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Walkability Around The Grand Palace in Bangkok

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Abstract

This paper analyzes walkability around the Grand Palace and the Temple of the Emerald Buddha (Wat Phra Kaew). The place is in the historic complex of Rattanakosin Island in Bangkok, Thailand. Also, it is an important Buddhist site. It is also a big tourist spot. Millions of people visit every year. It deals with mass tourism, improve urban mobility, and enhance pedestrian experiences.

This study analyzes walkability based on four points: 1) the quality of pedestrian infrastructure, 2) access to important services and facilities, 3) safety and security conditions, and 4) experiential factors and environmental comfort.

The Rattanakosin Island has been improved to be more pedestrian-friendly and smart under Thailand's National Charter. However, there are still problems. These include broken sidewalk networks, heavy traffic during busy times and festivals, not enough shade and relief from the heat because of Bangkok's tropical weather, not enough facilities for people who need extra help, and conflicts between the Royal Household's vehicle access needs and the goals of making the area better for pedestrians. The study highlights current policy efforts like the Transport System in Rattanakosin Island Study Project, BMA's bike lane network, and the larger smart city development plan as important first steps. However, it also points out that the implementation is still scattered and that principles focused on pedestrians have not been consistently used in managing heritage areas. This paper suggests a combined approach for assessing walkability in heritage sites specifically for sacred places in urban Southeast Asia and gives practical ideas for improving infrastructure, managing mobility, and promoting inclusive design. It should be noted that The Grand Palace area has a Walk Score of 86 out of 100.

Discipline: Multidisciplinary (Urban Analysis & Infrastructure Management).

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1 Introduction

Cities are made for movement, yet many fail to prioritise one of its most fundamental modes: walking. As urban challenges grow, fostering walkability is increasingly accepted as a core strategy for achieving social equity, public health, environmental sustainability, and quality of life in urban environments . Walkable environments are linked to numerous benefits, from improved public health outcomes and stronger social cohesion to lower levels of air pollution and increased property values . Given these advantages, strategies favouring walkability are increasingly accepted as key in supporting urban inclusivity and sustainable urban development.

Figure 1: The Grand Palace complex in Bangkok, Thailand.

The Temple of the Emerald Buddha (Wat Phra Kaew) is situated within the Grand Palace complex (Figure 1)_ on Rattanakosin Island in central Bangkok. It symbolizes one of the most important sacred sites in Theravada Buddhism. Also, it is the foremost cultural heritage attraction in Thailand. It was constructed in 1782 following the founding of Bangkok as the capital by King Rama I. Rattanakosin Island was purposely designed as a defensive and ceremonial island. It is bordered by the Chao Phraya River to the west and a dug canal to the east . The area is the centre of living heritage. It symbolizes Thai identity through arts and architecture of the Rattanakosin era, thus vital for the history and archaeology of Thailand .

Annually, Wat Phra Kaew attracts millions of domestic pilgrims and international tourists, creating extreme pedestrian densities during peak periods and particularly during major religious festivals such as Visakha Bucha Day and the changing of the robe ceremony. Yet despite this immense pedestrian volume and the area's national and international significance, the quality of the walking environment surrounding the temple remains under-examined in both academic literature and policy discourse.

The concept of walkability—the extent to which the built environment supports and encourages walking—has been extensively studied in Western urban contexts, yet its application to sacred heritage sites in Southeast Asian megacities remains underdeveloped. Guida (2026) have argued, walkability is best understood as the degree to which the system of open spaces and the presence of destinations useful in daily life encourages and supports walking as the primary mobility mode . This definition is particularly apt for the Wat Phra Kaew precinct, where the pedestrian experience encompasses not only functional mobility (getting from parking or transit to the temple entrance) but also spiritual procession, heritage appreciation, commercial activity, and social interaction.

This paper studies the pedestrian infrastructure and walkability conditions around The Grand Palace/Wat Phra Kaew located on Rattanakosin Island. This study identifies policy and planning frameworks to improve pedestrian mobility in Rattanakosin Island. Also, it takes learns lessons from international walkability assessment methodologies and heritage site management practices to apply them to the context of the Grand Palace/Wat Phra Kaew. This study provides a framework with recommendations to improve whereas maintaining the area's sacred and historical significance.

2 Literature Review

2.1 Conceptual Foundations of Walkability

The concept of walkability has evolved greatly over the past two decades from a transportation engineering concern to a multidimensional construct in urban design, public health, environmental psychology, and social equity. Southworth (2005) described walkability involving that the built environment supports and promotes walking by providing pedestrian comfort, safety, and access to destinations.

According to Carpentieri et al. (2025), walkability adds new point on spatial quality and the capacity of the environment to encourage pedestrian mobility, differentiate it from classical conceptions of accessibility involving primarily on travel time and distance efficiency. This feature is important for heritage precincts like Rattanakosin Island, where the pedestrian experience is as much about quality, beauty, and spiritual meaning as it is about efficient movement.

Contemporary walkability research has moved beyond simple link-node analysis to include more holistic frameworks. Guida et al. (2026) proposed a hybrid methodology integrating quantitative GIS-based audits with qualitative data from resident surveys, producing two key metrics: a Walkability Index evaluating path quality based on weighted factors of safety, comfort, attractiveness, and pleasantness; and an accessibility index adjusted by walkability quality along routes . Crucially, their method integrates open spaces such as parks and squares into pedestrian

networks, offering a more comprehensive representation of the urban environment pedestrians experience daily.

Dinc et al. (2025) proposed an integrated strategy combining spatial network analysis with design-multivariate optimisation to mathematically derive optimal walkability design criteria . Applied to 117 neighbourhoods in Çankaya, Turkey, their approach demonstrated how network analysis can classify walkability levels and identify priority areas for intervention, while optimisation techniques generate evidence-based design solutions.

