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## ECOLOGICAL BALANCE IN THE DEVELOPMENT OF TOWN PLANNING SYSTEMS: HISTORICAL ASPECT

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**Abstract.** The concept of forming a system of natural components at the regional level (the natural frame) has been suggested in the article. Such a system is complementary to a settlement system and provides a balanced development of urban planning systems. The natural frame as a system of poorly developed areas existed in all the historical periods of settlement, its decline being caused by industrialization.

**Key words:** balanced development, settlement system, natural frame.

### 1. Introduction

A balanced development that marks today's approaches to solving urban planning problems is based on resolving environmental problems. The disturbance of a historically formed balance between a settlement system and poorly developed natural or reservation areas comes from the growth of cities, which consume natural resources. Since regeneration of nature increases with combining single areas in a system, the issue of the natural frame within a settlement network, especially a town or city, is of great importance.

### 2. Basic Theory

The history of urban development and the preservation of ecological balance are the subject of numerous scientific studies. The article deals with urban prognostication and its impact on natural systems. In the 1950s to 1960s, limitations on the size of large cities and the development of small- and medium-sized towns were suggested. Towns with populations ranging from 100,000 to 500,000 inhabitants appeared as optimal [1].

The radical "superurbanism" ideas of the capitalist world of that time, consisting of an excessive density of developing areas initiated by Le Corbusier, were continued by European, American and Japanese architects, especially in the 1960s. The ideas of concentrated settlement in different spatial solutions, such as nodular, structural or chain-like solutions, were typical for Poland, Slovakia, Bulgaria, and the former GDR in the 1980s [2]. Since then, a skeptical assessment of new forms of area settlement opportunities has been observed, with their decline being anticipated [3].

The approach to the creation of new forms of group settlement remains unchanged until the late 1990s, when group settlements were formed on the basis of other types of relations and labor places, taking on trans-regional form (see interstate character) [4]. This enables the use of fragments of large urban complexes, which have lost a system of communications previously formed (for example, the group of the socialist countries). The transformation of the economic conditions of a former USSR Single Settlement System (severed today) within the new sovereign countries is based on the principles formulated in the 1970s and 1980s, such as in Russia or with an opposite orientation of economic relations in the countries of the former socialist camp: Poland, Romania, Slovakia, Hungary, the Czech Republic, and Ukraine. The chain-like concentrated settlement program along the major transport axes, known as "bananas", is offered for the current EU structure, and can be traced through the development of independent Ukraine, with the organization of the "corridors" related to the transit system of European communications.

### 3. Results and Discussion

The information technologies allow for a change of view on the development of urbanization, giving up concentration models in favor of dispersed models.

Of special significance nowadays is a gradual change in the system of concepts from “city-land as an opposition” to “city-land as a continuum”. This is manifested in various forms:

- Physiomic urbanization, that is the spread of urban forms of residential architecture, public welfare standard into the rural area;
- Functional urbanization, that is the spread of all the organizational structures of urban production and distribution, elongation of labor relations, commuting, development of new communication and information networks;
- Sociological urbanization of rural space, assimilation to the living standards of urban population, its structures, organizational forms of work, consumption, etc. [5].

The analysis of the interaction of nature and the settlement system in Western Ukraine shows that the limits of the areal settlement have mainly been reached nowadays, and their transgression may lead to the deterioration of the natural base as an environment for the human being. It should be noted that the spatial density of the location of the main production assets in the USSR was eight times higher than the average in the Soviet Union, while the area of degraded land was 20 times higher [6].

The maintenance of natural balance between the urbanized and natural environments is achieved by the interaction of two basic approaches: functional and areal. The first approach corresponds to a set of measures, which are usually known as the rationalization of the use of nature. It consists of appropriate agricultural machinery, regulation of industrial and other economic pressures on the area, which lead to changes in the environment. The second way is the nature protective system, which is a systemically balanced method of the complete or partial preservation the areal complexes [7].

