Influence of The Natural and Climatic Factor on The Colouristics of The Architectural Environment of Cities

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Abstract. Coloristics is conceived as a color medium or the polychromy of the objects that form it, which satisfy a person aesthetically and utilitarily in contrast to the spontaneously arising color surroundings. In connection with the increase in the scale of construction, with the inconsistency of the actions of the architects involved in creating the image of the urban environment, with their lack of an integrated approach to the formation of the city's color environment, the coloring of cities is formed spontaneously and not always in a harmonious solution with the already existing situation. It is necessary to take into account the factors of the formation of the color medium in design, including natural and climatic conditions that affect on the perception of the color in the architecture of the city. The aim of the research is to identify the disadvantages of color solution of the architectural medium of the city, determine the direction of their elimination, the formation of tasks for the further design of environmental elements, their restoration or reconstruction, taking into account the influence of natural and climatic factor.

Research methods are: analysis of the color medium of the city, conducted to determine the scheme of the color solution of urban space, recommended for using in design and further development of the colouristics of architectural medium of the city. In the process of research there are circumstances that have formed the existing kind of medium - it is a set of objective factors that somehow influence on the formation of the city's overall polychromy by their color manifestations. Pointing the sequence of the influence of external space on the color field, determining the natural and climatic features of the city medium, it is possible to suggest the ways of further development of the color formation in the architectural medium. Based on the already available theoretical design methods, taking into account the conditions of a specific locality of the city of Belgorod, it is proposed to develop solutions of the tasks that aimed at improving the quality of living medium and psychological comfort of a person in conditions of high urbanization of the territory. The results of research are: using the researches of the colorist Jean-Philippe Lanclo, who considers the natural landscape together with the results of human activity as an integral surroundings, as well as analysis of the main color structure of the city from certain species points in specific conditions, the development of a certain color-compositional system for its application in the development of the city's color medium is proposed. At the heart of this system the methodology for designing the color of cities in the region should be presented, which has developed with the feathers of identified factors that effect on its changes in conditions of changeable natural and climatic background.

1. Introduction
The city as a habitat has a serious impact on the formation and development of the person's individuality, its psycho-emotional state. The object-space medium is perceived in a complex way through the form, color and light, therefore the humanization of the architectural medium is impossible without the analysis of these properties and the subsequent account of their influence on a person in solving social and aesthetic problems.

With general aspiration of modern architecture to asceticism, simple and laconic forms, color is a powerful factor in the perception of the urban surroundings, a carrier of the aesthetic principle and a certain psychological content. It affects not only mental status (psychological tension, activity, general emotional state), but also physiology (tone of muscle contractions, pulse rate, peculiarities of the internal organs work) due to influence on the peripheral nervous system [4]. Therefore, the problem of the color organization of space is an integral part of architectural science. This issue was considered by the scientists: J. Agoston, S. Alekseev, O. Golubeva, S. Migal, T. Pechenyuk, S. Mikhailov, V. Tkachev, A. Kaidanovskaya, C. Moughtin, P. Steadman and others. They managed to identify some problems of the formation of the color identity of medium of certain cities and their regions, and features of the analysis of color solutions are presented. The importance of color as a factor in the formation of the city's identity is noted, the possibilities of manipulating the color means for the purposes of aesthetic and utilitarian ones are considered.

2. Organization of the Text

The natural and climatic features of the region that affect on the formation of the color medium include: first of all, the climate (length of day, intensity of illumination at different times of the year), temperature and humidity mode, the state of the atmosphere, the diversity of the landscape, flora and fauna, relief [1]. In addition, the image of the city largely depends on the colouristics of the natural environment, taking into account its diurnal and seasonal dynamics (Figure 1).

