The Effect of Nighttime Lighting on the Open Spaces with Heritage Values: The South Square of Yogyakarta Palace

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Abstract

A cultural heritage open space is a community gathering center in a cultural heritage area, especially for young people, with a uniqueness. This could include its elements of art, mysticism, and history being the primary source of attraction.

The South Square of Yogyakarta Palace is a cultural heritage open space usually busy at night. The nighttime lighting provides a visual excitement to gather and experience the open space's unique historical and cultural values.

This research aims to determine the suitability of the nighttime artificial lighting for the cultural meanings and the activities of the young people in the cultural heritage open space. A rationalistic method was adopted. It involved observing the gathering patterns of young visitors influenced by nighttime lighting repeatedly and deeply through quantitative and qualitative approaches.

The study found that artificial nighttime lighting led to youth gathering spaces with different activities and durations. The patterns created unconsciously also have a deep meaning in Javanese Hindu culture. This phenomenon is absent during the daytime.

Keywords: cultural heritage, visual perception, youth activities, square, nighttime lighting.

Introduction

A public open space is an unbuilt space in a city that is used to improve the aesthetic quality, environment, and citizens' welfare (Haryanti, 2008). It is commonly used by people with different age groups and diverse social, economic, and cultural backgrounds as a forum for mutual interactions and different purposes. Young people may use such a place to gather at a lower cost than a cafe or a mall. An example of this is often seen in the South square of Yogyakarta Palace: a cultural heritage area that has ample open space formed by the buildings' mass configuration. This phenomenon is often observed there, which has had a spiritual meaning during the ancient times with the day and night atmosphere very different. The nighttime lighting seems to trigger the increase in the attraction and cultural sense of the area, especially for the youth. Therefore, this research aimed to uncover the role of nighttime lighting on the South Square of Yogyakarta Palace and how it affected youth activities. The research objectives were to conduct onsite surveys and measurements to find the relation between the South Square of Yogyakarta Palace, its nighttime lighting, and the people who enjoyed that place. The findings of this research are expected to be used in designing nighttime lighting for open spaces, especially in

city areas with historical and cultural significance due to its positive effect on the community, especially young people, in utilizing open spaces to gather conduct different activities.

Literature Review

Night Light in a Palace Square

Night lighting in palace squares is intended to fulfill general lighting needs and enhance the site values. In historical palace squares, night lighting is supposed to reflect the values of those places. It makes its lighting unique, as every palace has its cultural importance. Night lighting may have a different approach for historical palaces in the eastern world, where mythical values are more substantial than western counterparts. Night lighting is not merely to satisfy night visual comfort but also to form a legendary atmosphere. It is particularly true in palaces in Indonesia, where eastern spiritual values are still more dominant than western secular values.

The above argument explains why finding research on the night lighting of Indonesia's palace squares is not easy. Google Scholar exploration using 'palace square' as a keyword found 2,830 articles. Adding another keyword, 'lighting,' found 417 articles with 236 journals. The number lowered to 188 articles when 'heritage' was added. Adding the fourth keyword, 'Indonesia,' found a report cited by 27 articles. This article contains a piece of concise information that Yogyakarta Palace has a village outside it, called *Siliran*, for lighting caretakers (Wardani et al., 2013). By using 'palace square' and 'lighting' keywords to seek images found around 50 images dominated by St. Petersburg square. Even though the St. Petersburg palace lighting seems popular, there is no critical or scientific review on it.

Another attempt using Publish and Perish software to seek any article using those four keywords found thousands of articles. However, after exhaustive sorting out the result list, there was no article discussing the four keywords at once. Most articles discuss lighting in squares or plazas of non-palace buildings. Moreover, they discuss lighting designs such as technological, conceptual, and aesthetical aspects. However, no article specifically discusses a palace square lighting in terms of its spiritual values, which are essential in Indonesian palaces.

Nightscape is the process of using artificial lighting as the primary medium to shape several spatial forms and provide diverse experiences at night. Artificial lighting is controllable and affects the landscape design and nightlife of the people. Lighting can show the shapes and textures and the changes in visual boundaries and scales. Meanwhile, artificial lighting provides more possibilities to create the quality of space needed to deliver a pleasant experience to a community at night (He, 2006). The nightscape phenomenon also shapes the habit of visiting places with people observed to visit a public space repeatedly, turning it into a daily ritual that further creates a visual character in the area (Anugeraheni, Rukayah and Setioko, 2015).

Therefore, the nightscape phenomenon is a combination of nighttime artificial lighting and illuminated physical environmental structures influencing the feelings and visual perceptions of the users. Meanwhile, perception is a process of interpreting information obtained through the human sensory system and this means visual perception is derived through the sight sense. Moreover, vision is the ability to recognize and analyze light with the eye. People, however, mostly link perception to visual perception in a daily context. It is also important to note that lighting is an element that plays an essential role in providing visual information about an environment. It allows people to enjoy the visual context of things around them, such as beautiful architectural works. It also can improve visual quality and enhance the character of an area for an observer. It, therefore, means lighting has a significant visual effect (Anugeraheni, Rukayah and Setioko, 2015).

Artificial Lighting

Nighttime artificial lighting creates the splendor of ancient structures around the city and provides a refreshing view of urban architecture and its surroundings. It also provides visitors with a friendly and safe atmosphere (Atmam and Zulfahri, 2016; Harefa, Feranita and Ervianto, 2020; Hale et al., 2013). Moreover, lighting effects can attract and persuade people to meet, interact, and get together when strategically configured. Finally, it means that the art of lighting has a significant role in shaping the city's future, as observed in major cities, which highlight aesthetic features in architecture using artificial lighting (Aqbar and Bahauddin, 2015). On the contrary, the night lights of the South Square of Yogyakarta Palace are simple. It is more functional lighting rather than aesthetics. Yet, people feel comfortable and adjust themselves to those lighting.