Under the natural frame, the development of areal elements are determined by natural components. The modeling of the natural frame is performed at different levels:

- The basic principles and mechanisms of forming the natural frame are developed at the regional level;
- The potential landscape of the natural frame: its components and their potential, structure and degree of relatedness are defined on the level of local settlement systems that are formed in the conditions of a mosaic of natural bases and limited by areas of natural landscape cells with relatively intact spatial characteristics of landscape components;
- The interaction of the town-planning structure with the natural base, along with the natural frame in each given natural landscape cell are researched at the town level. Finally, it allows for the elaboration of the town-planning measures at each level of realization.

In terms of current use for the purpose of urban planning, the characteristics of the region revealed a number of areas under heavy development that may become a basis for the natural frame of the region. These areas differ in the degree of their development potential, from the heavily developing ones by one of the factors to those that are not subject to landscape development. Yet, the total factor analysis of the region shows that the heavily developing areas are not homogeneous or continuous, are not interconnected, and are characterized by a different potential of naturalness. Thus, they do not make up a system that could be defined as a natural frame of the region. However, the property of integrity of the urban planning system, in fact, reflects two different qualities: balance and relatedness of elements [8].

The natural frame of a region as a planned (and to a certain degree designed) condition of natural environment, with a sufficient degree of naturalness for self-regeneration, can be achieved by a set of urban planning measures aimed at the strengthening, maintenance and development of the existing base of the natural frame of the region (Fig. 1).

In addition to the modern use of the natural basis of the region, stability of individual landscape components is essential. Firstly, the spaces correspond to the areas that comprised the natural settlement boundaries throughout the whole development period of the region (nodes of naturalness) and to the areas that performed this role during the first and second development periods, having possessed a lesser potential of naturalness. The natural ecologic systems were characterized by the “healing of the wounds”, which were not deep in the pre-industrial period, because they concern only surface landscape elements: land, vegetation, small hydrographic network, small elements of the relief. However, the refusal to use them even during one of the periods returns them to the status of natural areas.

The composition of natural frames of all the settlement periods of a region, including the modern one with the basis of the natural frame, reveals the total potential of naturalness as the principal criterion for evaluation of natural areas. The nodes of naturalness should serve as a basis for the upper level of the designed natural frame – reservation areas. All the levels of the natural frame are presented as a hierarchy of areas with varying degrees of protection, with the appropriate character and mode of use and, for this purpose, with necessary facilities and organizational measures. At the same time the geometry (figure) of the natural frame of the previous periods allows for the linking of the modern disparate non-developed areas into a single system (Fig. 2, 3).

