Principles of Ecological Settlement in the Zone of Influence of a Unique Natural Complex on the Example of the Volgograd Agglomeration

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Abstract. The classical town-planning concepts of "surface" and "framework" entered into the theory of town planning by Lezhava and Gutnov group's and concept of biosphere unit - catchment basin of the Volga River are the cornerstone of author's technique. The essence of ecologically reasonable territorial development of town-planning structures in system of the Volga-Ahtyba floodplain consists in achievement of mutually consistent space interaction by them by its purposeful modeling of parameters and structure of development based on the general patterns. Community of territorial localization of two systems: resettlement and natural habitat, and the content of results of planning formalization of process of their interaction, allowed revealing uniform territorial space complex. The purpose of scientific reasonable transformation of the interactions existing in territorial space complex is formation on its basis of urban environmental framework of the territory. The offered framework represents model of ecologically reasonable development of planning structures in catchment area of the Volga-Ahtyba floodplain. Space borders of urban environmental framework match contour of component of biosphere complex - territories of reservoir of the Volga-Ahtyba floodplain in which system uniform patterns of territorial and space interactions are carried out. For implementation of process of purposeful modeling of territorial and space interactions of natural and planning systems in structure of urban environmental framework the principle of identification of component structure, uniform for both systems, is entered. The following planning categories are marked out: a) "framework" - dominance of linear parameters for space forms of localization in structure of urban environmental framework; b) "surface" - dominance is compact - plane forms of space localization.

1. Introduction

Interaction of the human and the environment represents is a continuous process of purposeful transformation of natural habitat by basic impossibility of its stop. Modeling of condition of "ecological balance" is connected with possibility of regulation of biosphere resources in the course of town-planning development.

The idea of complex consideration of specific regional structure of resettlement in interrelation with natural complex found the reflection in the concept territorial natural - anthropogenic complex in which structure achievement of ecological balance is possible [1,2]. The offer on formation of self-
sufficient territorial natural anthropogenic complex as subject to town-planning design is based on identification of primary biosphere self-sufficient complex [3]. Implementation of this condition is possible in system of biosphere complex, one of which is the Volga basin [4]. Planning formalization of process of interaction of structure of regional framework of resettlement in system of bio-spherical complex was realized in technique of the basin approach. Adaptation of theoretical model territorial natural - anthropogenic complex to biosphere complex of the Volga basin allowed creating model of urban environmental framework of the Volga region based on basin type of development [5].

2. Main part
The territory of the Volga-Ahtyba floodplain is local component of the Volga basin. Features of distribution of resource potential of natural complexes in system of the territory of the area caused irregularity of resettlement and predetermined actually total development of the most useful natural component - inundated complex. Long existence of framework of resettlement stimulated emergence of tendencies of degradation of complex resource and biosphere potential owing to local changes in structure of planning components in the territorial plan.

1. The structure of anthropogenic framework is characterized by the following contents: the landscape dependence of structure of land invasion caused by space localization of resources in structure of the territory floodplain & town-planning land invasion is localized in system of floodplain territories, spatially matching catchment basin of the Volga-Ahtyba floodplain. The Volgograd agglomeration represents the following set of settlements now: the center of agglomeration (Volgograd and Volzhskiy); the residential suburb (zone of direct influence) created by settlements of the settlement in zone 1.5 of hour transport availability; external zone (zone of the creating influence) with settlements in zone of 2-hour transport availability. The natural framework of the Volgograd agglomeration represents multi-level territorially - space system: elements of gardening of urban development of Volgograd and Volzhskiy, structural elements of gardening articulated gully structural (extent of space distribution within the city reaches 30% of all territories) and riverbeds. Space form of localization of these components - linear, vulgar, cross - directed to urban development. The structure of natural components of residential suburb of agglomeration included the natural complexes located in steppe part (it is consecutive from the North on the South): page natural sanctuaries. Steppe wildlife reserves of natural (three areas) - Voronovsky, Tsarinsky and Kamensk; hunting reserve - "Kamensk" and the water protection zones of the small rivers. The most valuable component of residential suburb is the northern segment of Volga - Ahtyba floodplain and the island Sarpinsky. Placement of natural complexes in residential suburb it is presented by separate compact contours. Features of distribution of natural components in planning structure of the Volgograd agglomeration caused its ecological dependence on ecosystem of inundated complex.