Public Open Space

Public open space is defined as an open space where all the elements are accessible to society. There are different types in urban areas, such as squares, parks, and urban forests. Historically, the primary function of public open spaces is to support the community's economic and social activities (Nikšič and Watson, 2018; Gehl and Gemzoe, 2005; Mitchell, 2003; Janssens and Sezer, 2013). Still, their development has reduced some vital functions, such as serving as a community gathering room to socialize (Madanipour, 2014; Urry, 1995). However, the benefits of public open spaces are determined by their quantity, quality, and accessibility (Mäkinen and Tyrväinen, 2008). For example, the nighttime activities in the South Square of Yogyakarta Palace emerge naturally. The square was not designed to host those activities. However, every night, without any formal announcement, people from all over the place come to enjoy the South Square atmosphere.

Youth Activities

Young people most often use the public open spaces as the "explorers" that "mark" an area for self-demonstration and socialization (Mäkinen, K. and Tyrväinen, L., 2008). Their activities in a region are often associated with negativity (Omar *et al.*, 2016), but socialization has been essential for their psychological and personality development (Düzenli *et al.*, 2012). Moreover, there is a possibility of an increment in the relationship of young people with the environment, chances of becoming socialized, and skill development levels when suitable spaces are created. However, several planned areas are observed to ignore the needs of young people associated with their psychosocial development (Omar *et al.*, 2016). In the South Square of Yogyakarta Palace's context, the phenomenon of youth activities is unique as this square was initially designed for the royal private space. Until now, this extraordinary phenomenon has not been explicitly studied.

History of the South Square of Yogyakarta Palace

Researchers from different subjects have studied the South Square of Yogyakarta Palace. It is roughly one-fourth (160mx160m) of the North Square of Yogyakarta Palace. The South Square faces the Indian Ocean, while the North Square faces Mount Merapi. The Indian Ocean in the south, the Yogyakarta Palace in the middle, and Mount Merapi in the north form an imaginary sacred axis. The North Square and the South Square are meant to be public and private spaces (for the royal family activities). However, the South Square is much livelier with public activities during the night than the North Square, which remains empty and quiet. It is believed to be the people's response to their beloved Sri Sultan Hamengku Buwono IX, who dedicated his throne to his people. The change of the South Square from a private to a public space has been through a long process (Widyawati, 2017). Public activities in the South Square are contemporary (westernized) (Kurniawati, 2016) and do not follow the strict rules of the palace at all. The friendly atmosphere of the South Square is enjoyable for the youths,

where they gather peacefully even though there are many unrelated groups. It is a strong indication that the youth still follow their nation's foundation to be a country of Unity in Diversity (*Bhinneka Tunggal Ika*).

According to Handinoto (1992), the square (*Alun-alun*) has existed since the Majapahit Kingdom, founded in the 13th century. In the Negarakretagama manuscript written by Prapanca, it is explained that to the north of the Majapahit palace complex, there are two squares named Bubat and Waguntur. Bubat square is more profane, where people's parties are held in performances and games. While Waguntur is more sacred, it is used for coronation ceremonies and state receptions.

After Hindu rule ended in Java and was replaced by Islam, the Alun-alun was also present as part of the palace complex in the Islamic Mataram Sultanate, which Panembahan Senopati founded. The Sultan's Palace of the Islamic Mataram Sultanate has moved several times along with the course of its history. First in Kotagede (1586 - 1618), then moved successively to Kerta (1618 - 1647), Plered (1647 - 1680), Kartasura (1680 - 1745), and Surakarta (1745 - present). In 1754 through the Giyanti Agreement, the Islamic Mataram Sultanate was divided into two, namely the Surakarta Hadiningrat Sunanate (Surakarta Sunanate) and the Ngayogyakarta Hadiningrat Sultanate (Yogyakarta Sultanate). Kraton is the center of government and the cultural center where the king lives.

Through toponymy tracing, all the palaces of the Sultanate of Mataram always have a square. It is marked by the existence of a village (kampong) called Kampong Alun-alun. However, the existence of the Southern Square (*Alun-alun Selatan*) has only been found in the Surakarta and Yogyakarta palaces (Kraton).

The South Square of Kraton Surakarta, which is more private than North Square, is surrounded by a high fort wall and around it, there are several noble houses and the public people who make a living in the area. In this square, there is a building located a train carriage used to carry the body of Sri Susuhunan Pakubuwono X to the Astana Pajimatan Imogiri cemetery.

The South Square of Kraton Yogyakarta was built during the reign of Sri Sultan Hamengkubuwono I in 1755-1792. This square used to function as a venue for various activities of the Kraton Yogyakarta. One of them is the training ground for the Kraton soldiers ahead of the *Garebeg* tradition.

This area used to be very quiet and haunted. Particularly with the existence of two twin Banyan trees. Several main assets of South Square are still preserved, such as Banyan trees, *Kweni* trees, *Pakel* trees to *Gayam* trees. The Javanese people believed that the row of trees symbolized security, tranquility, and shade.

In addition to trees, access in and out of South Square, which consists of seven units, is still being maintained. The rows of roads include *Plengkung Gading* on the south side, then on the east side to Langenarjan Street and Langenastran Street. Then there is Pamengkang Street, and on the west side, there is Ngadisuryan Street and Patehan Street.

In the past, in one corner of the South Square, the location of the three fixed pillars functioned as a place to tie the Sultan's elephant. The king's elephant is only caged and made up and released during the Garebeg ceremony. In front of Siti Hinggil on the north side of South Square, there is a row of tiles that used to be bricks and served as a place for the Sultan to watch the training of soldiers.

The development of the South Square into a city public space

The Southern Square of the Kraton Yogyakarta has experienced a development of function and meaning. This development reflects how Kraton responds to the needs of the community. Community needs open urban space, while the Kraton allows its private areas for public activities.

On the 200th anniversary of Yogyakarta City in 1956, the Sasono Hinggil Dwi Abad building, located on the north side of the South Square, was built for public activities. From 1969 to 1970 Sasono Hinggil Dwi Abad building was used for puppet shadow performances and the Southern Square for the traffic park. However, the traffic park stopped because it damaged the body of the square. Around 1980 Sasono Hinggil was used to practice Tae Kwon Do and discotheques. Meanwhile, the square is used for the second-hand goods market (Widyawati, 2017).

The elephant cage was opened to the public in 1997 to attract tourists. This elephant cage is also an attraction to the community. Consequently, it also attracts traders and develops like a market. Public activities in the body of the square, such as decorative bicycles, and mini trains, enlivened the area of the South Square and were then stopped because they damaged the body of the square. In 2010 the elephant cage was closed to the public, but traders still operated. They were allowed to take action on the west and east sides with areas marked with andesite stone pavements (Widyawati, 2017).

