

From Traditional to Postmodern: Architectural Evolution and Implications for Cultural Preservation on Tha Phae Road, Chiang Mai, Thailand

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Abstract

This study examines the architectural heritage of Tha Phae Road in Chiang Mai, Thailand, which reflects the city's cultural and economic development. The preservation of its historic character and cultural significance is of utmost importance as rapid urbanization and development threaten its potential loss. Using Grounded Theory, the study analyzes non-numerical data, including photographs and site investigations, to identify the area's four main architectural styles: Modern, Postmodern, Traditional, and Traditional-Colonial, with Modern being the most prevalent. The Compound Annual Growth Rate (CAGR) is used to examine the distribution of styles over an 11-year period, revealing a decline in Traditional and Modern styles and a positive growth rate of Postmodern architecture. To preserve and enhance the area's visual quality while allowing for new development, the study proposes a Façade Control Guideline and zoning regulations. These guidelines consider criteria such as the history and importance of Tha Phae Road, ensuring that any changes made to the area respect the overall scale and character of the street. This study's findings have important implications for the development and preservation of Tha Phae Road's identity and highlight the value of preserving the cultural heritage and visual quality of the area.

Keywords

Cultural preservation; Architectural style; Façade Control Guideline; Zoning regulations; Tha Phae Road; Chiang Mai

1. Introduction.

In the heart of Chiang Mai, Thailand, Tha Phae Road stands as a testament to the city's rich historical tapestry, architectural variety, and socio-economic dynamics. Amidst the rapid urbanization and developmental pressures, the imperative to preserve its cultural heritage and spatial identity becomes increasingly urgent. Cultural heritage not only shapes the identity of a place but also plays a pivotal role in its economic revitalization, where the diverse architectural styles coalesce to reflect socio-cultural evolution (Carbone, 2016; Loakaewnoo, 2023). In alignment, Wandeler and Lo (2024) highlight how urban crises facing heritage areas like Tha Phae

Road demand innovative systemic design approaches to ensure socio-economic resilience and sustainability. Preserving architectural heritage sustainably involves maintaining original building aspects while integrating them within the urban landscape, considering societal characteristics, and employing local materials and techniques (Darwish, 2016). In heritage-rich regions like Chiang Mai, this approach is particularly important, where the integration of local materials not only supports long-term cultural preservation but also contributes to economic vitality (Auttarat & Poonsukcharoen, 2022). Specifically, preserving the physical elements of streets like Tha Phae Road has become crucial, as highlighted by Pisuttakoon (2011). An examination of the architectural styles along this road can illuminate the economic and social forces that have molded its development over time. Historic building façades, with features like arches, columns, and consistent styles, are instrumental in defining the historical identity of a region (Askari et al., 2014). Understanding building façades is vital for grasping urban identity, reflecting the cultural, historical, and social values of a community and influencing the visual quality of an urban area (Li, 2007). Therefore, a comprehensive analysis of the architectural heritage of Tha Phae Road is necessary to grasp its evolution and establish preservation guidelines to enhance its visual appeal.

This study sets out on an investigative journey to elucidate the nuanced evolution of architectural paradigms along Tha Phae Road, aiming to inform strategic interventions for its preservation and revitalization. Despite its cultural and historical importance, a comprehensive scholarly inquiry into the architectural evolution of Tha Phae Road is notably lacking, creating a gap in both scholarly discourse and practical conservation efforts. At the core of this inquiry lies the crucial question: How have architectural trajectories unfolded on Tha Phae Road and what implications do they hold for cultural heritage conservation? By addressing this fundamental query, we aim to unravel the complex interplay of socio-economic dynamics, cultural imperatives, and urban morphology shaping the street's spatial narrative. To achieve these scholarly objectives, our research adopts a two-fold approach. Firstly, through meticulous archival research and on-site exploration, we undertake a detailed analysis of prevalent architectural typologies along Tha Phae Road, tracing their historical trajectories and socio-cultural significance. Secondly, leveraging insights gained from this empirical inquiry, we aim to propose normative guidelines and strategic imperatives for the preservation and adaptive reuse of Tha Phae Road's built heritage, while accommodating contemporary needs and development requirements.

Beyond its academic significance, this research holds profound implications for urban heritage conservation practice and policy formulation. As emphasized by UNESCO (2012), safeguarding historic urban areas goes beyond mere preservation; it serves as a testament to a society's collective memory and cultural continuity. By delving into the architectural history of Tha Phae Road, this scholarly endeavor seeks to stimulate informed conservation discourse and practical interventions, thereby paving the way towards a more nuanced, equitable, and sustainable urban future.

2. Objective

The main objective of this research is to examine the architectural style trends on Tha Phae Road and provide valuable insights into the cultural and economic forces that have influenced the street's development over time. Additionally, this research aims to identify the architectural trends on Tha Phae Road through a study of building façade styles and formulate a Façade Control Guideline and zoning recommendations for preserving and maintaining the street's identity. Achieving these objectives can contribute to preserving and enhancing Tha Phae Road's visual quality and cultural significance.

3. Literature Review and Related Theory

The literature review is divided into two main sections. The first section provides an overview of the development of architecture on Tha Phae Road, a historical street in Chiang Mai, Thailand. This section discusses the different eras of shophouse construction on the road, from early influences of Chinese merchants to the modernization period. It also explores the postmodernism period in Thailand, which has contributed to the cultural diversity seen on the road today.

The second section of the literature review outlines the use of Grounded Theory and the Compound Annual Growth Rate (CAGR) as the theoretical framework for analyzing the data. This section explains the principles of Grounded Theory and how it provides a systematic method for obtaining, synthesizing, analyzing, and conceptualizing qualitative data to create theories. It also describes how the study employed this approach to conduct a comprehensive site investigation of Tha Phae Road and identify its architectural styles and identity. By providing a rigorous methodological framework for investigating the evolution of architectural styles along Tha Phae Road, the use of Grounded Theory and the annual growth rate calculation contribute to a deeper understanding of the architectural history of Chiang Mai.

3.1 Development of Architecture on Tha Phae Road

Scholars previously have divided the historical timeline of shophouses and Tha Phae Road into several eras based on cultural influences and urbanization. Chantavilasvong (1978) and SuchaXaya (1981) identified early construction influenced by Chinese merchants to modernization. However, Suwatcharapinun (2016) further divided Tha Phae Road's history into four periods from its creation before 1897 to 1977. While this division provides valuable insights, it also is important to examine the timeline after 1977 to present day characterized by postmodernism in Thailand (Horayangkura et al., 1993), resulting in the cultural diversity seen in the area today.

To identify the styles that represent the area in its current state, the study of Tha Phae Road's architectural heritage focuses on the visual features of building façades, production processes, and actors involved in its formation. Khatami and Boujari (2022) and Pattananurot and Khongsaktrakun (2022) emphasize the importance of considering these factors in understanding architectural heritage. Therefore, a comprehensive study of Tha Phae Road's architectural heritage is necessary to understand the evolution of its architectural characteristics, identify its unique features, and establish design guidelines for the preservation and enhancement of its visual quality.

