

## The Effects of Color and Light on the Beautification of Urban Space and the Subjective Perception of Citizens

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**Abstract:** Color is one of the most important phenomena in urban space seen through light. The color and light have an important role in the beautification, attractiveness and readability of the city. These elements represent the city's main faces so that if they are used professionally and correctly, they are considered to be the identity and reflection of the city's culture. Color and light not only have a special importance in the urban space and city's formative elements but also influence citizen's morality. The purpose of this paper is to survey the effects of color and light on the beautification of the city and the subjective perception of citizens based on documents and library studies. The results showed that the correct application and attention to the standards of coloring and lighting is the first factor in the formation of visual aesthetics in urban space. The second important factor is paying attention to the principles of quality and harmony of colors in coloring and lighting in order to prevent visual contamination in the environment. Observed principle and provision used by color and light will have been many effects in the city's visual calm and citizen's mentality.

**Keywords:** Color, Light, Visual aesthetics, Urban space, Psychic perception

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Date of Submission: 20-02-2019

Date of acceptance: 05-03-2019

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### I. Introduction

Technically, color is a visible reflection; through the pass, diffusion, or reflection engendering of color combinations by objects. It is scientifically proven that all colors are radiance from sunlight and each object within transparency and affection of radiance absorption, some beams attract and some of them reflect; As a result, it is seen that object in color of from reflected beams. On the other hand, these beams, by combining, make other lights which affect on findings the optic nervation conical of the shape and cause to see the light. When shape reflects all the lights; is white and when it absorbs all the light, black is seen (1). Colors, right or wrong, the source or motive of some emotions and sensory responses, psychological are considered (2).Color is life; because world display without the color, unbelief and dead. The main light is without color and in front of it, dark without color; just like that from the flame of fire glory goes out thus light it creates colors. Light is the first phenomenon in the world through the colors, the spirit and nature of the living world reveals to us (3).Colors, forces and radiant energies whether we want to or not will affect us positively or negatively; the effect of colors is not only visually, But also psychologically and symbolically, must be understood this way related issues to color can be identified from a few points (3). The first environmental factors that essential for any activity are light and brightness. This factor is more effective than other physical variables; because it manipulates other variables that play an important role in the quality of the work. It is very difficult to express a general opinion about the amount of lighting in the environment. The reason is that many factors such as the type of space, the background, the small components that can be cleaned, the opportunity to see things, the amount of saliency into background, age of the people, and finally, the building materials of the environment, the tools and devices involved in this. factors that affect our vision of how city lighting is designed to achieve greater security (4).In general, light is can be divided into two groups of natural light and artificial light, based on its matter. In order to of natural light, is a kind of light that actually emanates from the sun and the moon and it brings about the brightness of space at day and night, but artificial light, is that by autonomic harvested by humans through energy conversion (5).

Arasto has a vague expression on the light "Light is the activity of what is transparent." The great philosopher and poet of the fifth century AD, Empedocles, "had a clever and clear understanding of light. Light is a fluid substance released from the sun and we do not find it because it moves very fast", but he also believed that there was a fire in the eye, like the lantern flame (6).Max Lusher (1994), after a test on colors, concluded that tension and discomfort in the application of color in the environment can lead to inappropriate behaviors and can have a negative impact on personality. Johann Ethen in the book (color art) "as for the mental quality of colors, it says: in my studies, I have discovered mental colors which not only choice and bring together colors, but also the size and direction of their levels are very special. That means people get to all color levels vertically and others emphasize horizontal or corner levels. In every effort to understand the colors of the mind we must pay attention to the finest features; but the main factor is the person's mood". Bahraini has mentioned in his book (urban design

process) about the use of colors in the city: "how to use of color are under influence of two environmental major, factor such as beliefs and protocol of the place". Rikard Küller et al. (2006) have concluded that "the subjective quality of lighting affected people's moods more than illumination as measured in objective terms".

Maria Johansson et al. (2011) emphasized that "subjective judgments of brightness and the perceived level of pleasantness of an illuminated space are the two most important elements that determine the subjective quality of lighting". Tools used to assess the quality of lighting have also been developed on this basis"(7). Observed Problems in urban space show there is an inconsistency between the elements of the city like streets, sidewalks, walls and... and the inappropriate color and lighting is in place which is considered an important factor in urban landscape visual disturbance. The purpose of this article is to study the applications of light and color in urban spaces and how they interact with the elements of the city and psychological effects on citizens.