Changes to the character of the South Square

Research on three aspects forming the character of a place (physical aspect, function/activity aspect, and place meaning aspect) shows that the characteristic of South Square in the past was a private open space of the Kraton Yogyakarta. Meanwhile, the character of the South Square at this time is a public open space for the city of Yogyakarta. Changes in characteristics in the two periods indicate that the aspect of function/activity is the aspect that has the most significant influence on the formation of the character of South Square. On the other hand, the physical and meaning aspects have not changed much (Prasetiyo, 2015).

Research Method

Research Subjects

The subjects were young people observed to be active under nighttime artificial lighting from 06.00 pm to 01.00 am. They were between the ages of 15 - 25 years old with those at the age of 15 used to represent the active young visitors assembling in large groups while 25 represents young visitors in small groups or pairs.

Research Location

The research was conducted at the South Square of Yogyakarta Palace. Although the North Square is bigger and is facing the busy downtown, the South Square is more popular for night activities.

Research Tools

The tools to measure and map the nighttime artificial lighting spread include the following:

1. Two lux meters to measure the illumination in lux
2. Software Dialux 4.12 to simulate the nighttime artificial light spread.

Research Time Frame

The data were retrieved from 06.00 pm to 01.00 am for three weeks or 21 days. It was from May 1st, 2018, to May 22nd, 2018.

Data Collection Methods

Data collection process:

(1) Onsite observation and lighting intensity measurement using Lux meters and a visitor counter. The lux meter data were later inserted in Dialux 4.12 to simulate the lighting patterns formed while the

visitor data were mapped to the light patterns. The other processes include interviews, a literature study, and physical mapping of the environment through light distribution.

(1) Direct observation was carried out as the technique with the numbers of young visitors calculated for 21 days from 06.00 pm to 01.00 am and categorized based on the light distribution. Meanwhile, the lighting spread was measured using a lux meter at each light source point and stretched with the square divided into 25 zones to simplify the counting. Four volunteers conducted the counting process.

(2) The interviews were conducted using an interview guide and the success rate depended heavily on the ability of researchers. The symptoms of the phenomena were considered invisible or occurred before this research was explored. These include information on the selection of zones to gather, reasons for selecting the cultural heritage open space, gathering duration, and the perceived experience during the gathering based on the spread of lights. Some respondents were considered to have knowledge and experience related to research issues and they were classified as the visitor category.

(3) The documentary study was used to obtain theories that supports this research. The information explored through the literature studies were views, theories, concepts, potentials, and uniqueness of the region and the condition of the nightscape phenomena, open spaces, psychology of exposure, and artificial lighting.

(4) The physical environment was mapped based on the distribution of lights, types of lamps, inherent activities, and the assembled space's constituent elements. It was essential to correlate the gathering spread of the young people with the distribution of light in the cultural heritage open space.

Analysis Method

The data was analyzed using several steps indicated in Fig. 1. The first step was to summarize visitor data, types of activities, duration, and distribution of artificial lighting along with the lux values of light, materials, types of vegetation, and topography in each zone. The second step was to divide the zones with the same criteria to obtain the pattern of the subject's gathering spaces.

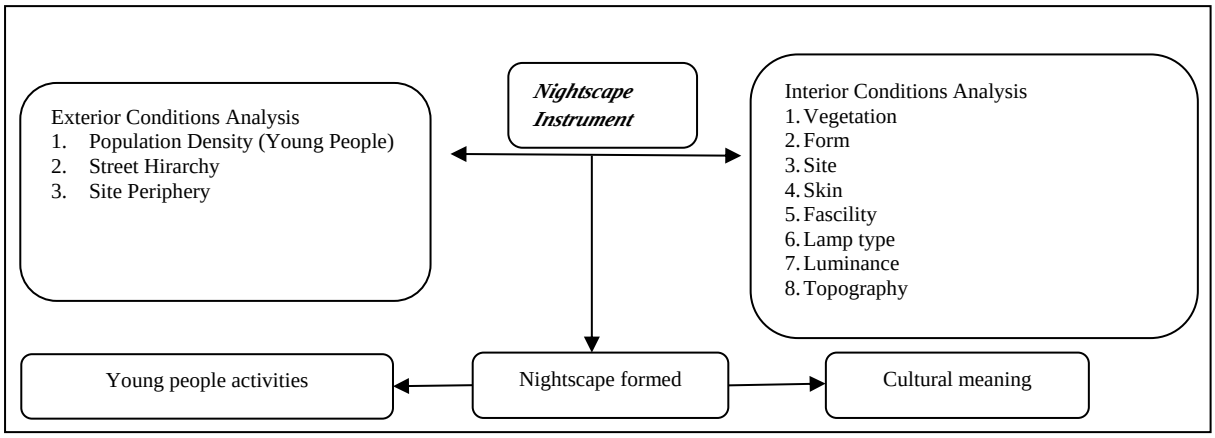


Fig. 1: Analysis diagram
Source: authors' analysis.

Findings and the Discussion

The search for references through the internet showed no previous studies on nighttime youth activities in heritage open spaces. Therefore, the analysis was conducted using a guide in the form of theory used to discuss the nightscape phenomenon based on He (2006) as indicated in

Fig. **2**.