3.1.1 *The First Era (1847-1897)*

Tha Phae market, known locally as “Kad Tha Phae,” emerged as a thriving commercial hub with the construction of shophouses, or “Huean Pae,” which were a type of local merchant house first built in 1847. The commercial landscape of Chiang Mai underwent extensive expansion following the amendment of the Chiang Mai Treaty in 1873. During this period, Tha Phae Road began to develop, with buildings strategically positioned parallel to the city's main transportation routes and in proximity to bustling market areas like Tha Phae market. These buildings were designed with simple and compact architecture to cater to the needs of small businesses in Chiang Mai, as depicted in previous photographs of Tha Phae Road (Satrabhaya, 1979). The buildings predominantly were made of teak wood and had a local architectural style. Another architectural style present during this period was Chinese-influenced commercial construction. The migration of Chinese merchants from the central region to Chiang Mai in the late 19th century resulted in the integration of Chinese

architecture with European-style architecture (Lieorungruang, 2008). This blend of architecture was prominent in the Wat Ketkaram area, which was located near the Ping River and served as a port for goods transport. Water transport was the most convenient means of transportation during this time and the original trading area of Chinese merchants was on the eastern bank of the Ping River. However, as the city expanded, these merchants moved to the Tha Phae Road area in the west along the Ping River.

The architecture of Tha Phae Road features a combination of two building styles influenced by both traditional and Chinese-European designs. The first section of Tha Phae Road incorporates these influences as follows:

1) Traditional style: This type of commercial building is characterized by having a gable that is parallel to the main road, with the long side serving as the storefront. The width ranges from one column span and up, with the front of the building being either partially open or fully open with a large display area. The commercial part of the building is raised half a meter from the road and is covered by a gable roof that extends to the adjacent residential building, which typically is a 1-2-story structure (Chiang Mai City Municipality, 2020).

2) Chinese-European influenced: According to Choomsang (2011, pp. 13-14), this type of building typically has a two-story brick or half-timbered structure, with a ground floor arranged as a corridor or colonnade. The upper floor features a protruding balcony adorned with stucco patterns and the roof is shaped and decorated with a perforated wood panel, featuring designs such as swirls, circles, intersecting lines, and various geometric patterns along the eaves. A vent above the door adds to the overall decorative element of the building. These elements come together to create a unique architectural style.

3.1.2 The Second Era (1897-1927)

In 1897, the Siamese government established direct control over Chiang Mai, marking the beginning of the Siam intendance period. This era saw significant infrastructural and administrative changes as part of Siam's modernization efforts. Tha Phae Road, located along the Ping River, became a crucial artery for trade and transportation, symbolizing the integration of Chiang Mai into the national economy. The architectural styles from this period reflect the blend of traditional Lanna elements with emerging modern influences, illustrating the area's transition towards a modern economic hub.

The second era of Tha Phae Road's development, which took place between 1897 and 1927, was characterized by an increased Western influence in architecture due to the country's contact with the Western world during the reign of King Rama V. This led to the adoption of Western-influenced construction methods and materials in traditional houses, such as the use of steel bars and cement, and galvanized roof tiles instead of clay tiles.

Wealthy people and nobles of the time built their houses with Western influences, characterized by two-story, square buildings with gable, hipped, or mixed roofs. The Victorian or Gingerbread house style became popular, which was a combination of Western plans and traditional Lanna half-cement half-wood houses. The Saranai house style, which is distinctively decorated with a carved wood finial attached to the gable end or in the middle of the gable, also was popular during this time.

Local commercial building architecture also saw developments during this era, with the emergence of traditional-Chinese commercial architecture. This type of building emerged from a shift in the trading system, which changed from large-scale merchants trading with the government to a system of small-scale merchants. This led to the proliferation of small shops in the city, which were expensive but profitable. The characteristics of this type of building include a low wooden floor, with the option to have it almost flush with the ground. The folding front doors are 3-4 meters wide and face the entrance of the shop. The design emphasizes

functionality and cost-saving measures. The wooden shutters and windows are decorated with horizontal or 45-degree angle woodwork, and small decorative carvings. The roof typically is gable, hipped, or mixed. Later, cement and brick buildings were constructed, some with one or two stories. Overall, the second era of Tha Phae Road's development was marked by an increased Western influence in architecture and the emergence of new commercial building architecture due to changes in the trading system.

3.1.3 The Third Era (1927-1957)

The year 1927 was pivotal due to the increased influence of Chinese merchants in Chiang Mai. This period saw Chinese entrepreneurs establishing stronger ties with the Siamese state and adapting to the new political environment. This development paved the way for architectural changes associated with the new constitutional monarchy established after the Siamese Revolution, reflecting democratic ideals and the nation's integration with global trends. This era was marked by changes in construction styles and techniques, such as the use of reinforced concrete and various steel materials. The transportation of construction materials, such as steel bars, by railway led to the development of construction standards, materials, and speed. A new building type, known as "row houses," played a significant role in Chiang Mai's urban development from 1927 to 1957. These two- and three-story reinforced concrete buildings, no higher than four stories, were about 3.50-4.00 meters wide per unit and had a ground floor height of not less than 3.50 meters. Generally, the buildings had a mezzanine floor that accounted for approximately one-third of the total building height. Examples of these commercial buildings include the White Building (built in 1932) and several other buildings along Tha Phae Road with wider and taller columns. The enforcement of the "Ministerial Regulation, B.E. 2498" issued in accordance with the Building Control Act, B.E. 2479, had an impact on the appearance of buildings along public roads.

3.1.4 The Fourth Era (1957-1977)

The fourth era, spanning from 1957 to 1977, was a time of economic expansion in Thailand. The turning point in 1957 corresponds to the implementation of the first National Economic and Social Development Plan (B.E. 2504-2509), which aimed to boost economic growth and development at a regional level. This plan led to the expansion of cities and increased road construction, resulting in the proliferation of row buildings along new roads.

The row buildings on Tha Phae Road during this period showcased the craftsmanship of local artisans and aimed to create a unique and distinctive architectural style. Commercial buildings, for instance, utilized the front area as balconies shaded by sun visors. These sun visors, often decorated, became a prominent feature of the façades. The use of materials like curved concrete, bent steel, or precast concrete walls added to the distinctiveness of the buildings.

While the architecture during this era retained similarities to the previous period, the enhanced sun visors and decorative façades marked a clear evolution in style. These elements contributed to the unique identity of Tha Phae Road, distinguishing its row buildings from those in other areas of Chiang Mai city.

3.1.5 The Fifth Era (1977-2022)

Post-1977 marks the beginning of the postmodernism era in Thailand, as noted by Horayangkura et al. (1993). By 1983, the influence of postmodernism became evident in Western architecture, leading to the emergence of classic-style commercial buildings that were considered luxurious. This period marked a crisis of identity in Thai architecture, with many organizations recognizing the lack of Thai identity.

In response, academic meetings were organized to encourage the creation of contemporary buildings that reflected Thailand's cultural heritage. Consequently, architectural styles emphasizing Thai identity began

to appear in both the public and private sectors. Hotels, offices, restaurants, and commercial buildings started to incorporate distinct Thai characteristics (Horayangkura et al., 1993). The construction of a new Tha Phae Gate in 1983 further stimulated development along Tha Phae Road. This led to the emergence of shops, department stores, hotels, commercial buildings, and financial institutions, all contributing to the evolving architectural landscape of the area (Sanyakiatikun, 2002).

The rapid physical changes that occurred during the urban development policy period, which involved the use of technology and the response to modern usage in the previous era, caused physical problems for the old city of Chiang Mai and resulted in a loss of uniqueness. Local government organizations began to recognize the importance of preserving local art and culture and issued building control regulations in the inner-city wall area in 1988, including the Tha Phae Road area up to the new Chang Moi Road. The regulations included controlling the architectural style and roof shape, requiring new construction or renovation to conform to the Lanna Thai architectural style or northern traditional style. This meant that the buildings must have some characteristic that reflects the Lanna architectural style, such as gable structure or roof section, decorative gable ends or Ka-lae, carved decorative patterns on bargeboards and gables, and carved decorative patterns on horizontal beams. The majority of modern-style buildings also add decorative elements as symbols, such as gables or decorative carvings on the eaves with various patterns, to comply with the conditions.