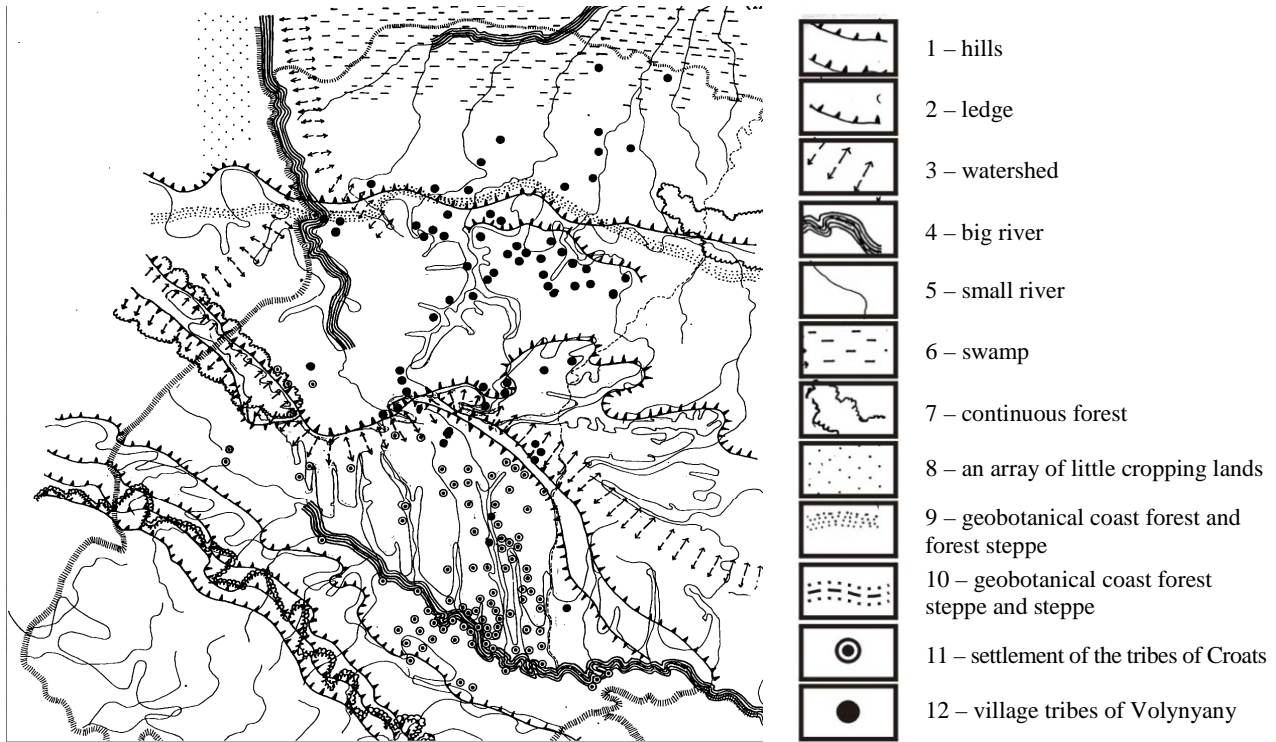


Fig. 1. Symbiosis of settlement and natural frame area in the early periods (today – the Western Ukrainian region, as of 10<sup>th</sup> century)