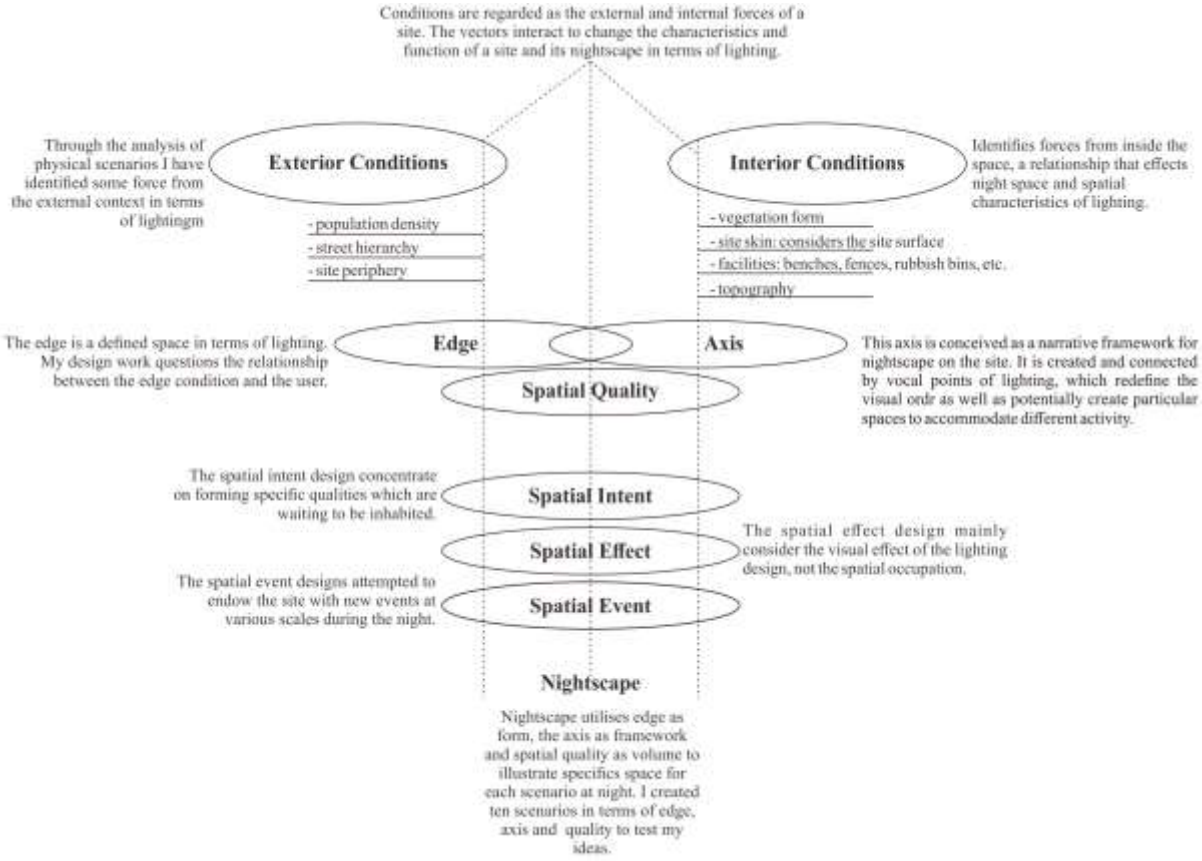


Fig. 2 Nightscape phenomenon analysis diagram.
Source: (He, 2006)

Exterior Conditions

Population Density

The division of research site zones helped calculate the number of young visitors as presented in Fig. 3, with zones (11, 12) and zone (13) found to be the most and least crowded zones, respectively, as indicated in Source: authors' analysis.

Table 1. In contrast, zone (11, 12) and zone (14, 15) have a high numbers of people. These zones, however, have high illuminance, as shown in Fig. 8.

Fig. 3: Division of zones and sub-zones used for the data collection (Wardhana and Hakim, 2016).
Source: authors' analysis.

Table 1: Number of people in zones.
Source: authors' survey.

Zone	Percentage	Number of people	density
zone 1,2,3,4	7	346	medium
zone 5,6	10	505	medium
zone 7,8,9,10	11	550	medium
zone 11,12	22	1076	high/crowded
zone 13	5	243	low
zone 14,15	21	997	crowded
zone 16,17,18,19	9	435	medium
zone 20,21	4	198	low
zone 22,23,24,25	10	478	medium

Street Hierarchy

The road hierarchy becomes essential given the fact that the South Square of the Yogyakarta Palace is surrounded by the main public road, as indicated in Fig. 4. It has led to the crowding of this area at night and its use as a recreational facility. It is also based on the five public roads that are connected to the South Square private ring road with clockwise traffic flow. Moreover, the street hierarchy in the South Square adds to the night's vibrant atmosphere due to the placement of the street lights, which light up the vehicle circulation. The existing conditions also show that the South Square is the meeting center of the city's arterial streets and this is the reason for its very dense activity, specifically at night. However, these conditions are different during the day because the only movement are the vehicles without any gathering activity. Furthermore, the fort walls bordering the settlements with the South Square shown in Fig. 5 also prevent the nighttime lighting from disturbing the settlements indicated in Fig. 6.

Fig. 4: The existing condition of vehicle traffic lane pattern in the south square of Yogyakarta.
Source: authors' survey.

Site Periphery

Fig. 5: The south square is surrounded by 3 meters and 30 cm fort walls.
Source: authors' survey.