Although these efforts may create a good impression, some of the resulting buildings reflect a lack of care in design and construction, leading to the need to temporarily halt the development of these buildings. This pause was implemented to address the issues arising from buildings that, despite adhering to the formal regulations, lacked quality in design and construction. This led to improved design standards and construction practices that better aligned with the cultural preservation goals of the region. Current building construction is still subject to the regulations of the Chiang Mai Municipal Ordinance, which sets restrictions on the areas under which construction, modification, or changes in use of certain types of buildings are prohibited. These restrictions specifically apply in the sub-districts of Si Phum, Su Thep, Chang Moi, Phra Sing, Chang Khlan, and Hai Ya within the Chiang Mai Municipality, Chiang Mai Province. These restrictions were amended in 2014 from the ordinance of 1988. They include regulations such as prohibiting triangular, circular, or irregularly shaped buildings, requiring gable or hipped roofs, and imposing color restrictions for exterior walls and roofs. Additionally, buildings must not be higher than three meters above the front road level and must not exceed 12 meters in height or the equivalent of 3-4 storeys.

These physical control measures have resulted in the characteristics of buildings up to the present time. However, the area from the new Chang Moi Road to the end of Tha Phae Road at the intersection of Buddha Sathan is not subject to these regulations, resulting in brightly colored buildings, buildings over 12 meters in height, and buildings outside of these regulations.

The characteristics of buildings in this era are very diverse, with buildings from each era still remaining, especially shophouse buildings. It can be considered an era of coexistence.

3.2 Grounded Theory and the Compound Annual Growth Rate (CAGR)

This study aims to explore the evolution of building façades on Tha Phae Road and identify the architectural styles from different periods. To achieve this, the study adopts the principles of Grounded Theory, a qualitative research approach widely used in social sciences. Grounded Theory provides a systematic way to obtain, synthesize, analyze, and conceptualize qualitative data to create theories (Bryant & Charmaz, 2017; Glaser & Strauss, 1967).

To establish the visual streetscape of the study area and identify architectural styles, the researchers conducted a comprehensive site investigation. This included analyzing façade elements such as roof, wall, door, and window design and decorations, as well as examining documents such as books, research, and photos. The gathered data were evaluated using coding and theoretical sampling processes, and a series of interpretive procedures were employed to develop a theory anchored in the evidence.

Since architectural styles have undergone changes and evolution throughout history, the study uses non-numerical data obtained from a range of sources, including photographs of buildings on Tha Phae Road, to develop a theory based on the evidence gathered. By adopting Grounded Theory in this study, a comprehensive and systematic approach for evaluating qualitative data is employed to develop a theory that is anchored in the evidence.

Furthermore, the study highlights the usefulness of the Compound Annual Growth Rate (CAGR) as a more suitable measure for studying trends and architectural styles since it smooths out the rate of growth across several periods (Wall Street Prep, 2023). CAGR measures the percentage increase or decrease in the number of buildings in a particular architectural style over a set period, usually a year. By tracking the CAGR of different architectural styles, architects and historians can gain insights into the popularity and longevity of various styles. Analyzing the CAGR of different architectural styles also can provide insights into cultural and societal changes.

CAGR is calculated using the following formula (Eq.1):

$$CAGR = \left(\left(\frac{V_e}{V_b} \right)^{\left(\frac{1}{n} \right)} \right) - 1 \quad (\text{Eq.1})$$

where V_e is the Ending Value, V_b is the Beginning Value, and n is the number of periods

In this study, the beginning and ending values represent the number of buildings in each architectural style, and the number of periods refers to the gap between the two years for which data is available. This approach enables the estimation of the number of buildings in five key periods of architectural development: 1847, 1897, 1927, 1957, and 1977—years where specific building records are unavailable. The percentage change in buildings for each architectural style, calculated using the CAGR, helps trace back the estimated number of buildings in each style for those five years.

Tracking the CAGR of different architectural styles also can be used to develop strategies for preserving Lanna contemporary architecture in the area. For instance, if the CAGR of Lanna contemporary architecture is found to be declining, architects and planners can work to promote this style by incorporating elements of it into new designs, hosting events and exhibitions to showcase its unique features, and collaborating with local craftsmen to create contemporary interpretations of traditional Lanna architecture.

3.3 Integration of Architectural Development, Grounded Theory, and CAGR

The integration of architectural development, Grounded Theory, and the Compound Annual Growth Rate (CAGR) establishes a robust framework for comprehending the evolution of architectural styles along Tha Phae Road and devising preservation strategies. Tha Phae Road's architectural evolution unfolds across distinct eras influenced by cultural shifts, economic dynamics, and technological advancements—from early traditional and Chinese-European shophouses to Western-influenced modern styles, each leaving a distinctive imprint on its

streetscape. This historical documentation unveils how migration, trade, urban policies, and cultural exchanges have sculpted Tha Phae Road's architectural identity.

Grounded Theory systematically collects, analyzes, and conceptualizes qualitative data concerning Tha Phae Road's architectural elements. Through thorough site investigations, encompassing façade assessments and material examinations, recurring patterns and themes are discerned. This methodological approach grounds theoretical insights in empirical evidence, revealing the fundamental processes driving architectural transformations. CAGR provides a quantitative gauge of the growth or decline of architectural styles over time. By computing CAGR for specific styles, it reveals insights into their popularity and durability, reflecting responses to cultural and economic influences. This metric plays a pivotal role in understanding stylistic evolution and guiding strategies aimed at preserving and promoting architectural diversity.

In summary, an in-depth exploration of Tha Phae Road's architectural trends, coupled with analytical methodologies such as CAGR, offers invaluable insights into its historical narrative, cultural significance, and prospects for preservation.

4. Study Area

The study area for this research is Tha Phae Road, situated in the historic city within the walled city of Chiang Mai. This stretch spans approximately 950 meters and covers both the north and south sides of Tha Phae Road, between the Buddha Sathan intersection near the Nawarat Bridge and Tha Phae Gate (Figure 1). By focusing on this specific road stretch, we aim to gain a comprehensive understanding of the various architectural styles that have developed over time, while also considering the cultural and historical significance of the study area.

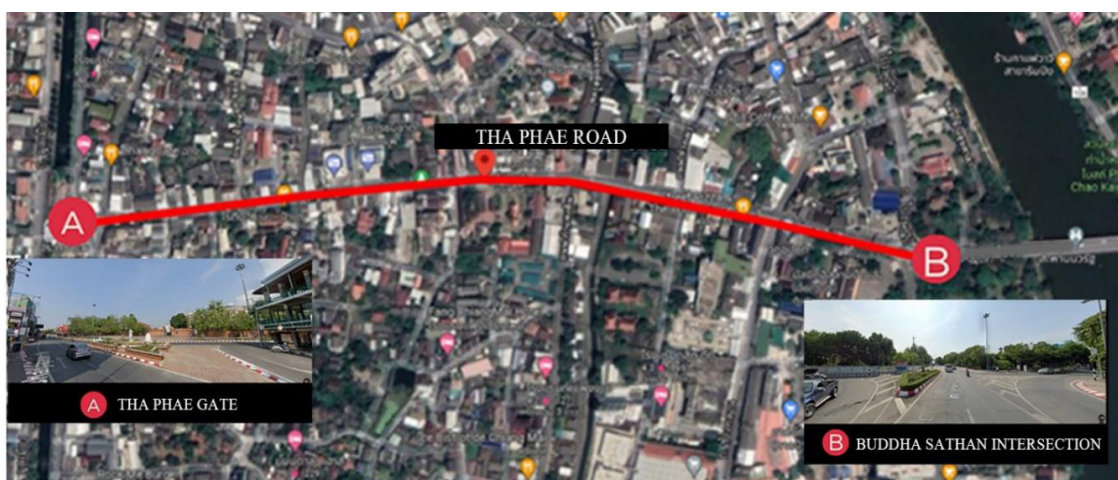


Figure 1. The boundary of study area (Modified from Google Map (n.d.)).