2.2 Walkability & Heritage Sites: The Pilgrimage Tourism Interface

The intersection of walkability and heritage site management presents unique challenges. Sacred sites such as Wat Phra Kaew serve multiple, sometimes conflicting functions: they are active places of worship for devotees, major tourist attractions for international visitors, symbols of national identity, and often sites of royal ceremonial significance. Each function makes different demands on the pedestrian environment.

For visitors, walkability holds not only physical ease but also spiritual appropriateness—the ability to approach the sacred in a manner consistent with religious practice. For tourists, legibility, information provision, and comfort (including shade, seating, and amenities) are paramount. For the Royal Household and temple authorities, security and protocol require controlled access and crowd management.

Recent research on pedestrian management at heritage pilgrimage sites has emphasised the potential of smart technologies. A study on the Camino de Santiago pilgrimage route, by Mar et al. (2026), proposed a framework integrating infrared counters, GPS tracking, and Wi-Fi analytics to monitor pilgrim flows, anticipate service demands, and detect overcrowding in sensitive heritage areas . While the Camino (Mar, 2026) differs significantly from an urban temple complex, the underlying principle—that real-time pedestrian data can inform proactive rather than reactive management—is directly applicable to Wat Phra Kaew.

2.3 Rattanakosin Island: Heritage, Mobility, and Development Pressures

Rattanakosin Island, the historic core of Bangkok, is an area of approximately 4.1 square kilometres bounded by the Chao Phraya River and a canal network that historically created an island configuration. As the seat of the Chakri dynasty since 1782, the island contains the Grand Palace, Wat Phra Kaew, Wat Pho (Temple of the Reclining Buddha), Wat Arun (Temple of Dawn on the opposite riverbank), the National Museum, Sanam Luang (royal field), and many government ministries.

The area has been recognised as a living heritage city, representing Thai identity through arts and architecture of the Rattanakosin era . However, Darndharmanont (2017) noted in a study

of Tha Chang area within Rattanakosin Island, there is a fundamental tension between heritage conservation and modern urban development: "Decay and lack of maintenance for this precious historic sites and buildings have partially been replaced by modern construction which impacts the visual aspect of the old city. Meanwhile, management of promoting cultural tour is inappropriate. Moreover, there is no cooperation between government sectors and participation of the residents regarding the conservation and sustainable development of the old city" .

Mobility in Rattanakosin Island has been a persistent policy concern. In 2015, the Transport System in Rattanakosin Island Study Project, conducted by the Old Town Group in collaboration with Silapakorn University's Faculty of Architecture, was presented at the Architect'58 Fair . The project was initiated in response to conflicts emerging after the Bangkok Metropolitan Administration (BMA) created a loop of 8 kilometres of bike lanes on 12 streets in the island. The study overlaid maps of land uses and transport to produce seven major recommendations, including adjustment of bus routes, converting streets to one-way traffic for cars, and extension of bike lanes to connect with electric train stations .

Following Ashworth (2020), Bangkok's smart city development plan identified Rattanakosin Island as one of four priority districts for improvement, alongside Chinatown, Asoke, and Tao Poon . The announced plans included extending roads and sidewalks to be more pedestrian-friendly, improving lighting and drainage systems, and upgrading the bus system . Silpakorn University was designated to design the smart city plan for Rattanakosin Island .

2.4 Research Gaps and Analytical Framework

Despite these policy initiatives, significant gaps remain in both understanding and practice. First, there has been no systematic walkability assessment of the Wat Phra Kaew precinct using contemporary, multidimensional methodologies. Second, the specific needs of different user groups—domestic pilgrims, international tourists, monks, vendors, and residents—have not been disaggregated in planning. Third, the relationship between vehicle access requirements (particularly for the Royal Household) and pedestrian-oriented design has not been explicitly addressed. Fourth, the potential for smart pedestrian monitoring technologies to inform management has not been explored in this context.

From these gaps, this paper adopts an analytical walkability framework of four dimensions.

1. Infrastructure Quality (safety): Sidewalk presence, width, continuity, surface condition, curb ramps, crosswalks, signage, lighting

2. Accessibility (destinations): Proximity to transit, parking, public toilets, food and water, seating, shade

3. Safety and Security (perception): Traffic conditions, crowding management, crime prevention, emergency access, ceremonial security

4. Experiential Quality (attractiveness): Heritage immersion, spiritual appropriateness, legibility, thermal comfort, aesthetics

3 Methods

3.1 Research Design

This study employs a mixed-methods case study design, integrating site observation, document analysis, and comparative case review. This multi-method approach is consistent with contemporary walkability research, which increasingly recognises the need to combine quantitative audits with qualitative, experiential data .

3.2 The Study Area

The primary study area encompasses the pedestrian precinct immediately surrounding Wat Phra Kaew/the Grand Palace, including Na Phra Lan Road (the street fronting the temple complex), Sanam Luang (the royal field to the north), Maharaj Road (to the west along the river), and Thai Wang Road and Rachini Road (to the south and east). The boundary extends approximately 500 metres from the temple walls, representing a comfortable walking distance for most visitors.

3.3 Site Observation Protocol

Site observations (Table 1) were conducted during multiple periods across 2024-2025 to capture variability in pedestrian conditions across different times, days, and seasons.

Table 1: Site observations during 2024-2025.

