



PROMOTION OF 15-MINUTE CITY FRAMEWORK AS AN URBAN
DESIGN GUIDELINE: A CASE STUDY OF BANTHAT THONG ROAD,
BANGKOK, THAILAND

BY

TANAVARA CHAWANID

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF URBAN DESIGN
URBAN DESIGN AND DEVELOPMENT INTERNATIONAL PROGRAM
FACULTY OF ARCHITECTURE AND PLANNING
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ABSTRACT

Banthat Thong, as an upcoming commercial and food district, is currently facing many problems with pedestrian mobility, transportation and traffic congestion even though situated within walking distance of 800 metres to multiple public transportation stations. The low walkability and safety of the footpath pavement not only induce the use of private vehicles but also act as a prominent barrier to developing seamless mobility in the area. The research topic: Promotion of 15-Minute City framework as an urban design guideline: A case study of Banthat Thong road, Bangkok, Thailand, aims to study the concept of the 15-Minute City framework and explore how to apply it practically to the selected site and solve the problem in the neighbourhood of Banthat Thong in Bangkok, Thailand.

Four research objectives correspond to three research questions, stating the scope and nature of the research throughout the paper. The first research question, “What are the development criteria a 15-Minute City should consider?” frame the first objective to study the 15-Minute City framework under the urban design context. The second research question, “Can the 15-Minute City framework be used as a design guideline for Banthat Thong?” correspondent with the second objective to study and

evaluate Banthat Thong road under the 15-Minute City framework. Finally, the third research question, “How can we develop a 15-Minute City framework as an urban design guideline for Thai city?” will answer with two final objectives to create urban design guidelines from the 15-Minute City framework for Banthat Thong and to propose a redesign for the Banthat Thong road where people can travel in the area seamlessly, safely and conveniently at any time of the day.

The research methodology worked with the combination of quantitative and qualitative urban data from preliminary secondary data collection and primary data collected by questionnaires and on-site observation. The literature reviews and the comparative case studies of foreign countries as examples in the application of the framework suggested that the four principle dimensions of the 15-Minute City framework should be in consideration with other two aspects in the physical environment readiness and the people’s behaviour and demand for mobility infrastructure in the area are the development criteria any 15-Minute City should consider.

The questionnaire received 170 responses, and the answer to multiple of the questions implies that there is high demand for connected, seamless transportation. According to the top three suggestions for mobility development in the area, 18.3% of the respondents suggested public transportation development, including commuter bus or tram to commute around the area or from BTS/MRT stations, in second place after more organised parking space (public, free or low-price and convenient) of 21.4%. As well as, 20.4% of the respondents desired bicycle/ e-scooter rental as a new service they wanted to see in the area.

The incorporated evidence in the integrated analysis of the spatial data demonstrated that Banthat Thong has the potential to develop under a 15-Minute City framework with development priorities of digitalisation, proximity, diversity and density dimensions, respectively, weighing from the current assets and how timely the development in each dimension will be impactful and effective in the current context.

The study proposed a localised 15-Minute City framework for urban design in Banthat Thong, which included the development of specific plans in four dimensions

and the input of development policy that prioritised mobility planning to encourage active and soft mobility (non-motorised means of transportation in the forms such as walking, cycling, skateboarding, running, and roller skating), enhancing connectivity and transportation choices for space users in Banthat Thong.

To look into details, the urban design and policy recommendations applicable to Banthat Thong encompassed promoting adaptive reuse of existing buildings, mixed-use development, transforming form-based codes into hybrid systems with mixed-use zoning, and incentivising smart city initiatives, with financial support and public-private partnership models.

As a guideline for implementation, the study recommended an action plan with assigned roles and responsibilities of the stakeholders involved from private, public, educational, and community sectors. The leading actor in the 15-Minute Banthat Thong project is the Property Management of Chulalongkorn University (PMCU). They oversee progress and coordinate with all sectors, including Chulalongkorn University, and private companies offering shared mobility services. Funding support comes from the Digital Economy Promotion Agency (depa) as a smart city accelerator, along with legal support from local government bodies such as the Pathumwan district office and police station.

However, the research faced limitations due to the COVID-19 pandemic, which hindered data collection with strict public health measures. Additionally, the contextualised framework designed for Banthat Thong's unique characteristics may pose challenges to implementing it as a default template in other areas. Adaptation of the concept for strategic planning and design in different neighbourhoods worldwide requires forming and regulating localised principles and criteria according to the context of each area.

Keywords: 15-Minute City, Active and soft mobility, Seamless mobility, Walkability

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I hope the information presented in this paper will benefit the readers and present the prominent part of the research. If there are any suggestions, I would request them with great thanks.

Tanavara Chawanid

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LIST OF ABBREVIATIONS

Symbols/Abbreviations	Terms
AI	Artificial Intelligence
APA	American Planning Association
BTS	Bangkok Mass Transit System Public Company Limited
CCTV	Closed-circuit television
COVID-19	Coronavirus disease 2019
CUURP	Department of Urban and Regional Planning, Faculty of Architecture, Chulalongkorn University
depa	Digital Economy Promotion Agency
EV	Electric Vehicles
FAR	Floor Area Ratio
GIS	Geographic Information System
IFEZ	Incheon Free Economic Zone
MaaS	Mobility as a Service
MBK Center	MBK Shopping Center
MRT	Metropolitan Rapid Transit
PMCU	Property Management of Chulalongkorn University
POI	Point of Interest
PPP	Public Private Partnership
SWOT Analysis	Strengths, Weaknesses, Opportunities, and Threats analysis
UddC	Urban Design and Development Center
USA	United States of America

CHAPTER 1

INTRODUCTION

1.1 Background and project rationale

1.1.1 Introduction to mobility development in Banthat Thong road

Rapid urbanisation and the emerging popularity of e-commerce lead to more traffic density in the public realm. The higher demand for the dependent on vehicles could lead to traffic accidents and negative input to global climate change from the combustion of fossil fuels and air pollution. Shared and sustainable transportation and active soft mobility become the best solutions to tackle these issues in Banthat Thong.

The smart city development, Samyan Smart City and Pathumwan Innovation District support the opportunity to develop better public transportation and mobility in Banthat Thong and Bangkok Green Link project that provides a major green corridor throughout Bangkok, providing safe and pleasant strips for walking and biking around the city.

However, the global pandemic of coronavirus or COVID-19 raises the health safety concern about using public transportation and suggests the practice of social distancing. As people are recommended to stay in isolation at their homes, they depend a lot on e-commerce and food delivery services such as grab food and food panda, causing more traffic congestion as riders park their motorcycles on the side of the road. In addition, when they must go out, people prefer using their private vehicles. These new normal lifestyles lower the demand for public transportation that is not well-ventilated and crowded; people prefer using their personal vehicles when they have to travel.

Therefore, it is crucial to plan and design to support urban growth and offers a smoother travelling experience, a secure and efficient transportation system and an improved quality of life in this metropolitan area. This includes preparing the urban space to support the new transport innovation and infrastructural

development needed for future modes of transportation and mobility as electrified, autonomous vehicles, including universal design elements that support active and soft mobility, with the aim to enhance safety, sustainability and convenience in urban mobility in Banthat Thong.

1.1.2 Banthat Thong road background and history

Banthat Thong road, a 2.2 km street paved between Bangkok's old town and Bangkok's central commercial district, is known for its sporting goods shops and recently gained popularity in classic and trendy rows of restaurants. The tasteful lifestyle and its prime location are strengths that would attract visitors and investments. Western to the road is the commercial area of old shophouses owned and managed by the Property Management of Chulalongkorn University (PMCU).

1.1.2.1 Morphological characteristics

Banthat Thong is a unique area in the sense of the relationship between street and building and its juridical characteristic. Its 100 years of history with Chulalongkorn University defines the area to be the commercial strip with 3-4 shophouses managed by the Property Management of Chulalongkorn University (PMCU) as a sole land owner in the area, offering commercial shophouses for leasing and commercial business opportunity to long-term renters. As the area are close to the National Stadium and Chulalongkorn University sports complex, the standout business in Banthat Thong is sporting goods, sports equipment and clothing or custom awards and tools for sports tournaments, as well as many famous restaurants situated in the area to support the local residence, university staffs, professors and students.

Even though the university owns the land, the secondary road is under the management of the Bangkok Metropolitan Administration; specifically, the Pathumwan district office and road traffic management are under the police department.

1.1.2.2 Demographical characteristics

The focused portion of Banthat Thong road is situated in Pathumwan district. The main demographics in the area are generation X and generation Y, however with the significant points of interest and magnetic programs such as Siam commercial district, MBK Center, Chulalongkorn University, Samyan Mitrtown, attract visitors in the younger generation (generation Z and Alpha) every day for shopping, socialising and mainly for educational purposes.

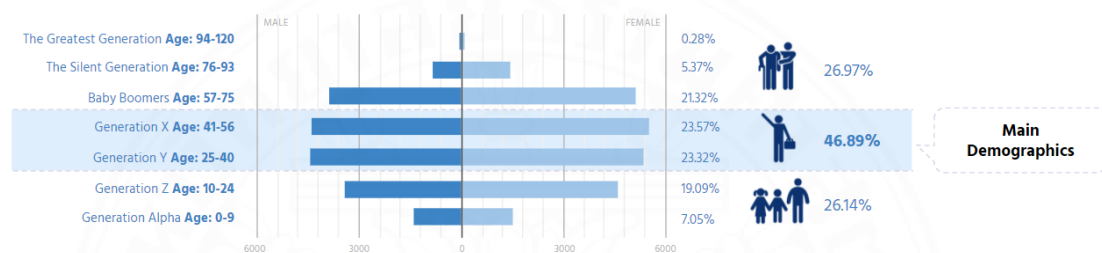


Figure 1.1 Pathumwan district demographics, population pyramid statistics

Source: National Statistical Office of Thailand, 2018

Below are the persona and characteristics of people in generation X and Y separated into three age groups (25-35 years old, 36-45 years old, and 46-56 years old). This persona analysis will be helpful in the urban design and development programming stage that can provide new or enhance existing urban programs and services that would answer the needs and pain points of the main demographics in Banthat Thong road.

