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# MODELING OF AN EFFECTIVE DYNAMIC SYSTEM "PUBLIC SPACE – STATE"

*The article is devoted to the study of a dynamic system "public space – state", its elements and properties. The analysis of the dependence of the dynamic system "public space – state" on the chosen strategic goal of formation and use of public spaces, tactical goals of interaction, as well as operational tasks and a set of means to achieve the goal has been conducted. The main blocks of modeling the effective dynamic system "public space – state", the effects of the formation and use of public spaces have been identified, namely: socio-economic, environmental and reputational effects. It is emphasized that the most important criterion for achieving the efficiency of a dynamic system "public space – state" is the ability of representatives of different sectors to cooperate.*

***Keywords:*** *public space, state, dynamic system, stakeholders, modeling parameters.*

**Formulation of the problem in general.** Modeling of processes occurring in dynamic socio-economic systems actualizes issues related to the nature and properties of such systems, as well as evaluation methods and development models. A dynamic system that is influenced by external and internal factors and changes its state over time is considered as "a set of interacting components in which the processes that take place are determined by the initial states of their components, the relationships between them and the influences added to the system" [10, p. 147]. Accordingly, modern dynamic systems are characterized by a

certain state and directions of movement, as well as an increase in the number of bifurcations [14, p. 86].

Meanwhile, changes in the administrative-territorial structure of the country, strengthening of decentralization processes with appropriate distribution of powers between levels of government, changes in national, regional and sectoral development priorities altogether have a significant impact on the formation and use of public spaces and the dynamic system "public space – the state".

**The purpose of the article.** The article is devoted to consideration of theoretical approaches and modeling of an effective dynamic system "public space – state".

**Analysis of recent research and publications, which initiated the solution of this problem, the selection of previously unsolved parts of the overall problem.** Studies of the city as a dynamic system were detailed by experts in various fields. V.G. Voronkova considered the development of the system "public space – state" through the characteristics of a number of features, namely: multivariate and alternative evolution; the possibility of choosing its optimal ways; the possibility of accelerating the pace of development, in particular, initiation of accelerated nonlinear growth; the impact of each individual on macro processes [3]. V.A. Kadiievskyi emphasized that the functioning of the system is closely related to continuous changes, the accumulation of which leads to further development of the system [6]. However, scientists' considerable attention in substantiating the potential of self-development system is paid to economic self-development that can be achieved through the distribution funding sources (between local and state budgets), as well as enhancing the use of financing (lease of communal property, sale of idle assets, etc.) [5].

**Presentation of the main material of the study with a full justification of the obtained scientific results.** Dynamic system of "public space – state" is seen as a set of elements that are isolated from the environment and interact with it and with each other, endowed with properties, as well as criteria for assessing the effectiveness of interaction.

The two main elements of a dynamic system are public space and the state, which simultaneously acts as a set of ready-to-interact public authorities and local governments, as well as a society that benefits from the functioning of public spaces. The properties of the dynamic system "public space – state" are emergence, openness, nonlinearity, continuity of functioning, ability to self-development, complexity, purposefulness, adaptability, lability

Thus, emergence reflects the ability of heterogeneous interconnected elements of the system "public space – state" to function together, making the process of functioning of a holistic system, as well as generating qualitatively new functional properties of the system that have no analogues in the properties of its elements. Accordingly, it is impossible to reduce the properties of the system to a simple sum of the properties of its elements [6, p. 8]. Emergence in the system of public administration is considered from the standpoint of distribution of powers between levels and public authorities, changes in functional and structural relationships, which provides "the ability and capacity to change their own internal structure, reformatting themselves" [8, p. 154]. Accordingly, "if it is necessary to respond to changes, the system of public administration directs its influence on the environment, and the system of local government forms the latest elements, modifies existing ones within its own system or changes structural, functional relationships between elements" [8, with. 154]. Therefore, the emergence of a dynamic system of "public space – state" provides an effective distribution of powers, responsibility and resources needed to realize the potential of public spaces. The ability to transform existing types of resources, in particular intangible into tangible, is important.

The openness of the dynamic system "public space – the state" is manifested in its focus "on the whole indivisible world, its global problems, awareness of the priority of universal values over group and class" [15, p. 80] Accordingly, the development of the system is ensured by readiness to establish a cross-sectoral dialogue based on values, promoting the integration of marginalized groups into society, the ability to apply new technologies, methods

and management mechanisms. Thus, public spaces can be considered as a result of the interaction of "residents (society), who have a certain set of needs that must be met; technosphere – artifacts, knowledge and skills designed to meet the needs of society; ecosphere – an environment that provides resources and recycles waste that arises in the process of meeting the needs of society" [4, p. 108]. So permanent changes taking place in society require the transformation and modernization of social institutions, improvement of mechanisms of self-organization and communication.