Period	Interval	Key Observations
Weekday (low season)	September, Tuesday 10:00-16:00	Baseline conditions, local visitors
Weekend (high season)	December, Saturday 09:00-18:00	Tourist crowds, market activity
Religious Festival	February (Makha Bucha), all day	Extreme congestion, ceremonial use
Early Morning	June, 06:00-09:00	Monastic alms rounds, joggers at Sanam Luang
Evening/Night	March, 18:00-21:00	Illuminated temples, evening strolling

Based on Guida et al. (2026) and Carpentieri et al. (2025), observation protocols assessed the following for each 100-metre segment:

- Sidewalk existence, width, continuity, and surface condition (0-3 scale)
- Shade cover percentage (natural vs. structural)
- Seating availability (benches, walls, steps usable for rest)
- Crossing infrastructure (crosswalks, signals, refuge islands)
- Traffic conditions (vehicle speed, volume, behaviour at crosswalks)
- Vendor presence and encroachment on pedestrian space
- Wayfinding signage and information provision
- Waste management and cleanliness
- Noise levels (qualitative assessment)

3.4 Policy & Planning Analysis

The policy and planning were thoroughly examined. The Bangkok Metropolitan Administration (BMA) has established the Smart City Development Plan from 2020 to the present. The Department of Public Works and Town & Country Planning has created regulations for the Rattanakosin Conservation Area. The Transport System in Rattanakosin Island Study Project (Chutima, 2015) provides suggestions. The Office of the National Economic and Social Development Council (NESDC) has outlined frameworks for urban development. Protocols from the Royal Household influence pedestrian access, which is available to the public. Royal Household protocols affect pedestrian access.

3.5 Comparative Case Analysis

To contextualise findings, walkability conditions at Wat Phra Kaew were compared with comparable heritage pilgrimage sites internationally, including the Dajia Jenn Lann Temple in Taiwan (TCG, 2026), the Fo Guang Shan Buddha Memorial Center in Taiwan (2025-2026 pedestrian environment upgrades) (FGS, 2026), and the Camino de Santiago pilgrimage route in Spain (smart pilgrim management framework).

3.6 Limitations

Several limitations must be acknowledged. First, the absence of comprehensive, publically available pedestrian count data for Rattanakosin Island constrained quantitative analysis. Second, access restrictions to certain areas (particularly those under Royal Household jurisdiction) meant some observations were conducted from public space boundaries. Third, the COVID-19 pandemic recovery period (2023-2025) may represent atypical visitor volumes compared to long-term patterns. Fourth, this study did not include systematic surveys of pedestrian perceptions, which would be a valuable direction for future research.

4 Results

4.1 Pedestrian Infrastructure Quality

The walkability conditions around The Grand Palace/Wat Phra Kaew exhibit extreme variability in different street segments, reflecting the absence of a coherent, whole-of-precinct pedestrian plan. The major findings are given below.

4.1.1 Na Phra Lan Road (Fronting Temple Complex)***

Na Phra Lan Road runs along the northern and eastern walls of the Grand Palace complex. It presents a paradox. As the primary ceremonial and tourist arrival route, it receives the most attention in terms of sidewalk infrastructure—yet conditions remain deeply problematic. Sidewalk width varies dramatically. In front of the main ticket entrance and at the intersection with Sanam Luang, temporary barrier systems are used during peak periods to channel pedestrian flow.

However, during the observation periods, these barriers were frequently absent or used inconsistently.

The fixed sidewalk infrastructure consists of pale stone tile paving that has become polished and dangerously slippery when wet during the rainy season (May-October). Surface unevenness from tree root uplift and settlement creates trip hazards, particularly problematic for elderly pilgrims and those carrying offerings. In many segments, utility poles are positioned directly in the sidewalk path, forcing pedestrians into the street or through narrow passages.

A significant finding concerns the relationship between traffic and pedestrian space. While Na Phra Lan Road does not carry heavy through-traffic compared to other Bangkok arterials, tour bus parking and Royal Household vehicle movements create periodic obstruction. During Buddhist holy days and royal ceremonies, entire sidewalk sections may be cordoned for ceremonial purposes or VVIP access, with pedestrian diversions poorly signed.

4.1.2 Maharaj Road (Western Edge, River Facing)

Maharaj Road presents the most promising pedestrian environment in the precinct, primarily due to the pedestrianisation efforts associated with the Tha Maharaj mixed-use development and riverfront promenade. This segment benefits from relatively wide, continuous sidewalks, shade from both mature trees and architectural awnings, and the absence of major vehicular through-traffic. Seating (both formal benches and restaurant-owned) is available throughout.

However, the continuity of this pedestrian-friendly environment is limited. North of the Tha Maharaj development, approaching the Royal Navy base and Wat Rachabophit, sidewalk conditions deteriorate rapidly. Width narrows dramatically, surface quality declines, and there is no shade provision on the west-facing afternoon exposure. The connection to the main temple entrance requires crossing at the Sanam Chai intersection, which has crossing signals but extremely long waiting times (observed 120+ seconds for pedestrian green phase).

4.1.3 Thai Wang and Sanam Chai Roads (Southern and Eastern Approaches)

These approaches present the most challenging walkability conditions. Thai Wang Road, which runs along the southern edge of the Grand Palace complex, lacks formal sidewalks for significant segments. Pedestrians walk on the unpaved shoulder or in the street, competing with vehicle traffic. The area is heavily used by tour bus parking, with groups disembarking directly onto the unpaved surface.

At the Sanam Chai intersection (Thai Wang, Maharaj, and Sanam Chai Roads), pedestrian infrastructure is fractured. Crosswalks exist but are faded and lack countdown signals. Refuge

islands are absent. During high tourist season, informal vendors set up on what should be pedestrian passages, creating additional congestion.

4.1.4 Sanam Luang (Royal Field, Northern Edge)

Sanam Luang, the 74-rai (approximately 12-hectare) royal field north of the temple complex, presents a unique pedestrian environment that functions as both ceremonial space and recreational open space. The perimeter pathway around the field provides a continuous 1.8-kilometre walking loop, popular for morning and evening exercise. This pathway is of consistent width (approximately 2.5 metres) and paved with interlocking concrete blocks.

