

*Short Reports***SYNERGETICS IN ARCHITECTURE  
AND TOWN PLANNING.  
INNOVATIVE ASPECTS**<sup>1</sup>Kremlev A.G., <sup>2</sup>Babich V.N.<sup>1</sup>*Ural Federal University, e-mail: kremlev001@mail.ru;*<sup>2</sup>*Ural State Academy of Architecture and Arts*

Innovative development of the economics in the conditions of information saturation (of knowledge, know-how, applied methods and technologies, used materials) and in the conditions of globality of communication opportunities (multiplicity and availability of information sources, an international innovations transfer and usage, hi-tech productions, intellectual products) cause radical (fundamental) changes in the architectural and town-planning sphere (new concepts and styles, purposes and tasks, ways and realization methods).

The continuous stream of innovations changes consumer inquiries, forms qualitatively different social inquiry, defines the basic directions of architectural creativity and urban policy. The perception of the modern city (megalopolis) in its spatial development as an elaborate socially-technical system irreversibly occurs from a position “a form – a movement” (change of a form, structural transformations, modernization of the intersystem providing processes) and is estimated as a result of an architectural and social co-evolution. The principles of the organization of co-evolution development of an urban environment of the megalopolis (as an elaborate system) are defined by systemacity, dynamism and self-organization [1].

Systemacity of an complex organized object is characterized by coherence, interdependence, interaction of its elements and components and appears through such system concepts as composition (elements, communications), structure (morphology, order), subsystem (components, units of system hierarchy), environment (a dichotomy “system – a system environment”), procedural invariants (life period, transition unit, a temporary condition), determination of system properties and processes (functional properties and relations, development and functioning processes) etc. [2].

Thus a system approach to the research of co-evolution development of an urban environment of the megalopolis (as a socially-technical system) means identification of mechanisms of establishment of coherent relation and mutual coordination of parameters of evolution of all components of the subsystems representing the population, production, economy and finance, transport, trade, culture and education and other spheres, in the conditions of an external environment (interchange with social and natural environment) which influence is also multi-vectorial, diversified (noncoplanar), has non-linear character, non-commutative and as a whole isn't associative. The multiple layers of an urban

environment are defined by polyfunctionality of the urbanized territory and are perceived systemically, being reflected in an image shape of the city.

The development of the city as a socially-technical system (dynamics, an orientation, an attractor – is a limit in time and steady phase condition) is caused by the balance of external environmental influences and internal inquiries (and opportunities). The potential (as the real ability) of the city development has to be purposefully used (realized) that assumes a search and development of the complex town-planning decision (modeling of the city space as a whole and in parts, in various layers of city infrastructure). The local centers of the urban environment development (individual building, trade and entertaining points, the services enterprises, etc.) supplement the city infrastructure, locally fill up an urban area, forming zones of compromise space [3]. They also form an urban environment (as the self-organization elements), influence the social and economic climate of an urban area. Their appearance is predictable in some measure, but an architectural and art representation is original (often nonprofessional, not expressive, not esthetical), and has to be regulated administratively (that is again lay in the context of the scheme of complex modeling). It indicates again the need of system approach to the research of the urban environment development problems.

The complex system has various stages in its development. Its structure, organization model (communications and relations), hierarchy are directly connected with the system evolution, with movement degree to the aggravation moment (a crisis point of the development trajectory – a bifurcation point). Besides the coherence (coherence in time) of interconnected (in complete, elaborate system) components (separate parts and elements, different hierarchical levels) takes place, besides a transformation of parameters of functioning system happens, the role of some parameters is intensified (they accept the dominating value), of others – is weakened. It causes the changes of the system properties and macroscopic behavior of the system. Reorganization of the internal organization of the system (structure, communications, functions, hierarchy) or self-organization take place, as well as reorganization of external (functional) qualities and above-system relations (structural communications with the environment). The process of the system self-organization is defined by transition to new, rather steady dynamic state in the conditions of nonstationarity of the environment and openness of the system itself which provide a continuous resources exchange (of energy, substance, information) with the environment.