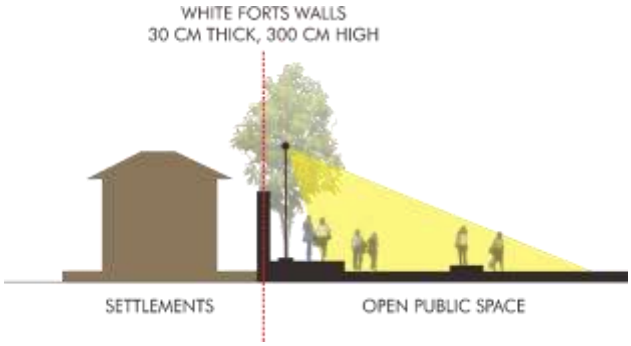
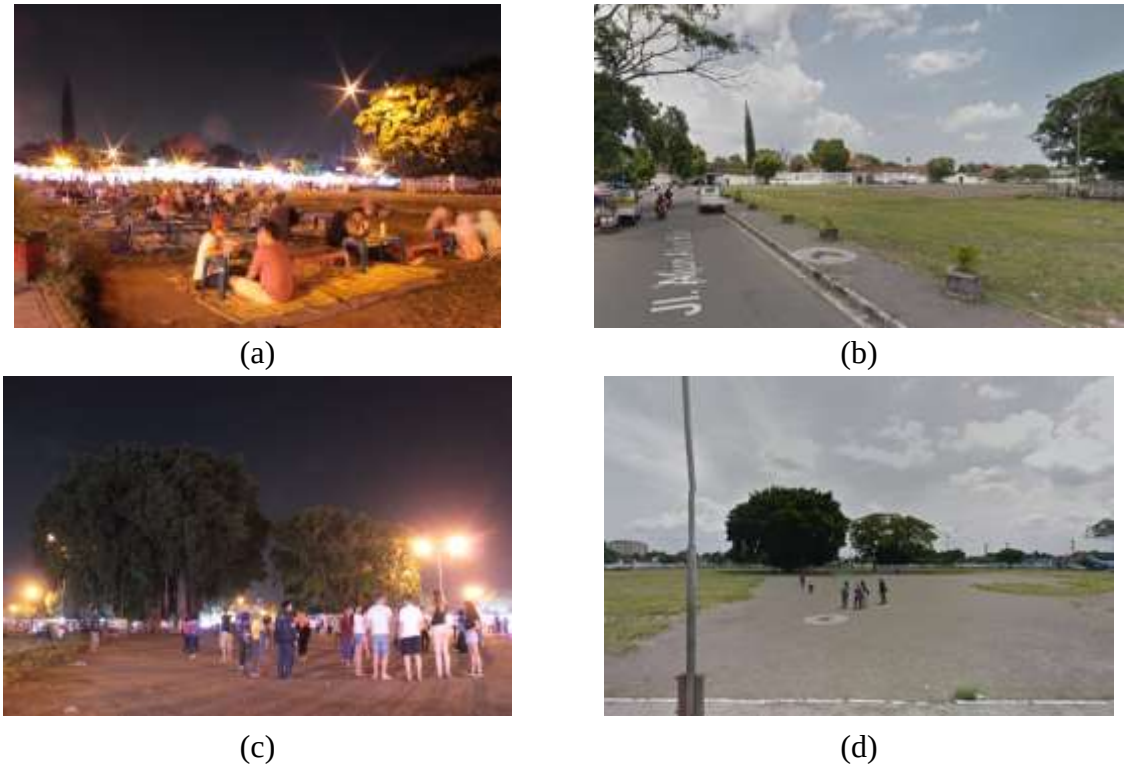


Fig. 6: Fort walls separate settlement from the square
Source: authors' survey.

Interior Conditions Analysis

The internal conditions indicate the existing objects and surfaces on the site, which influence the lighting effect and, consequently, reorganize the site's interior space. They are, however, classified as plants, surfaces, facilities, and topography. Plants are not dominant in the square. Studies in other countries indicate that greenery reduces crimes (Shepley *et al.*, 2019) or, at least, fear of crime (Jing *et al.*, 2021). However, the survey found no significant criminal cases in the South Square. Night and day atmospheres are very different. The South Square is lively during the night and relatively quiet during the day (Fig. 7).



(a) (b)

(c) (d)

Fig. 7: (a) A typical night view of the south square with youngsters conducting *lesehan* (dining while sitting on the ground). (b) Day view toward the Yogyakarta Palace south gate. (c) Night view showing youngster groups near the two Banyan trees. (d) Quiet and empty south square during the day. The two Banyan trees are iconic and have past mythical values. Source: authors' survey.

The analysis began by observing the nighttime lighting spread in the South Square, as shown in Fig. 8. The spread was observed to have caused reflected light on the plant media, soil level, facilities, and soil contour types, which create spaces for young people to conduct several activities. The detailed analysis of the zones is presented in Fig. **9**, Fig. **10**, and Fig. **11**.

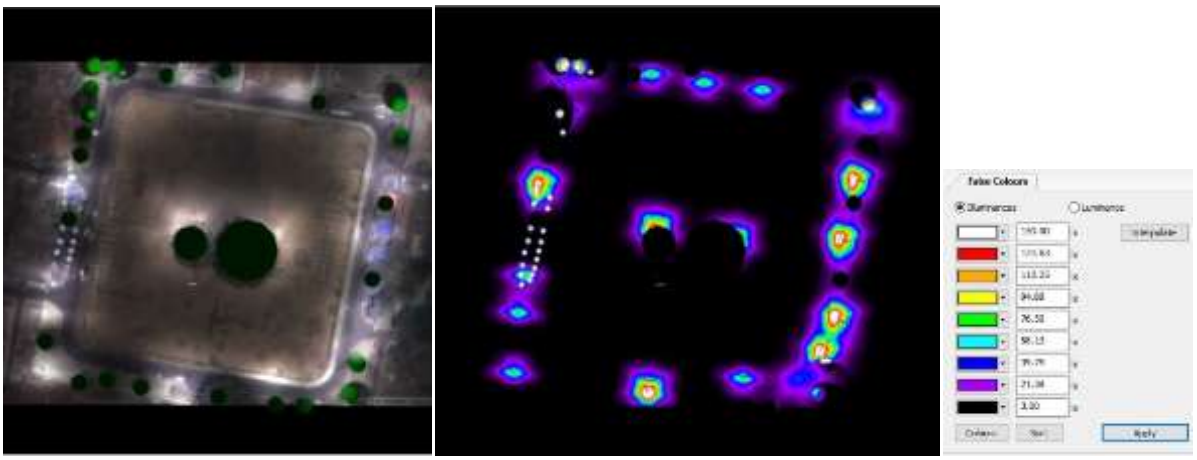


Fig. 8: The lighting mapping results using Dialux Software 4.12 and false-color showing the lighting's illumination level spread in the South Square.
Source: authors' simulation.

