

The Walking Bangkok: Inclusive Pedestrian Network's Integrated Design and Implementation Study on Bangkok's Emerging Transportation District

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Abstract

With a city growing in size, capacity, density, and intensity, walkability in the Bangkok district (Bangkok, Thailand) represents a challenge to produce more inclusive transportation through mobility planning that suits the multimodal transportation system (skywalk, MRT lines, water transportation) and the walking experience of the pedestrian. Drawing from Bangkok's Transit-Oriented Development (TOD) strategic plan, the challenge lies in the balancing point of efficiently and effectively elevating walkability while keeping the local urban identity. This study investigates the notion of walkability as both a ground-up participatory design process and within the overall mobility planning framework by reviewing both Thai and international sidewalk standards and through interviews with stakeholders. We conclude by producing an experimental design guide and policy recommendations on how area-specific sidewalks have the potential in shaping more feasible and equitable mobility planning from the ground up.

Keywords

Bangkok; Mobility; Sidewalk; Urban transportation; Walkability

1. BACKGROUND

In a vehicle-dominated contemporary city like Bangkok, the sidewalk becomes the canvas of urban activities reflecting the urban vivacity of the Global South (De Sousa Santos, 2016). Nevertheless, such 'space for the passer-by' often is given lower priority in the planning process in favour of transport development. Our research sets out the firm belief that worthwhile urban mobility planning should equally consider the users of all means to create a more walkable and inclusive city while embracing the global sustainable urban development goals.

Fundamentally, the term ‘sidewalk’ conveys the priority planners put in transport planning. The sidewalk is meant to be on the ‘side’ of something, be it the roadway, highway, waterbody or other so-called obstructions to the pedestrian journey, while there are different considerations for the crossroads. A multi-layer crossing (i.e., car tunnel or elevated walkway) allows for continuous crisscrossing with the compromise of at least one party(s) involved. Nevertheless, the ability to roam around freely and safely remains a fundamental right of civic life (Speck, 2012; Montgomery, 2014). Sidewalks in Thailand generally are considered as the ‘footpath,’ yet contemporary Bangkok sees the use of sidewalks for something more than pedestrian traffic. While pedestrians utilise such walkways as their journey route, other parties (i.e., street merchants and motorcycle taxis) see the opportunity to enhance street life through informal urbanism (Dovey, 2020). Such space requires regulation and spatial order to benefit all parties involved (Gehl 2011).

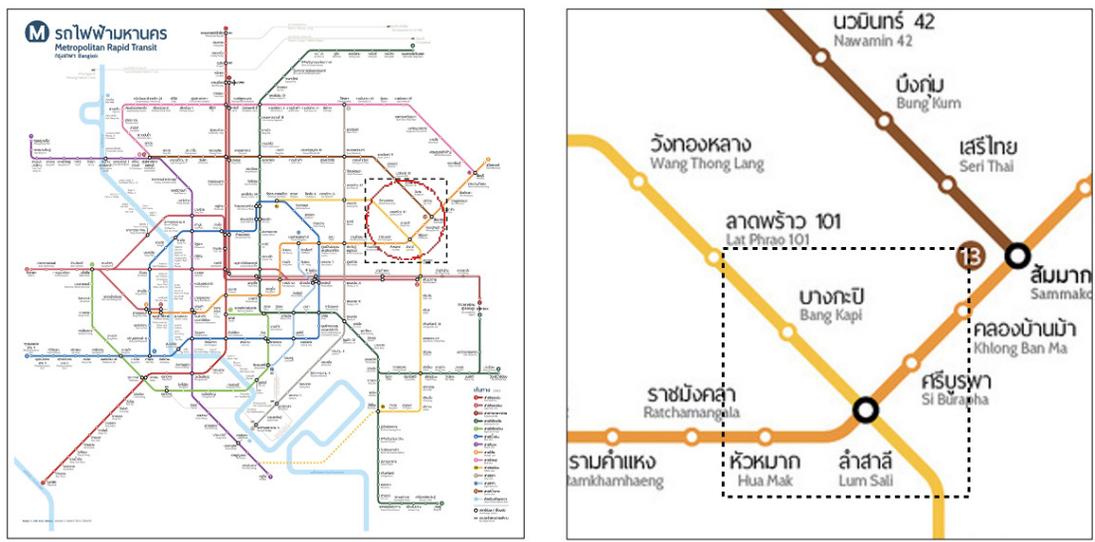


Figure 1 Study area overview and its location in the existing public transit network plan
 (source: <https://www.bangkokpost.com/thailand/general/2046807/new-rail-links-to-ease-jams>)

With the recent growth of Bangkok’s public transportation system, the Bangkapi district represents a new central area located within the existing network of a fine-grained functional mix and future accessibility development associated with two new skytrain lines and skywalk (not to mention the increased density from the emerging land-and-water transportation hub). As such, a strategic plan that suggests and/or results in a more inclusive physical built form for the sidewalk, crossing way, and public social space is crucially vital. Therefore, the Bangkapi junction area became the focal point for this study. Through a literature review, of Thai and international building standards, assessment of , user interaction, and example site analysis, this research looks at the potential of the Bangkapi area to have a more walkable and inclusive space for all (see Figure 1).