However, as a ceremonial and occasional event space, Sanam Luang cannot be relied upon as a consistent pedestrian connection. During royal cremations, festivals, and political events, the field is either closed or occupied by temporary structures. Access points to the field from surrounding streets are limited, with only four formal entry gates, creating detours for pedestrians moving between the temple and areas north of the field.

4.2 Accessibility and Service Proximity

4.2.1 Transit Access

The Wat Phra Kaew precinct is served by multiple transport modes, yet the walking distance from transit stops to temple entrance presents challenges. The closest is Sanam Chai MRT station (Blue Line), approximately 500 metres walking distance from the main temple entrance. The route from the station uses Sanam Chai Road and then Maharaj Road to Na Phra Lan. As documented, the segment on Sanam Chai Road near the intersection lacks adequate sidewalks.

Chao Phraya Express Boat services at Tha Thien pier (Wat Pho) and Tha Chang pier are approximately 600-800 metres walking distance. These routes require crossing the heavily trafficked Maharaj Road, which lacks adequate pedestrian refuge islands and has limited crossing points.

For private vehicles and tour buses, parking is the primary constraint. The main car park for the Grand Palace is located on Sanam Chai Road, but capacity is limited (approximately 150 cars). Tour buses are directed to Na Phra Lan Road for passenger drop-off and pick-up, but there is no formal bus bay, forcing buses to double-park and block both traffic lanes and pedestrian sightlines.

4.2.2 Amenities

The availability of essential services within walking distance is uneven. Public toilets: The main public toilet facility is located within the temple complex itself (entry fee required) and at the Sanam Chai car park. During peak periods, queues exceeding 30 minutes were observed,

particularly for women's facilities. The Tha Maharaj development provides superior facilities but is located on the western side, distant for those entering from the east or north.

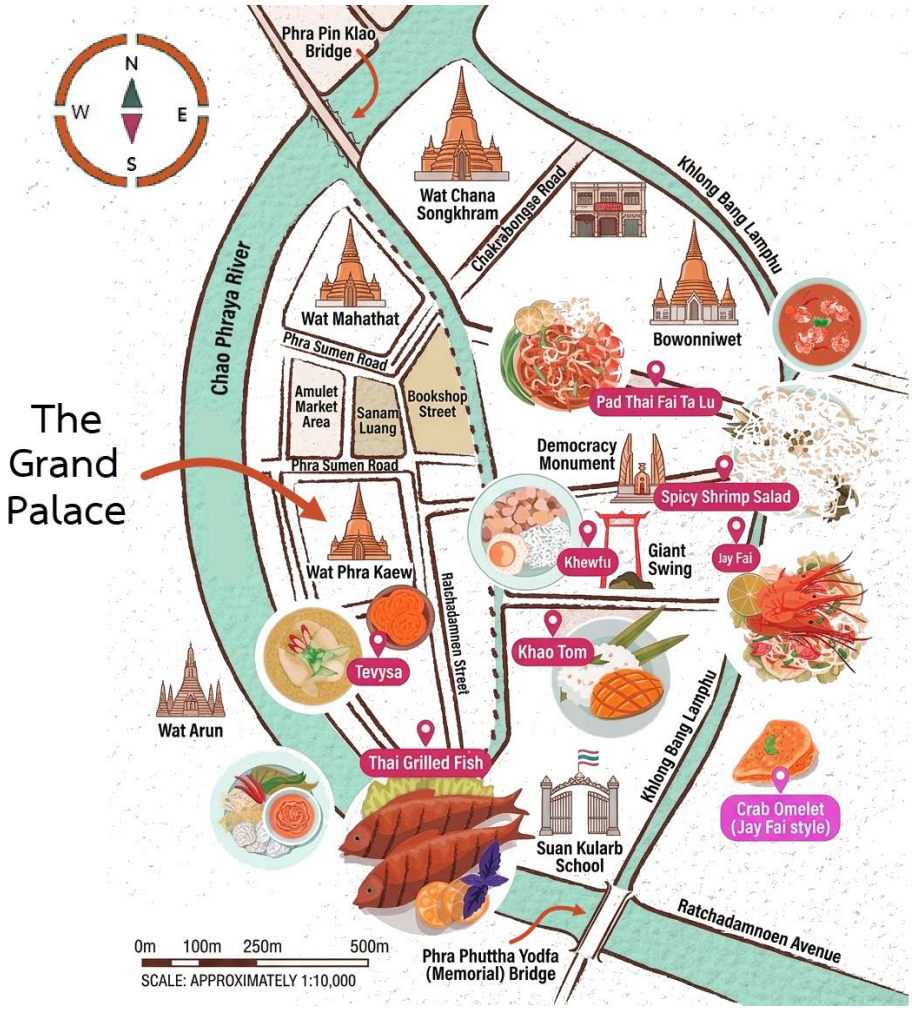

Figure 2: Rattanakosin Island Food Walk.
(Modified from Sunantha Maidee (2022)/ MICHELIN Guide Thailand))

Food and water: The area is well-served by both formal restaurants (Figure 2) (concentrated on Maharaj Road) and street vendors (distributed around the perimeter). However, vendor locations shift throughout the day and are not always present during off-peak hours. During the observation periods, water purchase points were consistently available, but at significant markups (typically 200-300% of Bangkok normal prices), potentially creating hardship for domestic pilgrims with limited budgets.

Seating and shade: These are critically deficient. Aside from the Tha Maharaj development, there are no formal benches or seating areas in the immediate temple precinct. Elderly visitors, those with mobility limitations, and pilgrims prostrating on hot stone surfaces have no dedicated rest areas. Shade is limited to trees along Na Phra Lan Road and the perimeter of Sanam Luang; the temple walls themselves provide no shade on the sun-exposed west and south facings.

4.3 Safety and Security

4.3.1 Traffic Safety

Traffic safety for pedestrians is the most critical concern identified in this study. While vehicle volumes in the immediate precinct are not as high as in Bangkok's commercial districts, the interaction of pedestrians, tour buses, taxis, tuk-tuks, and motorcycles is chaotic and largely unregulated.