The classical town-planning concepts of "surface" and "framework" entered into the theory of town planning by group Lezhava and Gutnov are the cornerstone of author's technique. In technique the content of ecologically reasonable territorial development of framework of the resettlement placed in system of biosphere complex reveals: the planning method of modeling of process of the balanced interaction natural and planning territorial systems is offered [6,7].

2. The essence of ecologically reasonable territorial development of town-planning structures in system of the Volga-Ahtyba floodplain consists in achievement of mutually consistent space interaction by them by its purposeful modeling of parameters and structure of development based on the general patterns. Community of territorial localization of two systems: resettlement and natural habitat, and the content of results of planning formalization of process of their interaction, allowed revealing uniform territorial space complex. The purpose of scientific reasonable transformation of the existing territorial space interactions is formation on its basis of the urban environmental framework of the territory representing model of ecologically reasonable development of planning structures in catchment area of the Volga-Ahtyba floodplain. Space borders of urban environmental framework match contour of component of biosphere complex: the territory of reservoir of the Volga-Ahtyba floodplain in which system uniform patterns of territorial and space interactions are carried out. For
implementation of process of purposeful modeling of territorial and space interactions of natural and planning systems in structure of urban environmental framework the principle of identification of component structure, uniform for both systems, is entered. The method of detection of the contents and structure of the general patterns of interaction of planning categories "framework" and "surface" in structure urban environmental framework is based on the following provisions: target orientation of modeling of interactions; content of process of the interaction created by typology of component structure. The following planning categories are marked out: a) "framework" - dominance of linear parameters for space forms of localization in structure of urban environmental framework; b) "surface" - dominance is compact - plane forms of space localization.

3. At the level of structure of urban environmental framework, the purpose of modeling of process of interaction natural and systems of resettlement is preservation of ecological stability of the general ecosystem. Criterion "ecologically reasonable" interactions of natural system with resettlement is priority of the formalized territorial space interactions in natural system: transit and connectivity.

   Level of local planning components of structure of urban environmental framework also has dual process of modeling in which structure there is providing favorable conditions for development of components of system of resettlement as a part of urban environmental framework and preservation of stability of natural complex in the course of its development. The criterion of ecologically reasonable interaction of components of natural complex and planning structures is based on the differentiated approach to results of process: the analysis of natural components on degree of safety and their functional priority for planning structure and ecosystem of urban environmental framework. This model allowed to present process of interaction in the form of two ground forms: interactions of the same planning categories (for example: "natural framework - planning framework") and interactions of planning categories of different type (for example "natural framework - planning surface").

   Form of the territorial interaction of "frame" categories causing deformation of connectivity of natural components is "node" - result of cross interactions with human systems (transport, planning). Two types of "nodal" interactions, proceeding from the provision of "node" in structure of urban environmental complex are allocated: structural and local. The functional maintenance of "node" is formed by the following provisions: a) system - creates transit conditions when functioning natural components for maintenance ecological stability of all ecosystem of urban environmental framework; b) additional node: deformation of natural bonds in it does not lead to loss of stability of ecosystem of urban environmental framework.

   At the level of all structure of urban environmental framework "ecologically reasonable" interaction of frame categories is the existing longitudinal type of mutually placement of components of natural system and resettlement not causing deformation of conditions of transit of natural framework. Combination of contents and planning structure of process of territorial interaction defined the principle of longitudinal territorial placement.

   At the level of local planning components, the detailed structure of elements and structure of deformations of frame interactions is allocated. Correction of planning framework, proceeding from offered "ecologically reasonable" like mutually placement of frame components - the longitudinal direction is offered.