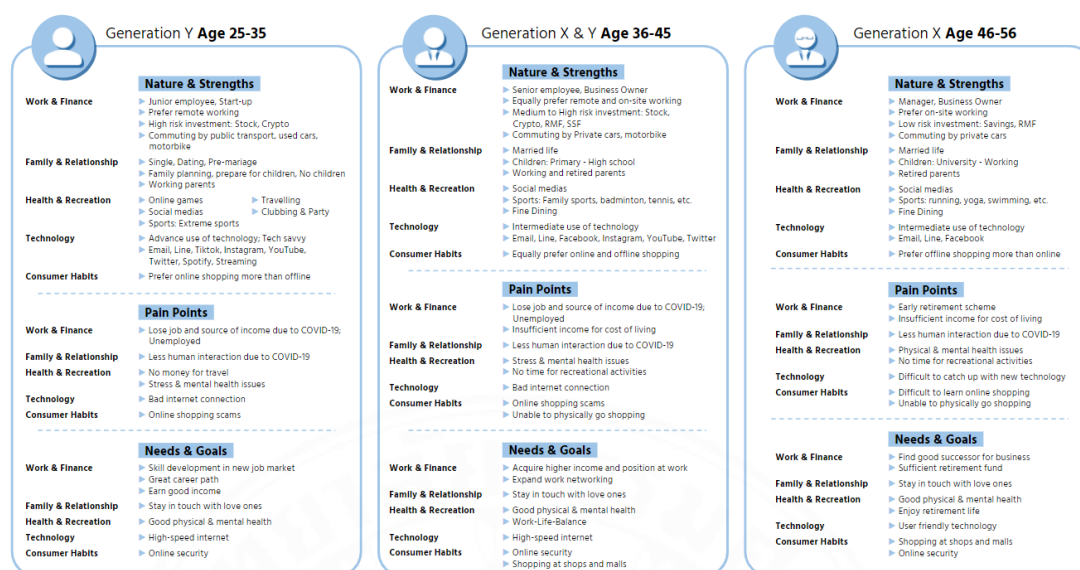


Figure 1.2 Generation X and Y persona

Source: Researcher, 2022

1.1.3 Site selection rationales: Banthat Thong road

Banthat Thong road, a 2.2 km street paved between Bangkok's old town and Bangkok's central commercial district, the tasteful lifestyle with roles of popular restaurants and its prime location attracts visitors and investments. The Suanluang - Samyan area is the property of Chulalongkorn University and is managed by the Property Management of Chulalongkorn University (PMCU). There is much opportunity on the site as the university and the local Urban Design and Development Center (UddC) are always finding ways to revitalise and develop the area to become a Samyan Smart City, which fosters education, livelihood and innovation. The area has robust and knowledgeable stakeholders, researchers and university students and policy support from the government. The Samyan Smart City project sets some of the infrastructures that can enhance and promote seamless mobility in the area, including the 5G coverage, Toyota Ha:mo, shared EV and CU electric bus. As well as there is multiple accessibility method to the area in an 800 metres radius, include MRT Blue line Hua Lamphong station, Charoen Phon Ferries stops BTS Silom line National

Stadium station, which has the potential to create seamless mobility throughout these different modes of transport.



Figure 1.3 Site advantages

Source: Researcher, 2022

1.1.4 Problem and opportunity statement

Presently, the area of Suanluang-Samyan has a high number of rundown buildings. The development of the new Chulalongkorn University master plan is in progress appropriation of people living in the old shophouses are starting to leave; this makes it very inactive at night. The development of Suanluang Square cannot gain popularity over Siam Square as the accessibility is less convenient with a similar commercial program. Some mentioned that parking space is hard to find, people usually park in the alleyway on the side of the road to visit many restaurants, and proper parking spaces are far away from where they want to go. Even though visitors can use some public parking, people are discouraged from walking because of the unpleasant walking environment.

Furthermore, the different organisation manages mobility transport with different ride systems, making it hard to achieve the seamless mobility concept when each organisation's vision is not aligned. Banthat Thong sidewalks are currently unpleasant for cyclists and pedestrians, with uneven surfaces, wet paths, and dark and inactive at night in some parts of the street. The condition also creates a further disconnection between public transport stations. It discourages people from walking, even though the area is within a walkable distance of 800 metres from underground (MRT) and sky train (BTS) stations.

Therefore, it will be an exciting and excellent opportunity to use the 15-Minute City as a design guideline for the development in the Bangkok context and solve the current problems that the city is facing.

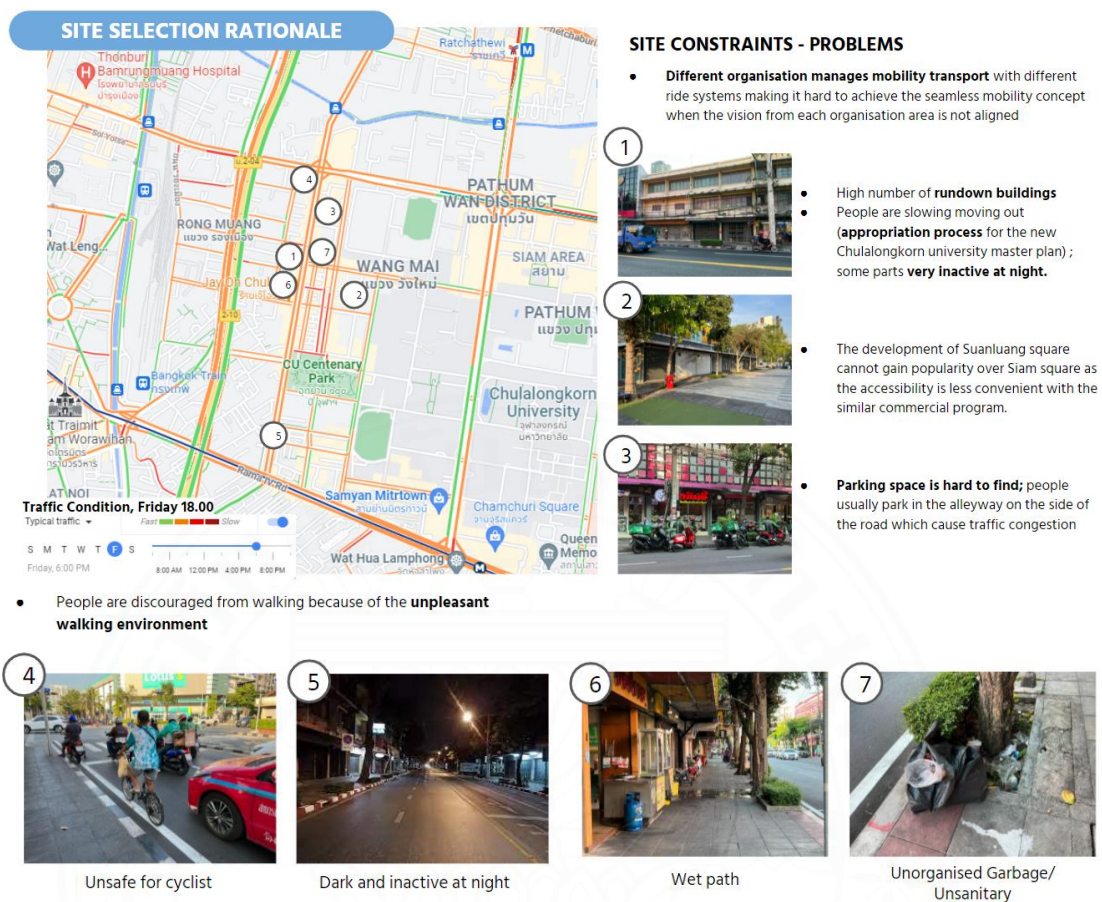


Figure 1.4 Site disadvantages

Source: Researcher, 2022

1.2 Scope of research

1.2.1 Research topic and question

Research topic: Promotion of 15-Minute City framework as an urban design guideline: A case study of Banthat Thong road, Bangkok, Thailand.

Research questions are listed as follows.

- 1) What are the development criteria a 15-Minute City should consider?
- 2) Can 15-Minute City framework be use as a design guideline for Banthat Thong?

3) How can we develop 15-Minute City framework as an urban design guideline for Thai city?

1.2.2 Scope of study

The research interest is based on the study of 15-Minute City framework principles and their application to a case study area of Banthat Thong road, Bangkok. The 15-Minute City framework will be used as a research framework for site analysis and potential urban design and development guidelines that could be implemented and specific to Banthat Thong and the Thai city context. As a result, the effectiveness of the 15-Minute City framework will be assessed and explore the capability in seamless mobility promotion and solving current mobility problems present in the urban site.

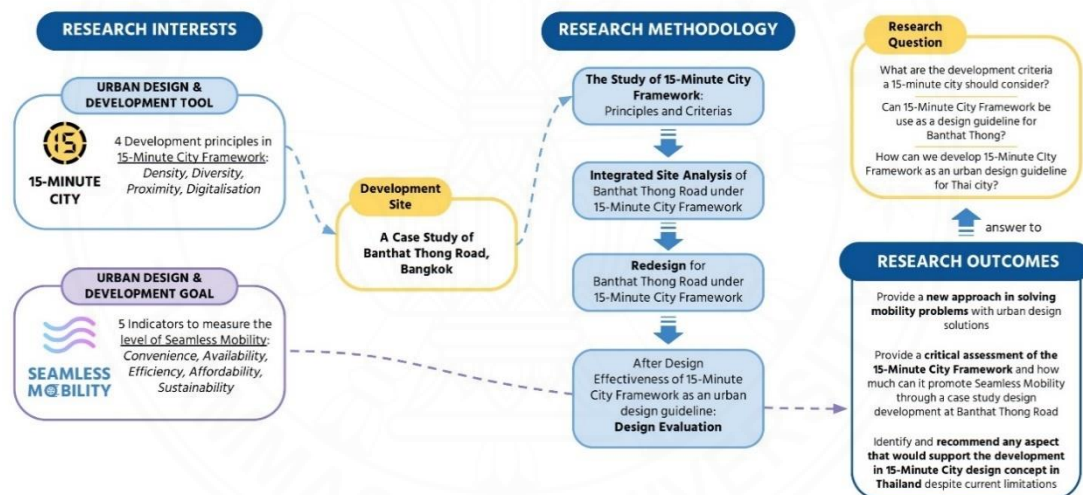


Figure 1.5 Scope of study

Source: Researcher, 2022

1.2.3 Research objectives

The research objectives are corresponded to the research questions, stating the scope and nature of the research throughout the paper.