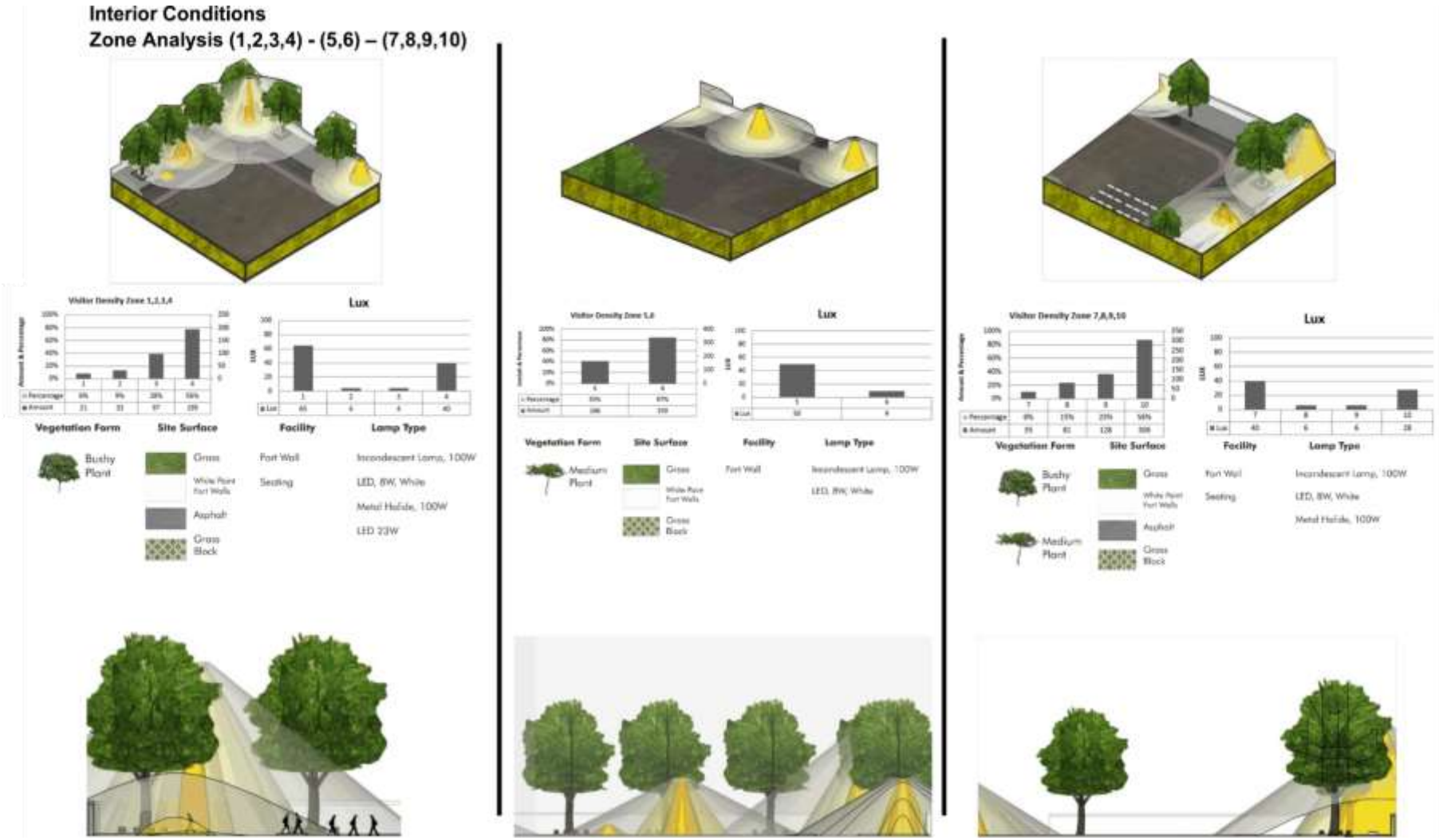


Fig. 9: Zone Analysis (1,2,3,4)-(5,6)-(7,8,9,10)
Source: authors' analysis.

Fig. 10: Zone analysis (11,12)-(13)-(14,15)
Source: authors' analysis.

Fig. 11: Zone analysis (16,17,18,19)-(20,21)-(22,23,24,25)
Source: authors' analysis.

Analysis Result

Table 2: Analysis of each zone.
Source: authors' analysis.

Zone	Visitor Amount (person / %)		Illumination (Lux)	Activities	Types of Visitor (person)		Duration of Visit (minute)	Trait	Facilities Used	Vegetation
1,2,3,4	346	7	28.25	Sit, chat	Group	3-6	30 - 60	not fixed	Seating Fort Wall	Moderate
5,6	505	10	29.5	Photograph, *Masangin*	Group	4-10	30	not fixed	Fort Wall	None
7,8,9,10	550	11	20	Sit, chat, dine	Group	3-6	30	not fixed	Seating Fort Wall *Table for dining while seating of floor*	Moderate
11,12	1076	22	8.5	dine, sit, chat	Group	4-10	120 - 180	fixed	*Table for dining while seating of floor* Fort Wall Food Vendor	Moderate
13	243	5	5	*Masangin*	Group	1-3	1 - 2	not fixed	Nothing	Lush
14,15	997	21	25	Sit, chat, dine	Group	4-10	60 – 120	fixed	Food Vendor Fort Wall *Table for dining with seating of floor*	Moderate
16,17,18, 19	435	9	15.5	Sit, chat	Group	2-3	60 – 120	fixed	Seating Fort Wall	Lush
20,21	198	4	35	Sit, chat	Group	2-3	60 – 120	fixed	Seating Fort Wall	Lush
22,23,24, 25	478	10	13	Sit, chat	Group	2-3	60 – 120	fixed	Seating Fort Wall	Lush

Note: *Masangin* used to be a traditional ritual where someone tries to walk between the two sacred Weeping figs (lt. *Ficus benjamina*) at the center of the square with closed eyes. A person that is able to walk straight will have his/her wish come true. This ritual is, however, currently just for fun.
Lesehan is a unique culture in Yogyakarta where people eat while sitting on the floor.

