the urban population (Position 3) and forms social relations of conflict-free coexistence within the city and with the natural environment surrounding the city (Regulation 4) all at a time [9]. Thus an important element of assessing the living environment within the framework of the Provisions and Principles of the Paradigm of Biosphere Compatibility is the assessment of the social well-being of the citizens' lives.

The following groups of indicators can be attributed to the group of factors of social well-being/disadvantage: *demography; education and culture; quality of life; morbidity; offenses;*

family, motherhood and childhood; older generation. The choice of factors affecting the examined indicators of a comfortable and safe environment for the city's life is made based on a meaningful analysis of environmental, socio-economic and demographic conditions and processes as well as regulatory requirements for urban planning of residential areas. This list of factors corresponds to the paradigm of a biosphere-compatible city as the city and its infrastructure primarily serve social functions, and every citizen of this country is entitled to a favorable living environment. As statistical practice shows, the most realistically estimated, well traceable are socio-demographic indicators, the most important of which are, e.g., the birth rate, mortality rate, the number of marriages/divorces; incidence rate.

In the process of analyzing urban planning activities and project documentation of residential neighborhoods as well as data from statistical reporting of cities, new indicators of the state of residential areas can be set forth, e.g., the index of happiness which reflects the so-called "well-being" of society. So, e.g., in Innopolis, one of the three science cities in the Russian Federation, sociologists indicate the proportions of positive and negative responses of the respondents and then compile ratings of happiness. On the one hand, this is merely an abstract characteristic, but on the other, it can be used as urban planning analytics to assess the comfort of the living environment.

Conclusions. Therefore the approach set forth by the authors to the development of the project methodology of territorial planning and urban planning relying on the principles of the paradigm of biosphere compatibility makes it possible to expand traditional urban planning indicators by including in the foundation of the general planning of cities, rural settlements and settlement systems as well as planning and development (reconstruction) of territories of various assignment by the hierarchy of functions of the city.

Having been able to keep the methodology of the urban planning design that has formed to date and the methods of urban ecology used in urban planning practice consistent, we should consider the paradigm of biosphere compatibility and its position, first of all, as an urban planning set of tools for analyzing the internal stability and well-being of the urban environment designing conditions for human development. To this end, the developed provisions of the paradigm of biosphere compatibility establish that urban planning and architectural planning solutions should be developed in view of the new methods for describing the state of planning units and introducing appropriate calculated indicators for quantitative assessment of the provision of urban functions of residential areas. The proposals for assessing social well-being for the purposes of a comfortable urban environment are hugely innovative.

The experimental calculations performed for assessing the options for design solutions at the level of planning projects for residential quarters prove the promising and social orientation of the developed methodology of urban planning in designing vital conditions and conditions for the comprehensive human development.

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