1) Study the 15-Minute City framework under the urban design context

2) Study and evaluate Banthat Thong road under the 15-Minute City framework

3) Create urban design guidelines from 15-Minute City framework for Banthat Thong

4) Propose a redesign for the Banthat Thong Road where people can travel in the area seamlessly, safely and conveniently at any time of the day

1.2.4 Research site boundary

The site boundary will be in the 800 metres radius from the middle of Banthat Thong road; the area is within a walkable 15 min distance, covering major public transportation nodes. In this proximity, the connectivity of each transport system is visible from MRT Blue Line Hua Lamphong station, Charoen Phon Ferries stops and BTS Silom Line National Stadium station.

However, the scope of the site survey, analysis and development will cover the area 50m from the edge of the road on both sides of the Banthat Thong road (see red dotted boundary line in Figure 1.6).

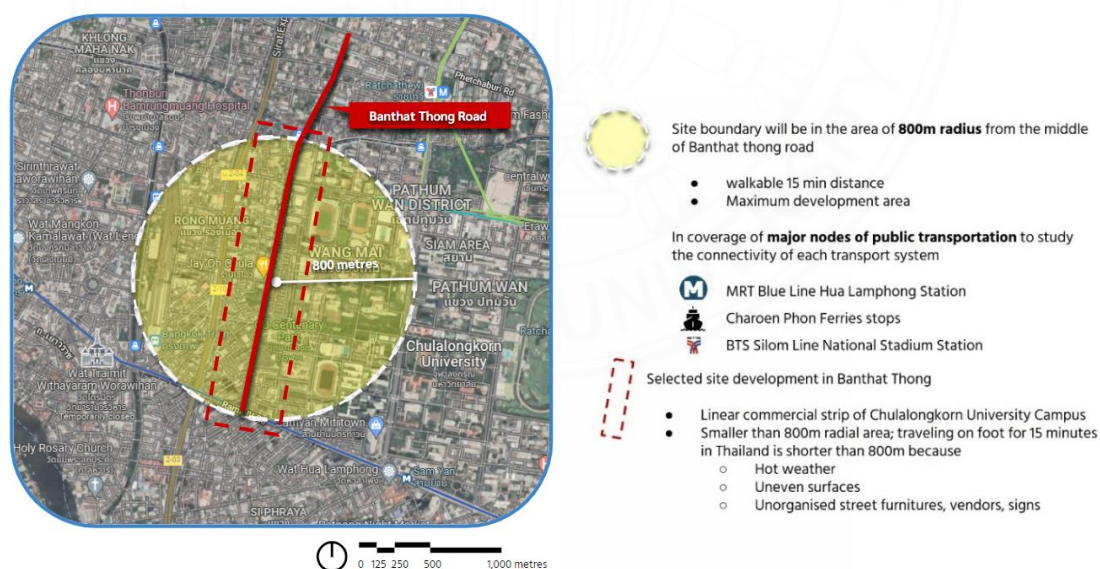


Figure 1.6 Research site boundary

Source: Researcher, 2022

1.3 Significance of research

1.3.1 Expected benefits & outcomes

As an outcome, this research project will be able to achieve the following.

- 1) Provide a new perspective in solving mobility problems with urban design solutions.
- 2) Provide a critical assessment of the 15-Minute City framework and how much it can promote seamless mobility through a case study design development at Banthat Thong road.
- 3) Identify and recommend any aspect that would support the development in the 15-Minute City design concept in Thailand despite current limitations or provide a critical reflection on the effectiveness of the 15-Minute framework.

1.4 Research structure

Table 1.1 illustrate the structure and the flow of this thesis by lining up the research questions with its objectives and the corresponding chapter highlighting the methodology that would lead to the deliverables and expected outcome of this paper.

Table 1.1

Thesis structure

Research topic	Research questions	Research objectives	Research methodology	Expected benefits & outcomes
Promotion of 15-Minute City framework as an urban design guideline: A case study of Banthat Thong Road, Bangkok, Thailand	What are the development criteria a 15-Minute City should consider?	Study the 15-Minute City framework under the urban design context	Chapter 2 - Literature reviews	Concept and theory reviews, Comparative case studies
	Can 15-Minute City framework be use as a design guideline for Banthat Thong?	Study and evaluate Banthat Thong road under the 15-Minute City framework	Chapter 3 - Research tool development	Data collection, observation checklist, 15-Minute City integrated framework for Banthat Thong
			Chapter 4 - Integrate analysis	Data analysis summary
	How can we develop 15-Minute City framework as an urban design guideline for Thai city?	Create urban design guidelines from 15-Minute City framework for Banthat Thong	Chapter 5 - Policy recommendation and action plan	Provide a critical assessment of the 15-Minute City framework and how much can it promote seamless mobility through a case study design development at Banthat Thong road
				Identify and recommend any aspect that would support the development in 15-Minute City design concept in Thailand or provide a critical reflection on the effectiveness of the 15-Minute framework
		Propose a redesign for the Banthat Thong road where people can travel in the area seamlessly, safely and conveniently at any time of the day	Chapter 5 - Physical urban design solutions	Provide a new perspective in solving mobility problems with urban design solutions

Source: Researcher, 2022

CHAPTER 2

REVIEW OF LITERATURE

The review of the related concept and theories and the comparative case studies will answer the first research question of “What are the development criteria a 15-Minute City should consider?”; therefore, the objective of this chapter is to study the 15-Minute City framework under the urban design context to get a clear understanding of the main research interest of the 15-Minute City framework as an urban design and development tool. This chapter will capture the main concept of 15-Minute City principles, case studies and its gaps and limitations gathered from previous research, as well as other related concepts and theories relating to mobility and transportation, for example, future mobility trends, smart mobility development in smart city concept and seamless mobility.

2.1 15-Minute City framework

2.1.1 Concept and components

The 15-Minute City is the chrono-urbanism concept developed by Carlos Moreno. It highlights the compact mixed-use city design concept of allowing people to access the most basic amenities within a 15-minute walk or bike from their homes (Moreno C., 2021). The concept focuses on developing a compact mixed-use neighbourhood with a well-connected transportation network that encourages people to walk rather than use their private vehicles. The framework (see Figure 2.1), updated and modified in 2020 accordingly to the current pandemic of COVID-19 and the advancement in technology and innovation, consists of 4 main principles: density, diversity, proximity and digitalisation.

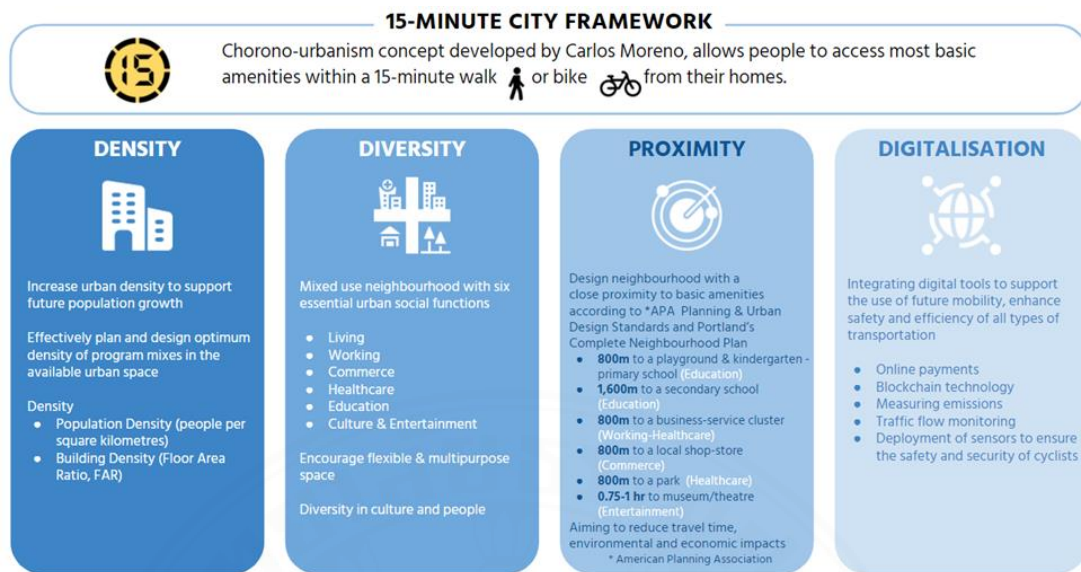


Figure 2.1 15-Minute City framework

Source: Researcher, 2022

2.1.1.1 Density

Density aims to increase urban density to support future population growth and effectively plan and design optimum program mixes in the available urban space, as density refers to both the built and population densities. The urban development in the 15-Minute City concept will have to be aligned with the land use law and regulation of those specific sites; following the specified Floor Area Ratio (FAR) and the population density as a development guideline is recommended.

2.1.1.2 Diversity

Diversity highlighted the importance of a mixed-use neighbourhood with six essential urban social functions, including the following.

- 1) Living: single-detached house, apartment, townhouse, condominium, hotel
- 2) Working: employment centre (e.g. office, factory)
- 3) Commerce: market, local shops, department store
- 4) Healthcare: hospital, pharmacy, clinic

5) Education: nursery, primary & secondary schools, tutorial school, university & collage

6) Culture and entertainment: tourist attractions, night clubs, cinemas, religious places (e.g. temple, church, mosque)

Aim to create a city with a diverse program to support the diversity in culture and people; flexible and multipurpose space – for example, using the parking lot as an exercise ground – is also encouraged in keeping the urban area active.