The most hazardous locations are:

- The intersection of Maharaj Road and Na Phra Lan Road (Sanam Chai): Vehicles turning from Maharaj onto Na Phra Lan consistently fail to yield to pedestrians in crosswalks. No enforcement was observed.

- Thai Wang Road: The absence of formal sidewalks for significant lengths forces pedestrians into the travel lane. Tour buses pulling into and out of parking positions create sudden hazards.

- Sanam Luang edge at Ratchadamnoen Nai Road: This major arterial carries high-speed traffic. The crossing points to access Sanam Luang are limited and do not include pedestrian-activated signals. Elderly pedestrians were observed waiting multiple minutes for gaps in traffic.

4.3.2 Crowding and Congestion

Crowding-related risks are significant during peak periods. Based on observation during Makha Bucha (February 2025), the main temple entrance can reach pedestrian densities exceeding 5 persons per square metre at peak hours (10:00-12:00 and 14:00-16:00). At these densities, several risks emerge: trampling potential if a person falls, inability for emergency services to access the temple, pickpocketing vulnerability, and extreme thermal stress given limited shade.

The crowding is exacerbated by pinch points where pedestrian flow is channelled through narrow passages. The ticket sales area, security screening (bag check), and the entrance gate itself all create queues that back up into the sidewalk and street. There is no queuing management system (such as switchbacks or timed entry) in place.

4.3.3 Security Protocols

The presence of military and police security forces around the Grand Palace and Wat Phra Kaew is intense, reflecting the site's royal and national significance. Security checkpoints are located at all vehicle access points to the precinct and at pedestrian entries to the temple complex. Bag screening is conducted at the main pedestrian entrance.

From a walkability perspective, these security measures create both positive and negative effects. Positively, the security presence deters crime and creates a sense of safety. Negatively, queues at security screening can exceed 30 minutes during peak periods, and the screening layout

is not designed for efficient pedestrian flow. There is no separate queuing or expedited entry for persons with disabilities, elderly pilgrims, or families with young children.

4.4 Experiential Quality

4.4.1 Heritage Immersion and Spiritual Appropriateness

The potential for a high-quality pedestrian heritage experience around Wat Phra Kaew is immense. The temple architecture, the views of the Grand Palace walls, the Chao Phraya River glimpsed between buildings, and the green expanse of Sanam Luang create a unique urban landscape. However, this potential is undermined by the infrastructure deficiencies documented above.

For the domestic pilgrim, the approach to the temple should ideally be a spiritual preparation—a walking meditation, a transition from the secular to the sacred. The reality, based on observed behaviour, is one of stress: navigating obstacles, managing heat, pushing through crowds, and enduring the queue. The pedestrian environment does not support the spiritual function of the site.

For the international tourist, the confusion created by fragmented wayfinding and inconsistent pedestrian conditions detracts from heritage appreciation. While guidebooks and tour groups provide orientation, the independent visitor struggles to understand the spatial relationships between sites.

4.4.2 Shade/Thermal Comfort

Bangkok's tropical climate—with average high temperatures of 32-35°C and high humidity year-round—makes thermal comfort a critical walkability factor. The analysis of shade cover is given in Table 2.

Table 2: Observation on Shade/Thermal Comfort

Site	Shade/Thermal Comfort
Na Phra Lan Road	Approximately 40% shade cover from trees and overhanging structures during midday. However, the shade moves and certain segments have no cover at all.
Maharaj Road (Tha Maharaj segment)	70%+ shade cover from well-designed awnings and mature trees.
Sanam Luang perimeter	20% shade cover during midday; the open field itself has no shade whatsoever.
Sanam Chai and Thai Wang Roads	Less than 15% shade cover.

Water fountains and drinking water access points are extremely limited. During the hot season (March-May), the lack of water access creates genuine health risks for visitors, particularly the elderly and those with pre-existing conditions.

4.4.3 Wayfinding and Legibility

Wayfinding signage is fragmented and inconsistent. Within the temple complex itself, signage is adequate (though predominantly in Thai only). However, signage in the surrounding streets is minimal. There are no maps showing the walking network between Wat Phra Kaew, Wat Pho, the National Museum, and Sanam Luang. The walking routes to MRT and river boat stations are not signed.

This finding is particularly significant given that Rattanakosin Island is intended to become a "smart city" with improved technology and infrastructure . Basic pedestrian wayfinding—signage that is legible, consistent, and multilingual—should be a foundational smart city investment, yet it is currently absent.

4.5 Walk Score

The Grand Palace in Bangkok has a Walk Score of 86 out of 100 (WalkScore, 2026). This location is Very Walkable (Figure 3) so most errands can be accomplished on foot.

