Studying the visual impact of modern construction on historic cityscapes: a case study of Lawang Sewu building, Indonesia

Estudio del impacto visual de la construcción moderna en paisajes urbanos históricos: un estudio de caso del edificio Lawang Sewu, Indonesia

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Hassan Gbran[1]
Suzanna Ratih Sari[2]

Abstract

Lawang Sewu, a historic building in Semarang City, stands as one of the premier tourist attractions in the area. Commenced in 1904 and completed in 1918, this iconic structure has undergone various transformations in terms of its use and ownership. Initially serving as the administrative headquarters for the Nederlands-Indische Spoorweg Maatschappij (NIS), a private corporation operating in the railroad sector, Lawang Sewu holds significant historical value within the old city.

To delve into the public's perception of this renowned historic building and its surrounding urban landscapes, a study was undertaken to examine the impact of tall structures on Lawang Sewu, as well as on the visual experiences of visitors and the overall historical environment. The research focused on a newly constructed high-rise building near Lawang Sewu, considering its height, design, and color as key physical attributes, while using governmental height regulations as a benchmark. Simulation experiments were carried out on a diverse range of respondents with varying demographic characteristics drawn from the vicinity of Lawang Sewu.

Analyzing the collected statistical data, which included assessments by interviewers and demographic details of the respondents, revealed insightful findings. The study highlighted the

Resumen

Lawang Sewu, un edificio histórico en la ciudad de Semarang, se erige como una de las principales atracciones turísticas de la zona. Iniciada en 1904 y terminada en 1918, esta emblemática estructura ha sufrido varias transformaciones en cuanto a su uso y propiedad. Inicialmente sirvió como sede administrativa de Nederlands-Indische Spoorweg Maatschappij (NIS), una corporación privada que opera en el sector ferroviario, Lawang Sewu tiene un valor histórico significativo dentro de la ciudad antigua.

Para profundizar en la percepción del público sobre este renombrado edificio histórico y sus paisajes urbanos circundantes, se llevó a cabo un estudio para examinar el impacto de las estructuras altas en Lawang Sewu, así como en las experiencias visuales de los visitantes y el entorno histórico en general. La investigación se centró en un edificio de gran altura de nueva construcción cerca de Lawang Sewu, teniendo en cuenta su altura, diseño y color como atributos físicos clave, al tiempo que utilizaba las regulaciones gubernamentales de altura como punto de referencia. Se llevaron a cabo experimentos de simulación en una amplia gama de encuestados con diferentes características demográficas procedentes de las cercanías de Lawang Sewu.

[1] Nacionalidad: indonesio, adscripción: Faculty of Architecture Engineering, University of Diponegoro, Semarang, Indonesia; email: gbranhassan882@gmail.com
[2] Nacionalidad: indonesio, adscripción: Faculty of Architecture Engineering, University of Diponegoro, Semarang, Indonesia; email: ratihsaris@yahoo.com; ORCID: https://orcid.org/0000-0002-9574-9254

influential role of the height, design, and color of the newly erected high-rise building on the public's visual perception of Lawang Sewu. Furthermore, it was observed that individuals with different demographic backgrounds tend to evaluate the historical district landscape in distinct ways.

The outcomes of this study present valuable considerations for shaping the future development and planning of the surroundings of historic buildings like Lawang Sewu, offering a solid foundation for addressing the visual impact of contemporary constructions on such culturally significant sites.

Keywords:

historic buildings; high-rise buildings; awang Sewu; Tugu Muda; demographic characteristics

El análisis de los datos estadísticos recopilados, que incluían evaluaciones de los entrevistadores y detalles demográficos de los encuestados, reveló hallazgos perspicaces. El estudio destacó el papel influyente de la altura, el diseño y el color del edificio de gran altura recién erigido en la percepción visual del público de Lawang Sewu. Además, se observó que los individuos con diferentes antecedentes demográficos tienden a evaluar el paisaje histórico del distrito de distintas maneras.

Los resultados de este estudio presentan consideraciones valiosas para dar forma al futuro desarrollo y planificación de los alrededores de edificios históricos como Lawang Sewu, ofreciendo una base sólida para abordar el impacto visual de las construcciones contemporáneas en sitios de importancia cultural.

Palabras Clave:

edificios históricos; edificios de gran altura; Lawang Sewu; Tugu Muda; características demográficas.

1. Introduction

The adoption of the Heritage Impact Assessment (HIA) Guidelines by ICOMOS has propelled heritage and impact assessment into a key research methodology for city planning and urban design, an observation echoed by scholars such as Ashrafi, Kloos, and Neugebauer (2021); Yahampath (2014); and Rodgers and Bandarin (2019), emphasizing its growing significance in the field. In Indonesian cities, distinctive approaches to urban planning around historic buildings have emerged, presenting contrasting visions for neighborhood development.

One prevailing approach involves the extensive development of areas surrounding historic structures, with the aim of maximizing their commercial value. However, this strategy comes with the risk of overshadowing the historic buildings with surrounding skyscrapers, potentially diminishing their significance as visual focal points within the environment. In contrast, an alternative strategy leans towards stringent overprotection, enforcing strict architectural limitations around historic structures to enhance their aesthetic and visual appeal. While this approach may elevate the historic structures, it also runs the risk of inhibiting potential economic development opportunities.

As Indonesia embraces global influences, a growing necessity arises for historic buildings to harmonize with the evolving urban landscape, emphasizing the importance of balanced preservation alongside progress. However, these historic structures face heightened threats due to inadequate protection measures and expanding urbanization trends (Najd et al., 2015). As urban planning proposals must respect the foundation laid by historic buildings, as highlighted by Sirisrisak (2009), and incorporate public perspectives into the decision-making process to ensure inclusive and community-driven engagement (Yuen, 2005). This underscores the critical need to investigate how the public perceives urban landscapes characterized by the juxtaposition of newly constructed high-rise buildings alongside historic edifices in order to inform more nuanced and sustainable urban planning strategies.

1-1. Dutch Architecture Evolution in Indonesia

Lawang Sewu, an iconic Dutch colonial building, is situated in the city of Semarang on the north coast of central Java, Indonesia, encompassing an area of 23m x 77m. In the Javanese language, which is spoken in Indonesia, "Lawang Sewu" translates directly to "A Thousand Doors." Constructed on February 27, 1904, and completed in 1907 by Dutch architects, the building served as the headquarters for the Nederlandsch-Indische Spoorweg Maatschappij, known as the Dutch Indies Rail Company PT. Indonesian Railways (2014).

Designed by Dutch architect Cosman Citroen in the New Indies Style, a modern architectural approach prevalent in the Dutch East Indies from the late 19th century to the pre-World-War II 20th century, Lawang Sewu showcases the influence of Dutch colonial architecture in Indonesia. Constructed with materials imported from the Netherlands, the building originally boasted a thousand doors, as reflected in its name; however, only 928 doors remain today due to wartime looting (EDIATI, Pure, 2009).