1.1 Research aims:

- i. To provide a street design guide for the future (re)development project.
- ii. To create an area-specific sidewalk guideline as the built standard for further development in the district and the surrounding area.

2. METHODOLOGY

In order to understand how we might improve the quality of the sidewalk, the study reviews both Thai and international standards to compare their differences and similarities. The selected international guidelines consist of basic standard design of streets from professional reference books, and various country standards: Hong Kong, China; Johannesburg, South Africa; Toronto, Canada; Boston, USA. For Thailand standards, the various government standards were selected: Criteria and Standard for Comprehensive Planning (Standard Department, Engineering and Planning Department, 2006); Criteria and Infrastructure Standard, and Transportation Facilities for Disabled, Children, and Elders (Ministry of Transportation); Handbook of Safety Crosswalk (Academic Center of Road Safety); Standards of Road, Sidewalk, and Pedestrian (Department of Local Administration, Ministry of Interior).

Subsequently, the study interviewed stakeholders who are involved and impacted by sidewalk design and planning. The first group of stakeholders represented disabled persons (3 people; 1 wheelchair and 2 blind). The second group of stakeholders were vendor and motorbike service representatives (3 people: 1 vendor and 2 motorbike service). The third group of stakeholders represented government agencies (4 people: 2 Bangkok district officers, 2 Engineering Department, Bangkok Metropolitan Authority). The fourth group of stakeholders were community representatives (4 people). The 4 online stakeholder interviews have set with a leader of each representative group in order to understand the needs and challenges they have confronted in daily life. Later, design guidelines for 10 locations around the Bangkok junction area were identified in consultation with the teams and stakeholders to mockup the specific site-based design guideline (see Figure 2).

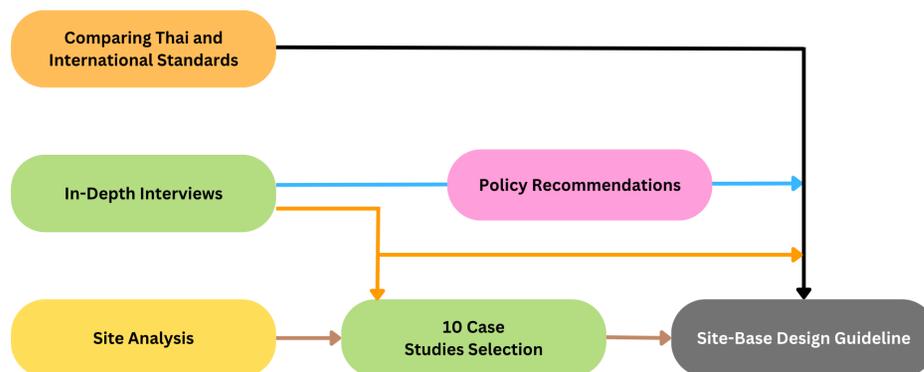


Figure 2 research process diagram (source: the author's team research)

3. THE ISSUE(S) OF SIDEWALK

Walkways, crossing ways, and public spaces are three main elements that make up the sidewalk and they all should be considered in the pedestrian sidewalk design. Although the sidewalk is meant to be the 'space for the passer-by', the practice of strolling down the street also involves stopping at the crossing, as well as seating and other social activities that require public space for staying. The informal activities and settings like those of food carts and street vending, for example, also contribute in shaping the sociological fabric of street life at eye level, affecting the density and intensity of activity and traffic in the area and thus the pedestrian trajectory and behavior (Songpetchmongkol 2022). The overall physical and socio-political fabrics contribute to two aspects of urban mobility planning (Jacquie 2005). This section investigates the underlying

factors in sidewalk's physical and social form(s) against the recognised international standard and suggests policy recommendations in (re)developing a district-specific design guide for the Bangkapi area.

