Illumination of Objects and Lighting of Public Spaces

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Abstract. The purpose of the research presented in this work are qualitative analyzes regarding night illumination of public buildings and spaces in selected large cities. The research concerned selected objects, a fragment or the whole city. The quality of illumination, direct and indirect effects of lighting spaces and objects, and the impact of lighting on users were examined. The functions of illumination it performs in the city space were also studied. The main results of research and observation include the fact that night illuminations of cities play an important role and are beneficial in various profit zones. The combination of LED and photovoltaic technology gives excellent economic results. Inhabitants and tourists are staying in public spaces in the evening, walking and using gastronomic services. They stay longer and are happy to come back or recommend such places to others. The lighting of objects and spaces plays an important role, e.g. functional, aesthetic and functional. It allows you to ensure safety, pleasure and attractiveness of use, and allows you to extend the use of space and objects, and shapes the space by highlighting and highlighting important objects, the dominant. The most important conclusions should be that lighting and photovoltaic technologies are constantly evolving, becoming more effective and cheaper. It is also important to use the latest lighting solutions for new projects and shape the space depending on the users' needs, using qualitative research of public space. Currently, there are trends in lighting buildings. There are probably no important objects without their night illumination. There are cities such as Budapest, Lion, Hong Kong, Opole, which have planned overall illumination of the whole or part of the city. Especially in the vicinity of the river or bay, the water is an additional element enhancing the aesthetic effects in the form of reflection of lights.

1. Introduction

We currently like to light buildings. There are probably no important objects without their night illumination. There are cities such as Budapest, Lion, Hong Kong, Opole, which have planned overall illumination of the whole or part of the city. Especially in the vicinity of the river or bay, water is an additional element enhancing the aesthetic effects in the form of reflection of lights. The lighting of objects and spaces plays an important role, e.g. functional, aesthetic, for safety and pleasure of use, as well as to extend the time of use, highlight and highlight important objects, etc. According to research and observation, this approach simply pays off. Inhabitants and tourists are staying in public spaces in the evening, walking and using gastronomic services. They stay longer and are happy to come back or recommend such places to others - and here it is. The combination of LED technology and solar farms gives excellent results. The most important thing is that lighting and photovoltaic technologies are constantly evolving, they are becoming more effective and cheaper. It is important to use the latest lighting solutions for new projects.
2. The important role of illuminating objects

Provide Lighting plays an important role, e.g. functional, aesthetic, for safety and pleasure of use, as well as to extend the time of use, highlight and highlight important objects, etc. We currently like to illuminate buildings. There are probably no important objects without their night illumination. There are cities such as Lion, Budapest, Hong Kong, Opole, or many others, which have planned overall illumination of the whole or part of the city, especially in the vicinity of the river, bay. Water is an additional element enhancing aesthetic effects in the form of reflection of lights in the water. Research and observation show that this approach pays off. Residents are staying in public spaces in the evening, walking and using gastronomic services. Tourists stay longer and are happy to come back or recommend such places. [1-4]

3. Research and dissemination of knowledge in the field of lighting objects

The Faculty of Architecture, a unit of a research university of the Silesian University of Technology, has been actively involved in research, didactic and popularizing activities in the field of lighting and illumination of facilities for years. It was here several years ago at the initiative of the current dean prof. The first didactic subjects of Architecture and Lighting, as well as Lighting and Lighting Techniques, were created by Klaudiusz Fross, first learned at the Faculty of Electrical Engineering, and now at the Faculty of Architecture. It all started with Philips lighting workshops. Light tests of objects (e.g. castle, town square, court building, university, etc.) are not only a great designer tool but also invaluable in teaching. The authors believe that light tests are a mandatory element of the pre-design phase. They allow the verification of preliminary design decisions. They guarantee the correct selection of color, power, sources, lamp types and luminaire locations, etc. [5, 6]

LED technology and photovoltaic development give enormous opportunities for energy-saving illumination of field, cubature and nature monuments. There is also the problem of littering light, avoiding overfill so that night lighting does not disturb.

![Figure 1](image1.png)

Figure 1. One of the largest photovoltaic facades in Poland at the SFW Energia hall in Gliwice. NDN Gliwice building and construction design, architecture: Klaudiusz Fross, 2017-2018.

4. Selected illuminations

Below are a few examples of illuminations from the Wisła (Figure 2), Tokyo (Figure 3-5), Dubai (Figure 6), Gliwice (Figure 1, 3, 7), Chorzów (Figure 7) and Budapest (Figure 8). If we highlight an individual object in an attractive way, such as the amphitheater in Wisła (multi-colored illumination) (Figure 2), it automatically becomes an interesting place for walks, meetings, interesting, inclines to visit. The situation is similar to the wooden tower of the radio station in Gliwice (Figure 3), which
encourages to visit the park and is also a night landmark. Through night lighting it has also become more known and recognizable - it is now part of the city's logo. (Figure 1-6)

Figure 2. Amphitheater in Wśła. Variable multi-colored illumination. LED strips illuminate the plane of a tight roof. The roof is a form of a screen with great possibilities for multimedia presentations, e.g. you can display images, films, information, advertisements, etc.

Similarly, the tallest television tower in the world Sky Tree Tower in Tokyo has its multi-colored and variable illumination. Built in 2012, it has observation terraces. Tokyo Sky Tree is located in the Sumida district. Due to its location and height, as well as night lighting, it is a significant landmark in the city. The combination of technical functions of the tower with a well thought-out commercial (tourist) is important in "making" the object. The facility has become one of the most important and obligatory tourist attractions of Tokyo. An additional attraction of the facility is the aforementioned multi-colored and changing light illumination. Due to the supplementary functions, the urban space around the tower is a meeting and rest area for residents until late in the evening. (Figure 3-5)

Spectacular buildings that often become icons of the place also have psychological significance for society and image for the region and the state.