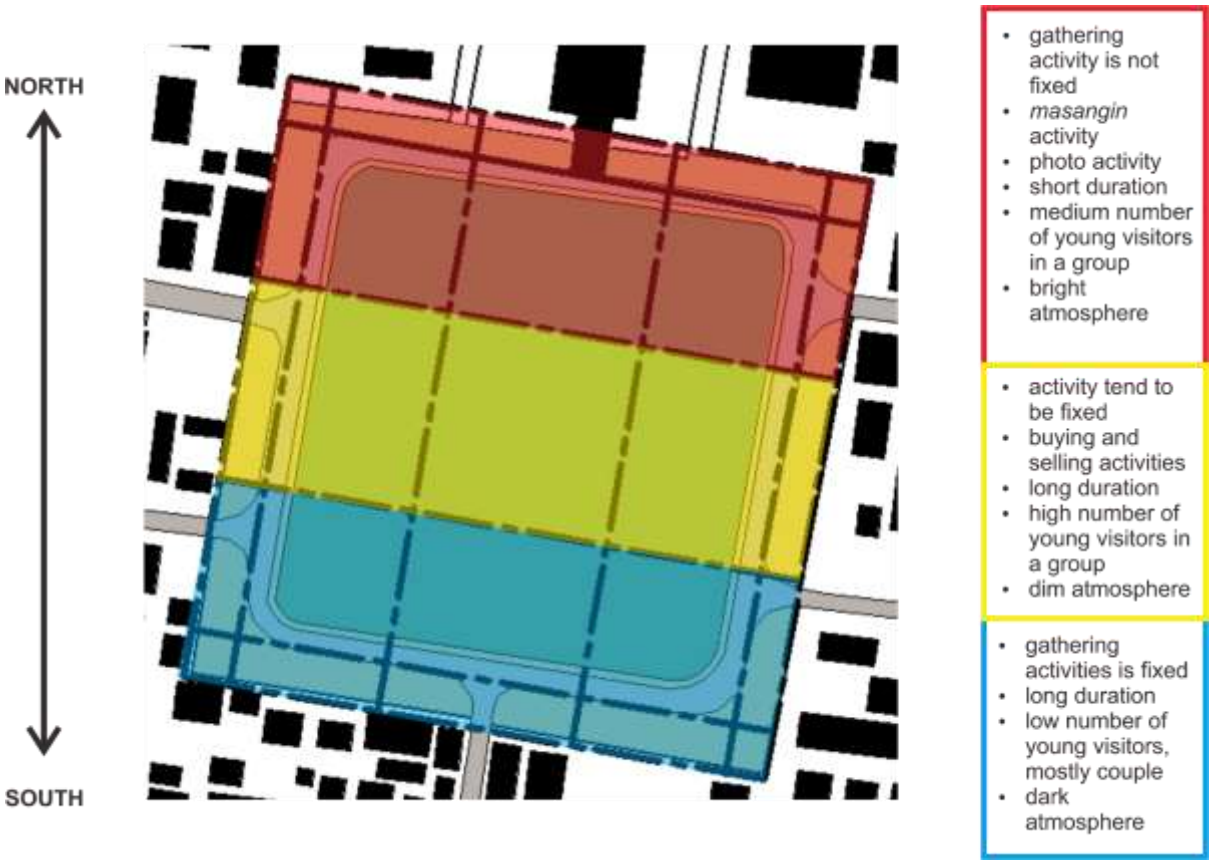


Fig. 12: Patterns formed from all aspects of exterior and interior conditions in the South Square of Yogyakarta
Source:authors' analysis.

Cultural Significance

People used the South Square as a place for rituals related to spirituality. Sri Sultan Hamengku Buwono I, the first Sultan of Yogyakarta, set the philosophy of all objects in the square and advised the people to love and submit themselves to God Almighty, act diligently and modestly, be careful in their daily behavior, and others (Cahyani, 2015). Even though there are Islamic instructions toward nightlife (Khorsand, Alalhesabi and Kheyroddin, 2020), the South Square only showed common local habits of good conduct during the survey. The orientation used in organizing the Yogyakarta Palace complex, the location of the South Square, is to adhere to a system that combines Islamic teachings with the Javanese Hindu cosmic system (Yeru, 2016).

Fig. 7 shows a nighttime lighting distribution and the visitor density spread, which form a Tri Hita Karana's Hindu concept pattern. According to Dwijendra (Dwijendra, 2003), it dictates the composition of the cosmos from the most macro (*bhuana Agung*/universe) to the most micro (*bhuana alit*/human being). In the universe, the soul is *Paramatma* (God Almighty), energy is a variety of natural energy, and the body is *Panca Maha Bhuta* (five great elements). Meanwhile, at the housing or village level, the soul is *parhyangan* (*pura desa*/village temple), power is *pawongan* (peoples), and the body is *palemahan* (village area). Similarly, in banjar, the soul is *parhyangan* (*pura banjar*/banjar temple), power is *pawongan* (banjar people), and the body *is palemahan* (banjar area). At a residential level, the soul is *sanggah pemerajan* (holy place), energy is the occupant, and the body is *pekarangan* (yard) while the soul for humans is *atman*, power is *sabda bayu idep,* and the body is *stula sarira* (human body) as indicated in Table 3.

Table 3: Tri Hita Karana in the order of the cosmos (Sulistyawati, 1985) in (Dwijendra, 2003)

Composition/elements	Soul (*atma*)	Energy (*prana*)	Physical (*angga*)
universe (Bhuana Agung)	God Almighty (Paramatman)	energy (which moves nature)	elements (panca maha bhuta)
village (desa)	village temple (pura desa)	villagers (pawongan)	village area (palemahan)
hamlet (banjar)	hamlet temple (pura banjar)	hamlet people (warga banjar)	hamlet area (palemahan)
house (rumah)	place of worship (sanggah/pemerajaan)	house occupant (penghuni rumah)	yard (pekarangan rumah)
Human (bhuana alit)	human soul (jiwa manusia)	energy (prana, tenaga sabda bayu idep)	human body (angga)

The *Tri Hita Karana*, which is interpreted as the three elements of life, regulates the balance or harmony of Man with the environment based on the arrangement of the bodies (*angga*) in line with the derivatives of the concept of space called *Tri Angga*. *Tri* means three and *Angga* means body emphasizing the three physical values of Utama Angga, Madya Angga, and Nista Angga (Dwijendra, 2003) as indicated in Table 4.