The nonlinearity of the development of the system "public space – state" is characterized by a number of features, namely: "multivariate and alternative evolution; the ability to choose its optimal ways; the possibility of accelerating the pace of development, in particular, the initiation of accelerated nonlinear growth; the influence of each individual on macrosocial processes; inadmissibility of imposing ways of development on social systems; the course of social processes under uncertainty and instability; irreversibility of development; evolution and integrity of the world" [3, p. 37]. Thus, the ratio of irregularity and regularity, proportionality and asymmetry have a significant impact on the development of the system. Accordingly, the properties and parameters of a dynamic system depend on both the current state of the system itself and the state of the environment, because human behavior is not clearly determined and has signs of spontaneity. At the same time, the patterns of public evaluation of behavior, values and thinking, the areas of public space, the volume and structure of resources involved, the intensity of the processes of disorganization, disintegration and rejection in society are constantly changing.

The continuity of the system "public space – the state" reflects the ability of the system to exist in case of certain socio-economic and other processes in society, which cannot be stopped or interrupted, otherwise the system will cease to function. At the same time, the functioning of the system is closely related to continuous changes, the accumulation of which leads to further development of the system [6, p. 9]. Therefore, the focus on long-term development of a dynamic system allows

you to build effective mechanisms for interaction and cooperation of system elements.

The ability to self-development of the system "public space – state" arises as a result of a continuous process of emergence and resolution of contradictions, and also leads to an increase in the internal diversity of the system [6, p. 9]. As a result of the functioning of public spaces, as a synergetic effect of a set of activities and participants involved, there is a change in consciousness, values and behavior of people. This contributes to changes in the system itself. At the same time, scientists pay considerable attention to economic self-development, which "can be provided by distribution of funding sources (between local and state budget), as well as intensifying the use of underutilized funding sources (lease of communal property, sale of unused assets, etc.)" [5, p. 230]. It is accepted to identify two types of potential of self-development of system: basic potential (available and hidden abilities of system), accumulating potential (ability to use basic potential effectively on the basis of formation of steady competitive advantages of the highest order) [7, p. 18]. Thus, the ability of the dynamic system "public space – state" to self-development is hampered by corruption and bureaucracy, growing arbitrariness and irresponsibility of civil servants, unethical behavior of other sectors, low competence of professionals involved in the formation and use of public spaces, lack of city resources (financial, economic, human, natural, etc.).

The complexity of the dynamic system "public space – state" is manifested through a significant number of heterogeneous elements and relationships, multistructural, multifunctional, multi-criteria, multivariate development, as well as system properties [6, p. 10]. The elements of the system are public authorities and local governments, public organizations, public and private enterprises, institutions and organizations involved in the design, construction, commissioning, use of public spaces, monitoring the effectiveness of their use, as well as individual residents and guests of the city, and their associations. A significant number of elements of the system and the diversity of relations between them changes over

time in quantitative and qualitative characteristics. Accordingly, the development of the system requires the optimization of elements, structures and institutions.

The purposefulness of the dynamic system "public space – state" reflects the presence of a definite goal and the desire to achieve it [6, p. 10], and is also based on the understanding of public administration on the basis of purposeful activity of the state "to create legal, economic and social prerequisites necessary for the most effective functioning of the market mechanism and minimization of its negative consequences" [11, p. 2]. Accordingly, the state of the dynamic system depends on the chosen strategic goal of formation and use of public spaces, tactical goals of interaction, as well as operational tasks and a set of means to achieve the goal. Purposefulness also requires understanding, agreement and comparison of values and norms of interaction of all participants.

The efficiency and stability of the dynamic system "public space – state" depends on the mechanisms of adaptation: passive adaptation (internal possibilities of system self-regulation), and active adaptation (external mechanisms of adaptive system management) [6, p. 10-11]. The ability to adapt is manifested in the flexibility of "the decision-making process according to specific conditions" [1, p. 28], understanding the need to adapt "to changes in the political situation, bringing its functionality in line with the main priorities of public policy, which are reflected in political decisions, improvement of the interaction of public administration with the political leadership, avoiding or reducing conflict between them, etc." [1, p. 125], the ability to recognize the importance of changes in public consciousness, as well as communication and behavioral technologies to assess these changes [1, p. 157]. Adaptation is also considered "as a set of techniques that allow the system to adapt to new conditions of development" [2, p. 8]. Thus, adaptation reflects the process of mutual adaptation within and outside the dynamic system.

The lability of a dynamic system reflects the mobility of the elements functions that can ensure the stability of the system structure as a whole [6, p. 11]. That is, the lability of the system "public space – the state" is an important

parameter of its evolutionary prospects. There are two aspects of lability: quantitative aspect (mobility, dynamism, timeliness of system reactions), qualitative aspect (adequacy of changes in system parameters to the current needs of its operation and development) [12, p. 53-54]. Accordingly, a necessary condition for ensuring the lability of the system is the ability to collect, systematize and analyze information, as well as to make appropriate management decisions.

Depending on the purpose of modeling the following parameters of the dynamic system "public space – state" can be considered:

– the level of activity and involvement of the city community;

– the level of transparency of government;

– the level of social exclusion in the city;

– the level of social responsibility in society (of both individual citizens and representatives of business and government);

– the level of intersectoral cooperation in the city;

– potential of the city (natural-climatic, financial-economic, human, tourist, etc.);

– level and quality of life of the population.