Synergetic approach to the consideration of the modern city defines it as a dissipative system, as a complex, open and non-equilibrium structure which is affected by multidirectional streams (of various

nature) of the environment and internal processes of structural transformations. Non-equilibrium systems are characterized by special conditions – points (zones) of bifurcation where the natural (determined) process is broken, and a possibility of fundamental uncertainty of further system behavior appears [4].

Dynamics of the city depends on arriving resources, their volumes, frequency, target orientation, and also possibility of their rational consumption. A city structure formation can happen irregularly (selectivity of its separate objects), depending on stimulating factors and administrative decisions. Not only economic (material, financial) levers can stimulate, but also natural, social, historical and other essential circumstances.

As a result of changes of existence conditions of a system (new factors and/or transition of some former factors influencing its functioning and development in the status of defining ones) the values of any local system parameters (structural and quantitative) deviate the average values (on concrete time interval) – there are appeared new fluctuations which interact with the existing ones. Domination of any fluctuation leads to transformation of the general (system) structure. Besides it is possible to operate an appearance and development of necessary fluctuations by regulating an intensity (direction) of resource streams. However there are exist (uncontrollably arisen) the natural (spontaneous) fluctuations, which are capable to weaken (to limit) the actions of operated fluctuations that leads to non-predictable situations. The trajectory of the city development has bifurcation zones, which help the system to change an extreme condition – an attractor defining the new direction in development.

The architectural system considered from an object and process position, uniting an architectural activity result and realization process (from the project development to its introduction, implementation), is the object of management, i.e. of the impact directed on artificial transformation of this object. Thus, architectural and town-planning activity concerning a concrete object of an urban environment is carried out within administratively accepted development plan and/or reconstruction of city space. Besides the control object is developed as well by natural laws (independent of administrative activity): the changes of external form, of the infrastructure elements, landscape take place, and not only of local character, but also of regional one (in larger territories). Therefore it is necessary first of all to consider the object as a natural system, to define tendencies of its natural development, to make the forecast of such development. After that to consider the object as artificial system – as a result of purposeful activity that will demand to make its project (model), to estimate a degree of deviations from a predicted condition (in case of natural development), to develop the management program, choosing operating parameters (significant from the point of view of the project) with an estimation of

their influence on transformation process, to define methods and program implementers.

Architectural and town-planning management has to be carried out in a resonance with immanent tendencies of the city system development.

Synergetic approach to the idea of city system (megalopolis) as actively developing dissipative system, self-organizing and evolving (coexisting and interacting to environment – social and natural) takes place in the field of the innovations defining the appearance of the various probable alternatives of development (with irreversibility of changes, acceleration of reorganization processes, diversification).

It is possible to characterize innovative aspects of architectural activity through innovation of means (methods, technologies) of the architectural and town-planning design, innovation of means (methods, technologies) implementation of such project, through innovation of the architectural activity object, urban environment, town planning process.

Specification of the presented innovative groups reflects the current scientific and technical level of society development, the degree of distribution of innovative activity in the architectural and construction sphere in its various manifestations, covering all stages of architectural and construction process. Besides the theoretical researches and developmental works directed on the solution of the arising conceptual or current tasks (during practical realization) can be also performed: choice and usage of innovative materials, designs, equipment, construction technologies; technical and economic foundations of the project (including carrying out various expertise); IT-based mathematical modeling, including geometrization of architectural forms (architectural space), parametrization of a designed project, optimization of a model choice on the basis of a multicriteria assessment; and also the actions directed on the solution of organizational, administrative, financial, labor, legal and other problems of social and economic character.

Innovation of the architectural activity object, urban environment, town-planning process includes not only new forms, new architectural concepts, new purpose, but also arising opportunities transformed depending on today's (also tomorrow's) tasks allowing to satisfy arising society requirements in time and effectively.

#### References

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