Western building styles have had a significant impact on diverse cultures worldwide, with European settlers introducing building technologies, materials, and design principles wherever they established settlements. However, these imported architectural elements often did not align with the local cultural or climatic conditions. Consequently, adaptations were made over time to suit the local environment, leading to the emergence of unique architectural typologies. Dutch buildings in Indonesia evolved distinctly over the centuries, particularly in response to the tropical climate. The architectural styles of Dutch buildings in Indonesia can be categorized into four main periods: Masonry European Style, The Indies Empire Style, The New Indies Style, and Art Deco Style. Tables 1 and 2 provide detailed differences in materials and construction systems across these architectural periods, showcasing the evolution and adaptation of Dutch colonial architecture in Indonesia.

The stylistic evolution of Dutch architecture in Indonesia, particularly in the early 20th century, was not merely a matter of aesthetics, but primarily aimed at confronting the challenges posed by the extreme tropical climate of Indonesia. Considering that the Netherlands, the home country of the Dutch, experiences a climate vastly different from that of Indonesia, it becomes evident that architects importing their building techniques needed to tailor their designs to suit the local climate. In reality, a direct replication

of Dutch architectural styles could lead to unfavorable living conditions for the occupants. Consequently, the progression of Dutch architectural styles, as previously categorized, can be viewed as a result of centuries of problem-solving in response to the Indonesian climate.

Figure 1. A front view of the Lawang Sewu building

Source: Not specified

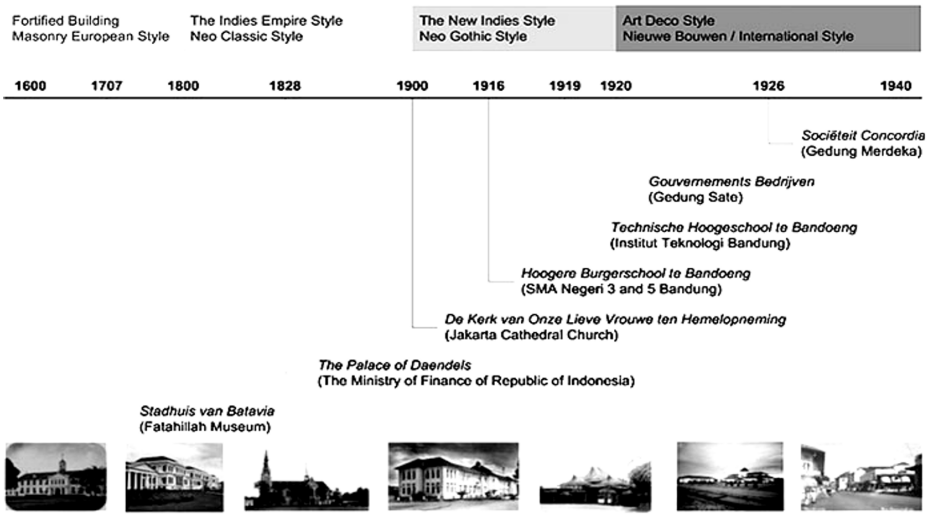
This adaptation has endowed Dutch architecture in Indonesia with a unique character within the Western architectural context, as no other country shares the exact weather conditions encountered in Indonesia. Therefore, the evolution of Dutch architectural styles in Indonesia reflects a distinctive fusion of Dutch expertise and indigenous adaptations, growing out of the necessity to address the specific challenges posed by the Indonesian climate.

1-2. What is Lawang Sewu's current usecase

After Indonesia gained independence, Lawang Sewu was owned by PT Kereta Api Indonesia and served as their main office, as well as accommodating other agencies like the Java Ministry of Transportation until 1994. Unfortunately, in 1994, the building was left vacant and fell into neglect. After years of abandonment, the PTKA's Heritage and Conservation Department, Indonesia's major public railway operator, decided to renovate Lawang Sewu in the hopes of revitalizing it. Although the building has been restored and is now in pristine condition, its primary use is limited to being a museum for tourist attractions. It has also gained popularity as a wedding venue. As it is currently owned by the PTKA, Indonesia's public railway company, Lawang Sewu primarily serves the purpose of showcasing the history of trains rather than focusing on its colonialist history ("Desain Tropis Dan Eropa," August 17, 2016).

The initial design process for Lawang Sewu commenced under Ir. P. de Rieu, but construction was postponed until 1903. Subsequently, Prof. J. Klinkhamer, B. J. Oundag, and his assistant C. G. Citroen were appointed by the Dutch government to continue the project, incorporating European architectural styles adapted for the tropical climate of Indonesia. Detailed working drawings were prepared in the Netherlands, and the majority of

Figure 2. Dutch architecture evolution in Indonesi



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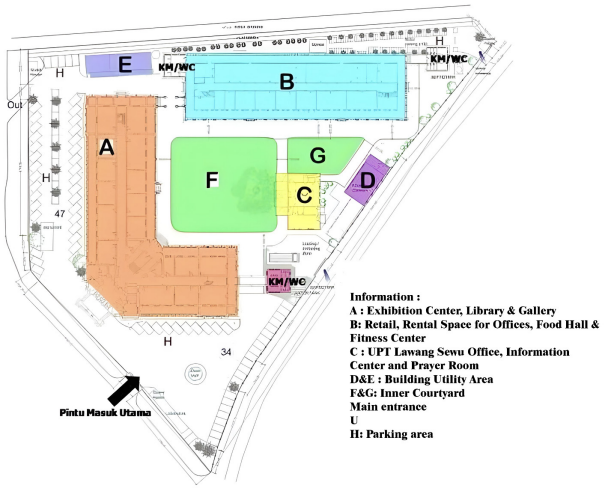
construction materials were imported from Europe. Construction began on February 24, 1904, and was completed in July 1907, during which the first buildings to be constructed were building A, with an "L" shaped floor plan, and building C. As the operations of the NIS expanded, the space in building A became insufficient to accommodate all the activities, leading to the construction of an additional building, later referred to as building B, on the northeast side of the site. The construction of building B commenced in 1916 and concluded in 1918, with notable differences in construction from buildings A and C. While granite, marble, and ceramics were imported from Europe for the construction of buildings A and C, building B incorporated local materials such as brick and wood.

During the years of World War II, Lawang Sewu had a diverse history of occupancy. The Japanese transportation agency office, named Riyuku Sokyoku, occupied Lawang Sewu from 1942 to 1945. In 1945, the building was utilized by DKARI (Djawatan Kereta Api of the Republic of Indonesia) as an office. However, in 1946, the Dutch recaptured Lawang Sewu from Japan and repurposed it as a military base.