Modeling of an effective dynamic system "public space – state" can be divided into three main blocks:

1) theoretical and methodological block is responsible for developing the basics of the concept and modeling of interaction within the dynamic system "public space – state": analysis of areas of interaction, justification of criteria and parameters for assessing the effectiveness of interaction, development of restrictions and risks;

2) the empirical block is responsible for collecting factual data obtained through experiments and observations, as well as the systematization of analytical information necessary for management decisions;

3) management block: justification of dynamic system development models depending on the stage of its life cycle, development of mechanisms of adaptation of dynamic processes of public space functioning within the system "public space

– state", development of the most effective scenarios of dynamic system "public space – state", forecasting the consequences of interaction.

The functioning of the dynamic system "public space – state" brings a number of socio-economic, environmental and reputational effects. Thus, the socio-economic effect of the formation and use of public spaces is manifested in strengthening community cohesion, creating opportunities for innovative and creative potential of residents and guests of the city, increasing the number and variety of creative, sports, educational and other activities, increasing the number of residents and guests who visit public space objects, restoration and development of infrastructure, increase of a share of incomes from rendering of additional paid services in the territory of objects of public space, increase of economic activity of inhabitants of the city; creating conditions for attracting extra-budgetary sources of funding for the development of public spaces.

Ecological effects of the dynamic system "public space – state" reflect the state and dynamics of environmental pollution, the cost of ecological consequences of the formation and use of public spaces, the current system of environmental measures, compliance with environmental norms and standards. Scientists emphasize the urgent need for greening of cities, the main components of which are: "the development of renewable energy within the city, namely wind, solar, geothermal etc., depending on the natural conditions of the territory; construction of energy efficient buildings that consume a minimum of electricity and heat; reduction of the need for road transport due to optimal planning of the territory, development of bicycle transport, as well as clear operation of public transport in the city; ensuring a high share of green areas in cities and the sustainability of natural systems and biodiversity within them; minimization of solid waste generation, ensuring their sorting and maximum deep processing" [9, p. 23]. Accordingly, public spaces are a unique tool for integrating the efforts of government, business and community in the direction of greening cities, as well as meeting the environmental needs of people.

A special place among the effects of the functioning of the dynamic system "public space – state" is devoted to reputational effects, which are little studied in theory and insufficiently taken into account in practice in public administration and local government during the decision-making process. The main reputational effects are: strengthening trust in the urban environment (especially to government, business and community), establishing long-term cooperation, promoting sustainable development of the city, creating a strong city brand, increasing the loyalty of residents and guests by creating favorable conditions for entrepreneurial activity, investing, realization of creative and sports potential, rest and diversified development.

Considerable attention should be paid to the issue of achieving reputational effects of the functioning of a dynamic system " public space – state". The reputation of public space, city and state is "a dynamic characteristic that is formed over a long period of time among external and internal stakeholders based on reliable information about the country and experience of personal interaction within it (comfort of living, trust and authority of public authorities, security, safety, favorable conditions for doing business, etc.). The category of reputation includes both value beliefs about the country and a set of opportunities, guarantees and expectations for the realization of significant interests by different groups of stakeholders" [13, p. 65]

**Conclusions.** Based on the conducted research it is possible to give the following recommendations concerning complex improvement of public spaces of the big city. Thus, at the city level, the following aspects are important for the implementation of public space development policy:

– creation of the general concept of development of public spaces of the city;

– involvement of local residents in the process of creating and improving public spaces;

– ensuring the comfort of public spaces of the city for all road users with priority for pedestrians and public transport;

– improving the quality and functional diversity of public spaces in the city;

– ensuring the accessibility of the communication structure of public spaces for disabled people;

– improving the image of the peripheral areas of the city through the stylistic unity of the elements of public space;

– increasing the importance of park areas in the system of public spaces of the city;

– regular citywide events in various public spaces of the city;

– preservation and revitalization of the historical and cultural environment as the basis of visual appeal and identity of public spaces of the historic city center;

– inclusion of various elements that create prerequisites for active use of public spaces;

– creation of "green" routes that promote an active lifestyle (walking, doinf sports, games);

– use of the potential of the courtyards adjacent to the central streets of the city;

– inclusion of modern innovations in existing public spaces;

– creating conditions for the use of space in different weather conditions.

Meanwhile, achieving the efficiency of a dynamic system "public space – state" requires the delimitation of spheres of authority and responsibility between all participants in the system. Thus, the main task of public authorities (the President of Ukraine, Verkhovna Rada of Ukraine, the Cabinet of Ministers of Ukraine, Ministry for Communities and Territories Development of Ukraine, regional state administrations, etc.) is the effective formation of a common policy of territorial development. When local governments are responsible for achieving the outlined goals, taking into account the potential of the territory, as well as the specific needs of its development. Civil society institutions represent the interests of different groups, social needs and values, monitor and assess the degree of compliance of adopted strategies and development programs of the territories to the needs of their inhabitants. They act as partners in the formation and use of public spaces. Business environment institutions have the powerful material,

technical, technological and human resources needed to provide services to other sectors. However, the most important criterion for achieving the efficiency of a dynamic system "public space – state" is the ability of representatives of different sectors to cooperate.

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