5. Methodology

The study of the architectural heritage of Tha Phae Road was conducted using the following methodology:

- 1) Examination of the evolution of building styles on Tha Phae Road. The first step involved reviewing relevant documents, such as books, research papers, and photographs, to determine the general features and styles that were influenced by different historical periods.

2) Identification of the characteristics of architectural styles from different periods. The second step involved analyzing façade elements such as roof design, wall design, door design, and window design and decorations to identify the various architectural styles present on Tha Phae Road.

3) Extensive site investigation. The third step involved conducting a visual streetscape analysis of the study area. This was accomplished by photographing 99 buildings on both sides of Tha Phae Road from across the street to create accurate street elevation composite images. These images were then rearranged into a series of digital street elevations to identify the architectural styles and overall identity of Tha Phae Road. This investigation included data collection on building typology, function, and height

4) Analysis of the trend of different styles and the development of design guidelines. The fourth step involved organizing the photographs of the 99 buildings in a table to compare the trend of architectural styles between the chosen years of 2011 and 2022. The year 2011 was selected because it was the earliest year that Google conducted street view data, compared to 2022, the year the study was conducted. This analysis determined the percentage of buildings in each architectural style using the CAGR calculation (Eq.1). Based on this analysis, a Façade Control Guideline and zoning recommendations were developed to strengthen the identity of Tha Phae Road. The guideline considered criteria such as the history and importance of Tha Phae Road.

The methodology for the study of the architectural heritage of Tha Phae Road involved a comprehensive analysis of the evolution of building styles, identification of architectural characteristics, extensive site investigation, and analysis of trends to develop design guidelines. The use of various sources and techniques provided a holistic understanding of the architectural heritage of Tha Phae Road

6. Research Outcomes

6.1 Four Architectural Styles on Tha Phae Road

This study investigates the evolution of architectural styles along Tha Phae Road from 1847 to 2022, using a combination of archival materials, on-site observations, and scholarly works. The research categorizes findings into five periods, and classifies architectural styles into Traditional (T), Traditional-Colonial (TC), Modern (M), and Postmodern (PM) as presented in Figure 2.

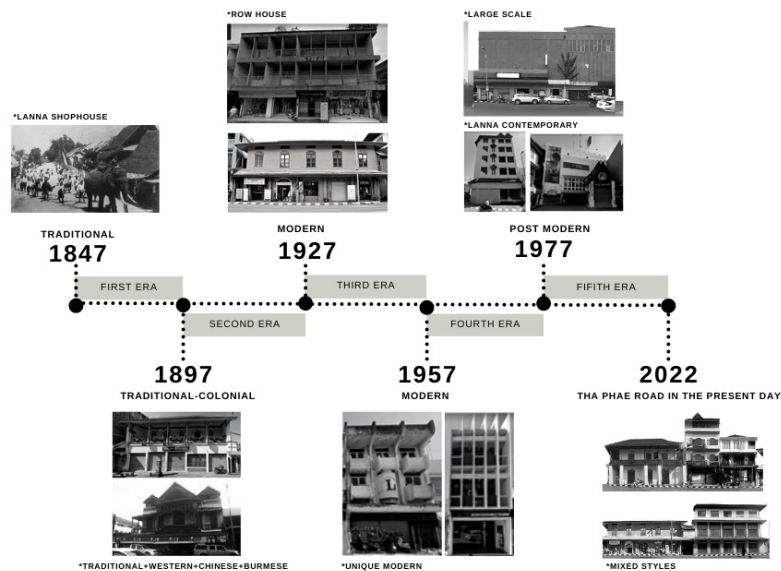


Figure 2. The evolution of architectural style on Tha Phae Road.

6.1.1 Traditional (T)

Traditional style was found before the first era of Tha Phae Road in 1847, also known as Lanna shophouse. This commercial building style is characterized by a gable that runs parallel to the main road, with the long side serving as the storefront. The width of the building ranges from one column span and up, with the front of the building partially or fully open for a large display area. The commercial part of the building is raised half a meter from the road and is covered by a gable roof that extends to the adjacent residential building, which typically is a 1-2-story structure. The building materials used typically are wood, with wooden tile (Pan Kled) or clay-tile (Din Khor) roofs. Walls are made of horizontally laid wooden planks.

6.1.2 Traditional-Colonial (TC)

This style refers to traditional buildings influenced by Western, Chinese, and Burmese architectural styles. In the first era (1847-1897), Chinese-European architecture was the primary influence, derived from Wat Ketkaram's shophouse. In the second era (1897-1927), the Gingerbread house, or Sa Ra Nai house, was the dominant style. These buildings have hip roofs, horizontal louvered wooden partitions, panel doors and windows, and mouldings along the building, with eaves, gables, and the top of the roof decorated with carved or perforated wood. The gable end is adorned with sharp-end lathed wood. Roof types include gable, hip, and Manila (hipped-gable) roofs, with louvers and perforated wooden motifs also commonly used. The building is two-stories tall with a brick or half-timbered structure. The ground floor at the front of the building is arranged as a corridor or colonnade. The upper floor has a protruding balcony, which typically is decorated with stucco patterns. The roof is shaped and decorated with perforated wood along the eaves. A vent above the door adds to the overall decorative element of the building. These elements create a unique architectural style that is a blend of Chinese and European influences.

6.1.3 Modern (M)

The two- and three-story buildings known as "row houses" are a new architectural style that played an important role in Chiang Mai's urban development from 1927 to 1977. These reinforced concrete buildings are no higher than four stories, with a width of about 3.50-4.00 meters per unit and a ground floor height of not less than 3.50 meters. Generally, the buildings have a mezzanine floor that accounts for approximately one-third of the total building height. Sometimes, the design of these row buildings on the streets of Tha Phae showcased the skill of craftsmen and aimed to create uniqueness and distinctiveness that differed from other row buildings as seen in the fourth period (1957-1977). For example, commercial buildings used the front area as a balcony, which was shaded by sunshade fins or decorated sunshade fins on the building's façade. The fins might include use of curved concrete casting or other building materials such as bent steel or precast concrete walls.

6.1.4 Postmodern (PM)

After 1977, there was an increasing focus on architectural styles that emphasize Thai identity for buildings in both the public and private sectors (e.g. hotels, offices, restaurants, and commercial buildings). The Lanna Thai architectural style, or northern traditional style, often is incorporated, meaning that the building must have some characteristic reflecting the Lanna architectural style, such as a gable structure or roof section, decorative gable ends or Ka Lae, carved decorative patterns on bargeboards and gables, and carved decorative patterns on horizontal beams. While adhering to municipal regulations, many Postmodern-style buildings also incorporate symbolic decorative elements, such as gables or intricately carved eaves with diverse patterns. A minority of these Postmodern buildings blend Western architectural elements, such as classical ornaments, with the Lanna Thai style, forming a distinct sub-style within this architectural movement. This blending of traditional Lanna

Thai aesthetics with modern and Western elements not only complies with regulatory requirements but also enriches the architectural landscape, reflecting cultural integration and evolving design sensibilities.

The in-depth findings of this study provide a comprehensive understanding of the development of architectural styles on Tha Phae Road and their cultural and historical importance. Through the analysis of the physical characteristics of building exteriors, a classification system has been created to categorize the architectural styles of buildings on Tha Phae Road. This system, presented in Figure 3, aims to identify styles that are representative of the area's current state. The categorization of architectural styles is an essential step towards preserving and enhancing the visual quality of Tha Phae Road, as it allows for the identification of unique features and the establishment of design guidelines for future architectural design and preservation efforts.