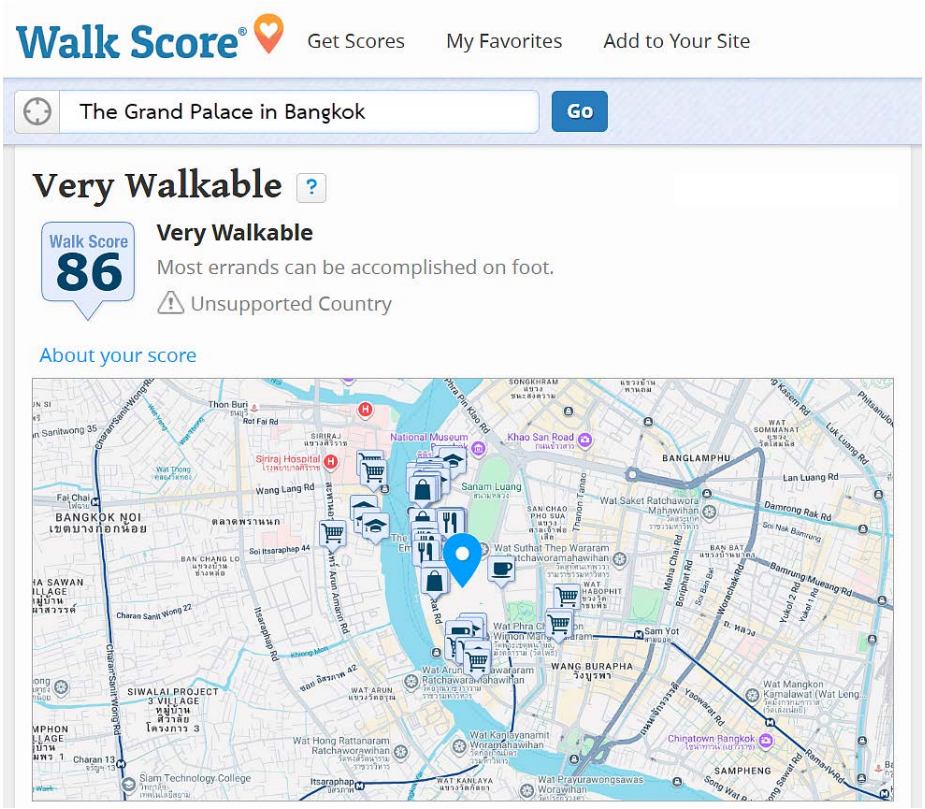

Figure 3: Walk Score for The Grand Palace in Bangkok (WalkScore, 2026).

4.6 Comparative Observations from International Cases

Comparison with documented walkability improvements at other religious pilgrimage sites illuminates both possibilities and contexts.

The Dajia Jenn Lann Temple (TCG, 2026) in Taichung, Taiwan, which attracts similar millions of annual pilgrims, recently completed a pedestrian environment improvement project with three distinct strategies: "pedestrian priority zones," "pedestrian-friendly zones," and "time-

limited pedestrian zones" . These strategies are deployed based on time of day, day of week, and festival period, recognising that pedestrian needs vary temporally. The project also included dynamic parking guidance displays and additional YouBike (public bicycle) stations to encourage "park and walk" behaviour . Wat Phra Kaew would benefit from similar temporal zoning and parking-to-walking transition improvements.

The Fo Guang Shan Buddha Memorial Center (FGS, 2026) in Kaohsiung, Taiwan, implemented pedestrian upgrades including roundabout traffic calming, speed reduction platforms (road humps), and 500 metres of new sidewalk marking to clearly separate pedestrian and vehicle space . The project reportedly reduced congestion, improved pedestrian safety perception, and enhanced the visitor experience during peak periods including the Lunar New Year. The use of simple, low-cost interventions (raised crosswalks, painted sidewalk markings) is particularly relevant for contexts like Thai Wang Road where formal sidewalk infrastructure is lacking.

The Camino de Santiago smart pilgrim management framework (Mar, 2026) offers lessons in pedestrian monitoring rather than infrastructure. By integrating infrared counters, GPS tracking, and Wi-Fi analytics, municipalities along the pilgrimage route can predict crowding, anticipate service demands, and proactively manage congestion. For Wat Phra Kaew, where crowding at entry points is the primary constraint, such monitoring could enable timed entry systems or real-time congestion alerts to visitors.

5 Discussion

5.1 Interpreting the Findings: Four Overarching Problems

The results reveal four interconnected problems that undermine walkability around Wat Phra Kaew:

5.1.1 Problem#1: Fragmented Infrastructure Responsibility

No single agency has comprehensive accountability for pedestrian infrastructure in the Wat Phra Kaew precinct. The Bangkok Metropolitan Administration (BMA) typically has responsibility for roads and sidewalks, but the Royal Household Exercises authority over the Grand Palace vicinity, the Fine Arts Department manages heritage conservation aspects, the Tourism Authority of Thailand has promotional interests, and various transportation agencies control transit interfaces. This fragmentation, noted in the study of Tha Chang area (Darndharmanont, 2017), means no entity has both the authority and the resources to implement a holistic pedestrian plan.

This fragmentation was evident in the Transport System study (Chutima, 2015), where multiple stakeholders—the Old Town Group, Silapakorn Univ faculty, BMA, & community representatives—participated in developing recommendations, yet implementation has been slow and incomplete.

5.1.2 Problem#2: Conflicting Vehicle and Pedestrian Priorities

The precinct serves multiple functions requiring vehicle access: Royal Household ceremonial movements, tour bus and taxi passenger loading, goods delivery to vendors and restaurants, and police/emergency vehicles. Yet no clear hierarchy of mobility priorities has been established. The result is an environment where vehicles and pedestrians compete for space, and pedestrians consistently lose.

The 2020 smart city announcement expressed intent to "extend the roads and sidewalks to be more pedestrian-friendly and also reduce traffic" , yet five years later, there is little evidence of implementation. A fundamental policy shift—from vehicle-first to people-first—has not occurred.

5.1.3 Problem#3: Inadequate Design for Tropical Climate and Demographics

The precinct's design does not adequately address either the tropical climate or the demographics of visitors. Shade is inadequate and inconsistently distributed. Water access is limited. Seating is practically non-existent. For the significant proportion of visitors who are elderly—domestic pilgrims from rural areas, often travelling in family groups—these deficiencies are not mere inconveniences but genuine barriers to access. For persons with mobility disabilities, the conditions are even more challenging.

5.1.4 Problem#4: Reactive Rather Than Proactive Crowd Management

Crowd management at peak periods is reactive rather than proactive based on real-time data. No visible pedestrian counting or density monitoring systems are in place. Queues at entry gates are not managed with timed entry or switchback systems. Emergency service access routes are not clearly designated or maintained.