## **II. Properties and Aspects of Aesthetics Color and Light**

### **Main color properties**

#### **Hue**

A characteristic of any color that distinguishes it from other colors. Hue indicates a combination of different colors, such as orange-red, yellow-green, or blue-purple dark (8).

#### **Saturation or Chroma**

Chroma represents the degree of saturation or the strength of a color. Chroma is a degree of color. The chrome scale starts from neutral gray with the zero number and continues to the highest saturation level at each color level (8).

#### **Color value**

The value of color is the brightness or darkness a relative color. Bright colors are made of white and darker colors will be produced by adding black color from slightly color. (9).

#### **Expression of colors**

Observation visual interactions lead to chemical magnetization reactions in the eye with which they will occur in the human's psychical circle. Such reactions occur after color observation affects the inner part of human and on the psychological regions. Therefore, the main cause of neural and mental effects is observation (10).

#### **Impact of lighting quality**

- Promoting environmental quality (safety and security, readability, vitality, energy efficiency, sense of time, identity and personality).
- Social justice
- Utilizing the psychological effects of light
- Economic Value Added for the City
- Restoration of night life: 24-hour city (11).

#### **Goals of the formation of lighting in urban spaces**

##### **-Functional: Lighting Supply**

Elements have been seen in space aim of certainty from safety feeling and increased public supervision of decline crime, orientation, recognition face of person and see other citizens in the public place (12).

##### **-Decoration and symbolization**

In fact, from this group onwards lighting means the qualitative and artistic design of a structures or spaces light which refer to the normal and aesthetic aspects which depend on the plot (13).

##### **-Creation of artwork**

In many cases, making a simple plane can be done by lighting transformation an art work. One of the most important lighting events with the aim of creating artwork, is lighting festival (14).

##### **-Creating artistic text**

lighting to a building or urban space does not endure completely and it does not deal with this, but by the way of its presence, background types of public participation and their activities provides an urban space(12).

### **III. The effect Of Color and Light In Urban Space**

The colors in the urban environment play an effective and useful role in creating visual comfort and improving spaces. If colors are used in the environment, according to their aesthetic aspects they own as well as environmental elements, a direct connection is found which will affect them and this is considered to be a major issue in the beauty and comfort of an urban environment. The urban environment graphics are influenced by colors So that their application in the environment should be used according to the dominant color at that location to create harmony and balance of the environment. (15)

Color helps to reduce fatigue and stimulate the eyes. The colors create a wide variety of contrasts at different times of the day and new shadows every hour, which make the space vibrant and variety. The lack of diversity and vitality unwittingly hinders the presence of people in the spaces and their participation in civil life. By considering this, making diversity and creating joy is an appropriate space and easy possibility. The most striking example is the commercial streets and children's playgrounds and their color variation. In order to create happy spaces, it has become obvious order. (16)

Considering light and bright as one of the environmental variables is based on this assumption that there exists a correlation between the efficiency of the individual and the intensity of the light; that is, by increasing the brightness, the efficiency of the individual increases. Urban landscape lighting , actually a combination of street lighting, buildings, urban furniture, traffic lights, urban screens (city TVs)that in addition to create conditions, continue to urban function at night and provide security and comfort and attractiveness of urban environment and play a significant role(17).

#### **Method of use from color and light in urban spaces**

In the urban environment, colors can be seen everywhere. In the body and facades of the buildings, roof covering, flooring, urban furniture and green space, cars and even the sky, as well as colorful clothes of people all play an important role in determining the color of the city. So how constant colors are combined by designers near other design factors, can cause recognition of the city. So that citizens always remember their city with a pleasant memory, in other words, colorful memories (8).Color composition as one of the most effective factors on color perspective is term that two or more colors in a way put together which has a special order and give a special meaning. Selecting the tone, their ratio and state, pitch place, their direct, the relation of colors together and finally, each of the seven contrasting colors, are effective factors to create color combinations(3).

Colors play a role not only in enhancing visual quality and space environment but also increasing powerful mental effects on humans and his mental states. In the various pillars of urban management including economics, politics, culture, social relations, safety and security of citizens and so on which are often simply by passing this role (18).

#### **Lighting classification based on functional objectives in city**

- Brightness
- Security
- Recreation
- Aesthetic
- Cultural Function
- Commercial Function
- Religious and publicity activities (19).