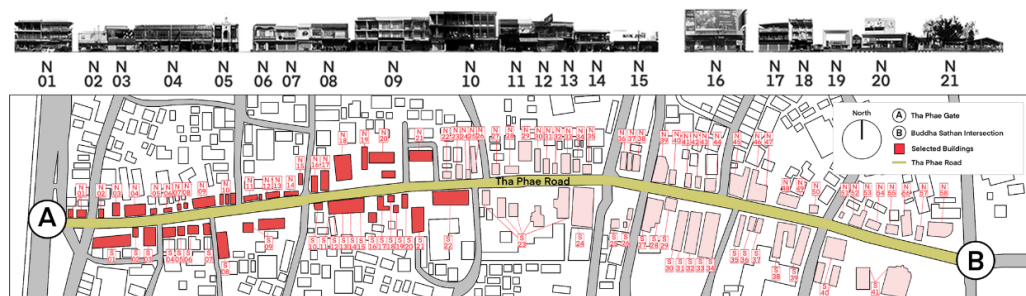
| | |
|--|---|
| 1. Traditional (T) | |
| <ul style="list-style-type: none"> A commercial part of the building is raised 0.50 meter from the road Residential building has typically a 1-2-story structure A gable roof extends to the adjacent residential building | <ul style="list-style-type: none"> Wooden tile (Pan Kled) or clay-tile (Din Khor) roofs A gable is parallel to the main road Walls are made of horizontally laid wooden planks |
| 2. Traditional-Colonial (TC) | |
| <ul style="list-style-type: none"> Windows with wooden shutters Arched doorway Colonnade Decorated with lattice patterns Perforated gable Two-story buildings Built with real wood Porch Half-wood and half-concrete structure Decorated with plaster motifs or stucco Wall-bearing structure Decorated with Sa Ra Nai Eaves, and gable ends with decorative wooden lattices or plasterwork | <ul style="list-style-type: none"> Doors and windows are made of wooden panels Ventilation openings above the doors Windows often are decorated with wooden lattice patterns or fixed wood carvings, or colored glass Cornice decoration Plasterwork above or below the windows. Wooden lattice patterns decorate the light and ventilation openings, gables, corners, balcony balusters, and around the eaves Small wooden decorations Gable ends are decorated in a triangular shape Gable faces outward to the front of the building. Eaves, gables, and the top of the roof decorated with carved or perforated wood A wooden folding door, 3-4 meters wide in front of the store The windows are decorated with horizontally or diagonally placed wooden panels. The roof is a hip roof, with gables and ridges, and a combination of gable and hip roofs |
| 3. Modern (M) | |
| <ul style="list-style-type: none"> Flat roof Stepped parapet Glazed windows Horizontal fins Unadorned columns | <ul style="list-style-type: none"> Reinforced concrete structure A width of about 3.50-4.00 meters per unit A ground floor height of not less than 3.50 meters Sunshade fins as a decorative element. Shutter door |
| 4. Postmodern (PM) | |
| <ul style="list-style-type: none"> Decorated with Kalae Wooden bracket Imitated traditional roof structure Terracotta roof Curved roofline Classical ornament | <ul style="list-style-type: none"> Wide entrance with open walls Tall floating columns Wooden pediment Carved wood pattern above the window grilles Glass cladding the building Triangular floating columns in front of the building |

Figure 3. A classification of four architectural styles on Tha Phae Road.

6.2 Contextual Study and the Trend of Architectural Styles

The survey focused on the area between the Buddha Sathan intersection near the Nawarat Bridge and Tha Phae Gate, spanning approximately 950 meters and encompassing both the north and south sides of the road. The neighborhood comprises 99 buildings constructed in various historical periods. The data collected from the site investigation were transformed into a series of digital street elevations of the study area, with each building assigned a unique code consisting of the letter “N” or “S,” representing its location on the north or south side of Tha Phae Road, respectively, followed by a sequential number. For instance, a building on the north side would be designated as “N01,” while a building on the south side would be designated as “S02.” A total of 58 buildings were located on the north side, and 41 buildings were located on the south side of Tha Phae Road. (Figures 4 and 5).

NORTH ELEVATION - 01

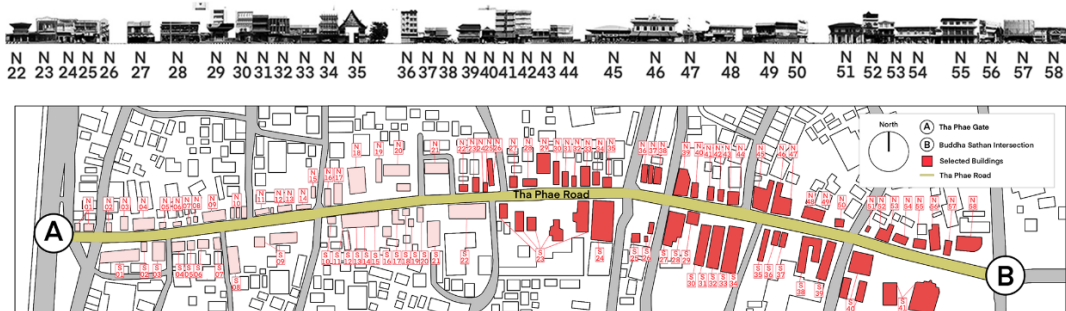


SOUTH ELEVATION - 01



Figure 4. The contextual study on Tha Phae Road (East).

NORTH ELEVATION - 02



SOUTH ELEVATION - 02



Figure 5. The contextual study on Tha Phae Road (West).

To analyze the architectural styles along Tha Phae Road for the years 2011 and 2022, four main architectural styles were identified and used to classify each building. These styles were Modern, Postmodern, Traditional, and Traditional-Colonial (Figure 6-10).

| Code | Year | Elevation | Style | Code | Year | Elevation | Style | Code | Year | Elevation | Style |
|------|------|---|-------|------|------|---|-------|------|------|---|-------|
| N01 | 2011 |  | M | N02 | 2011 |  | M | N03 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | M |
| N04 | 2011 |  | M | N05 | 2011 |  | PM | N06 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | M |
| N07 | 2011 |  | M | N08 | 2011 |  | M | N09 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | M |
| N10 | 2011 |  | M | N11 | 2011 |  | M | N12 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | M |
| N13 | 2011 |  | M | N14 | 2011 |  | PM | N15 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | M |
| N16 | 2011 |  | M | N17 | 2011 |  | PM | N18 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | M |
| N19 | 2011 |  | M | N20 | 2011 |  | M | N21 | 2011 |  | PM |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | PM |

Figure 6. The comparison of architectural style on Tha Phae Road between 2011 and 2022 (N01-N21).






























| Code | Year | Elevation | Style | Code | Year | Elevation | Style | Code | Year | Elevation | Style |
|------|------|---|-------|------|------|---|-------|------|------|---|-------|
| N22 | 2011 |  | PM | N23 | 2011 |  | M | N24 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| N25 | 2011 |  | M | N26 | 2011 |  | PM | N27 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | M |
| N28 | 2011 |  | PM | N29 | 2011 |  | M | N30 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| N31 | 2011 |  | M | N32 | 2011 |  | M | N33 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | M |
| N34 | 2011 |  | M | N35 | 2011 |  | T | N36 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | T | | 2022 |  | M |
| N37 | 2011 |  | M | N38 | 2011 |  | M | N39 | 2011 |  | TC |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | TC |