Figure 3. General site planning and building blocks



Source: Not specified

Table 1. Elements of building materials

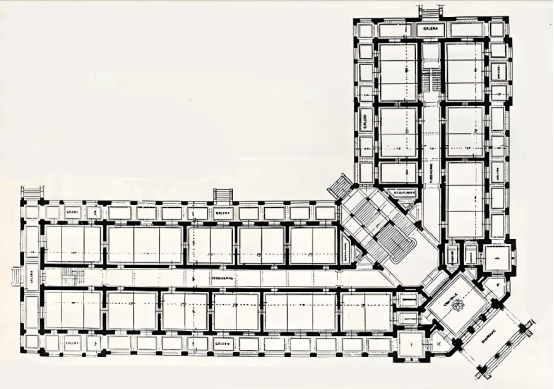
Architectural Style	**Indische Empire (18th-19th Century)**	**Transitional Architecture (1890-1915)**	**Modern Colonial Architecture (1915-1940)**
Structural System	Bearing wall, with column rows on the front and back porch	Bearing wall with prominent front gevels	The frame construction system, with walls as mere cover
Construction Technique	Column and beam construction system	Roof shaped like a saddle roof with roof tile coverings	Dominance of gable roofs with roof tile or shingle material
Roof Design	Roof shield with roof tile coverings	Introduction of additional construction for ventilation on the roof	Inclusion of concrete construction with flat concrete roof

Table 2. Elements of construction systems

Architectural Feature	**Indische Empire (18th-19th Century)**	**Transitional Architecture (1890-1915)**	**Modern Colonial Architecture (1915-1940)**
Wall Structure	Bearing wall with column rows on front and back porch	Bearing wall with prominent front gables	Frame construction system where the wall acts as a cover
Structural System	Column and beam construction system	Roof shaped like a saddle roof with roof tile coverings	Dominance of gable roof with roof tile or shingle material
Roof Design	Roof shield with roof tile coverings	Effort to use additional construction as ventilation on the roof	Inclusion of concrete construction with flat concrete roof

Sources: Not specified

Figure 4. Architectural plan for the first and second floors



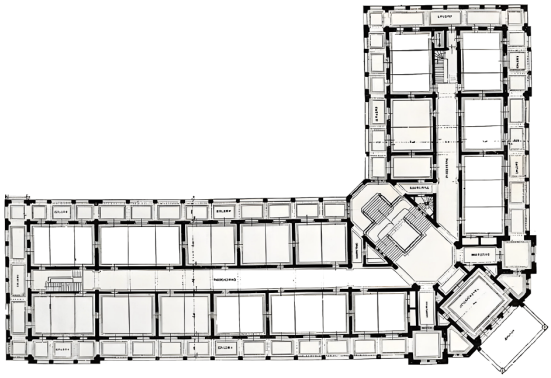


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Figure 5. Lawang Sewu ground floor plan, 1916

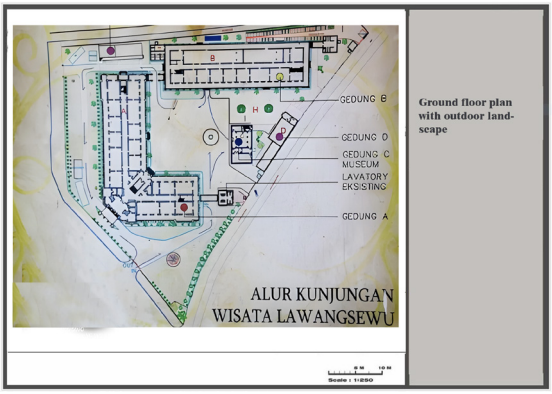

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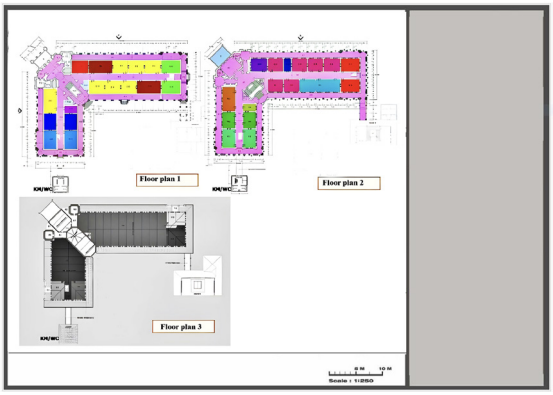
Figure 6. Lawang Sewu three floor plans, 1916



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2. Research purpose

2-1. The primary objective of the research is to examine the impact of modern high-rise buildings on the Lawang Sewu building in the Old City. This involves investigating the alteration of the architectural skyline and the convergence of old and modern architectural features, such as tall glass buildings, with the historic structures. The study will also assess how these modern constructions have influenced visitors' perceptions of the site before and after their implementation. This research is important due to the growing urbanization of cities worldwide, which poses a threat to the preservation of historic urban landscapes. Figure 2 illustrates the layout of Lawang Sewu, also known as the "a thousand doors," and its surroundings, highlighting the impact of high-rise buildings on the visual ambiance of the area.

2-2. Additionally, this study aims to identify alternative guidelines for neighboring structures that could mitigate irreparable damage to architectural heritage while maintaining a balance between its preservation and urban development. Employing a mixed methods approach, the study delves into the tangible factors influencing the visual impact assessment of historic structures within the context of heritage impact evaluation. The research involves integrating the subjective psychological evaluations of respondents with the visual characteristics of the studied objects. Specifically, it seeks to determine the potential influence of newly constructed high-rise buildings on the public's perception of the Lawang Sewu historic district and to evaluate how the physical attributes of these constructions affect public preferences regarding the urban landscape. Furthermore, the study aims to assess the feasibility of proposed solutions. Notably, the proximity of high-rise structures to the south and north of Lawang Sewu, known as the "a thousand doors," restricts the comprehensive visual appreciation of the entire vista of Lawang Sewu and its neighboring structures. Consequently, the northeas-

tern square, offering a clear and comprehensive perspective, was chosen for photography, while other observation locations were disregarded due to their inability to capture the complete view of Lawang Sewu and its environs.

Figure 7. Masterplan Early Development Lawang Sewu, 1916) (Norberg. 1963)

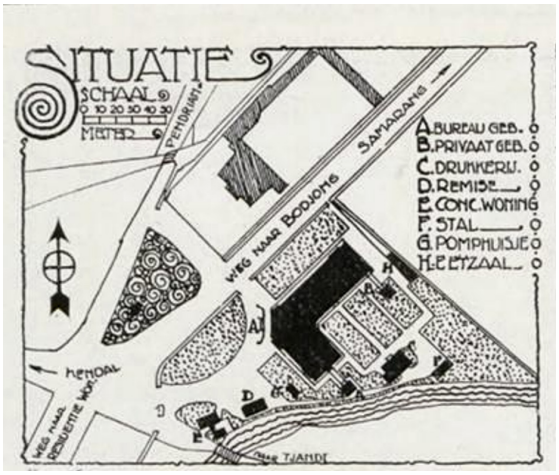

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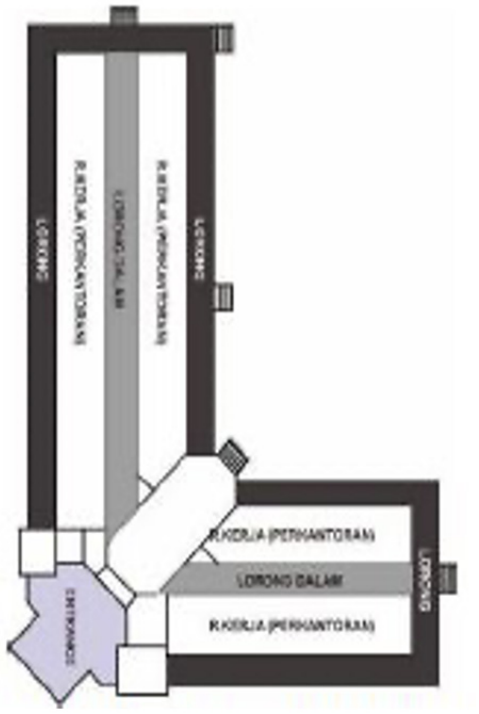
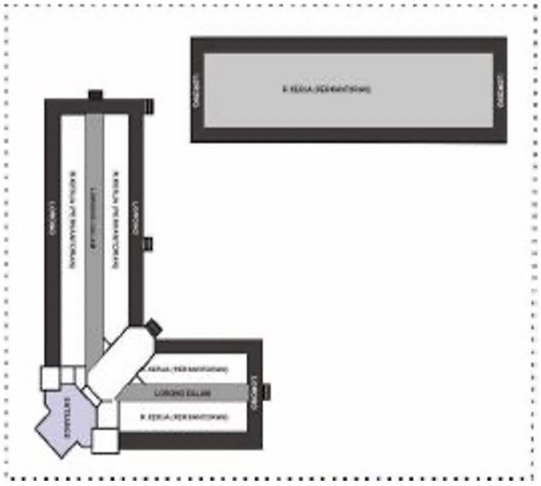
Figure 8. Lawang Sewu (below and right column)