Table 4: Tri Angga in the cosmos order (Sulistyawati, 1985) and (Adhika, 1994) in (Dwijendra, 2003)

Composition/elements	Sacred main body (*utama angga, sakral*)	Neutral mediocre body (*madya angga, netral*)	Dirty despicable body (*nista angga, kotor*)
universe (*alam semesta*)	*Swah loka* is a realm inhabited by souls with clean hearts and lives full of compassion and kindness to those with broad consciousness.	*Bwah Loka* are the realms of existence in which we are currently living. This is often referred to as the middle realm.	*Bhur Loka* is a realm with a dim or dark atmosphere.
area (*wilayah*)	mountain (*gunung*)	plain (*dataran*)	ocean (*laut)*
settlement, village (*perumahan, desa*)	*kahyangan tiga*	settlement	graveyard (*kuburan*)
house (*rumah tinggal*)	place of worship (*sanggah, pemerajan*)	building (*tegak umah*)	backyard (*tebe*)
building *(bangunan*)	roof (*atap*)	posts, walls (*kolom, dinding*)	floor (*lantai, bataran*)
Human (*manusia*)	head (*kepala*)	body (*badan*)	leg (*kaki*)
Time (*masa, waktu*)	future time (*masa depan, watamana*)	present time (*masa kini, nagata*)	past time (*masa lalu, atita*)

Young people only gather in the South Square's northern zone for a short duration and move afterwards. The atmosphere is bright, making it the center of activities and known in the Hindu concept as the center of human movement with God, which regulates their daily behavior.

The middle zone is where the young people enjoy culinary tours and provide tables to dine while sitting on the floor (*lesehan*) with different menus for a long duration and they are more fixed in the area. It is in line with the *Tri Hita Karana* and *Tri Angga*, which show the housing complex as a residential area or *pawongan* (village people) with economic and social activities or worldliness. According to their backgrounds, visitors of parks (and squares) can be diverse, in terms of economic and social status (Willemse, 2018). However, this tendency does not seem to exist in the South Square. People gather in a relaxed and friendly atmosphere.

The young visitors gather in the South Square's southern zone for an extended time with low density consisting of young couples. The atmosphere is darker with the perception that it is safe without interruption. However, the Tri Hita Karana and Tri Angga represent the despicable zone (*nista*/*palemahan*). Meanwhile, in the Javanese culture, this pattern represents a home, an ordered place where the concept of geometric space is irrelevant. Moreover, the parts of the Javanese residence further indicate the understanding of the place with the term *dalem* on the main house (*omah*) interpreted as ego since *dalem* is a first-person (eng. I) in high Javanese language (Kartono, 2005). The *Sentong tengah* located in the *omah* is a place for homeowners to connect and integrate with *Illahi* (God). At the same time, *pendopo* is a means to communicate with fellow human beings (Priyotomo, 1984) as indicated in Figure 13.

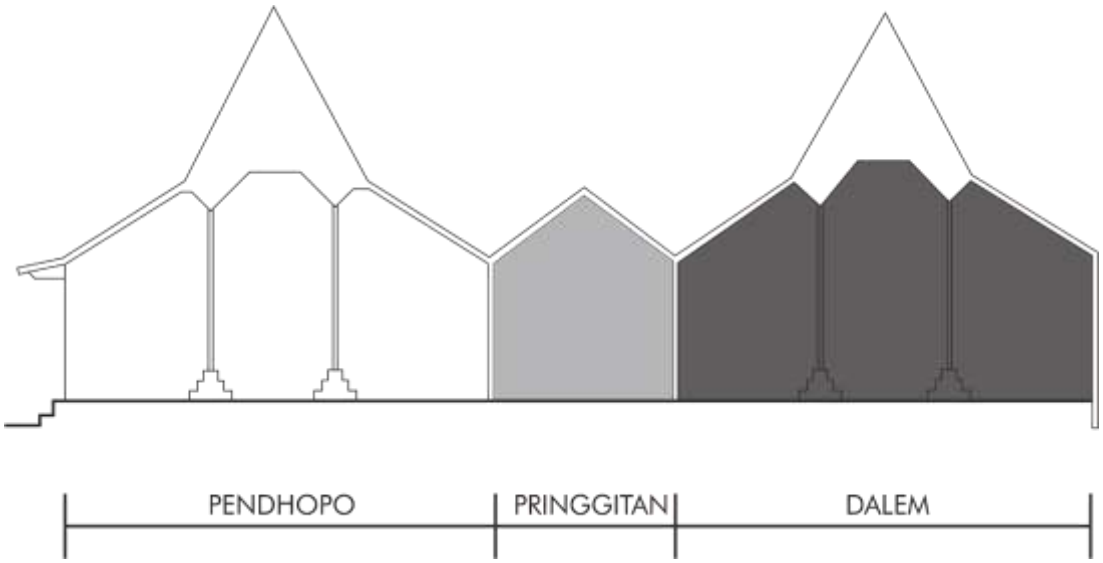


Fig. 13: Order of sacredness and light in space.
Source: (Tjahjono, 1989).

Conclusions

Artificial lighting at night provides the young visitors opportunities for the perception of forming subspaces according to their needs. It is related to the distribution of different populations of young visitors under varying luminance values. The bright luminance is observed to have low visitor density, medium (dim) has high density, and low has shallow density values. Other influencing factors include the absence of facilities and vegetation in each sub-space and the combination of illumination levels that affect the duration of activity under the spread of light based on personal or individual feeling and a sense of security.

The subspaces formed indicate the possibility of using nighttime artificial lighting to promote social revitalization. The open space of the cultural heritage area was specifically designed to impart meaning as a symbol of life. The young people visiting the South Square were discovered to come from different cultural backgrounds. They seemed to be unconsciously directed by the nighttime artificial lighting of the South Square of Yogyakarta Palace and uncovered why the square was initially established.

The square is considered a public space with economic equality values, and this means there are no prevailing activities. However, its uniqueness has also been further strengthened by the element of cultural meaning through artificial lighting at night, even though the intention is implicit.

The phenomenon of nighttime lighting in the South Square of Yogyakarta Palace affects the young visitors' density forming gathering spaces with different purposes and

durations. These patterns, however, have a depth of cultural meaning and are observed from the daily activity. Moreover, the nighttime lighting spread provides a visual perception that creates a sense of need. Even though the Yogyakarta Palace was designed based on Islamic concepts, the influence of Hinduism can still be traced.

The nightlife of the South Square of the Yogyakarta Palace is unique. Its artificial lighting contributes to the formation of that uniqueness. However, the square can be enhanced to increase its attractiveness. For example, it can be developed using a modern approach without sacrificing its cultural uniqueness, such as in other countries (Kaftangui *et al.*, 2019). Its lighting can even elaborate to add symbolic meanings, like in other places (Hui, 2021).

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