Figure 7. The comparison of architectural style on Tha Phae Road between 2011 and 2022 (N22-N39).



| Code | Year | Elevation | Style | Code | Year | Elevation | Style | Code | Year | Elevation | Style |
|------|------|---|-------|------|------|--|-------|------|------|---|-------|
| N40 | 2011 |  | PM | N41 | 2011 |  | M | N42 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| N43 | 2011 |  | M | N44 | 2011 |  | M | N45 | 2011 |  | PM |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | PM |
| N46 | 2011 |  | PM | N47 | 2011 |  | M | N48 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| N49 | 2011 |  | M | N50 | 2011 |  | M | N51 | 2011 |  | TC |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | TC |
| N52 | 2011 |  | PM | N53 | 2011 |  | PM | N53 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | PM | | 2022 |  | M |
| N54 | 2011 |  | M | N55 | 2011 |  | M | N56 | 2011 |  | PM |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | PM |
| N57 | 2011 |  | M | N58 | 2011 |  | - | | | | |
| | 2022 |  | M | | 2022 |  | PM | | | | |

Figure 8. The comparison of architectural style on Tha Phae Road between 2011 and 2022 (N40-N58).



| Code | Year | Elevation | Style | Code | Year | Elevation | Style | Code | Year | Elevation | Style |
|------|------|---|-------|------|------|---|-------|------|------|---|-------|
| S01 | 2011 |  | PM | S02 | 2011 |  | T | S03 | 2011 |  | PM |
| | 2022 |  | PM | | 2022 |  | PM | | 2022 |  | PM |
| S04 | 2011 |  | PM | S05 | 2011 |  | M | S06 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| S07 | 2011 |  | PM | S08 | 2011 |  | M | S09 | 2011 |  | T |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | T |
| S10 | 2011 |  | M | S11 | 2011 |  | M | S12 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | PM |
| S13 | 2011 |  | PM | S14 | 2011 |  | M | S15 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |
| S16 | 2011 |  | M | S17 | 2011 |  | PM | S18 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | M |
| S19 | 2011 |  | PM | S20 | 2011 |  | M | S21 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | M | | 2022 |  | M |

Figure 9. The comparison of architectural style on Tha Phae Road between 2011 and 2022 (S01-S15).




































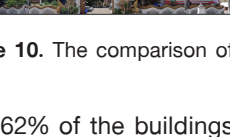
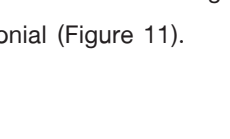

| Code | Year | Elevation | Style | Code | Year | Elevation | Style | Code | Year | Elevation | Style |
|------|------|---|-------|------|------|---|-------|------|------|---|-------|
| S22 | 2011 |  | PM | S23 | 2011 |  | T | S24 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | T | | 2022 |  | M |
| S25 | 2011 |  | M | S26 | 2011 |  | M | S-27 | 2011 |  | M |
| | 2022 |  | M | | 2022 |  | M | | 2022 |  | M |
| S-28 | 2011 |  | PM | S29 | 2011 |  | PM | S30 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | PM | | 2022 |  | M |
| S31 | 2011 |  | PM | S32 | 2011 |  | PM | S33 | 2011 |  | M |
| | 2022 |  | PM | | 2022 |  | PM | | 2022 |  | M |
| S34 | 2011 |  | M | S35 | 2011 |  | PM | S36 | 2011 |  | TC |
| | 2022 |  | M | | 2022 |  | PM | | 2022 |  | TC |
| S37 | 2011 |  | M | S38 | 2011 |  | TC | S39 | 2011 |  | PM |
| | 2022 |  | M | | 2022 |  | TC | | 2022 |  | PM |
| S40 | 2011 |  | T | S41 | 2011 |  | T | | | | |
| | 2022 |  | T | | 2022 |  | T | | | | |

Figure 10. The comparison of architectural style on Tha Phae Road between 2011 and 2022 (S16-S41).

In 2011, 62% of the buildings were Modern, 29% were Postmodern, 5% were Traditional, and 4% were Traditional-Colonial (Figure 11).

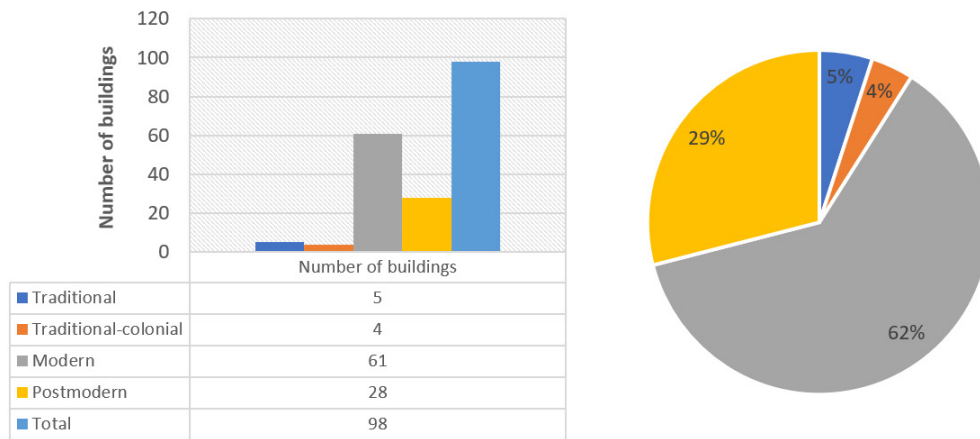


Figure 11. The distribution of architectural style on Tha Phae Road in 2011.

To compare the architectural styles of Tha Phae Road between 2011 and 2022, an analysis of Google Street View images was conducted, with the results showing that the distribution of architectural styles was similar in both years. For the year 2022 the survey showed that the Modern style was the most common, accounting for 60% of the total buildings, followed by Postmodern with 32%, and Traditional and Traditional-Colonial styles with 4% each (Figure 12).

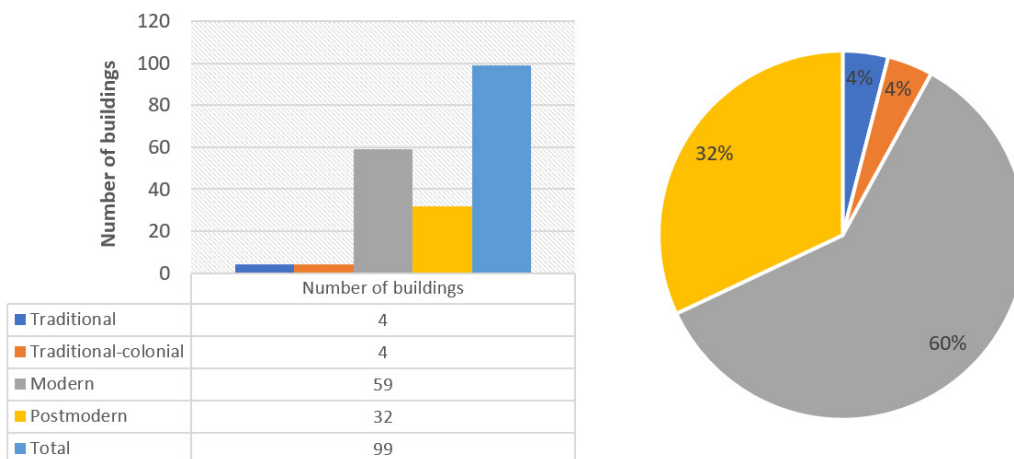


Figure 12. The distribution of architectural style on Tha Phae Road in 2022.

To investigate the trends in the four architectural styles along Tha Phae Road, we calculated the CAGR for each style between 2011 and 2022, covering an 11-year period. The formula (Eq.1) was applied where V_e = number of buildings in 2022, V_b = number of buildings in 2011, and $n = 11$.