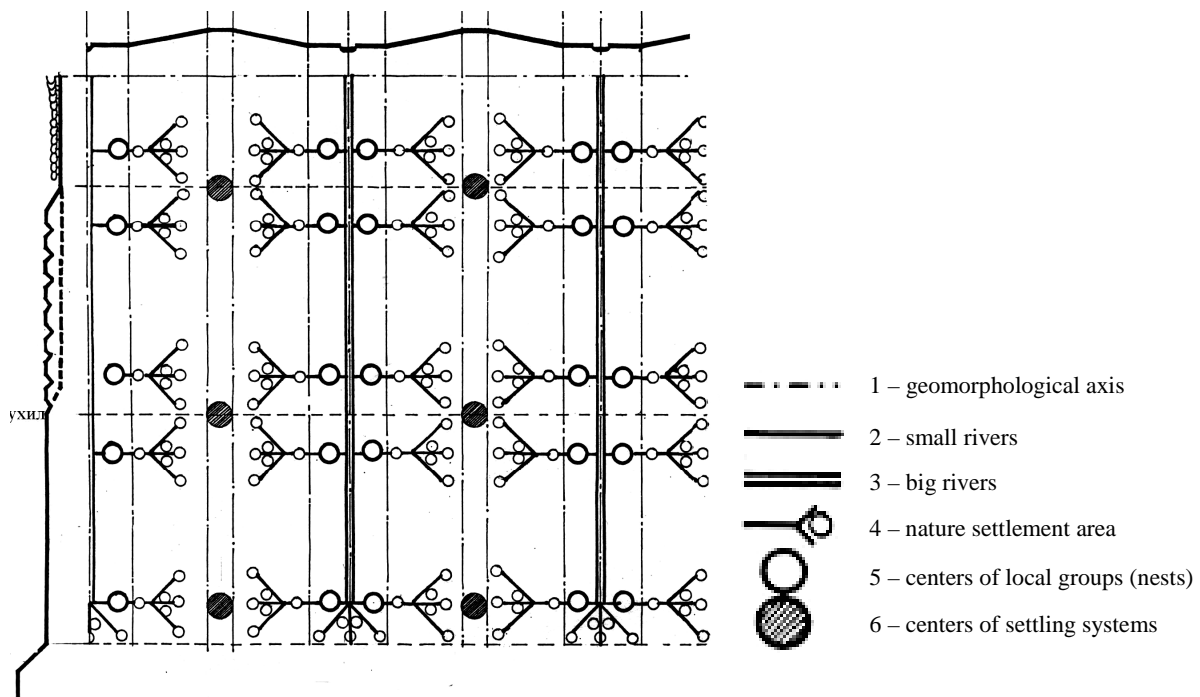


Fig. 2. An extensive settling system of Volyn', 13<sup>th</sup> century

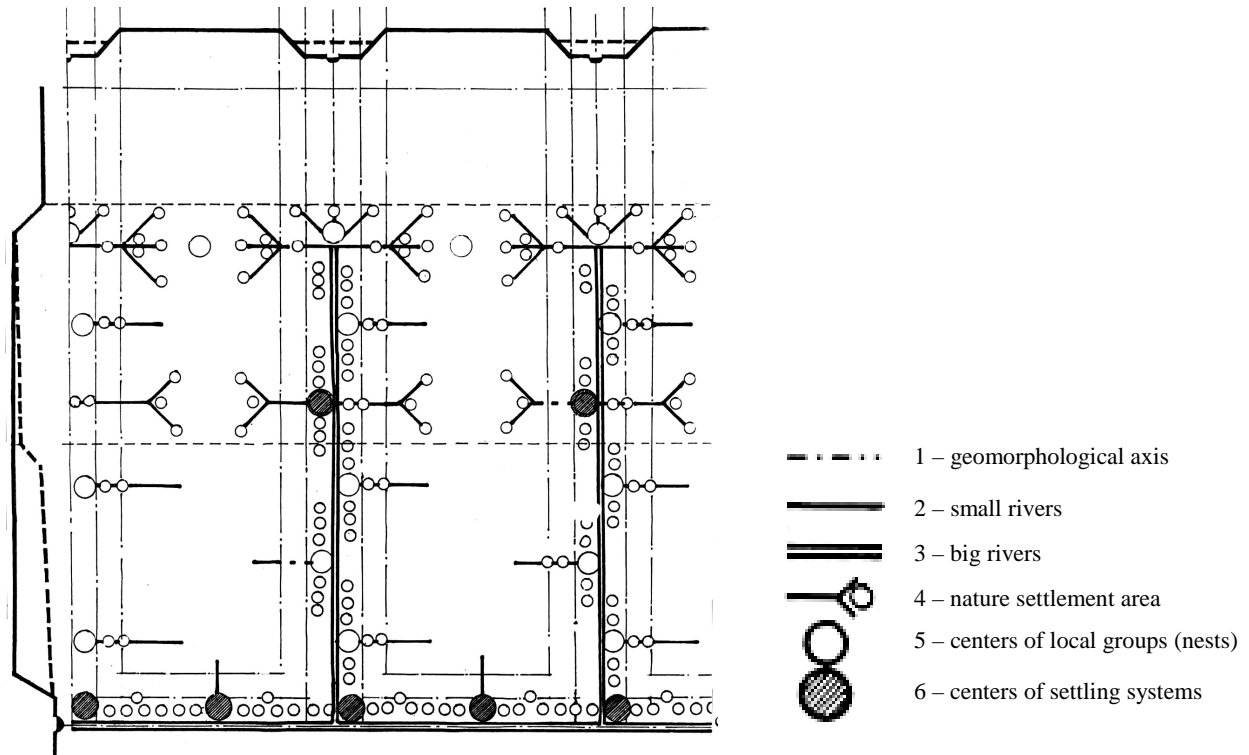


Fig. 3. Stream skirts settlement system, 13<sup>th</sup> century (Podolia)

The conditions of the area relatedness by the factor of naturalness permits for the allocation of spaces in the region. An anthropogenic pressure exceeds the capacity for regeneration of nature (mostly plain landscapes), in which the task of restoring elements of the natural frame is particularly complicated. Functional zoning of the area of the region should ensure recoverability of the natural frame. For this purpose, proposals should firstly be developed during the district planning of the region, as well as during the general planning for the entire set of settlements. It is necessary to solve the area-balance problem in functional zoning, where the ratio of urban and natural elements in which the ecological balance is kept.

The structural descriptions of a natural frame are determined by its geometry and the arrangement of separate elements. In the most general aspect, the natural frame can be considered as a system of axes, points, nodes, lines and areas. The “thinnest” structural elements, which provide relatedness, must be accurately determined according to environmental sustainability.