#### **Types of lighting in the city**

##### **-Lighting from the bottom**

Using this mode in lighting fountains, especially in colorful once, creates a beautiful image of the droplet of water jumps. This method for creating sharp shadows and undesirable, in lighting, sculptures are less useful, but are very common in vegetation lighting, especially in trees. (20).

##### **-Lighting from the bottom with angles**

The tunnel wall and the use of its reflection to illuminate the entire space form the specific uses of this lighting mode. In addition, in the lighting of plants, sculptures and waterfronts are also very useful (21).

##### **-Direct lighting**

Emphasizes more on its shape and color and creates a special edge in the darkness of the night. The most important principle of direct lighting is the contradiction between the object and the surrounding space (22).

### **-Lighting High angle**

In the all surfaces that are vertical and horizontal, different volumes and spaces are to be used. Vertical surfaces like advertising billboards, views and horizontal levels like the stadium and volumes like the statue with this method in a way desirable lighting (21).

### **-Lighting from the top**

In cases where turning on horizontal levels like the level of the gates, public parking or underpasses lighting is meant, this method uses light sources of high brightness intensity and focus at high altitudes is applicable (11).

### **-Lighting from the inside**

Sometimes lighting a whole tower including the light of the windows and lamps on that facade, it has been seemed, all of it as one volume from within the lighting( 22).

### **Criteria to Evaluate Lighting**

Years ago, Dr. John Flynn developed criteria for evaluating the lighting of spaces. His work is considered seminal to this day. Flynn's conceptual framework used the following cues to determine the users' subjective response to the lighting of the space.

- uniform/non-uniform distribution of light
- bright/dim levels of illumination
- overhead/peripheral (or wall) lighting (23).

### **Light and color effects on readability, identity, beautification and city security**

Color is one of the most important elements that can simply be used at a lower cost than construction to define spaces, in making readability, sense of unity and the sense of place be effective. Actually identity creation and determine the perspective and round view specify the city among the goals of urban design that can be color the factors affecting it (10).

Among all the senses, eyesight feeling the most important role in the perception of urban space. Entire things by sense of sight will be received and whatever in city and urban spaces is present and it forms with the help of light which is obvious and understandable. The light makes the forms and reveals the colors, they bring them to perfection. Color in the perception of urban spaces plays an important role and a great impact on readability, identity and diagnosis urban spaces (24).

Colors elements affect on visual quality, beauty and readability the city's atmosphere; its correct application in the city causes stinging the morale of the citizens in crowded cities and creates good feeling from the city they created them. Color in the architecture is not only a basic feature but also constituent part of the legacy which is above the values of aesthetics and a cultural value in terms of anthropology treated. Color has an important visual element that can be effective and active in public appearance of a city (25).

### **The positive effects of light in urban space:**

- 1) Readability (path identification, space identification, navigation)
  - Routes and Communication nodes: Streets, highways, and so on
  - Active Night Space: Commercial buildings, parks And Recreation centers, parking lots, stations, hospitals
  - Inactive spaces at night: Telecommunication Tower, Spaces Historical, High-rise buildings
  - neighborhoods
  - Reference points
  - Hazardous points: crossroads, pedestrian crossings
  - Information boards: driving boards, paths, billboards, neighborhood names and streets
- 2) Beauty
  - Unique Perspectives: Urban Potentials
- 3) - Lighting, motion and sound: at special ceremonies and special places
- 4) - Light pollution and light rape: sky with many stars in the city
- 3) Safety and security
  - View ability and visibility
  - Preventing delinquency and crime
  - Combating vandalism (6).

Light usually allows people to experience any space, thus making lighting design an important architectural component. Joels (2006) emphasizes that lighting is a crucial factor in improving the harmony between functional and visual statements in the urban context. One of the aims of urban lighting is to establish essential characteristics of an urban identity, which is increasingly less certain today. Appropriate illumination is also one of the key principles of sustainable streetscape design (26).

### **The effects of light and color on the behavior and perception of citizens**

It's completely psychological how humans are affected by color and directly in the norms, individual it is affect. Colors affect so much on the human's spirit and psyche which leads to change the behavior and causes change in specification and person's character (27).

The psychological impact of colors on citizens is very important to be evaluated: dark colors often cause people to become depressed but they also have a symbolic role; for example, the green and turquoise colors are remembered of religious buildings or bright and happy colors vitalized the memory of childhood spaces. The color is an aspect of the city's identity and cities with colors define their identity: painted wall of city without artistic meditation that is not any meaning extend. Entree art in the city requires a comprehensive approach for city. In urban spaces, colors should complement each other and do not cause visual disturbance (28).