3.1 Sidewalk standard: Thai vs. Global

A comparative view of the international standards for sidewalk design suggests several physical and spatial qualities that local sidewalks lack (see Table 1). For example, the internationally recognised standards outlined by the Global Designing Cities Initiative, and National Association of City Transportation Officials (NACTO-GDCI, 2016) consider the surrounding context and conditions, the usage density, and their timely intensity of use. These guidelines suggest the need to consider designs and concerns applicable to social and economic activities happening on Thai urban sidewalks rather than simply the physical usages. The current local street guide in Thailand only requires a minimum street width and a few other elements (i.e., crossing point detail and pedestrian island width). Ideally, designing the sidewalk is about more than organising paving and walkways alone but also the other elements along the journey (Dovey & Pafka 2020). With the more inclusive physical and socio-economic guidelines come a clearer perspective for further development. Therefore, such further development also should consider the overall surrounding context, density, intensity, and other related elements in the planning and design process (Boston Transportation Department, 2013).

Table 1 Comparison Between International and Thai Standard of Walkway, Crossing Way, and. Public Space (source: the author's research team)

Sidewalk standard comparison (Thai vs. international design guideline)			
	Sidewalk elements	International standard	Thai design guideline
Walkway	Walkway width (standard)	1.5 - 2 m	> 1.5 m
	Walkway width (high-density area)	2 - 4.2 m	-
	Walkway width (area-specific)	2 - 4.2 m	-
	Bus stop design	> 1.5 x 2.5 m	-
	Vendor's selling area	0 - 4 m	-
	Green space & system service	0.3 - 5 m	-
	Bicycle path	2 - 3 m	-
Crossing way	Crossing path	3 - 7.6 m	> 2 m
	Sidewalk extension	1.8 m	0 - 7 m
	Pedestrian island	1.8 - 2.4 m	> 1.2 m
Public space	Slope	< 1:12	1:12
	Handrail	H = 1.1 m	H = 0.8 - 0.9 m
	Light pole position	14 - 15 m	-
	Tree alignment	6 - 9 m	-
	Seating alignment	1.5 - 1.8 m	-
	Bicycle parking space	1.5 m clear path	-

3.2 Excerpt from interaction & in-depth user interview

The majority of interview input from the area users suggests there exists a wide range of physical and urban sociological factors that make it difficult (or in some cases impossible) to walk on the existing sidewalk in the Bangkapi area safely. Selected interviewees (namely, wheelchair users, street vendors and merchants and community representatives) were invited to reflect on Bangkapi sidewalk issues and their potentials. When categorised against the existing official design guide outlined by Bangkok's Department of Public Works, the main issues identified cover the accessibility, walking quality, and safety of the pedestrian. The pedestrian interviews also highlight a number of remarks on the ups and buts of walking down the sidewalk itself (see Table 2).

Table 2 Selected excerpts from the Bangkapi users' interview (source: the author's research team)

Excerpts from user interview				
	Governmental officials	People with disability & wheelchair users	Merchant & streets vendors	Community's representatives
Walking zone	2. Unorganised construction flow	1. Uneven pavement 2. Sidewalk blockage 3. Discontinued walking guide 4. Not suitable drainage cover	-	1. Narrow walkway 2. Rough surface 3. Sidewalk blockage 4. Need more light
Bus stand	-	1. Not accessible to wheelchair users 2. Discontinued interchange 3. Could use smart city elements in the traffic and sidewalk planning	1. Skywalk also could allow merchants vending space	1. Off-set drop-off space intervening the walkway 2. Need shaded seat 3. Need larger space near the transport interchange hub
Sidewalk business	-	1. Vendors blocking walkway	1. Restrictions affect vendor's income	1. Informal street economy is important
Green space & etc.	1. Service unit blocking walkway 2. Tree roots grow into the walkway	1. Bushes narrowing the walkway	-	1. Need more green space 2. Need more shaded seating area
Building frontage	-	1. Cannot sell in front of buildings	1. Utilise building set-back for public use	1. More flexibility for street vending
Bicycle path	-	1. Dedicated cycle lanes	-	1. Need to be culturally appropriate in cycling clothes 2. More bicycle parking around marketplace
Crossing route	1. Need appropriate construction	1. Prefer raised surface crossing	-	1. Prefer zebra crossing to elevated way
Elevated walkway	-	1. Inaccessible to wheelchair users 2. Need more zebra crossing spots 3. Need more pedestrian-friendly design	-	1. Old and damaged crossing bridge
Walkway extension	1. Need appropriate construction	1. Prefer raised surface crossing	-	-
Pedestrian island	-	1. Not suitable to wheelchair users 2. Elements blocking wheelchair user's vision of the traffic.	-	-

The collected data from the literature review and user interviews suggest the potential of addressing Bangkok's sidewalk planning gaps in three areas - construction, planning, and design. The existing site conditions have a sidewalk that lacks construction quality in terms of width and material, and the elevated walkway is not up to design standard. Furthermore, a lack of communication and collaboration with the local community results in the conflict of spatial appropriation that leads to the loss of area identity and economic value through informal street vending. Likewise, the lack of inclusive design elements makes crossing the road difficult (or, in some cases, impossible) for the elderly and people with visual and walking disabilities.