Plan Lawang Sewu 1904-1907



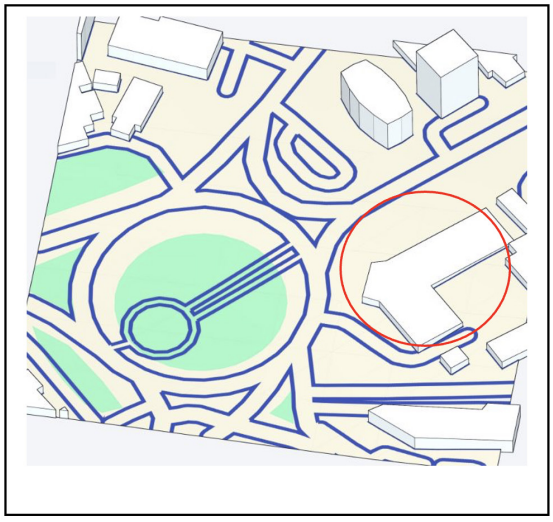
Plan Lawang Sewu 1916-1917

Lawang Sewu 1907-1913

Lawang Sewu 2018-23

Source: The picture was taken from a distance of 98 meters, in order to be able to contain the neighboring buildings, as well as the location of the picture is appropriate because there are no trees that hinder photography

Figure 9. Map of the flow of visits to Lawang Sewu. You can also see the arrangement of the buildings in Lawang Sewu



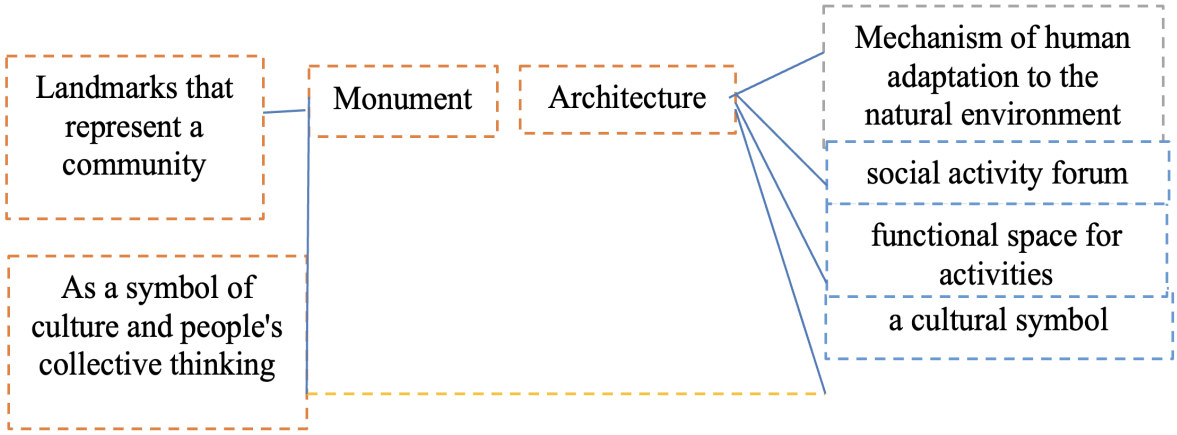
Source: http://ekioula.blogspot.co.id/2013/08/lawang-sewu.html

Figure 10. Two photos from the same direction, the first was taken in 1915 and the second in 2022. The two photos show the impact of the adjacent building on the character of the building (below and right column)

2022

1915

Figure 11. The Relationship between Architecture and Monuments in the Context of Monumentality



Source: Not specified

3. Method

3-1. Location of photo shooting

The photographs depicting the overall setting of Lawang Sewu and the nearby structures are utilized as the primary study resources for this project. The high-rise building being examined is located approximately 300 meters away from the tower, in the southern corner of Lawang Sewu. This building project involves the development of a four-star hotel and is currently in its initial stages of planning and research. Lawang Sewu is positioned at the convergence of five avenues, with four avenues running respectively to the east, west, north, and south. High-rise structures are situated in close proximity to Lawang Sewu in the southwest, southeast, and northeast directions, resulting in limited visual distance from these angles.

Due to the presence of high-rise structures in these three directions, there is insufficient visual distance to encompass the entire vista of Lawang Sewu and its surrounding buildings. However, the west-facing square offers a clear and comprehensive view that is easily observable and analyzable. Therefore, the decision was made to conduct the photo shoot at Tugu Muda Square, located west of Lawang Sewu (as depicted in Figure 2-3), as it provides the best vantage point to capture Lawang Sewu and its neighboring structures in their entirety. Other observation points were disregarded as they did not offer a complete view of Lawang Sewu and its surroundings.

Tugu Muda Square stands out as an optimal observation location, providing a panoramic view of Lawang Sewu and its neighboring structures, making it the preferred location for the study. It offers the broadest horizon and is easily accessible, making it a popular choice for observation.

3-2. The physical characteristics of surrounding high-rise buildings

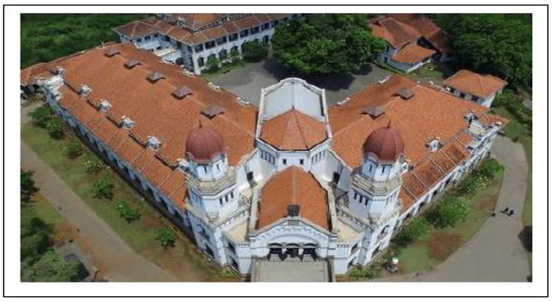
The aim of the experiment was to examine how the visual impact of Lawang Sewu and nearby buildings is influenced by their height, volume, roofline, and color. However, during field research, it was discovered that the change in volume of the structures being evaluated for this study was directly related to their height alterations due to site area and plot ratio restrictions in the construction project. Consequently, this aspect was not taken into consideration in the study. Meanwhile, the variables of height, roofline, and color were categorized into three levels using a control variable approach (referenced in Table 1).

1) Height: The hotel structure, located approximately 300m from Lawang Sewu, is subject to a maximum height limit of 28m, in compliance with the regulations governing height restrictions. Hence, based on Lawang Sewu's 36m height as a benchmark, the nearby structures were classified into three levels: 28m (equivalent to Lawang Sewu's height, with a height ratio of 1), 54m (comparatively taller than Lawang Sewu, with a height ratio of 2), and 72m (twice the height of Lawang Sewu, with a height ratio of 2).