2.1.1.3 Proximity

The proximity principle focuses on the distance from home to those mentioned basic social amenities in the neighbourhood. Aiming to reduce travel time and encourage people to walk or bike instead of relying on personal cars; would also reduce the environmental and economic impacts caused by the conventional mode of car-dominant transportation pattern.

Basic urban amenities proximity standards from American Planning Association Planning and Urban Design Standards and Portland's Complete Neighbourhood Plan concluded the recommended distance between home to those facilities starting from 400-800 metres radius or within walking distance to the travelling time of 1-hour trip as follows.

1) 800 metres to a playground & kindergarten - primary school
(Education)

2) 800 metres to a business-service cluster (Working-
Healthcare)

3) 800 metres to a local shop-store (Commerce)

4) 800 metres to a park (Healthcare)

5) 1,600 metres to a secondary school (Education)

6) 1,600 metres to a religious place (Culture)

7) 30-45 minutes to a hospital (Healthcare)

8) 45 minutes - 1 hour to museum/theatre (Entertainment)

2.1.1.4 Digitalisation

Digitalisation is the concept refined from the original 15-Minute City framework principle in 2020 to fit current technological advancement and digitised lifestyle. The digitalisation principle presents new digital infrastructure and innovation as the supporting technical system in developing a 15-Minute City; digital solutions will ensure the actualisation of the other three dimensions mentioned above. By integrating digital tools – such as technological platforms (e.g. high-speed internet, blockchain technology, an integrated mobile application for transport services, online payments method), the EV Charging station, smart street lights/poles for emission and traffic flow monitoring and the deployment of sensors to ensure safety and security of cyclists, a CCTV motion sensing system as a crime prevention mechanism or shared mobility fleet operation system – will support the use of future mobility, ensure safety and efficiency of all types of transportation.

Based on the 15-Minute City framework, there are variations in the similar approach to the urban development concept. The two notable variations include the 15-Minute Walkable Neighbourhoods (Weng et al., 2019), which focuses on promoting a healthy lifestyle in the neighbourhood and the 20-Minute Neighbourhood (Capasso Da Silva et al., 2020) that concentrates on the development of the community that foster accessibility to jobs opportunities in the city in a more extensive area than 15-Minute area coverage.

2.1.2 Case Studies

To better understand the different approaches in the implementation of the 15-Minute City framework, 3 case studies from 3 countries are listed and summarised below.

2.1.2.1 Paris en Commun 2020

Paris applied this 15-Minute City concept to their 2020 development strategy. Under the 15-Minute City concept, the development plan aims to create self-sufficient and diverse communities with distinct features, including housing, employment, food, recreation, and amenities, that should be accessible without depending on cars.

Paris 15-Minute City

The street space distributed in a 15-minute city.
Illustration by: N.Bascón / for Paris-en-commun



Figure 2.2 The street space distributed in a 15-Minute City

Source: <https://www.citiesforum.org/news/15-minute-city/>

2.1.2.2 Melbourne 20-Minute Neighbourhood

In 2018, Melbourne applied this 15-Minute City concept to their Plan Melbourne 2017-2050 long-term planning strategy by introducing the 20-Minute Neighbourhood “Living Locally” concept. The plan aims to create more inclusive, vibrant and healthy neighbourhoods to increase the citizens’ quality of life. Similar to the 15-Minute City concept, the 20-Minute Neighbourhood will give people the ability to meet most of their daily needs within a 20 minutes return walk from home, with access to safe cycling and local transport options.

Within 800 metres from home, the ideal liveable communities, according to the 20-Minute Neighbourhood concept, should have access to the following features shown in Figure 2.3.



Figure 2.3 Features of a 20-Minute Neighbourhood, Plan Melbourne 2017-2050

Source: <https://www.planning.vic.gov.au/guides-and-resources/strategies-and-initiatives/20-minute-neighbourhoods>

2.1.2.3 The Portland Plan 2012

Portland, USA, applied this 15-Minute city concept to their 2012 complete neighbourhood development strategy. With the goal that 80% of residents live in a “complete neighbourhood” by 2035, the plan provides urban design guidelines that define the nature of a complete neighbourhood and conduct the study of the current city performance in the 20-Minute Neighbourhood concept.

A complete neighbourhood must satisfy five of the following seven factors: streets with sidewalks on at least one side, 400 metres to a trail or greenway, 800 metres to mass transport system or 400 metres to frequent transit service or 200 metres to regular transit service, 800 metres to neighbourhood park and 4.8 kilometres to a community centre, 800 metres to a store/shop, 800 metres to a business/service centre and 1.6 kilometres to a public primary school.

The plan measurement and data analysis process are an excellent example for site synthesis mapping through the measurement of baseline scenarios and the utilisation of data to conclude the 20-minute neighbourhood concept site analysis of Portland (see Figure 2.4) to determine the area development

potential as well as using the results to determine the development priorities in different areas around the city.

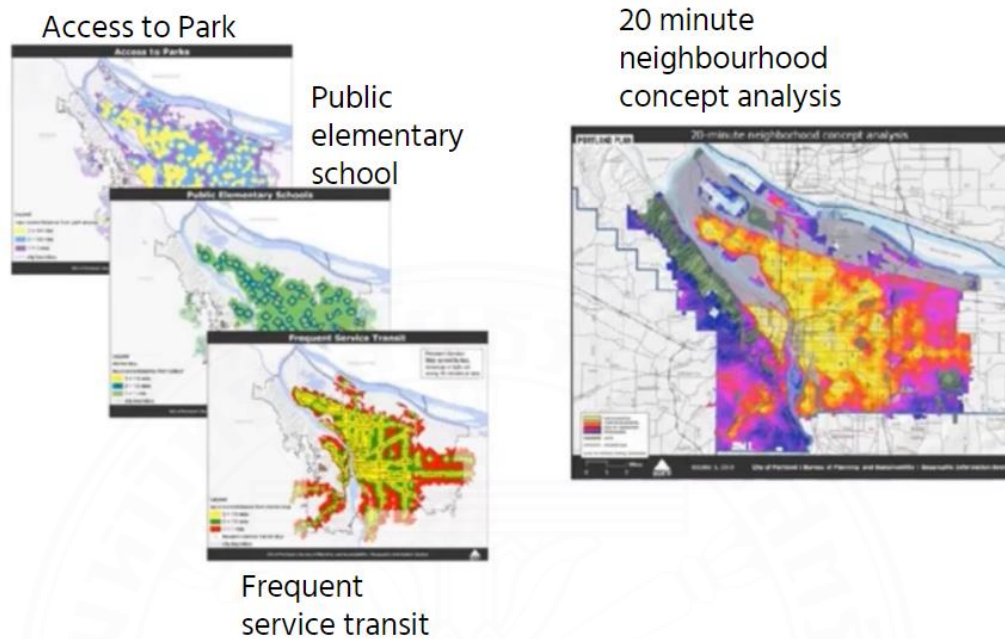


Figure 2.4 Measurement of 20-minute neighbourhood baseline scenarios, Portland

Source: <https://www.portlandonline.com/portlandplan/index.cfm?c=56527&>

15-MINUTE CITY CONCEPT VARIATIONS

1. 15-Minute Walkable Neighbourhoods (Weng, et al., 2019) that focuses on promoting a healthy lifestyle in the neighbourhood
2. 20-Minute Neighbourhood (Capasso Da Silva, et al., 2020) that concentrated on the development of the community that foster accessibility to jobs opportunities in the city in a more extensive area than 15-Minute area coverage

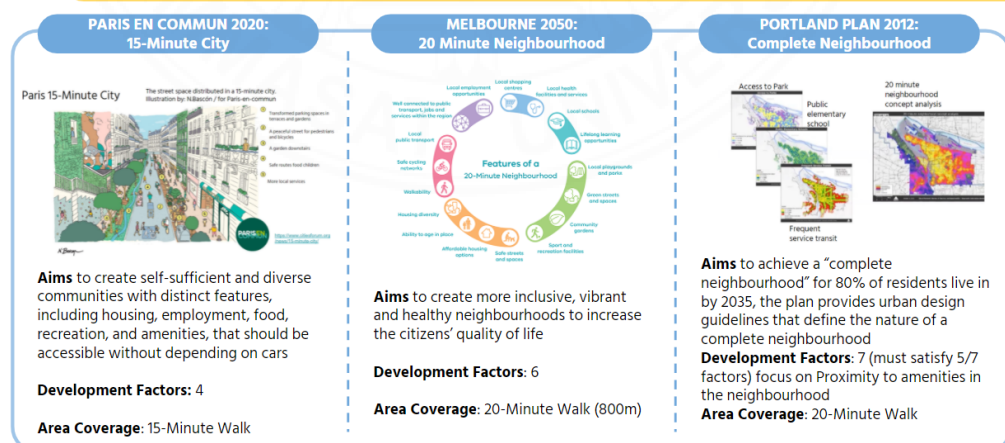


Figure 2.5 Comparative case studies

Source: Researcher, 2022

2.1.3 Benefits of 15-Minute City framework

The 15-Minute City framework presents the concept that is relevant to the current world situation, the complex city and the convenient urban lifestyle that needs to be adaptive and resilient to uncertainty, such as the global pandemic of COVID-19—according to C40 and an article in The Lancet Planetary Health stated that the 15-Minute City offers a new framework for sustainability, liveability, and health. To expand, the 15-Minute City framework could enhance environment protection and sustainability and increase convenience and a sense of community by focusing on the design concept of compact neighbourhood and transit-oriented development, as well as paving the way for affordable housing and Improved resilience via multi-purpose neighbourhoods by offering multi-purpose neighbourhoods making the area more convenient to stay and travel by walk or bikes.

On the other hand, the expected benefits of the new design for Banthat Thong road under the design principle of the 15-Minute City framework and aim toward seamless mobility includes,

- 1) Promotion of walkability,
- 2) Fruitful commercial activities,
- 3) Improved road safety,
- 4) Improved livelihood and promotion for better health,
- 5) Reduction of traffic congestion and air pollution problems,
- 6) Development of a high-quality street design standard.