### **The effect of color on the perception of humans**

Color perception depends on three factors:

- 1) Conditions and the environment in which the color is seen.
- 2) Reflective object surface characteristics like its texture and its ability to absorb or reflect light.
- 3) The person's ability to perceive colors (25).

Good lighting it creates, security and comfort feeling and it prevents excessive fatigue in humans. In contrast, incorrect lighting creates an annoying sensation. Bad lighting can cause discomfort at the site or residents of that place nervous, worried and anxious.

Brightness in the environment from two directions on performance effective and increases its effectiveness. In this final mechanism, the interactions have divided into two categories that improve performance; 1) Perceptual remnant: research's finding have shown a lot of brightness and appropriate increased ability of sight, the perception of things was more accurate and detected components and their movements make it easier. On the other hand, human in a brighter environment can recognizes color better. 2) Psychological effects: many researchers say that white light improves human mood and motivational forces make focuses on individual on more activity(4).

Diana Joels (2006) has notes that the high prevalence of the created harmonious lighting that was appropriate for its environment and sensually illuminated its context. Considering the principles of sustainability, in addition to the environmental and economic aspects, one should also consider enhancing the appearance of spaces as well as establishing the social engagement and wellbeing of city residents (29).

### **Creating the appropriate impression by lighting**

- 1) Pleasant: use a non-uniform distribution of brightness in the space; how bright or dim is dependent upon the visual al tasks being performed within the space.
- 2) Public: rely on higher levels of illumination with a more uniform distribution of light from overhead lighting sources, predominantly.
- 3) Spacious: provide overall high levels of illumination with even distribution of light on the walls and uniform lighting on all surfaces.
- 4) Relaxed: use non-uniform distribution, wall lighting, and lower light levels, typically.
- 5) Visually clear: provide higher luminance on the activity/task planes, with peripheral luminance.

"Lighting design is an art and a science. This is true for many components of our built environments. Designers are concerned about the aesthetics and the art of lighting. It also means utilizing an enormous body of technical knowledge and updating due to new technology and the science of lighting. But the most important, factor is lighting for people, so there must be an understanding of the visual quality users need for health, safety, and enjoyment the process for lighting designers follows the same basic phases used by all designers, going through programming and schematic design, through design development, etc. In the schematic design of the process, many lighting designers think in layers:

- visual task: providing enough light to recognize a flaw in black silk or to be able to walk safely through a corridor
- general lighting or ambient lighting: to set a mood or impression and maybe the lighting provides safe circulation within the space
- Visual interest: something that adds a touch of magic, or something to tickle the user's "joy button.""(23).

## **IV. Conclusion**

Color and light in space design complement each other. To design urban spaces particularly the beautification of the city must be paid comprehensive principles coloring and lighting. According to the principles of beautification design colors and lights should be used in the right way. In the use of color, application and location types should be noted. Also in the selection of colors for the beautification of urban space, the principles of color combination and their quality and quantity must be taken into account and in addition to being in harmony with the surroundings need more attention, because it prevents visual disturbances in cities. Dazzle, light color,

visibility, high of light source its location should be considered in choosing the light. Quality of external lighting should be in touch with visual order directions and urban identity. Standard coloring and lighting according to the specialized approaches are included this factors: reducing visual and mental pollution creating a sense of identity, reflecting the city's artistic culture, readability and beautification city spaces. Attention to the application of principles and art-centric in the field of color and light will cause intellectual and artistic growth, creation relaxed feeling, mental - visual comfort and citizen security. Needs of people such as mental ad visual comfort should be designated in urban space designing due to having lots of impacts on culture and identity. Color and light are two important understandable elements which are seen by humans. The two phenomena have direct and indirectly effects on people in the city. If they are used correctly, it would not only help to improve the environment, but also cause intellectual growth and aesthetic vision in them under people's consideration. Due to this significant reason, urban space designing must pay attention to type of materials used in buildings, facades, historical remnant, cultural, city environment and green spaces.

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Elham Dabbagh" The Effects of Color and Light on the Beautification of Urban Space and the Subjective Perception of Citizens" International Journal of Engineering Science Invention (IJESI), Vol. 08, No. 03, 2019, PP 20-25