2) Roofline: The study selected the predominant building top types in the city of Xi'an, encompassing red domes, modern flat roofs, and Indonesian sloping roofs to describe various roofline styles.

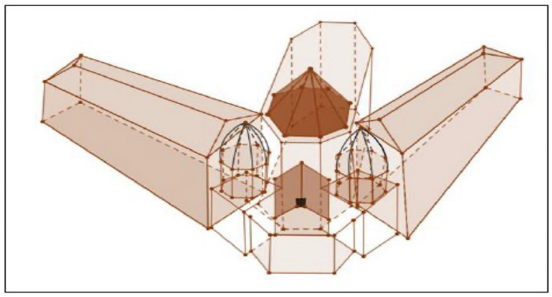
3) Color: Following a preliminary assessment of the buildings in the area, the colors white, red, and light yellow were chosen due to their frequent use.

Figure 12. View of the building



Source: Not specified

Figure 13. The engineering view of the building

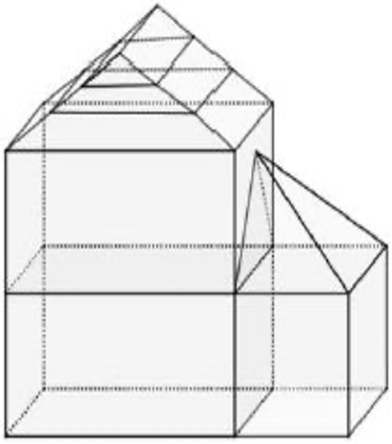


Source: Not specified

Figure 14. View the Lawn Siwu Building from the inner courtyard

Source: Not specified

Figure 15. The engineering view of the building



Source: Not specified

Table 3. Physical characteristics statistical

Table-3. Physical characteristics statistical.	Levels
Physical properties	
Height	36 m; 54 m; 72 m
Top	Indonesia slop roof; Modern flat roof; European pitched roof
Color	White; Yellow; Red

Source: Not specified

Table 4. Physical characteristics statistical

Value	implication
1	very dislike
2	mid dislike
3	Neutral
4	Mild like
5	very like

Source: Not specified

3-3. Analysis of respondents' preferences

The research methodology involved presenting 27 images depicting the heights, volumes, tops, and colors of neighboring structures to respondents selected at random from the street. These images were printed on nine sheets of A4 paper for the convenience of the respondents. The individuals were then asked to rate the overall scene of Lawang Sewu and the nearby buildings based on these images. To ensure a diverse sample, the experiment was conducted on a weekend to prevent the demographic traits of the respondents from being overly singular.

Furthermore, the decision to utilize images for visual impact evaluation was justified by previous research indicating the effectiveness of using photos to represent real landscapes. The respondents were also required to fill out a questionnaire regarding their gender, age, educational attainment, and place of residence. The data collected from this study was then analyzed using SPSS 22.0 for further examination.

3-4. Method of data analysis

Statistical analysis was performed on the average scores of the gathered photos using the SPSS 22.0 program. First, the impact of the three physical features on respondents' preferences was examined using one-way ANOVA. The quantitative links between the three physical features and the demographic factors as well as the qualitative relationships between the three physical properties and the respondents' preferences were both investigated using stepwise multiple linear regression analysis. In related investigations, these analytical techniques are frequently employed.

The text provides valuable insights into the Lawang Sewu building, focusing on its architecture, spatial layout, origin of its name, and its monumentality:

Architecture Style:

The Lawang Sewu building follows the style of the Indisch Empire characterized by elements like gables, heads on columns, balustrades, and dormers. It comprises five building masses, with Building A facing Jalan Pemuda, serving as the facade of Lawang Sewu.

. Spatial Arrangement: The spatial layout of Lawang Sewu demonstrates a horizontal division with a central corridor and vertical division into floors. The relationship between spaces includes voids and stairs, enhancing the complexity and functionality of the building.

. Name Origin: The name "Lawang Sewu" stems from the Javanese dialect, where "Lawang" means door and "Sewu" means one thousand. This name signifies the building's distinct feature of having numerous doors lining its structure, making it impossible to accurately count the exact number.

. Monumentality: The text distinguishes between architecture and monuments, highlighting that while architecture caters to human activities and needs, monuments serve as markers of significant situations or achievements in a culture. Lawang Sewu's architectural form and historical significance contribute to its monumental status in this context.

The comprehensive analysis provided sheds light on the historical and architectural significance of Lawang Sewu, showcasing its unique features and cultural importance in Semarang.

Table 5. The demographic characteristics of respondents

1) Demographic characteristics	2) Variable	3) Number of respondents	4) Percentage of respondents
5) Gender	6) Female 7) male	8) 172 9) 222	10) 46.4 11) 59.6
12) Age	13) Between 18 and 34	14) 150	15) 40.3
16) Education	17) Over 60Receiv higher education	18) 100 19) 170	20) 27.3 21) 45.5
22) Place of residence	23) Lawang sewu	24) 170 25) 120	26) 70 27) 31.1

Source: The data was examined to see how different demographic traits might affect how the height, volume, top, and color of the chosen buildings around Lawang Sewu are perceived by onlookers. Multiple linear regression analysis was then performed to examine the influence in more detail. These analytical techniques were heavily employed in the earlier investigations (Wang and Zhao 2017)

Figure 17. Balustrade, gable, and dormer on western look building a Lawang Sewu, 191

Source: Not specified

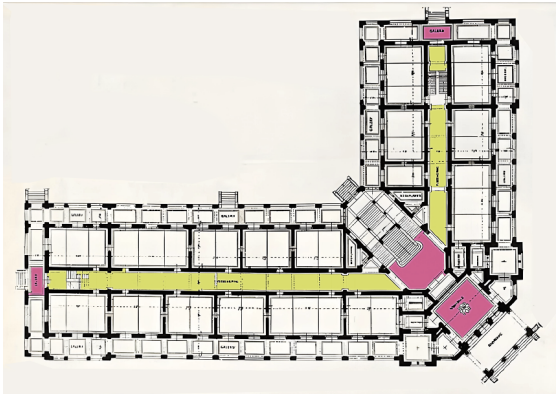
Figure 16. Balustrade and gable in the western view wing meeting of building a Lawang Sewu, 1916

Source: Not specified

Results:

The inter-group reliability of the 27 images was evaluated. These images portray various building heights, volumes, tops, and color combinations in the vicinity. The reliability, assessed using SPSS 22.0, was found to be 0.757, indicating strong internal reliability. This suggests that the questionnaire survey and the gathered information were re-

Figure 18. Model lantai dasar Gedung Lawang Sewu 1916



Source: Not specified

Figure 19. A detailed horizontal section showing the ground floor spaces in 3D of the wing staircase area north of the building A Lawang Sewu, 1916

Source: Not specified

liable for further in-depth study. "S" represents the mean score for each image, which ranged from 1 to 5, with the highest at 3.79 and the lowest at 2.63. All images received an average rating of 3.36.