![Diagram](image.png)

**Figure 1.** The effects of the external space on the color field of the city.

Modeling the dynamics of the city's color field should be based on the interpretation of the color dynamics of the natural landscape [1]. Analyzing the process of color natural self-regulation,
architects will be able to act in concert with it in the urban environment. The coloristic medium of the natural landscape can be defined by the combination of many components that form certain properties of the city's color solution: climatic conditions that will influence on the brightness and contrast of the coloristic decision of buildings, in particular, the state of the atmosphere, its purity or degree of pollution; temperature regime, causing fog and precipitation in the form of rain and snow; morphological features of the territory, including its relief, creating a game of chiaroscuro, cold and warm shades; the surface texture on which its general lightness depends; color of its own coating in harmony with the color of the building; the presence or absence of flora affects on the changes in the overall color of the terrain, because it affects on the chromatic components of the natural landscape. The atmosphere influences on the character of illumination, direct or diffuses, and also has its own color shades: depending on the presence of suspended particles and water vapor in it, it gives the landscape a color characteristic, softening the light and chromatic contrasts, creating a common background [1].

The color shades of the natural landscape are changed each season. For example, the winter period is characterized by increasing in the proportion of achromatic constituents in the color palette of the natural environment (Figure 2.). The quality of sunlight and duration of a light day complete the color image of the natural landscape [2].

![Figure 2](image)

**Figure 2.** An example of a seasonal change in the color shades of the city's atmosphere.

The relief influences on the structure of the color basin of the natural landscape significantly, sets spatial plans, underlined by the color perspective, and potentially contains significant possibilities of color dynamics at perceiving this landscape from various species points.

The outer space of the city of Belgorod refers to an open type of relief structure, the relief is relatively calm, and the city is located on a comparatively flat surface of the earth's crust and does not have vertically marked boundaries. The hilly-erosive relief of the Central Russian Upland prevails on the territory of the region.

In the Belgorod region rivers are typically plain gullies; shallow waters have a slow and calm flow. The largest is Seversky Donets. It is the largest tributary of the Don. On the territory of the district it passes for about 25 kilometers. Its most significant tributaries are the tributaries of Vezelka and Toplink, Udy and Razumenka. Mirror of water surfaces reflects the dominant natural colors, and strengths them, because they are variable, the chromatic dynamics of nature and urban development in the vicinity of them is increased.

Flora is the most dynamic component of the natural environment. The forests of Belgorod are represented by oaks, birches, maples, ash, poplar and acacia. Forest tracts were preserved in small
areas in the eastern part of the district. The main forests are the part of the State forest resource and assigned to the forests of the first group (green zone) [12]. Accordingly, their influence on the color content of the natural environment should be highlighted. Seasonal changes in flora are the most active factor of natural color-dynamics. Soil is the most important component of the natural environment. Soils are leached black earth. Mechanical composition is loamy. The prevailing winds are northern.

Belgorod region has a wide range of natural and climatic conditions, which presuppose the preferred use of certain color combinations.

The European school of architectural coloristics is known by the works of French specialists. Comprehension of the role of color in the scale of cities and even regions is the main feature of the works of French colorists in architecture and town planning. The researchers of the colorist Jean-Philippe Lanclo are more systematic, who views the natural landscape together with the results of human activity as a holistic medium.

Using his theory when designing the coloristics of the city of Belgorod, three phases can be distinguished: analysis of the landscape, visual synthesis, development of the "alphabet of colors" adapted to the district [9].

The first phase involves the analysis of components that are relatively constant in terms of color characteristics: earth, sand, rocks, rocks, etc., as well as components with pronounced color dynamics: sky and green under changing lighting (Figure 3).

The constant mobility of polychromy in the city plays an important role: shop windows, transport, advertising, pedestrians, etc., which is mainly observed within the first floor. The first phase also includes analysis of samples of materials that make up the ground, walls, roofs and parts of buildings, as well as vegetative elements [11]. When gathering the information you can use land surveys, photos from space, and landscape maps of the Belgorod region to accumulate an exhaustive iconographic material.