4. SITE ANALYSIS AND CRITERIA

In order to select specific study sites, the area (see Figure 3) was divided into 4 zones: commercial, community, prime, and connection zones. Each zone identifies the characteristics of the area (see Figure 4). Moreover, the study identifies the width of the sidewalk at each site in order to understand the site conditions (see Figure 5). This informs the critical areas that need attention and new sidewalk design solutions.



Figure 3 Mobility infrastructure and local commercial and educational nodes (source: adapted from Google Maps satellite image)

Prior to site selection, the concept of selecting the site based on 3 main criteria: a center of activities and transportations; near a new mass transit system; the walkway is wider than the normal standard as its convenient to be a showcase. The study then set the score to the area. The transitional area is the highest score with 40 points; the activity center area has a score of 30 points; the future project development is scored 25 points; sidewalk condition is 5 points. The score also is given to its walking distance of 400 m. in radius (see Figure 6). However, for the site-specific study, the criteria of the area are the implementation could be utmost impact (the higher the color density, the higher impact) and work ability (see Figure 7).

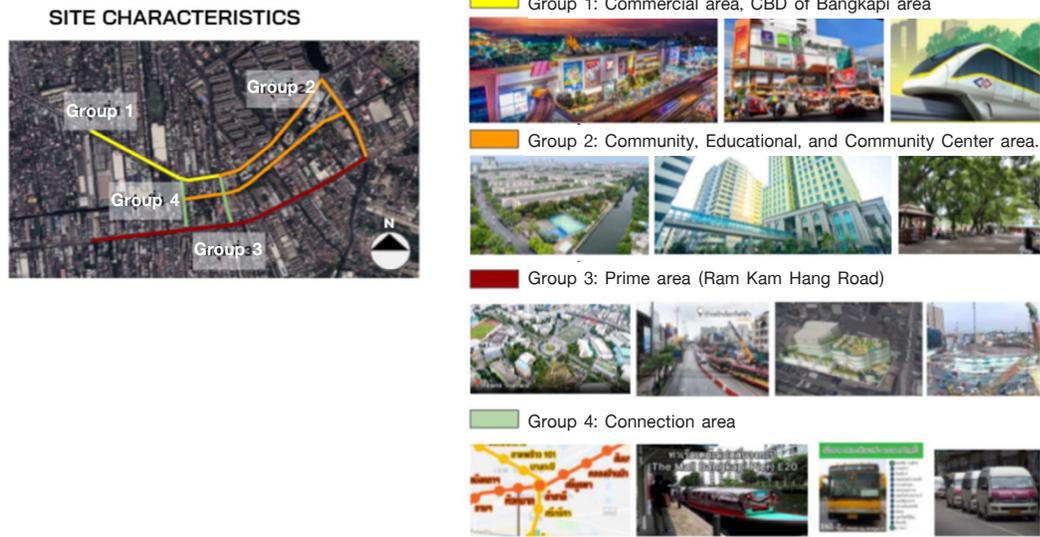


Figure 4 Characteristic identification of the Bangkapi junction area. (source: adapted from Google Maps satellite image)

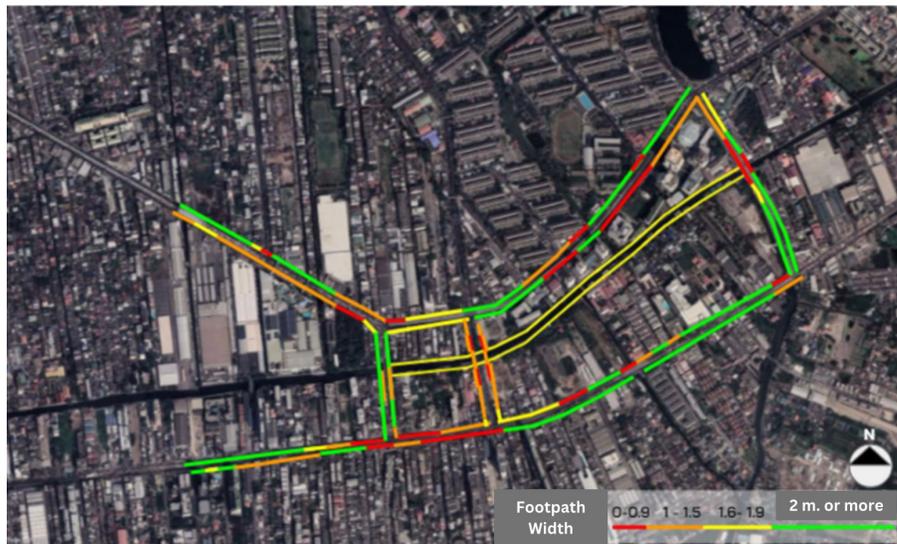


Figure 5 Sidewalk width in the study area. (red is 0-0.9 m.; orange is 1-1.5 m.; yellow is 1.6-1.9 m.; green is more than 2 m.) (source: adapted from Google Maps satellite image)