6.2.1 Detailed Analysis of Traditional Style (T)

where $V_e = 5, V_b = 4$, and $n = 11$

CAGR Calculation:

$$CAGR = \left(\frac{4}{5}\right)^{\left(\frac{1}{11}\right)} - 1 = -0.020 \text{ or } -2.00\%$$

6.2.2 Detailed Analysis of Traditional-Colonial Style (TC)

where $V_e = 4, V_b = 4$, and $n = 11$

CAGR Calculation:

$$CAGR = \left(\frac{4}{4}\right)^{\left(\frac{1}{11}\right)} - 1 = 0.000 \text{ or } 0.00\%$$

6.2.3 Detailed Analysis of Modern Style (M)

where $V_e = 61, V_b = 59$ and $n = 11$

CAGR Calculation:

$$CAGR = \left(\frac{59}{61}\right)^{\left(\frac{1}{11}\right)} - 1 = -0.0030 \text{ or } -0.30\%$$

6.2.4 Detailed Analysis of Postmodern Style (PM)

where $V_e = 61, V_b = 59$ and $n = 11$

CAGR Calculation:

$$CAGR = \left(\frac{32}{28}\right)^{\left(\frac{1}{11}\right)} - 1 = 0.012 \text{ or } 1.20\%$$

The results revealed that Traditional Lanna and Modern styles experienced a negative annual growth rate, with rates of -2.00% and -0.30%, respectively, indicating a decrease in the number of buildings in these styles during this period. On the other hand, Traditional-Colonial style remained stable, with a 0% annual growth rate. Interestingly, the Postmodern style experienced a positive annual growth rate of 1.20%, indicating that the number of buildings in this style increased on an annual basis over the same period.

To estimate the number of buildings in each architectural style in 1847, 1897, 1927, 1957 and 1977, we performed a backward calculation using the CAGR. Figure 13 visually represents these projections. We assumed that the annual growth rate between 2011 and 2022 remained constant. The results indicated that Traditional style and Modern style had a negative annual growth rate, while Traditional-Colonial style remained stable. The Postmodern style showed a positive annual growth rate since 1957. Using these trends, we also can project future estimates of building numbers, assuming the same constant annual growth rate between 2011 and 2022. However, this projection involves several assumptions, including the continued availability of space for construction and the absence of new architectural styles or external influences. Factors such as economic changes, evolving cultural preferences, building regulations, and emerging architectural trends could all affect the growth rate, meaning that the actual future development may deviate from these estimates.

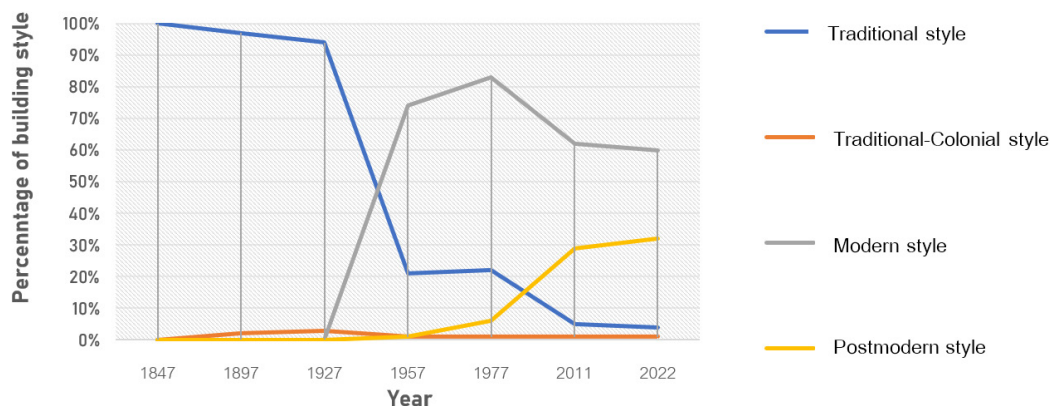


Figure 13. Trend of architectural style on Tha Phae Road from 1847-2022.

The architectural styles of the buildings along the road play a vital role in defining the area's identity and character. The analysis of the trend indicates that the Modern and Postmodern styles are more prevalent, while the traditional styles, including Traditional and Traditional-Colonial, are less common. This trend could result in a loss of the area's cultural and historical identity, which is associated with traditional architecture.

To address this issue, it is essential to develop design guidelines that recognize the historical and cultural significance of Tha Phae Road. The trend analysis can provide valuable insights to inform these guidelines, ensuring that the traditional styles are preserved and promoted. This way, Tha Phae Road can continue to be a vibrant and culturally significant destination for both locals and tourists while preserving its heritage for future generations. It is important to balance modernization and preservation to sustain the cultural and historical significance of Tha Phae Road. Design guidelines should consider the historical and cultural significance of the area and new buildings should be built with traditional styles in mind. This way, Tha Phae Road can maintain its historical and cultural significance, while also accommodating modern needs. The preservation of the traditional architectural styles will help to promote the area's heritage and enhance its identity, making it an attractive destination for tourists and locals alike.

These findings are crucial for the development and preservation of Tha Phae Road's identity. As the most common style, the dominance of the Modern architecture in the streetscape could potentially affect the street's cultural identity. The negative annual growth rate for Traditional and Modern styles emphasizes the need for stronger efforts towards preserving cultural heritage in the area. Conversely, the positive growth rate for the Postmodern style presents an opportunity to incorporate modern architecture while respecting the area's character and history.

6.3 Implications for Cultural Preservation

6.3.1 Façade Control Guideline on Tha Phae Road

Preserving the architectural heritage of Tha Phae Road requires ensuring that any changes or new developments respect the overall scale and character of the area. An analysis of the architectural styles and elevations of Tha Phae Road was conducted to develop a Façade Control Guideline that aims to provide a framework for preserving and enhancing the visual quality of Tha Phae Road while allowing for new development and changes to the area.

Our proposed Façade Control Guideline is divided into four categories based on the different architectural styles found on Tha Phae Road: Traditional-Lanna style, Traditional-Colonial style, Modern style, and Postmodern style.

1) For buildings with a traditional style it is recommended that the entire building be retained and restored, with strict prohibition on demolition. These buildings should be marked as conserved buildings to maintain their historical and cultural value.

2) For buildings with a Traditional-Colonial style, preservation and restoration should be prioritized, and demolition should be prohibited.

3) For buildings with a Modern style, the original structure and height of the building should be maintained and restoration should follow the principles of conservation to retain the building's intrinsic character and historical value. Any alterations or strengthening of the building structure should be done in the most sympathetic and unobtrusive way possible, using the original methods and materials wherever possible. The design of the front façade should take reference from the scale and rhythm of the adjacent conserved buildings.

4) For buildings with a Postmodern style, the design should reflect the Lanna architectural style and follow municipal laws. The original structure and height of the building should be maintained and the design of the front façade should take reference from the scale and rhythm of the adjacent conserved buildings. By implementing these guidelines, any changes made to Tha Phae Road will respect the overall scale and character of the area and preserve its historical and cultural value for future generations.

By implementing these proposed guidelines, any changes made to Tha Phae Road will respect the overall scale and character of the area and preserve its historical and cultural value for future generations. The proposed Façade Control Guideline provides specific design recommendations for each category, including guidelines for building height, setback, façade design, and materials (Figures 14 and 15).



Figure 14. Area for applying proposed Façade Control Guideline.