5-1. Relationship between Visual Impact Assessment and Height, Top, and Color:

The connection between respondents' visual impact opinions and the height, top, and color of neighboring buildings was examined using multifactor variance analysis. Specifically, "H" denoted height, "T" denoted top, and "C" denoted color of the buildings in the area. The average score of each photo "S" was set as the dependent variable, with height, top, and color as the factors. The multifactor variance analysis in Table 5 showed a significant model ($F = 153.972$, $p = 0.000$) in terms of total coherence. The model fit number (R square = 0.615) indicates that the model fits the data acquired from the questionnaire survey well. The SPSS analysis refuted the initial hypothesis, suggesting that at least one of the three components (H, T, C) exhibits a significant difference. Further analysis revealed substantial differences in all three factors (H: $F = 474.218$, $p = 0.000$; T: $F = 27.221$, $p = 0.000$; C: $F = 2.412$, $p = 0.035$). This indicates noticeable disparities in the height, top, and color of neighboring buildings when the average score is considered. In essence, the top, height, and color of the surrounding structures are influential variables affecting the overall grade of the photographs.

5-2. Respondents' Demographic Characteristics and Visual Impact Assessment:

Initially, a one-way ANOVA was used to explore the connection between demographic data and visual impact evaluation. Significant differences were found in the average ratings based on gender ($F = 8.652$, $p = 0.000$), age ($F = 4.128$, $p = 0.020$), place of residence ($F = 7.215$, $p = 0.042$), and education level ($F = 5.211$, $p = 0.000$) of the respondents. Kendall correlation analysis showed significant correlations between average score (S) and gender (negative), age (positive), education (negative), and place of residence (positive), as presented in Table 6. A multiple linear regression model further confirmed that gender, age, education background, and place of residence significantly influence picture assessment. Collinearity analysis was conducted to examine potential reciprocal effects among demographic characteristics, as indicated by the results of the multiple linear stepwise analysis.

5-3. The impression of the unity of the building from the environment of the Tugu Muda area:

Study was done by looking at the contrast between the Lawang Sewu building and the surrounding environment and image of what came next. This test refers to the formulation of Yoshinobu Ashihara regarding primordial monumentality 3. Based on testing using foreground and background images, there is an image of Lawang Sewu that consistently emerges. The picture is of two towers in building A. From these results, there is a monumental value contained in the visibility of Lawang Sewu.

The research conducted analyzed various factors influencing visual impact assessment, including the height, top, and color of neighboring buildings, as well as respondents' demographic characteristics.

Figure 20. Lawang Sewu exterior image capture map

Source: Not specified

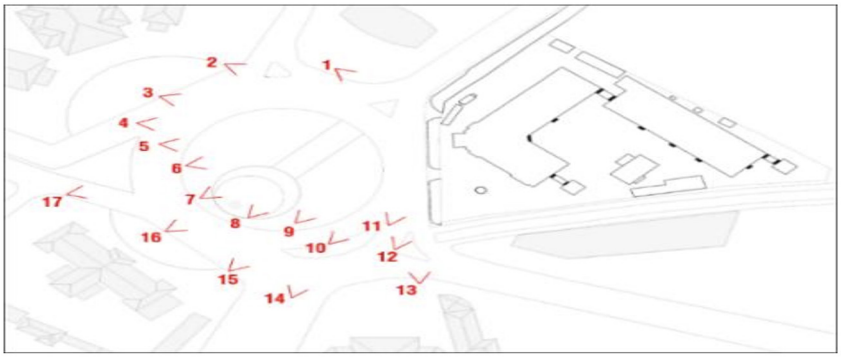
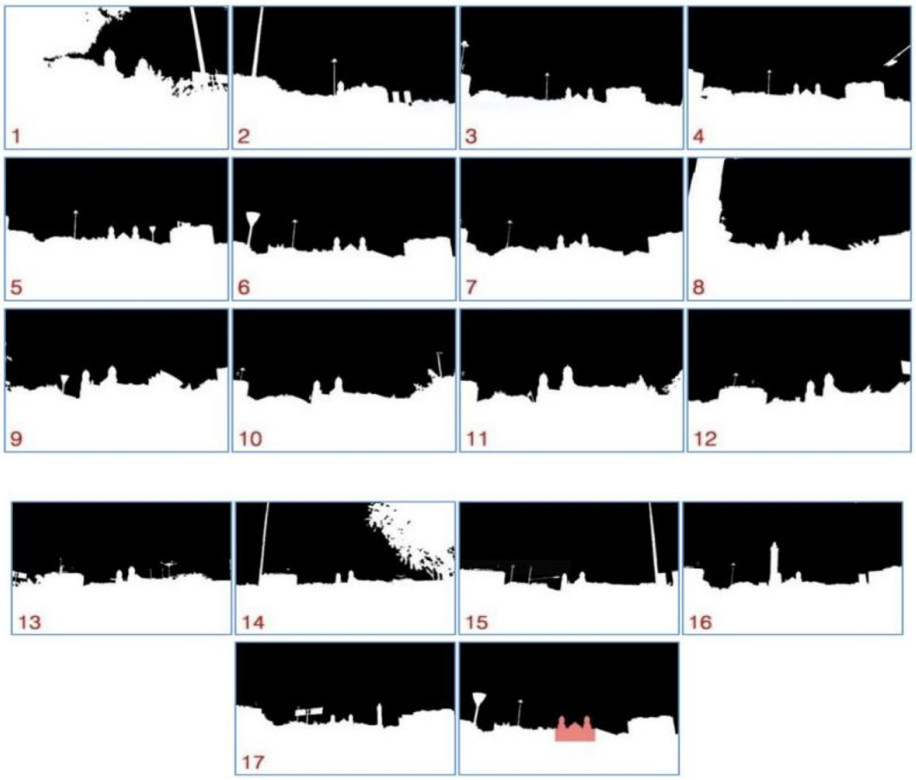
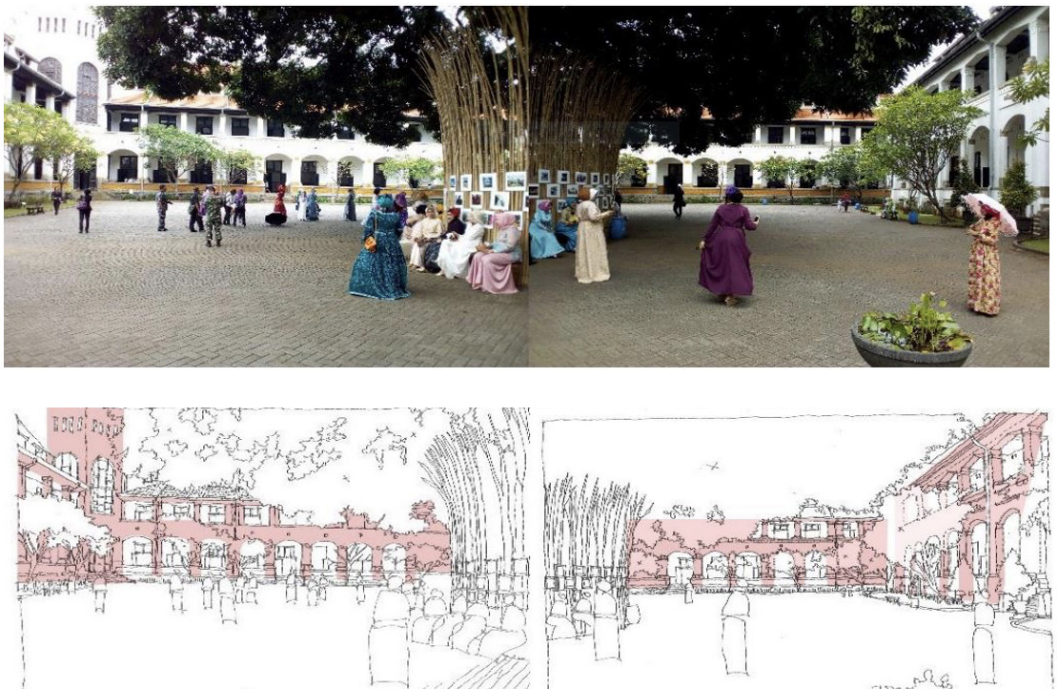