2.1.4 Gaps and limitation in 15-Minute City framework and mobility development

1) The tool concept and principle are broad and lack in specific detail.

The 15-Minute city framework is a popular comprehensive urban development principle that many cities reference as a guideline for urban planning goals and guidelines. It focuses mainly on creating a complete, compact, mixed-use neighbourhood; however, the listed principles are broad and need more specific details. In order to adapt the concept into strategic planning and design implementation tool for Banthat Thong or any other neighbourhood around the world, localised principles and criteria are formed and regulated to fit with the context of the area.

2) Variable standards in defining walkable distance in different contexts and versatility in applying the concept to be implemented in real urban environments.

The core ideology of the concept is to develop a compact mixed-use neighbourhood with a choro-urbanism guideline of accessibility from a place of origin to necessary urban amenities of a 15-minute travel time. The specific distance and travel time of using 15 minutes as a standard are discussed in many studies and adapted differently in various implementations in multiple cities. Many variables come into play when assessing the suitable distance and time under the 15-Minute City concept in different cities and contexts, for example, user behaviour, urban design history and characteristics, local policy and regulation, regional temperature and climate. When comparing Melbourne's 20-Minute Neighbourhood and Portland's Complete Neighbourhood Plan, because of the different lifestyles, user mobility behaviour and their relationship with walking-biking, Melbourne's span of development area is larger than the 15-Minute City standard may relate to the use of trams and public transportation as city buses which is less prevalent or not present in Portland where American cities are very car-centric.

Furthermore, the adaptation of the 15-Minute City concept could also vary depending on the period of time that the principle is adopted; Paris's and

Melbourne's adaptation of the principle comes much later than Portland's, which is influenced by the zero-carbon movement and affected by the COVID-19 pandemic. The political situation and global trends will significantly impact the goals and method of implementation details of the 15-Minute City concept.

2.2 Other related concept and theories

15-Minute City framework revolves around the concept of accessibility and mobility around the city. It is also related to other urban mobility concepts that could result from or enhance the efficiency of the system created under the urban development that follows the 15-Minute City concept. Some of those include seamless mobility, MaaS, future mobility and the focus on smart mobility in smart city development principles.

2.2.1 Seamless mobility

Seamless mobility defines the ability of commuters to remain connected and undisturbed while travelling across different transportation networks; it will offer a smoother travel experience, a secure and efficient transport system and improve the quality of life. The concept highlighted the possibility of future transportation solutions, including no-emission autonomous vehicles, connectivity between different modes of transport, vehicle and ride-sharing.

The level of seamless mobility can be measured by five criteria: convenience, availability, efficiency, affordability and sustainability. The differences from the baseline will determine the improvement of the environment and moving towards seamless mobility. The condition that indicates a nature of seamless mobility is listed below.

- 1) High convenience: more point-to-point trips in the area
- 2) Sufficient and abundant availability of transport system: passenger-kilometre per year

3) Travel time is fast and efficient: less time-consuming and less average time per trip

4) Affordable: less expensive cost per trip

5) High sustainability: fewer emissions of greenhouse gases per year

Mobility as a Service (MaaS) is a related concept with the main idea of the seamless mobility concept. MaaS is the concept of a travel system that combines all transportation services for planning, booking and paying for mobility services using digital channels, which is the most convenient area for people by contributing to the new form of future mobility: autonomous and shared cars. MaaS examples include public transport, ride-sharing, car-sharing, bike-sharing, taxis, and car rental.

Mobility-as-a-service will likely reduce the number of private car use, and lower vehicle traffic will also reduce the average road time. Other benefits of MaaS are improving the traveller's behaviour towards cars, increasing the transportation network's efficiency, reducing users' costs, reducing city congestion, and reducing emissions.

2.2.2 Future mobility

Future mobility separates into four main stages, and the variables are determined by vehicle ownership and vehicle control, starting from the first stage with personally owned driver-driven mobility until stage 4 of the shared autonomous vehicle. Each state of future mobility has different infrastructure requirements in the urban area, as shown in Figure 2.6; the infrastructure required to achieve all four stages of future mobility includes public parking, standardise physical space with universal design, maintenance station and service centre, transit hub, the rental station for shared mobility, charging station for electric vehicles, supporting technological platform (e.g. Wi-Fi, GPS, Mobile Application), fleet operation system and shared mobility system supervisor.



Figure 2.6 Future state of mobility

Source: Researcher, 2021

In this project, the 4 stages and the infrastructure requirements will be used as guidelines to enhance the performance of stage 1 and 2 that is already present in Banthat Thong mobility development.

2.2.3 Smart city

The Smart City Thailand concept's seven principles include Smart Living, Smart People, Smart Governance, Smart Energy, Smart Economy and Smart Environment. Whereas, the research site, Banthat Thong road, are in the area of Samyan Smart City project oversee by Property Management of Chulalongkorn University (PMCU) as well. The principle that aims toward seamless mobility is the Smart Mobility principle.

Smart Mobility solutions include using the electric vehicle (EV) and charging stations, smart parking systems, traffic management, and public transport application. The development concept introduces ways to increase the smart mobility concept's smart aspect through the Internet of Things (IoT) and Information Communication Technology (ICT). Its criteria from Smart City Thailand, led by the Ministry of Transport, align with the seamless mobility system indicator listed below.

- 1) Accessibility to transportation networks and public transport systems
- 2) Convenience use of public utilities and facilities of transport systems
- 3) The efficiency of public transport management
- 4) Safety of transportation
- 5) Green mobility

Furthermore, a smart city development pilot implementation focusing on a small block area to improve walkability, called a Smart block, is the new development principle developed by the smart city charter that combines the smart city concept with the Superblock concept. Resulting in the development of a smart city in a smaller plot that is suitable for applying sustainable development mechanisms aiming to Improve the quality of life and health of the people, promote the local economy, maintain local identity and increase the efficiency of the area in various fields.

2.2.3.1 Case study 1: Songdo Smart City

Songdo Smart City is a great case study to learn about the intelligent system embedded in the city infrastructure network and the flow of urban data and information (see Figure 2.7) that oversee and monitored daily. Songdo Smart City offers a comprehensive and advanced IFEZ technology system that manages the city's safety and efficiency, including traffic monitoring, crime prevention technology, transportation and mobility management, and other public and private services and urban utilities. Their integrated operation centre and innovative technology system will also be another great tool that would support the implementation of a 15-Minute City concept and could increase the seamless mobility performance in the Banthat Thong area.

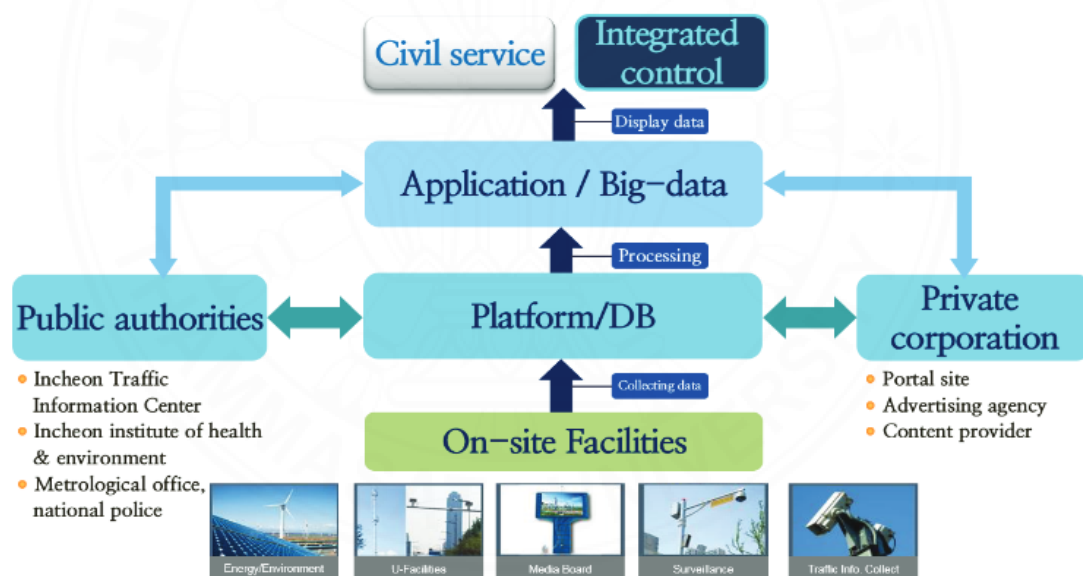


Figure 2.7 Information flow, IFEZ integrated system

Source: <https://publications.iadb.org/publications/english/document/International-Ca-se-Studies-of-Smart-Cities-Songdo-Republic-of-Korea.pdf>

2.3 What are the development criteria a 15-Minute City should consider?

As a conclusion to all of the reviews on past research, case studies and the concept, apart from the four main principles of the 15-Minute City, there are another two aspects to be considered: the physical environment readiness and the people's behaviour and demand for mobility infrastructure in the area. The success of the 15-Minute City is that the two aspects must match, just like demand and supply, to develop a sustainable and complete neighbourhood.

To expand, the physical environment must support the people's activities, which makes commuting, and living in the area convenient with all of the infrastructural support. The 15-Minute City concept will not work if the users' demand does not match what the physical environment supplies; for example, a city is equipped with all of the high-end technology, but the people do not use smartphones or have low digital literacy, the development will not be sustainable nor cost-effective.

The reviewed case studies clearly show that the infrastructure matched the lifestyle and behaviour of people in each place. This is the crucial point in applying the 15-Minute City framework as urban design guidelines in Banthat Thong, the study of the area is equally important to the study of the social behaviour and demand in the area as well, which is different with different contexts different people and different culture and lifestyles.