Figure 6 Selected areas and nodes for study, and their categorical scoring (source: author's research team)



Figure 7 Site analysis score, as overlaid with factors from Figure 4 (source: author’s research team)

The initial suggestion for site redevelopment circulates the traffic of the herringbone road structure, with crossing points and walking distance defining the linkage (and difficulty) for an individual’s access to the public amenity and activities hub in the area. The existing walking condition of the Bangkapi area is below the national standard (let alone the international design guideline) and is particularly apparent in its narrow sidewalks (if any) as well as the physical obstacles of the walking experience (i.e., blockage, discontinued or inaccessible walkway).

5. SITE SELECTION (10 SITE-SPECIFIC CASES)

The case of Bangkapi reflects the emerging transportation that includes the need for more mixed-use land planning with urban points and nodes at several corners and junctions, displaying a mixture of civic vivacity. What is next for Bangkapi lies in its potential for further planning and urban design. As a hub for business, community, real estate and an interchange point (see Figures 3 and 4), the new transport and area-specific mobility plan should consider the increasing number of users associated with the introduction of the new infrastructure (see Table 3). Based on our study, the area can be classified into 6 types of development: commercial node, community node, connector, intersection, physical problems, and green linkage (see Figure 8). The 10 selected case studies of Bangkapi also are within the 6 types of development (see Figure 8).

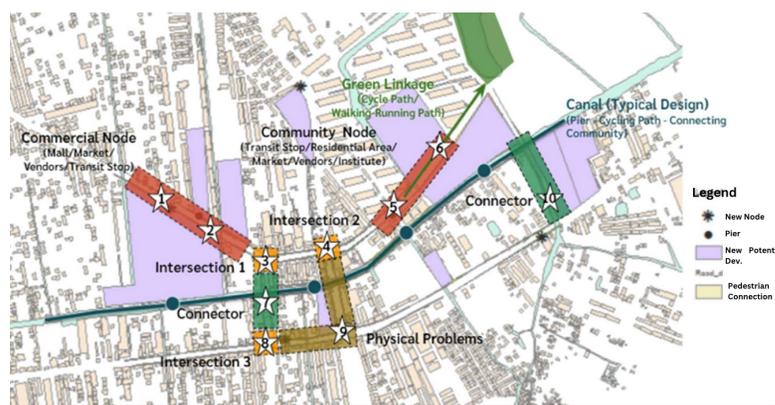


Figure 8 6 design development classifications and 10 selected site-specific case study areas. (source: author’s research team)

Table 3 Existing conditions and redevelopment recommendations for 10 selected site-specific case study areas (source: the author’s research team, adapted map from Google map) (source: adapted from Google Maps satellite image) Note: Street Diet is a design to narrow down an original road to increase pedestrian walkway.