Figure 21. Testing with foreground and background images



Source: Not specified

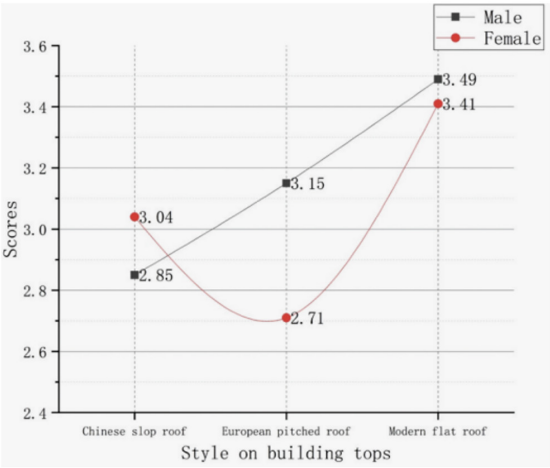
Figure 22. Central Court Area Space Photography Image



Source: Not specified

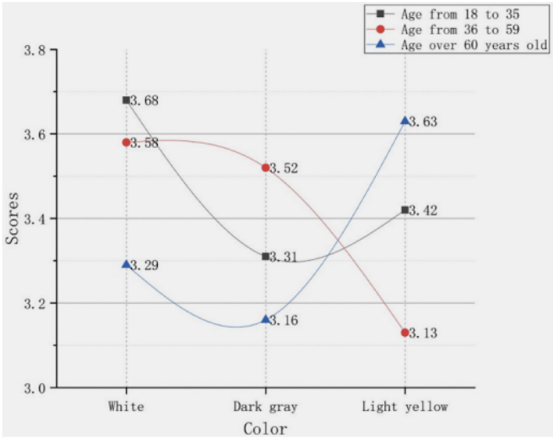
By observing the space and identifying its architectural and structural elements through comparison of the image of the atmosphere of the room. Observer range limits are used to sharpen the discussion where only observable spaces are representations of monumentality. Architectural elements can include structural elements. the structure also forms the boundaries and expressions of space Hernández, J., L. GarcıA, and F. Ayuga. 2004. Comparison results can be shows how the relationship between the two elements is related to the monumentality of space. The redrawing of photographic images aims to break the outline of the atmosphere-captured space. Outline imagery helps identify the structural elements of the scene-captured space.

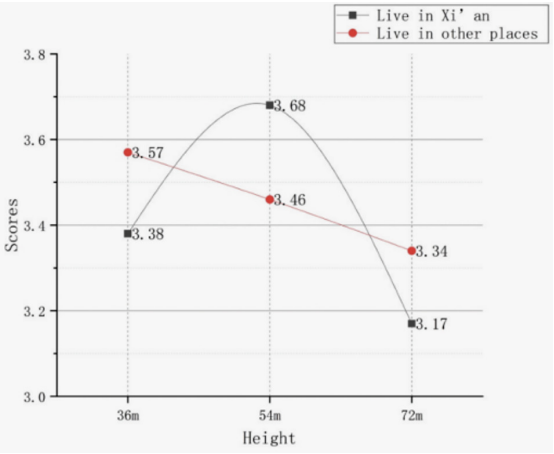
Figure 23. Preferences of different gender groups for building top



**Correlation is significant at 0.01 level*

Figure 24. Preferences of groups with different places of residence for building height





Source: Not specified

Table 6. Kendall correlation analysis

**Correlation is significant at 0.05 level*

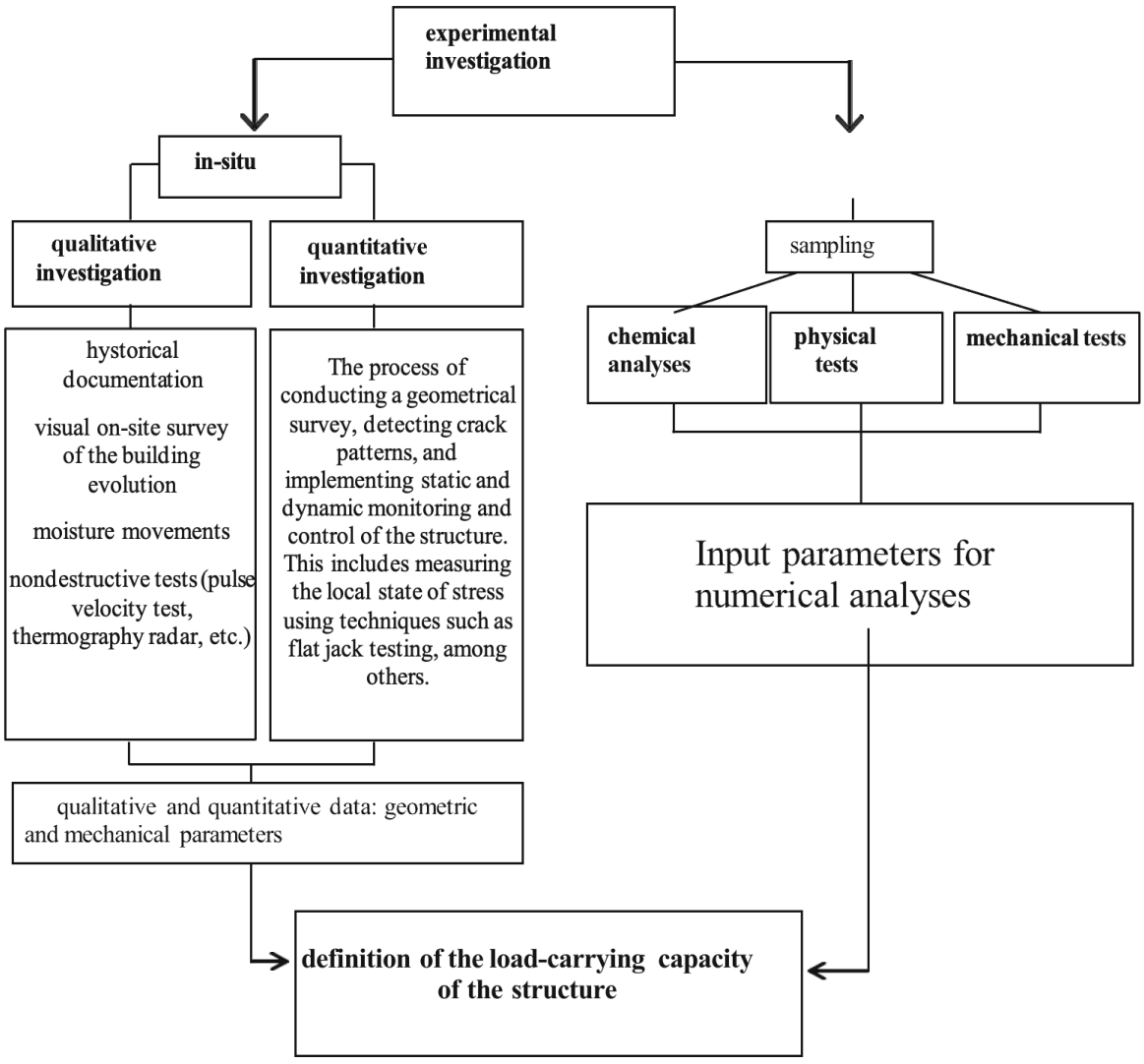
		Score	Sex	Age	Educational Background
Gender	Coefficients Significance	-.22			
Age	Coefficients Significance	.000 .2	.5.2		
Educationa	Coefficients Significance	.32 .44	.4 .3	-.22 .1	
Place of residence	Coefficients Significance	.5 .04	.12 .4	-.3 .4	.6 .4