CHAPTER 3

METHODOLOGY

This chapter will describe the process of conducting the thesis in research methodology and explain the details of research tool selection and development, including data collection tools such as site observation checklist and questionnaire. As well as elaborating on the modification of 15-Minute City concepts to create a specific framework that is applicable to the context of Banthat Thong by combining relevant principles and design guidelines reviewed in the last chapter, the 15-Minute City integrated framework for Banthat Thong will be discussed.

When combined with the result from Chapter 4, the two chapters can fully answer the second research question of “Can 15-Minute City framework be use as a design guideline for Banthat Thong?” with the objective to study and evaluate Banthat Thong road under the 15-Minute City framework.

3.1 Research methodology

The research methodology will describe the research process from forming the thesis proposal, collecting and analysing the data to concluding the research findings. This section will highlight the main actions taken, indicate important deliverables from each action, and summarise in a research methodology diagram (Figure 3.1).

3.1.1 Action 1: Frame of research and preliminary findings

The research topic comprises two main research interests, the 15-Minute City framework as an urban design and development tool and the case study area of Banthat Thong road, Bangkok, Thailand. The preliminary research is conducted on the main concept of 15-Minute City development and Banthat Thong site characteristics. This secondary data research will provide a broad understanding of the

area's site context and development opportunity by looking into current development projects and the principles that will influence the area of Banthat Thong and its vicinity.

Deliverables are listed below.

- 1) Project rationale
- 2) Background and history research
- 3) Problem and opportunity statement of Banthat Thong road

3.1.2 Action 2: Review of literature

The review of relevant concepts and theories relating to 15-Minute City framework, mobility development for the future and cases studies of cities that have implemented the 15-Minute City framework as the concept for their urban development will demonstrate insights and a deep understanding of the research topic. It will help answer the objective of studying the 15-Minute City framework under the urban design context.

Deliverables are listed below.

- 1) Literature reviews of concepts and theories
 - (1.1) 15-Minute City framework
 - (1.2) Seamless mobility indicators
 - (1.3) Future mobility trends: Soft and sustainable transport
 - (1.4) Smart City: Smart mobility, Smart block
- 2) Comparative case studies
 - (2.1) Portland Complete Neighbourhood Plan 2012
 - (2.2) Melbourne 20-Minute Neighbourhood
 - (2.3) Paris en Commun, 15-Minute City strategy

3.1.3 Action 3: Research framework & methodology design

After identifying data points that need to be collected according to the studied concepts and theories, the research tools development process follows. The development and design of tools for the research include the formation of a 15-Minute City Integrated Framework for Banthat Thong and the data collection forms such as questionnaires and site observation checklists.

Deliverables are listed below.

1) Data collection forms

(1.1) Questionnaire: Activities and attraction points in Banthat Thong, travelling and mobility behaviour patterns and transport choices

(1.2) Site observation checklist: According to the four principal dimensions of 15-Minute City (Density, Diversity, Proximity and Digitalisation)

2) 15-Minute City integrated framework for Banthat Thong

3.1.4 Action 4: Data collection

Collecting relevant data and information would help support the analysis and design practicality. Data will come from primary and secondary sources, from site visits and questionnaires, and from secondary sources such as published research papers, design guidelines and reports from the internet.

During the site survey, will time the walk along the Banthat Thong road scope of the area that will be observed (Banthat Thong road and covering the area 50m from the edge of the road on both sides).

Deliverables are listed below.

1) Data collection summary: Questionnaire responses and site observation checklist results

3.1.5 Action 5: Data analysis and simulation

Integration of the data from preliminary research and the data collection process will be used to produce graphs, charts, maps and information that would draw conclusions about current urban situations and future opportunities.

Deliverables are listed below.

- 1) Descriptive data analysis from questionnaire responses
- 2) Integrated site analysis maps
- 3) Potential and constraints maps
- 4) Stakeholder ecosystem analysis

3.1.6 Action 6: Design development and implementation

Urban design and development under the 15-Minute City integrated framework for Banthat Thong.

Deliverables are listed below.

- 1) Design master plan
- 2) Street section design
- 3) Perspective visualisation
- 4) Action-implementation plan
- 5) Public-Private Partnership model

3.1.7 Action 7: Design reflection and future development

Evaluation of the 15-Minute City framework as an urban design and development tool by identifying and recommending any aspect that would support the development of the 15-Minute City design concept in Thailand despite current limitations and provide a critical reflection on the effectiveness of the 15-Minute City framework.

Deliverables are listed below.

- 1) Research findings, conclusions and recommendations

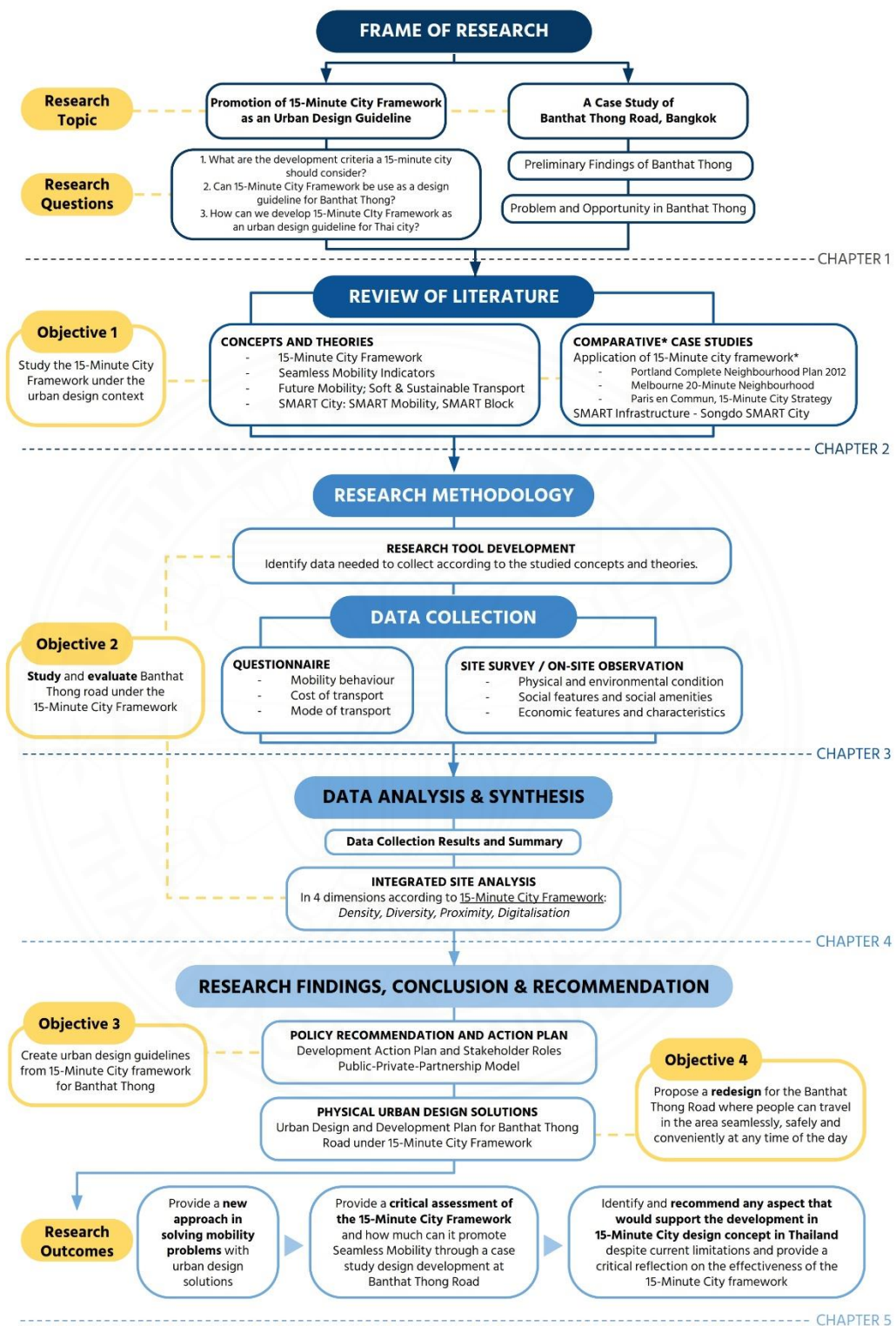


Figure 3.1 Research methodology

Source: Researcher, 2022

3.2 Research framework

3.2.1 15-Minute City framework as an urban design guideline for Banthat Thong

To be able to use the 15-Minute City framework as an urban design tool for this research, the Banthat Thong's 15-Minute City integrated framework is formulated by the integration of many criteria pulled from case studies and other concepts and theories (see Figure 2.8). For example, proximity criteria for Banthat Thong are referenced from guidelines provided in the three case studies of foreign countries and other design standards from the American Planning Association (APA).

This research aims to explore and assess the effectiveness of the 15-Minute City framework as an urban design guideline in possible relation to seamless mobility development. The digitalisation concept of 15-Minute City would not only serve as the integration of technology to support urban development and urban living in the digital world, but for Banthat Thong; it would also highlight the critical infrastructure that is required to facilitate and ensure smooth travel in many types of future modes of transportation and mobility choices from walking and biking to the use of autonomous cars.