10 selected cases of Bangkok transportation district				
	Sidewalk width analysis	Existing pedestrian condition	Sidewalk width	Redevelopment recommendation
Site 1: Bangkapi Skytrain Station and entrance to the skywalk		<ul style="list-style-type: none"> - Uneven pavement - Narrow traffic island - Physical obstacle 	0.8-2.5 m	<ul style="list-style-type: none"> - Widen the sidewalk - Integrate elements for the disabled - Escalator to the skywalk
Site 2: Connecting skywalk and commercial area		<ul style="list-style-type: none"> - No slope for the raised sidewalk - Vendors blocking sidewalk. - High user density 	0.8-2.5 m	<ul style="list-style-type: none"> - Widen the walkway - Create space to accommodate food carts and street vendors. - Inclusive design
Site 3: Bangkapi intersection		<ul style="list-style-type: none"> - Narrow walkway - Inaccessible for people with disability. 	3-3.5 m	<ul style="list-style-type: none"> - Street diet - Accommodate commercial uses and street life through public participation
Site 4: Phuangkiri Rd - Ladprao Rd intersection		<ul style="list-style-type: none"> - The end of the road goes to the economic area, linking to the residential area - Physical obstacle on the walkway 	1-1.5 m	<ul style="list-style-type: none"> - More explicit street signing - Widen the crossing path - Consider vertical connection
Site 5: Commercial, public office and residential area		<ul style="list-style-type: none"> - Narrow walkway - Physical obstacle on the sidewalk - Uneven pavement 	0.8-2.5 m	<ul style="list-style-type: none"> - Street diet - Escalator to the sidewalk - Connection to the pier and nearby buildings
Site 6: Skywalk - public green space		<ul style="list-style-type: none"> - Light pole, pedestrian bridge and bus stop blocking the walkway - High pedestrian intensity (particularly students at rush hours) 	0.9-3.0 m	<ul style="list-style-type: none"> - Increase green public space with green network on sidewalk - More connections to skywalk
Site 7: Car - rail - pier interchange (Lamsali intersection - Bangkapi Station - Bangkapi Pier)		<ul style="list-style-type: none"> - Low car use, no sidewalk - Consistent green space though not usable - High pedestrian usage 	1.2-1.5 m	<ul style="list-style-type: none"> - Add wheelchair-friendly elements. - Provide pier access at ground level - Utilise green space to allow inclusive access and use.
Site 8: Lamsali intersection		<ul style="list-style-type: none"> - Wide road but very narrow sidewalk; not proportional - Expected increase in user density and intensity with the new developments 	3-3.5 m	<ul style="list-style-type: none"> - Street diet - Redesigned pedestrian island - Accommodate disabled users
Site 9: The issue of sidewalk (Bangkapi Skytrain - underground - pier)		<ul style="list-style-type: none"> - Uneven roadway - Physical obstacles on sidewalk - High user intensity - Dark walkway toward the pier (safety concern) 	0.8-1.2 m	<ul style="list-style-type: none"> - Accommodate disabled users - Redesigned accessible walkway - Connection to Bangkapi pier
Site 10: Rail - walkway (Sri Burapha Station - new pedestrian network)		<ul style="list-style-type: none"> - Uneven roadway - Pedestrian crossing way not up to the standard - Tree in the middle of sidewalk - Physical obstacles on the sidewalk 	0.9-2.0 m	<ul style="list-style-type: none"> - Inclusive redesigned 'green linkage' pedestrian planning - Connection to the adjacent railway
	<p>footpath width</p> <p>0-0.9 1-1.5 1.6-1.9 2 meters or more</p> 			

The research team sees the pedestrian's walking condition as displayed in Table 3 (ranking from the most to the least critical) as follows: the area around the main commercial street (sites 1-4), community area (sites 5-6), the transit area (sites 7-9) and the area with a need for newly redesigned pedestrian green linkage to connect with the adjacent railway (site 10). The study investigates the area as a series of interrelated transportation hubs. Furthermore, street life does not guarantee the consistency of traits and walking conditions when examined through a sequential sectional study approach.

As evident in the site application, it is essential that the Bangkok area planning considers the complexity of traffic and organised civic spatial settings. The areas surrounding the emerging transportation hub area rely heavily on the fine mixture of usage and regular users to activate the intersecting points and other related nodes in the surrounding context.

6. DISCUSSION

Although this research is based on sidewalk design standards, it also illustrates the importance of developing design recommendations that consider the user's centric and site-specific needs, and as such, a participatory design process is highly recommended. A participatory design process will help to produce a suitable proposal for the local users' economic and sociocultural needs.

The design solutions for Bangkok are challenging for the site-specific design responses but the 10 selected sites represent results from the analysis and suggestions from the stakeholders. With regard to developing specific design details, the criteria for selection are density of usage, road network hierarchy, priority places, and finally the new transportation system development. In addition, while the designs are informed by the stakeholders' responses, the designs should be tested and monitored for quality and efficiency. A process of placemaking to justify the designs with the practical and real users would be helpful in this testing and the approach could be applied to other areas in the city undergoing development change.

Notably, accessibility to the sidewalk is a critical issue in the case of a user with visual and walking disabilities. Obstacles appear in the form of discontinued guide pavement for the visually-impaired, sidewalk without slope, narrow walkway, physical blockage, and the lack of crossing at the ground level (the absence of elevated crossways to wheelchair users). The increasingly aging population in Thailand also highlights the importance of sidewalks. Furthermore, walking quality requires an appropriate site-specific design that allows for the informal economy of food carts and street vending, which paint the joyful urban narrative of the vibrant city. Likewise, while a walk is enhanced by being enjoyable, it is foundational and supposed to be safe (Speck 2012), with the crossing points and crossing ways identified and organised to allow appropriate space and pace for the users at the crossroad.

According to the sidewalk analysis, Bangkok sidewalks do not meet the national standard. Thus, an expansion of the existing sidewalks is preferred, but the existing physical conditions and traffic congestion present challenges to this option. To achieve a comfortable walk, one of the solutions is to elevate a sidewalk (skywalk) along with the skytrain system above the street. The skywalk currently is under construction as a Department of Public Works, BMA project. Therefore, the proposed sidewalk solutions from this research are consistent with the BMA plan. Nevertheless, the liveliness, safety, and accessibility of the sidewalk are key elements to the planning and design. The skywalk also could be designed for the street level by adding socioeconomic activities and clearly determining the points of connection between ground level, and other nodes of the commercial area, prime area, transportation link and nodes, and community and educational nodes.