Table 7. analysis of multiple linear stepwise regression

Variable	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Constant	3.5811	0.042		25.962	0.000		
Age	0.36	0.0282	0.752	4.992	0.031	0.84	1.269
Gender	-0.52	0.0183	-1.578	-7.157	0.000	0.482	3.589
Educational Background	-0.698	0.080	-0.496	-3.69	0.026	0.466	3.212
Residence	0.61	0.0221	-1.70	-7.613	0.003	0.982	7.235

Source: Not specified

Figure 25. Finalization of the experimental survey to the structural analysis



Source: Not specified

Table 8. Multiple linear regression analysis of the physical characteristics of the images for various gender groupings

Independent Variable	Dependent Variable	Constant	B	Std. Error	Beta	t	Sig.
Scores for male		2.789	0.442	2.712	0.491	2.822	0.00
(R2 = 0.52, N = 219)	H		1.552	1.821	0.471	2.321	0.03
	T		0.931	5.9	0.359	4.121	0.001
Scores for female		8.531	0.318	0.953	1.381	5.9	0.931
(R2 = 0.53, N = 158)	C		2.012	0.922	0.539	1.532	0.000
18–35 years old		5.982	0.351	0.598	0.45	5.851	0.001
(R2 = 0.538, n = 148)	C		1.298	0.254	1.321	3.985	0.005
35–59 years old		5.9.492	0.35.95	4.802			
(R2 = 0.518, n = 135.9)	C		5.85.94	1.325	2.599	4.985	0.008
50 years old or older		8.982	0.592	1.553	0.5.915	4.5.955	0.001
(R2 = 0.591, n = 102)	H		0.355	2.559	0.598	4.148	0.000
With higher education		3.598	0.305	1.858	0.584	3.852	0.001
(R2 = 0.585, n = 153)	C		0.259	2.503	0.505	4.509	0.025
Without higher education		4.554	0.258	0.541	0.458	4.325	0.000
(R2 = 0.582, n = 214)	Xi’an		0.554	1.482	-0.398	4.812	0.01
(R2 = 0.598, n = 255)	C		0.428	1.559	0.521	3.859	0.01
Other places		5.812	0.451	1.052	0.428	4.545	0.000
(R2 = 0.539, n = 120)	C		0.548	1.324	0.555	4.820	0.010

Source: Not specified

5. Discussion

The analysis conducted using a multiple linear regression model to examine the relationship between demographic characteristics and visual impact ratings revealed that gender, age, educational background, and area of residence all significantly influence picture evaluation. Interestingly, the study uncovered that these four demographic factors—gender, age, education, and place of residence—do not have reciprocal effects among each other, as illustrated in Table 7.

Previous research by Zube, Pitt, and Evans (1983) discussed how various demographic factors could lead to diverse assessments of visual impact even when presented with the same set of images. They observed that as respondents' ages increased, the average scores tended to decrease. However, in this particular study, it was noted that the middle-aged group provided the lowest average score, contrary to the typical pattern, mainly because older respondents tended to focus more on Lawang Sewu itself, diminishing the significance of changes in surrounding structures. Consequently, the older group's average score generally exceeded those of the other age groups. Younger respondents, having witnessed Indonesia's urbanization, displayed greater acceptance of diverse architectural forms, resulting in higher average scores. Howley, Donoghue, and Hynes (2012) suggested that individuals of different ages might offer varying visual impact ratings due to influences from their living environment and experiences, a notion supported by this study's findings.

Regarding gender differences, Wang and Zhao (2017) highlighted that gender variances could lead to contrasting assessments of visual impact, consistent with the current investigation's results. Gender disparities have been observed to influence visual preference evaluations for urban green plant landscapes by Abello and Bernáldez (1986) and Howley (2011). Notably, male respondents tended to rate the scenery higher than female respondents, potentially explained by males focusing more on the overall impact of the scene, where the building under evaluation constitutes a small portion of the overall image of Lawang Sewu and its surroundings.

Moreover, López-Martínez (2017) argued that educational background influenced people's evaluations of visual impact in landscapes. Research by Lindemann-Matthies, Junge and Matthies (2010) and Molnarova et al. (2012) consistently found that individuals with lower levels of education tended to score higher in visual impact evaluations compared to their more educated counterparts. This trend is likely due to educated individuals placing greater value on preserving historic structures, leading them to critically assess the entire scene of Lawang Sewu and its environs with a high regard for conservation. Consequently, their evaluations of visual impact are generally lower than those of individuals with less education in this context.

6. Conclusion

Urban development and the preservation of old buildings have always been in conflict. The preservation of ancient structures that dominate the urban landscape is at risk due to new construction. In today's globalized world, it is essential for emerging nations to prevent irreversible damage to historic buildings and find a balance between urban expansion and preserving historical architecture. Research conducted on Lawang Sewa and its neighboring structures revealed that various factors influence the permissible height of new high-rise buildings in the vicinity. These factors can interact and potentially change the rule that limits high-rise structures to 25 meters. While this outcome was unexpected, the data from the study highlights the importance of maintaining the landscape around historic buildings.

Designing a building requires consideration of numerous elements, especially in historic districts where the architectural style complicates matters. A study on demographic differences and public expectations for adjacent structures around Lawang Sewa showed varying perceptions of space based on residents' locations. The research found differences in preferences for building heights between Semarang residents and those from neighboring cities. It emphasized the need to account for individual variation, historical context, respondents' experiences, and regional characteristics in evaluating visual impact.

To protect and highlight the value of historic buildings, factors such as color and roof design should be thoroughly considered, public participation should be encouraged, and urban planning guidelines should be developed. Visual impact assessment should be integrated into public participation methods for future urban planning to accurately reflect public preferences. However, the study's scope is limited by the rapid urbanization around Lawang Sewu, which is altering the historical environment. It may not directly apply to smaller cities experiencing slower urbanization rates. Despite some methodological limitations, the study provides valuable insights for decision-makers on balancing urban development and historic preservation in Indonesia's evolving urban landscapes. C

Confession: An admission that artificial intelligence tools (Silder and Grammarly) have been used to correct sentence structure and improve language quality.

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