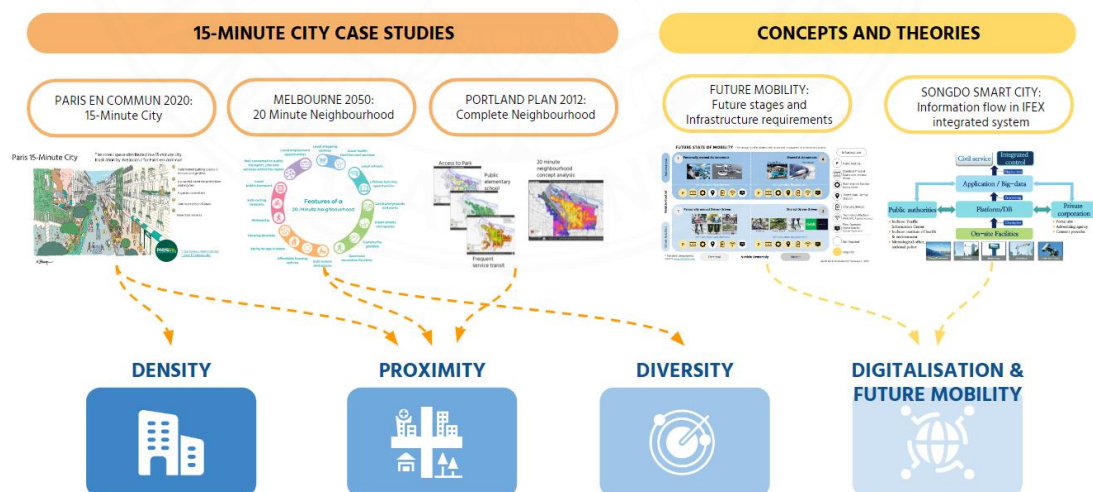


Figure 3.2 Formation of 15-Minute City integrated framework for Banthat Thong

Source: Researcher, 2022

3.2.2 Banthat Thong's 15-Minute City integrated framework

To create the 15-Minute City framework as an urban design guideline that would be specifically fit to the Thailand context and the context of Banthat Thong road. The development points and the technical concept of foreign countries' case studies and theories are selected and combined to fit the four dimensions of the 15-Minute city framework for Banthat Thong road, as shown below.

In the density dimension, Bangkok, with 10.7 million people, fit in the large size city population of more than 1.5 million people; according to the Department of Public Works and Town Planning indicate, the characteristic of commercial land use has a density of 80-120 people per rai with the FAR of 10:1 the maximum building coverage ratio of 90%. According to the standard, we can see that Banthat Thong has the ability to grow more as the law allows the urban fabric to be denser and serve more people to the fullest potential.

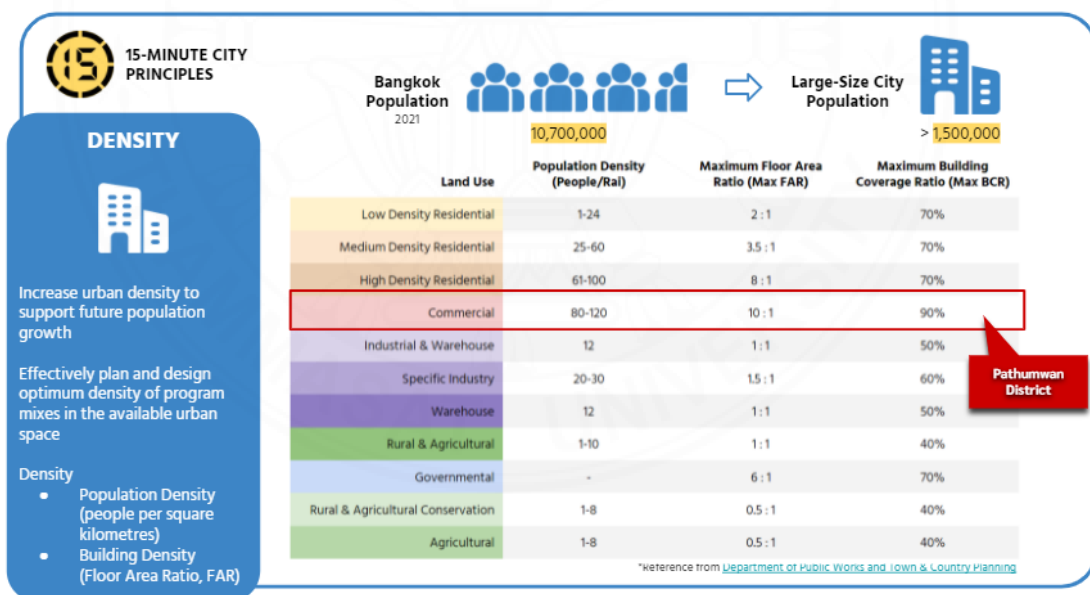


Figure 3.3 15-Minute City integrated framework for Banthat Thong, density dimension

Source: Researcher, 2022

In diversity, the Banthat Thong area will represent the six essential social amenities as follows.

1) Living: There is a decreasing number of local communities, but with the big educational institution and commercial cluster of Bangkok, many people come to study and work in the area every day. The current living space in the area available are the old shophouses, student dormitory and condominiums. The demand for affordable housing in the area is increasing.

2) Working: The place of employment along both sides of Banthat Thong road are mainly local restaurants and shops. Chulalongkorn University also serves as a workplace for many staffs and professors. A new place for business incubation like BLOCK28 Creative Startup Village is also one of the upcoming workplaces for new companies.

3) Commerce: restaurants, local sports goods shops and many commercial complex-shopping centres nearby, such as Stadium One, Samyan Market, Dragon Town, Samyan Mitrtown and Chamchuri Square.

4) Healthcare: There are multiple local clinics and pharmacies and also in the service area of big hospitals such as Chulalongkorn Hospital and police hospital. As well as sports facilities, the National Stadium and public parks.

5) Education: Chulalongkorn University and demonstration schools, as well as tutoring schools.

6) Culture & Entertainment: places of religious belief such as temples, shrines or churches, different fun and active activities in Stadium One, Movies theatres in shopping malls, galleries and exhibition spaces and shows.



Figure 3.4 15-Minute City integrated for Banthat Thong, diversity dimension

Source: Researcher, 2022

In proximity, recommended distance of walking and biking within 15 minutes are adapted to fit in the Thai context; the walkable distance will reduce from 800 metres to 400 metres because of the hot weather as a hindrance to walking as the main issue.

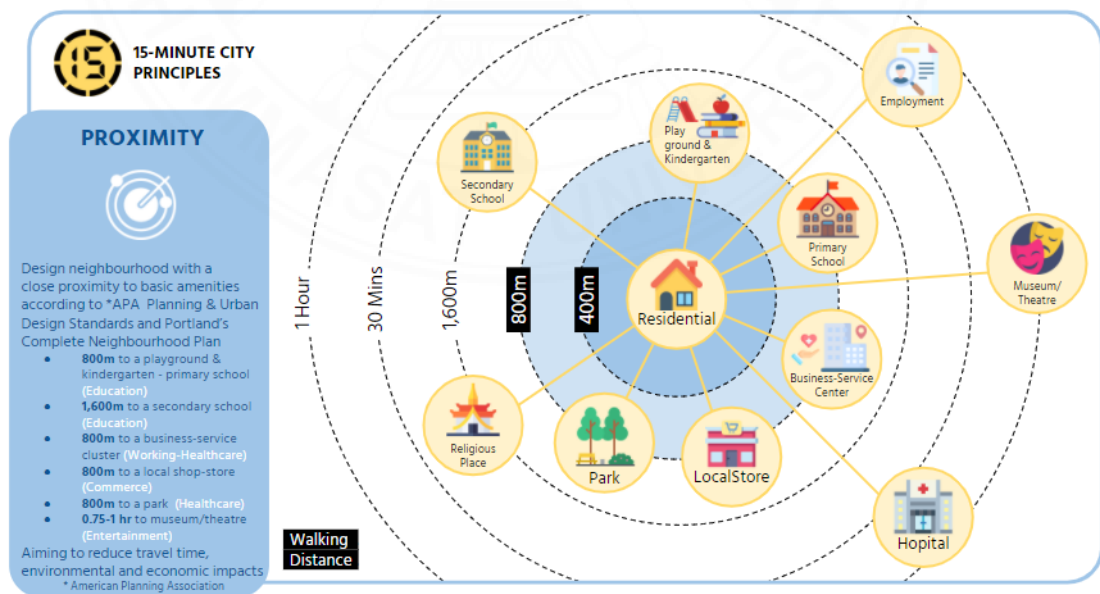


Figure 3.5 15-Minute City integrated framework for Banthat Thong, proximity dimension

Source: Researcher, 2022

In digitalisation, they must have the following infrastructure to support future mobility trends, facilitate the use of shared mobility, and enhance convenience and safety in travelling in the area of Banthat Thong. Including infrastructure such as electric vehicles (EV) charging stations, CCTV security cameras with motion detection and AI technology, smart street lights with connection to the internet and a shared mobility fleet operating system.



Figure 3.6 15-Minute City integrated framework for Banthat Thong, digitalisation dimension

Source: Researcher, 2022

3.3 Data collection tools

Primary data collection is separated into two types of tools: Interviews via questionnaires and site surveys or on-site observation. The combination of quantitative and qualitative data will give more depth of information, leading to more evident and more supported results and findings. The data collection process will be deliverable for the first research objective of studying and evaluating Banthat Thong road under the 15-Minute City framework as it could provide more information on the travelling and mobility patterns in the area.

3.3.1 Interview and questionnaire: quantitative data

1) Form questions that aim to gather information about mobility and travelling patterns in the area, as well as from them according to the criteria measuring the level of seamless mobility: type of transport, cost of transport, destination and mobility activity, efficiency and availability of transport.

2) Check the correctness with experts and test the questionnaire as a trial run. Points of consideration for the correctness of the questionnaire questions are as follows.

(2.1) Check if all the questions are derived from the framework studied.

(2.2) What other information needs to be collected to be useful for analysis and results summary in the next phase.

(2.3) Check for spelling and grammatical mistakes.

(2.5) Google form format: links to each section, question requirements.

(2.6) Time the amount of time used in completing the questionnaire.

3) Edit accordingly.

4) Distribute and gather interview results.

5) Conclude the survey result in table form and graphical charts.

The structure of the questionnaire will be separated into three parts (see the questionnaire form in Appendix A), which are transferred and designed according to the four dimensions of the 15-Minute City framework and the two aspects of physical space readiness and the people's behaviours and their demand in mobility infrastructure.

1) Personal information section will answer the proximity where the people are coming from and the diversity of people on the site from the question that identifies people's relationship with Banthat Thong from the local community, regular visitors, people who works and study in the area or tourist.

2) Activities and Attraction points section will answer the diversity of activities and programs available on the site, as well as part of the density dimension where the response will answer the people density in the Banthat Thong area during different periods of time in a day.