As noted above, there are three important gap elements in Bangkok's sidewalk planning - construction, planning and design. For the planning aspect, our research heavily emphasises participatory research. The process offers each stakeholder an opportunity to express and identify the issues and impacts of the sidewalk conditions as related to their walking experiences. This process is recommended as an integral part of the urban planning process in order to optimize design approaches. While upgrading the existing conditions to meet standards, a sidewalk design should adapt according to determined needs of the local people and existing conditions and include close collaboration and communication between authorities and other stakeholders. This approach necessitates that the authorities enforce the process and are open-minded to consider stakeholder suggestions. The construction aspect of the project also is important in making the desired physical conditions become realistic and support the sidewalk experiences. The construction process and standards should support the accessibility, durability, and safety for the pedestrian. In addition, the new materials and technologies should be updated to respond to the site for improving the walkway quality.

The project has implications for scaling up planning and design considerations related to walkability. The walking condition (and thus walkability) is vital in improving the local civic life at the eye level, but it also has impacts and makes contributions on a larger scale (i.e., area, district or city) that influences (for better or for worse) the way people, goods and information roam around the city. Individuals utilise and appropriate civic space in a way that shapes the civic image and narrative and thus, pedestrian planning should be inclusive of community sociological and spatial needs.

7. Design-Based Guidelines And Policy Recommendations

As an emerging transportation district, the Bangkok sub-district requires a suitable and walkable sidewalk to accommodate the increasing user needs. While the study results set the tone through which the walkable sidewalk and pedestrian planning could be integrated into the growing metropolitan transport system, future and emerging transport hubs also could implement the study approach for planning a walkable and inclusive civic environment suitable for the site or area-specific needs. As such, we propose five important design guidelines, outlined in the next section and summarized in Figure 9.

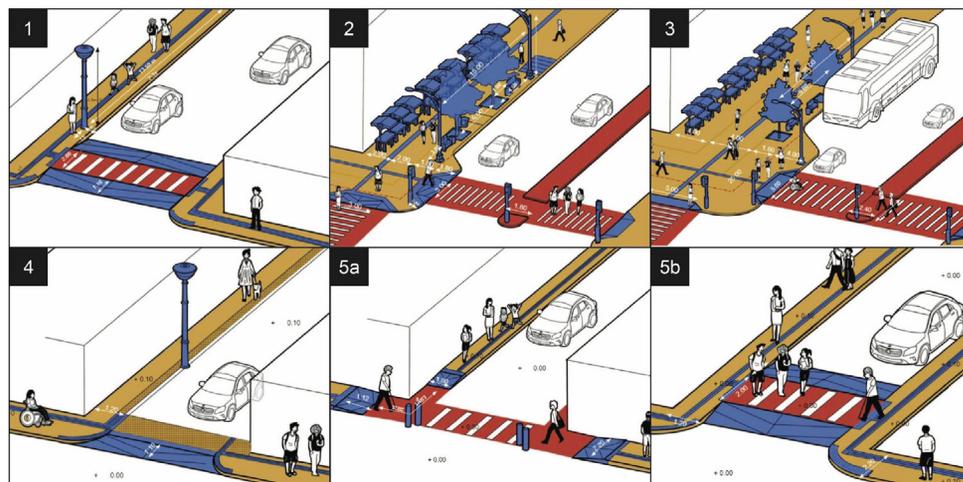


Figure 9 Design sidewalk guideline solutions for the area overview (source: author's research team)

7.1 Design guide

Recently, Thailand has developed its own standards and design recommendations; however, the integration of solutions and user-friendly, site-specific responsive designs, is inefficient. The sidewalk is meant to be used by all and supposed to be maintained accordingly. Therefore, our proposed design guidelines accumulate all the requirements, international standards, and discussions from the stakeholders to introduce design sidewalk solutions for the Bangkapi area.

7.1.1 Case 1: *Narrow sidewalks on big streets*

As a larger road means the tendency of faster moving vehicles, it is essential to create a pedestrian path which not only allows for continuous movement but also stops (or at least slows down) the automobile. To do so, the introduction of the raised crosswalk allows people with walking difficulty or walking disability (as well as vendors and carts) to more comfortably cross the wide roadway without the change in altitude, highlighting the essence of inclusive design in the vertical plane.

7.1.2 Case 2: *Inclusive recreational and commercial space*

Lack of sufficient public space (and green space) influence community behaviour, wellbeing, and socio-economic opportunities (especially apparent in the commercial aspects). The proposed pedestrian plan suggests the integration of public commercial space to allow enough spaces for vendors and food carts as well as spaces for people stopping by (i.e., bus stay and seating by the trees) to assimilate street life.