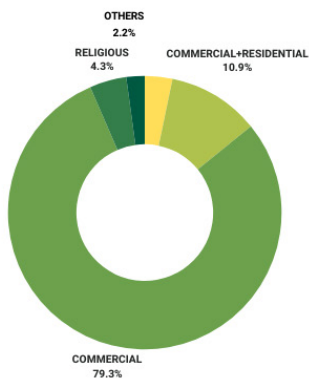
Figure 15. Area for applying proposed Façade Control Guideline (cont.).

6.3.2 Recommendation for Zoning Regulations

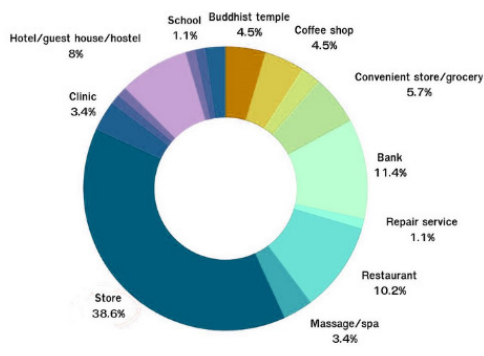
To develop effective zoning regulations, a thorough typological investigation of the buildings along Tha Phae Road was conducted. This investigation classified buildings by their architectural styles, functions, and heights, providing a detailed understanding of the area's functional and spatial characteristics.

The analysis (Figure 16) revealed that commercial buildings account for the majority of the structures on Tha Phae Road (79.3%). More than one-third of the buildings (38.6%) are mixed-use, with stores on the lower floor and dwelling spaces above. Approximately half of the buildings (45.8%) are two- to three-stories high, while one-story buildings are rare. The predominant building type is shophouses, typically built at a height of six to nine meters.

BUILDING TYPOLOGY ANALYSIS



FUNCTION ANALYSIS



BUILDING HEIGHT ANALYSIS

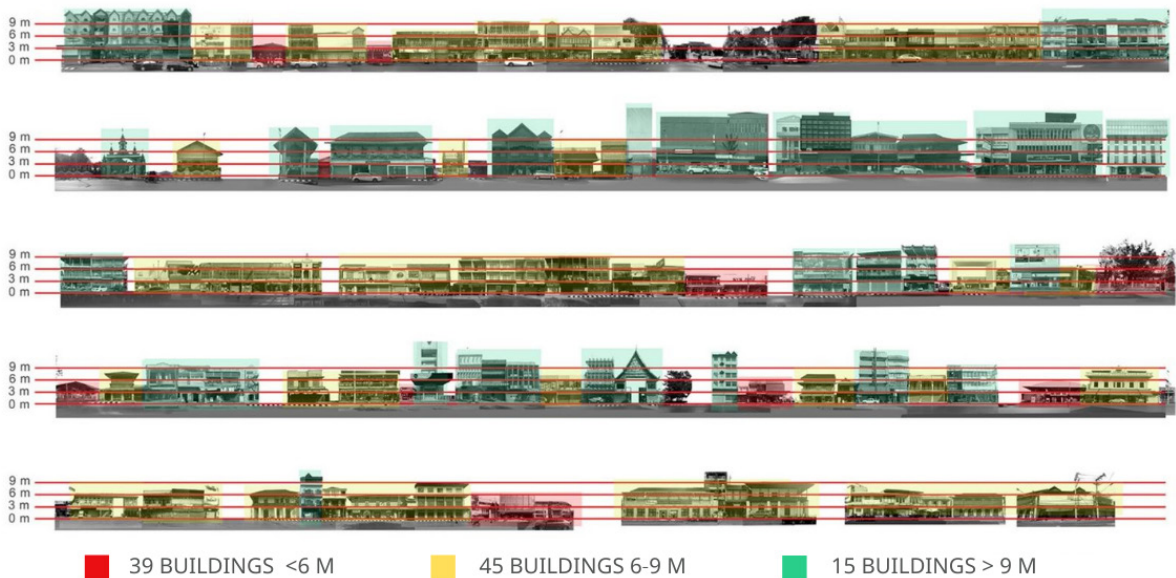
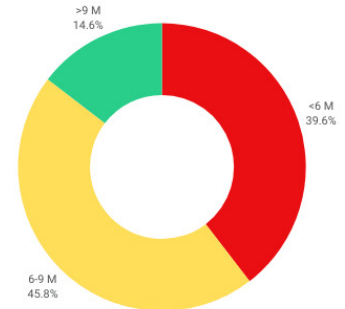


Figure 16. Building typological analysis.

Based on this analysis, the following zoning regulations are proposed:

- 1) **Building Height Regulations:** Limit the height of new construction to maintain the streetscape's visual coherence. Most buildings are two- to three-stories high, which should be the maximum height for new buildings. Encourage the construction of one-story buildings in designated zones to preserve the traditional architectural character.
- 2) **Mixed-Use Building Guidelines:** Promote the development of mixed-use buildings with commercial spaces on the lower floors and residential spaces above. This reflects the current typology where more than one-third of the buildings are mixed-use. Ensure that new mixed-use buildings are designed in a way that supports the historical and cultural context of the area.
- 3) **Architectural Style Preservation:** Encourage the preservation and restoration of traditional Lanna and Traditional-Colonial architectural styles, which are crucial to maintaining the cultural heritage of Tha Phae Road. Provide incentives for property owners to restore and maintain buildings in these styles.
- 4) **Public Spaces and Accessibility:** Enhance public spaces and pedestrian accessibility to promote a vibrant urban environment. Ensure that new developments include public amenities that cater to both locals and tourists. Implement guidelines for building frontages to create a pedestrian-friendly environment, with features such as covered walkways and open display areas for commercial buildings.

Implementation of these proposed guidelines and recommendations is envisioned to safeguard the distinctive character and cultural identity of Tha Phae Road. By integrating these measures, the area's historical and architectural heritage can be preserved amid ongoing urban development. This balanced approach not only fosters the sustainable evolution of Tha Phae Road as a culturally significant urban precinct but also ensures the continuity of its architectural legacy and historical essence.

7. Conclusion

This research set out to explore the architectural evolution and cultural preservation of Tha Phae Road in Chiang Mai, Thailand. By employing a Grounded Theory approach, the study delved into the historical and socio-economic influences that shaped the architectural landscape of this iconic street. The research identified four primary architectural styles—Traditional (T), Traditional-Colonial (TC), Modern (M), and Postmodern (PM)—and analyzed their prevalence and transformation over time using the Compound Annual Growth Rate (CAGR) method.

The findings of this study are important for several reasons. Firstly, they highlight the dynamic interplay between cultural heritage and urban development, revealing how socio-economic changes have influenced architectural trends. The decline in Traditional and Modern styles, contrasted with the rise of Postmodern architecture, underscores the evolving identity of Tha Phae Road. Secondly, the study emphasizes the importance of preserving architectural heritage amidst rapid urbanization. By proposing a Façade Control Guideline and zoning regulations, the research offers practical recommendations to maintain the visual and cultural integrity of the area while accommodating contemporary needs.

In conclusion, this research underscores the critical role of architectural preservation in maintaining cultural heritage. The study's insights into the architectural evolution of Tha Phae Road provide a valuable framework for future conservation efforts. As urbanization continues to transform cities worldwide, preserving the unique architectural identity of historical streets like Tha Phae Road becomes ever more crucial. This research not only contributes to academic discourse but also serves as a practical guide for policymakers and urban planners dedicated to cultural preservation and sustainable development.

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Authors Contributions

Conceptualization, N.L. and E.M.; methodology, N.L. and E.M.; formal analysis, N.L.; investigation, N.L.; resources, N.L.; writing – original draft preparation, N.L.; writing – review and editing, N.L.; visualization, N.L.; supervision, E.M.; funding acquisition, N.L. and E.M. All authors have read and agreed to the published version of the manuscript.

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