The Camino de Santiago smart management framework demonstrates that proactive, data-driven management is technically feasible and operationally effective. Wat Phra Kaew's status as a national heritage site of immense significance warrants investment in such systems.

5.2 An Integrated Framework for Heritage Walkability in Sacred Southeast Asian Sites

Based on the findings, this paper proposes an integrated framework for assessing walkability at sacred heritage sites in Southeast Asian urban contexts. The framework extends the hybrid methodology of Guida et al. (2026) and the optimisation approach of Dinc et al. (2025) by adding dimensions specific to sacred sites.

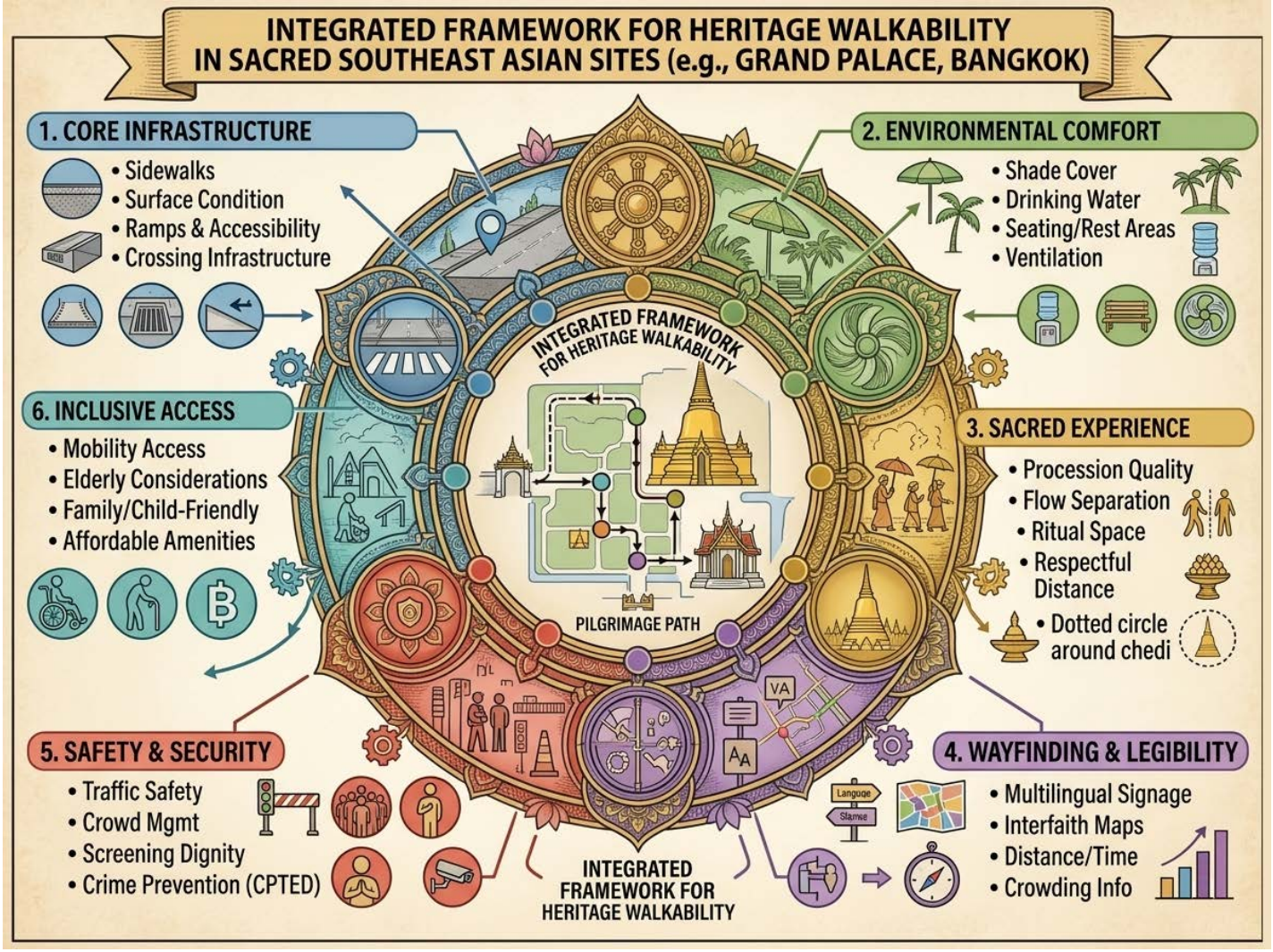

Figure 4: Integrated Framework for Heritage Walkability in Sacred Southeast Asian Sites.

The integrated framework for heritage walkability in sacred Southeast Asian sites comprise six dimensions (Figure 4). These dimensions are 1) Core Infrastructure, 2). Environmental Comfort (climate-responsive design), 3) Sacred Experience, 4) Wayfinding and Legibility, 5) Safety and Security, 6) inclusive access dimension.

5.3 Policy Implications and Recommendations

Three categories of recommendations emerge from the analysis: short-term low-cost interventions, medium-term capital investments, and long-term policy and governance reforms. Table 3 gives policy implications and recommendations in shor-term, medium-term, and long term.

5.4 Governance and Stakeholder Engagement

There is a need for cooperation between government sectors and participation of the residents regarding the conservation and sustainable development of the old city. Table 4 gives effective walkability improvement.