7.1.3 Case 3: *Sidewalk to accommodate vibrant street vending and informal economy*

This particular plan is circular around the same nature as the 7.1.2 only double in sidewalk width (that is gained as a result of the 'street diet' policy). Various commercial elements (i.e., food carts, street vendors, buskers) and communal/transportation (i.e., motorcycle or tricycle taxi and bus stand) aspects collectively contribute to the building of a 'place for stopping' which in turn allows for more appropriation of civic space, painting a more vibrant civic life, and safety.

7.1.4 Case 4: *Walkway in the sidewalk-less alley*

The lack of dedicated raised walkways in lanes and alleys is undeniably the norm in the local context, though it does not (and should not) limit the right of way for pedestrians in these spaces. That said, our policy recommendation suggests a visual outlining of the pedestrian walkways through traffic lines and other paint-based signage as the overall width of the alley is not enough for building a sidewalk. Additionally, raised crosswalks are recommended at the crossing points to reflect higher user density of pedestrians over automobiles.

7.1.5 Case 5a & 5b: *Same-level walkway in the alley*

Small alleys could accommodate pedestrian and car traffic at the ground level with the option of having roadways exceeding 5.4 meters in width. Case 5a is a lower sidewalk at the street level applied when the traffic of an alley is busy; while Case 5b is a raised walkway when the traffic of an alley is less busy.

7.2 Policy recommendation

As the nature of local sidewalks is mostly considered public space and thus owned and managed by the government, the question remains with respect to the responsibility of maintaining the sidewalk itself. While the national policies emphasise the importance of having a walkable pedestrian network and have previously invested in exploring suitable solutions for creating a walkable city, it is the local government management that paints the image of the lucid city the people yearn for. Thus, recommendations also should adhere to acceptable, consistent and standardised management of the stakeholders with inclusive design at the local level. Similarly, the government plays a major role in launching the policy and maintaining the sidewalk and

public facilities. However, with various agencies and stakeholders involved in the design and construction of civic mobilities (such as skywalks and mass transit systems), the government should promote collaboration between public and private sectors to promote and apply inclusive designs as standard practice for civic facilities.

The current case of the BMA sees the integration of policy planning and usage (i.e., Building Control Act, Urban Planning Act, Hygiene Act, etc.) and the occasionally applied investigative practice and collaboration with local groups and urban initiatives - all of which push forward the development of the area or district-specific mobility system. However, policy planning is only one of several parts of the complex mechanism that enables and allows for the creation of a more walkable city. Thus, user-centric and site-specific designs should be added in order to respond to the users' needs. The policy planning can provide a general governing framework and guideline, while the user-centric and site-specific input has flexibility for specific contexts.

8. CONCLUSION

Not only should roads and sidewalks be accessible and up to international standards, but they also should be socially attractive and engaging to encourage walking in the civic environment. A deeper and more investigative understanding of sidewalks and their physical and sociological impact on urban mobility could produce a more pedestrian-inclusive environment, as well as create a more sustainable city development in the long run.

The research team sees an area-specific pedestrian network as the opportunity to investigate the much-needed notion of urban walkability and its underlying urban fabrics as well as to encourage public participation in the planning process. Further research is necessary for determining the optimum scale within the context of Bangkok to understand and generate suitable pedestrian and mobility plans for the Thai metropolis.

The research was conducted during the Covid-19 pandemic in Thailand and this is a limitation for our research. Interviews and site surveys used online meeting tools and information from available websites. A more interactive and engaging face-to-face workshop organization could be integrated into the process for a superior, deeper, stakeholder response.

The case of Bangkapi sees the importance of the sidewalk, pedestrian and walkability planning in the growing urban area. That said, not every case or context is identical and so pedestrian planning will rely heavily on the specific physical and sociological fabric of the area. People walk and appropriate public space differently as shown in the analytical study and thus, the need for area-specific pedestrian planning becomes crucial in creating walkable cities, particularly in Bangkok and other big Global South cities where street life plays an important role in shaping city image and vitality.

9. ACKNOWLEDGEMENTS:

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Author Contributions

Conceptualization, N.N. and C.T.; Methodology, N.N. and C.T.; Validation, N.N.; Formal Analysis, N.N., C.T., and W.S.; Investigation, N.N., and C.T.; Data Curation, C.T.; Writing-original draft preparation, N.N., C.T., and W.S.; Writing-review and editing, N.N., and C.T.; Visualization, C.T. and W.S.; Supervision, N.N.; Project administration, N.N. and C.T.; Funding acquisition, N.N.. All authors have read and agreed to the published version of the manuscript.

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