The identification of chromatic communities as a result of the ordering of color patterns was the problem of the second phase. These communities can be used as a basis for color decisions of buildings that will be erected in given district. Within the identified set color, combinatorics of colors allows to get a series of options that meet the basic requirement is - the color relationship with the district. In addition, the obtained data are correlated as a statistical material for the use of certain colors or combinations in specific areas of the city.

Figure 3. Analysis of the coloristic medium of Belgorod. Panoramic view on the northern residential area.

And, finally, the third phase is the development of the "alphabet of colors", a practical guide how to use the color. "Alphabet" consists of two palettes - common and point, which are coordinated among themselves and guaranteeing the harmony of all combinations which were obtained on their basis. The general palette contains soft colors and is used for large surfaces (walls, roofs, paving ground) the
dotted palette contains saturated colors and is intended for building details (doors, windows, shutters, socles, etc.).

Thus, using the basis for designing the color medium of Belgorod, the influence of the natural and climatic factor, it is possible to form an icon of the city that is harmonious with the external space and the environment. Chromatic combinations were professionally selected and they will make the coloristics of the urban environment aesthetically harmonious for human perception. Pre-project investigations of the natural framework and climatic characteristics will make it possible to develop the structure of the city's coloristic medium. For a designer, architect or other professional, who is responsible for planning the coloristics of the urban medium, it is important to create such structure where color solutions will be in harmony. In this case, the simplest way is to use one color series, playing with saturation and depth of color, regulating the balance of light and dark. If the chosen solutions are closer to the natural environment, it will be more opportunities for a harmonious and positive impact of the color range on the human psyche. In order to find a win-win combination, one should apply to nature: it is impossible to be mistaken, revising the harmony which was created by it. Talking about the coloristics of the whole city, it is difficult to calculate the number of colors and shades which are involved in it. However, it is necessary to achieve the compatibility of the primary colors involved in the palette. Additional colors do not destroy harmony in general. Naturally, the maximum task is to create an absolutely perfect color environment, but a real solution of it is hardly possible. Cars, people, animals are constantly moving on the streets of the city; It is impossible to control the color decisions of advertising banners, signage. However, in a general harmonious background these "noises" will create only light tension and no more.

The spatial color field of the city is designed to help people to distinguish buildings, areas, navigate the city space, and create visual comfort. The color basin of the city is a "container of color harmonies", organically associated with relief, massifs and urban buildings. Coloristics of the city can cause person's aesthetic emotional stress [10]. This aesthetic sub-base serves as a canvas for specific art and compositional color solutions of individual objects, complexes (Fig. 4). We emphasize that color is important not for decorative art, but primarily as a system of architectural polychromy. Only in this case the art and aesthetic function of the color of the city is realized [5]. Color harmony suggests that two or more colors, near to each other, enter into a relationship and as a result have a positive effect on a person's emotional state. When these connections are broken and color discord occurs, the effect becomes negative. It is important that there is no such dissonance in the habitat of a healthy person, or, at least, it is necessary to reduce them to a minimum. Color in town planning reveals the content of the economic, political and spiritual life of cities, contributes to the dialectical relationship of the content and form of the city.

Figure 4. Substance of specific artistic and compositional color solutions of individual objects.

3. Summary
To ensure the nature of the artistry of the cities, a necessary condition is the creation of a color compositional system. The methodology for designing the coloristics of the cities in our region should
be present at the heart of this system, taking into account the natural and climatic conditions. The
design method at all stages of the process relies on the method of obtaining information about the
projected color objects with the analysis of visual frames and panoramas of the city. The color-
volumetric compositions predicted with their help are linked with the planning structure by the method
of multivariate modeling of testing from various points of visual perception, determination of the
location of color dominants and background basins. Based on the research of the natural and climatic
conditions of this or that climatic zone, with the aim of improving the quality of the environment of
life activity and psychological comfort of a person in conditions of high urbanization of the territory,
architects will be able to apply a color map formed by selecting chromatic combinations in accordance
with external factors.

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