4. At the level of all structure of urban environmental framework "ecologically reasonable" interaction of categories - "surface" is the existing type of mutually placement of components of natural system and resettlement not causing deformation of conditions of connectivity of natural fillings - adjunction. Combination of contents and planning formalization defined the principle of border territorial development. At the level of local planning components, the possibility of modeling of process of mutually placement of "surfaces" is connected with studying of properties and microstructures of planning surface. Stability of space dimensions of components of planning structure of the city is the cornerstone of typology of microstructure: a) coarse modules - micro regional building (M1); b) medium modules – building by quarters (M 2); c) close-meshed modules – zone of the individual inhabited sector (M3). The impact exerted by them on natural surface in the course of interaction reflects both positive (impacts that increase the ecological potential of the natural
complex), and negative (impacts that lowers the ecological potential of the natural complex) influence. Qualitative values of impacts that increase the ecological potential of the natural complex of planning components reflect the sizes of natural component as a part of the corresponding module. Quantitative values of impacts that increase the ecological potential of the natural complex - result of mark assessment of structure of the deformations arising owing to formation and existence of the module. Combination of properties and structural features of these modules allowed entering their gradation characterizing influence of planning surface on natural: "rigid type" (block of houses and location) (M1, M 2), "soft type" (the build with an advanced stage of natural elements) (M3).

The analysis of balance combinations of "soft" and "rigid" planning types as a part of "planning surface" revealed three basic types with different potentials of transformation: a) proliferation of structure of components in contour of town-planning development (M1, M 2 > 60%); b) high-quality transformation of structure of components in development contour (M1,M 2 < 30%); c) components with limited potential of development (M3 < 30%). Correction of the existing development contour of "planning surface" assumes identification of complex planning zones: a) zone of preferential development of town-planning complex which structure is formed zone of external growth (M1, M 2 > 60%; M3 no more than 20%) and consolidations (M1, M 2 < 30%, M3 > 40%); b) zone of preferential development of natural complex (M3 < 30%). Content of results of interaction of planning categories of different type allowed developing structure of planning actions for implementation of correction of the revealed deformations. At the level of planning structure of the Volgograd agglomeration use of the following structure of planning methods is offered: a) "duplicative axes"; b) "shift of axes"; c) "the dismembered node"; and planning actions: system of planning gaps and "ecological seams" [8].

3. Conclusions

The principles of territorial development of planning structures in the Volga - Ahtyba floodplain, reflecting the content of ecologically reasonable territorial design in system of local biosphere component are offered.

1. At the level of all structure of urban environmental framework work out of ecological and reasonable planning structure:
   a) the principle of longitudinal placement corresponding to the existing practice of territorial design and which is characterized by lack of the width planning bonds in structure of the floodplain;
   b) the principle of border development determining as preferential the external growth of contour of town-planning land invasion;
   c) the principle of disperse development directed to formation of connectivity of the floodplain with its water-collecting territories on condition of preservation of planning gaps in "resettlement strip";
   d) the principle of "the opened contour" defining strategy territorially - space development of contour of town-planning development of planning structures of the Volgograd agglomeration in structure of the Volga-Ahtyba floodplain.

2. The offers of ecologically reasonable territorial development of planning structure of the Volgograd agglomeration based on the principles of ecologically reasonable territorial design in system of the Volga - Ahtyba floodplain are formulated. The following directions of development of planning structure of kernel and residential suburb of agglomeration are offered:
   - the external development of frame components which is not assuming formation closed on Volga-Ahtyba floodplains of contour of town-planning development;
   - reconstruction of the resettlement existing in the floodplain by limited development of resettlement in preferential longitudinal direction to waterways of the Volga-Ahtyba floodplain;
   - the contour of town-planning development in structure of territories of reservoir of the Volga-Ahtyba floodplain is revealed nodal structure of planning zones of "external growth" (three nuclear system) and combined linearly - the dismembered structure of the planning zone "consolidations".

3. The modern planning structure of the Volgograd agglomeration aims at territorial compactness and partition of northern segment of the Volga - Ahtyba floodplain [9].
4. To overcome inevitable anthropogenic deformations of natural complex and to keep its ecological resources it is offered by the following planning methods and actions:
- method of "displacement of axes"; "duplicative axes" method;
- the "dismembered node" method (in structure of the Volgograd agglomeration - the dismembered resettlement strips in structure of the Volga-Ahtyba floodplain);
- "ecological seam"; system of planning gaps. For preservation of ecological structure of northern segment of the Volga-Ahtyba floodplain formation in its territory of park complex with the status of natural territorial parks [10, 11 and 12] is reasonable.

Results of research are implemented in the section "recreation and agribusiness industry" when developing the Concept of sustainable town-planning development of Volgograd till 2010, the custom-made city administration of Volgograd in 1999, and also in degree design on the subject "System of Recreational Territories of the Volgograd Agglomeration", VOLGGASA, 2000.

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