Table 3: Policy implications and recommendations

Short-Term Recommendations (0-12 months)
1. Install temporary shade structures and water stations; at key waiting areas (main entrance queue, Sanam Chai car park, taxi drop-off points). These low-cost interventions would immediately reduce heat stress. 2. Deploy movable seating; (simple benches that can be shifted during festivals). Cost is low; estimated 100 benches at approximately 2,500 baht each = 250,000 baht (approximately $7,500 USD). 3. Implement simple painted sidewalk markings; on Thai Wang Road segments lacking formal sidewalks. This low-cost intervention requires only paint and stencils but clearly indicates pedestrian priority. 4.Conduct temporary pedestrian counting using handheld counters; during peak periods to establish baseline density data, enabling evidence-based recommendations. 5. Develop a simple multilingual wayfinding sign; for the primary walking route between Sanam Chai MRT, Tha Thien pier, Wat Phra Kaew, and Wat Pho. Estimated cost: 50 signs at 2,000 baht each = 100,000 baht ($3,000 USD).
Medium-Term Recommendations (1-3 years)
1. Implement pedestrian crossing improvements; at the Sanam Chai intersection, including countdown signals, refuge islands, and raised crosswalks for traffic calming. This is the most hazardous pedestrian location in the precinct. 2. Construct continuous sidewalk on Thai Wang Road; from the Sanam Chai intersection to the car park area. This serves both pedestrian safety and dignifies the southern approach to the temple. 3. Install permanent public toilet facilities; with separate queuing for women's and accessible stalls. Capacity should be sized for peak festival demand (estimated requirement: 80 women's stalls, 40 men's stalls, 8 accessible stalls). 4. Implement real-time pedestrian density monitoring; at entry gates using infrared counters or Wi-Fi analytics , enabling proactive crowd management and timed entry during extreme peaks. 5. Establish coordinated vendor management; to prevent encroachment on pedestrian clearways while supporting local livelihoods. Designate specific vending zones and enforce sidewalk clearance.
Long-Term Recommendations (3-10 years)
1. Establish a dedicated Rattanakosin Island Pedestrian Authority; with representation from BMA, Royal Household, Fine Arts Department, Tourism Authority, and community/resident groups. This authority would have budget authority and implementation responsibility for pedestrian improvements. 2. Develop a pedestrian master plan; for Rattanakosin Island, extending beyond the Wat Phra Kaew precinct to include Wat Pho, the National Museum, Sanam Luang, riverfront connections, and transit interchanges. 3. Implement smart city pedestrian information systems; including real-time crowding maps, estimated wait times, and alternative route recommendations delivered via mobile app and digital signage . 4. Conduct a full accessibility audit and upgrade; to ensure persons with disabilities, elderly visitors, and families with young children can navigate the precinct safely and with dignity. 5. Create a pedestrian-preferred ceremonial route; from Sanam Luang to the temple main entrance, with upgraded surfaces, consistent shade, and processional dignity. 6. Explore vehicle restriction and congestion charging; during peak festival periods, with revenue directed to pedestrian infrastructure.

Table 4: Effective walkability improvement.

Action	Details
Formal coordination mechanisms	There is a need for cooperation between BMA, Royal Household, Fine Arts Department, Tourism Authority, and temple administration. A memorandum of understanding should define roles, responsibilities, and shared budgets.
Community and vendor engagement	This is to understand walking patterns, needs, and concerns. Walkability planning cannot be top-down; it must incorporate local knowledge.
Pilgrim and tourist consultation	This is to understand how different user groups experience and value the pedestrian environment.
Transparent performance metrics	To track progress, baseline data on sidewalk quality, crossing safety, shading, and crowding should be collected annually.

6 Conclusions

This paper has examined walkability in the urban environment surrounding the Temple of the Emerald Buddha (Wat Phra Kaew) on Rattanakosin Island, Bangkok. The analysis reveals a precinct of immense spiritual, cultural, and economic significance where the quality of the pedestrian environment falls far short of what the site's importance—and its millions of annual visitors—deserves.

The key findings are sobering. Pedestrian infrastructure is fragmented, with sidewalk continuity, width, and surface quality varying dramatically by street segment. Safety is compromised at several critical intersections and along Thai Wang Road where sidewalks are absent entirely. Accessibility to essential services—particularly public toilets, seating, and shade—is inadequate for current visitor volumes, especially for elderly and mobility-limited individuals. Thermal comfort is severely compromised given Bangkok's tropical climate, with limited shade and almost no drinking water access. Crowd management is reactive rather than proactive, creating safety risks at peak periods. Wayfinding is fragmented, undermining heritage appreciation and independent exploration.

Yet the findings also reveal opportunity. Rattanakosin Island has been designated as a smart city priority district . A transport system study has developed recommendations for improved mobility . Silpakorn University stands ready to contribute design expertise . International examples from Taiwan and Spain demonstrate that walkability improvements at pilgrimage and heritage sites are technically feasible and operationally effective.

What is required is not new knowledge but new will, and new governance structures capable of translating fragmented authority into coordinated action. The fragmentation documented in 2017 persists in 2025. The pedestrian master plan recommended years ago remains unimplemented. The smart city vision has not yet materialised in improved sidewalks.

This paper concludes with a call to action for the multiple authorities with jurisdiction over the Wat Phra Kaew precinct. The temple is not merely a tourist attraction; it is the spiritual heart of the Thai nation. Its approach should be worthy of its destination. Every pilgrim arriving by foot, every elderly grandmother making her once-in-a-lifetime journey, every young family introducing their children to the Emerald Buddha, deserves a walk that is safe, comfortable, and dignified.

The framework proposed in this paper—integrating infrastructure quality, environmental comfort, sacred experience, wayfinding, safety, and inclusive access—provides a roadmap for what that dignified walk could look like. The low-cost interventions recommended here can begin immediately. The governance reforms will take longer but are ultimately more important. The

question is not whether improvement is possible, but whether the authorities with responsibility will choose to act.

As the 2026 walkability research of Guida, Maglione, and Carpentieri reminds us , truly walkable cities are not measured by the efficiency of their traffic flow but by the quality of life they afford their most vulnerable pedestrians. By that measure, the streets around Wat Phra Kaew have far to go. The journey begins with recognition and continues with action.

7 Availability of Data and Materials

All information is included in this article.

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