Figure 3. Sky Tree in Tokyo at night. View of Gliwice with a wooden radio station.
Figure 4. Sky Tree in Tokyo. View of the city at night from a height of 350 m. An interesting steel structure illuminated at night.

Figure 5. An interesting characteristic brewery building in Tokyo with backlight directed at the eye-catching roof element.

Figure 6. Currently under construction Creek Tower (1.350 m) in Dubai will be the tallest illuminated building in the world.
Figure 7. Sometimes, not much is needed for a good-looking object at night. Illuminated logo of the Silesian University of Technology on the side facade of the building of the Faculty of Electrical Engineering in Gliwice. Bastra building in Chorzów - interior lighting creates the illumination of the building.

Figure 8. Budapest by night. Comprehensive one-color illumination of the object. From the river side, most of the buildings are illuminated creating overall illumination of the city. This is an important element in the tourist promotion of the city.

The examples listed and tested confirm the great importance of contemporary architecture in urban development. Well-thought-out and interesting night lighting plays an important role in this task. Prestige, development and success have been expressed through modern architecture. Modern architecture is an image of a place. Her appearance and character are of great importance for the assessment of a place. Attractively lit facilities and public spaces are the best forms of advertising and promotion of the city. (Figure 1-8)

5. Public spaces - quality and attractiveness

Public spaces testify to the quality of life and have an impact on the assessment of the city, commune, region. Interesting and attractive contemporary architecture gives a new quality. Modern architecture is not only a complement but also a background for historic buildings, perfect for revitalizing historical buildings. So, through well-planned contemporary architecture, we create a new quality and give a new image to the city. Attractive public spaces and architectural objects are becoming a significant marketing element of the place. They are an expression of development, success, prestige. They attract users, tourists and other investors. Wise management of built space, appropriate urban and economic decisions have an impact on the increase in building development and the well-being of residents. [1, 4] (Figure 8-10)
Figure 9. The Katowice Culture Zone is now a cult place for evening walks of the inhabitants. It would not have been possible without attractive facilities, public spaces and lighting.

Figure 10. The Gdańsk Old Town is a beautifully lit area of the city. The overall illumination mostly provided by individual gastronomic establishments encourages walking and visiting. The raised footbridge is also decorative.

6. Users evaluate the objects they use
As stated - public spaces testify to the quality of life and have an impact on the assessment of the city, commune, region. To illuminate them, they must first be well designed. What does the word "good" mean? That is, according to the needs of future users. Through qualitative research, universal methods for assessing objects, selected elements, zones, interiors, external environment, and above all, getting to know the opinions of users, you can get knowledge - professional knowledge for design. Traditional design based solely on intuition and artistic approach is always associated with an increased risk. Therefore, a qualitative design using qualitative research is an obligation. Currently, without professional knowledge, there can be no effective design. Therefore, at the investment programming stage, it is worth knowing the opinion of users. It is worth reaching for this knowledge using known research techniques. After all, the essence of architecture is to create works for the user. Qualitative research is an effective method for obtaining design information. At every stage of the investment, from the idea through programming, concept, design and management during use, always remember about the user. He uses buildings and spaces and assesses them. It is important not to lose the essence of architecture in the service of man in an investment rush. The basis is well-prepared pre-project qualitative research and identification of users and their needs. The Silesian School of Qualitative Research (Department RAr5 - Design and Qualitative Research in Architecture) has been operating at the Faculty of Architecture of the Silesian University of Technology for over 20 years, which has created its own methodology of qualitative research for the design of new objects or existing assessments. The methodology also applies to recovery programs for unprofitable or inefficient facilities. [3-6] (Figure 11-13)
Figure 11. How do users want to spend their free time? Is the bench alone enough today? Expectations are constantly increasing, so you have to ask and meet them. Stylized stones for sitting and couches for rest in Katowice. Glowing blocks in Tokyo or an illuminated platform to sit at a hotel in Warsaw.

Figure 12. Thanks to the night illumination, the Hilton Hotel in Venice advertises itself from a great distance, and its tower illuminated by white light is almost a lighthouse. Aesthetic space around gives a sense of security and encourages walking around the area. The building, thanks to the overall illumination, affects the entire district by changing its character and giving a new, higher quality.
Figure 13. Attractive lighting lines at the entrance to the Chrobry Park in Gliwice. Fountain lighting and blue lines of LED lamp amphitheater seats in the Tropical Island park in Marklowice.

7. Technology favors illuminations
Currently, technology favors the lighting of buildings. The combination of LED and solar farms gives the dream results. Most importantly, lighting technologies are constantly evolving, and light sources are becoming more efficient, cheaper to buy, and have greater power and efficiency. It is important to use modern lighting solutions in new projects and revitalizations. Then it is good to use lighting to observe and examine and draw conclusions from implementation in order to be able to propose more effective and attractive solutions next time. Energy-saving and durable, as well as with color control function, LED lamps give technical possibilities for almost any artistic expression in the form of object lighting. Modern times are rich in solutions for lighting buildings. Most importantly, these are energy saving solutions. You don't need thousands of watts to illuminate the building, but a few hundred or even several dozen are enough. (Figure 14-17)

Figure 14. Walls of architectural concrete illuminated with LED lamps. The wall at Sky Tree in Tokyo and the connector from the Congress Center to Spodek in Katowice during 4DD.
8. Conclusions
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