A natural landscape basis of a region, as well as its natural frame as a whole, should be described with the help of the system of spatial features, which are compared with the determining features of urban development structures. The relief as the main component of the landscape has two polar characteristics: the upper axes (watershed surfaces) and the lower axes (catchment surfaces). They are interrelated and exist in a single system on the principle of mutual complementarity (Fig. 4).

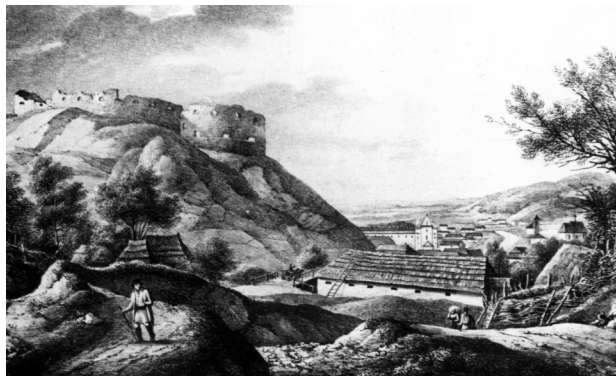


Fig. 4. Natural frame in the towns, 19<sup>th</sup> century. Left – Terebovly, the autor – A. Lange. Right – Zhovkva, the autor – N. Orda

The basis for the detection of the natural frame as a spatial system of non-developed areas are the lower and upper axes of the relief, which are materialized through specific structural elements of the landscape (slope, terrace, ledge) and content elements (types of tracts). All the elements of a natural frame are divided into two groups: long and compact. The geometric shapes include the axes that make up the beds of major rivers, large swampy valleys of small rivers, bands of wide swampy flood plains of rivers, hilly ridges, long ledges, points, areas and nodes. The form of elements derives within the natural frame: the axis (a small river) may gradually turn into the band while increasing its width (a large river, a river in a swampy flood plain); the same processes can occur in the upper axes (watershed ridge). Break may also appear in a line, converting it into points (vertices of some hills). The development of linear forms occurs by branching out of the component, and the density of the latter makes it possible for the natural frame to shift into homogeneous massifs to the porous or solid form. Districts are made into large areas with the similar landscape features: mountain ranges, forests, wetlands and lowlands. The points of a natural frame are the separate components of the landscape (hill, swamp, a wood) that can form a dispersed area (e.g. hills along the outliers of the Holohory Voronyaky ridge). Nodes are formed by an intersection of linear elements or by partial matches of solid elements.

#### 4. Conclusion

The process of historical settlement is defined by successive changes in significance of the components and structural elements of the landscape in the development of productive forces, as well as by the possibility of using natural resources. As a result, regional urban systems are formed at different times, with some towns appearing and developing, and others declining. In relation to the settlement process, natural base elements are preserved, forming an independent system, known as the natural frame, which goes through all levels of urban development projects. In modern conditions, the activation of settling leads to the fact that, in areas outside the scope of urban planning development, the natural frame dismembers the city structure. In areas of moderate urban planning development, the natural frame in the city structure is manifested in the form of separate green areas. Furthermore, in areas of intensive urban planning development, such a frame does not exist. Finally, in areas of intensive urban planning development, dispersed green areas of the city are connected into a larger system with the help of different components of the landscape.

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#### **ЕКОЛОГІЧНИЙ БАЛАНС У РОЗВИТКУ МІСТОБУДІВНИХ ПЛАНУВАЛЬНИХ СИСТЕМ: ІСТОРИЧНИЙ АСПЕКТ**

***Анотація.** Запропоновано концепцію утворення системи природних компонентів на рівні регіону – природного каркасу. Така система є взаємодоповнювальною для мережі розселення і забезпечує урівноважений розвиток містобудівних утворень. Природний каркас як система слабкоосвоєних територій існував у всі історичні періоди розселення, а його деградація була спричинена промисловою революцією.*

***Ключові слова:** урівноважений розвиток, система розселення, природний каркас.*