3) Mobility section will answer the digitalisation dimension (questions about shared mobility services) and collect data on people's mobility behaviour.

The response from the questionnaire will show the relationship between age group, relationship with Banthat Thong and income have any effect on the choice of transport they choose to come and travel in Banthat Thong. As well as gather general ideas and feedback on the user's impression of the site in the problem they find regarding mobility in the area and ask for their demands and ideas on how to develop the Banthat Thong area to make their time spent in Banthat Thong more pleasant. As a result, section 2 and section 3 of the questionnaire could determine the physical space readiness of Banthat Thong to develop under the 15-Minute City framework and the user's demand for mobility infrastructure in the area.

3.2.2 Site Survey and On-site Observation: Qualitative Data

1) Extracted and create an observation checklist (see 15-Minute City framework criteria for Banthat Thong in appendix) from the studied concept theories and case study: 15-Minute City framework, Future mobility infrastructure requirements; Checklist curated from the 15-Minute City Integrated framework for Banthat Thong.

2) Check the correctness with experts.

3) Use the checklist while going on the site survey.

4) Conclude the survey result in table form and maps.

3.4 Data analysis tools

The specific tools utilised to analyse the combination of quantitative and qualitative data in order to achieve all research objectives and answer all research questions are listed below and identified in Table 4.2 Data collection summary.

3.4.1 Descriptive data analysis

Descriptive data analysis: A useful technique to identify patterns and association in the dataset; descriptive data analysis will help describe, demonstrate and summarise primary dataset from the questionnaires conducted in this research. With process starting from data collection, data preparation which involve data cleaning and transformation and lastly data visualisation in applying the method of descriptive analysis to identify the core trends and variations (such as frequency distribution and the central tendency of the data - means, medians, and modes). Together with Excel as a software tool, help visualise the questionnaire's statistical responses in the form of frequency tables, proportional pie charts and bar graphs and rearrange data using pivot tables to extract interested variables to identify possible correlations between them.

3.4.2 Integrated site analysis

Integrated site analysis: A comprehensive approach to urban design analysis by utilising the geographic information system (GIS) software. It is a powerful

spatial analysis tool that allows the researcher to extract insights from the layering of relevant data points from various contexts, including natural features: climate and geography, human and man-made features: culture and community, legal and urban planning, transportation, utilities and infrastructure. The combination of various data sets using GIS technology can help the researcher gain a deeper understanding of the urban environment. It enables them to make informed decisions based on the spatial relationships and the site potential that supports the 15-Minute City concept in each dimension. Below is list of possible datasets and information that could be applicable in the analysis of each dimension.

1) Density dimension: The objective for this dimension is to study the current urban density to see if it can support future population growth; data needed for the analysis may include building height, land use regulation, building program and population density.

2) Diversity dimension: To study ways to promote mixed-use neighbourhoods with six essential urban social functions, data needed for the analysis may include building use, location of the main point of interest (urban amenities: communities, workplaces, commercial areas, healthcare facilities, educational institutes, cultural & entertainment centres).

3) Proximity dimension: To see if Banthat Thong will be able to facilitate convenient routes to basic amenities in the proximity with pedestrian-oriented design, data needed for the analysis may include the location of main public transportation stations/ stops, traffic density, condition of the footpath, location of the main point of interests (urban amenities: neighbourhoods, workplaces, commercial areas, healthcare facilities, educational institutes, cultural & entertainment centres), accessible service area of each point of interest.

4) Digitalisation dimension: To determine whether Banthat Thong can integrate digital tools and develop infrastructure to enhance the safety and efficiency of future transportation, data needed for the analysis may include internet service coverage and the location of existing CCTV/ EV charging stations/ shared mobility service stations.

3.4.3 SWOT analysis

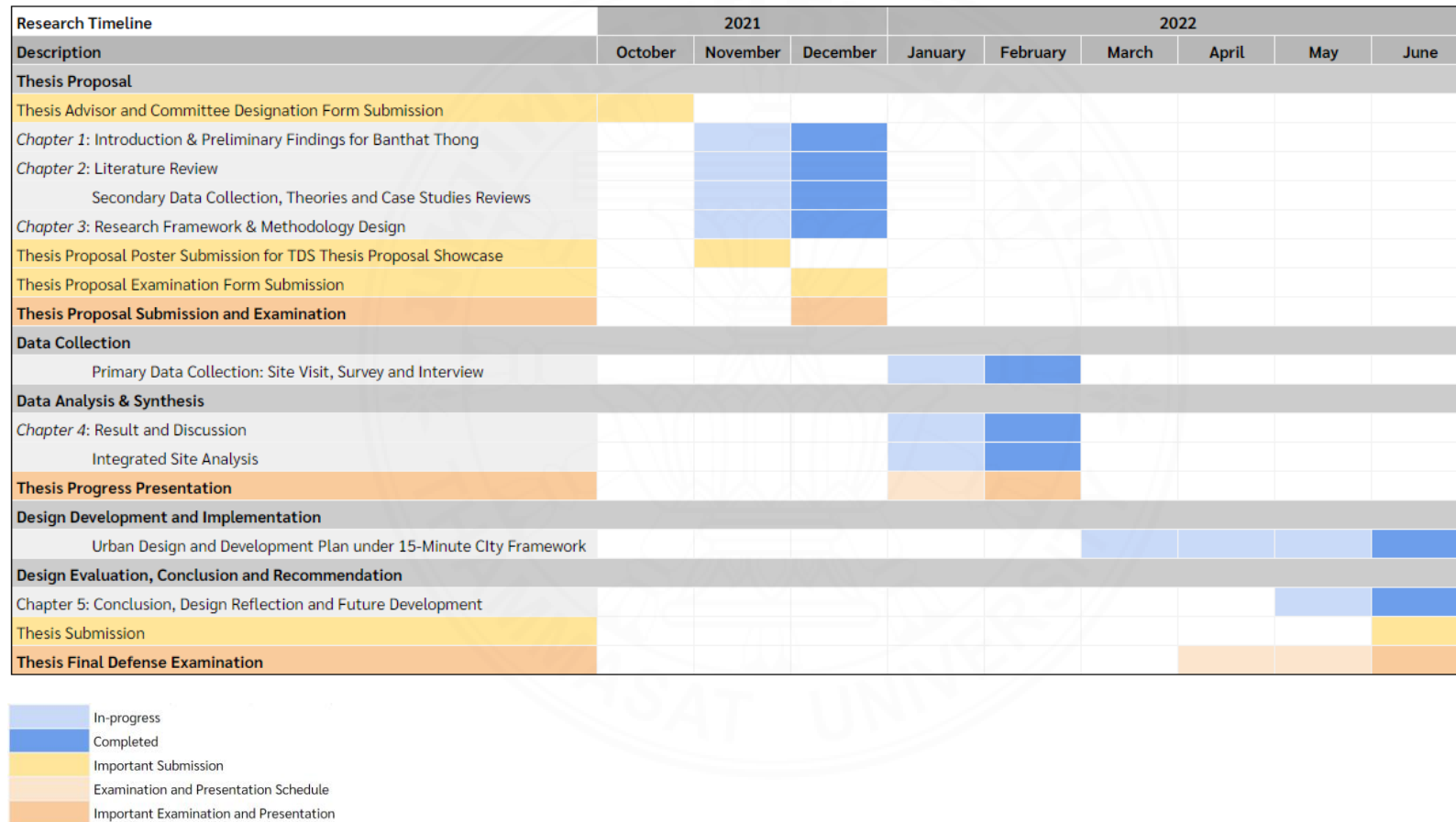
SWOT analysis: A valuable method used to assess internal strengths and weaknesses and external opportunities and threats that influence the current and future conditions of the selected site. Employing this analytical tool helps the researcher visualise and gain insights into the overall characteristic of the case study area and effectively showcase critical arguments. The related components of spatial data collected are grouped into Site potential (SWOT analysis: Strengths and opportunities) and site constraints (SWOT analysis: Weaknesses and threats); these maps aid in determining the prospects and limitations associated with the selected site.

In the context of this research, SWOT analysis plays a crucial role in assessing the site's potential for development under the 15-Minute City framework. It identifies areas that exhibit promising implementation opportunities and pinpoints aspects that require improvement. Additionally, the SWOT analysis helps to highlight obstacles that may need to be addressed or approached with caution. Overall, SWOT analysis is a powerful tool to make informed decisions and guide strategic development goals for the selected site of the Banthat Thong area.

3.5 Research timeline

Gantt Chart below illustrates the monthly schedule of task descriptions for the conduct of this thesis, covering a maximum of 9 months starting from October 2021 until June 2022.

Table 3.1

Research timeline: Gantt chart

CHAPTER 4

RESULTS AND DISCUSSION

The objective of this chapter is to study and evaluate Banthat Thong road under the 15-Minute City framework from the data collected by questionnaire, preliminary research and site observation. The expected outcome of this chapter will include the integrated analysis as a data analysis summary from both qualitative and quantitative sources. Together with the research framework from Chapter 3, the result from the two chapters will be able to answer the research question of “Can the 15-Minute City framework be used as a design guideline for Banthat Thong”.

4.1 Data collection results

4.1.1 Questionnaire responses and feedbacks summary

The questionnaire was distributed via google forms, targeting Banthat Thong visitor of all ages with a particular focus on people from generation x and y, which is the primary demographics in the area. The questionnaire was distributed for two weeks from 15 February and closed for a total of 170 responses.

The questionnaire separates into three main sections: Activities and attraction points in Banthat Thong, Mobility and commute in Banthat Thong and Demographic information.

In the questionnaire, the users in Banthat Thong are classified by age (generation Z – from 11 to 26 years old, generation Y – from 27 to 42 years old, generation X – from 43 to 58 years old), occupation (student, business owner, freelancer, employee, government officer and others), monthly income (low income – from less than 15,000 to 25,000 baht per month, middle income - from 25,000 to 45,000 baht per month, high income – from 45,000 to more than 55,000 baht per month) and most importantly their relationship with Banthat Thong as in are they are outsider visiting Banthat Thong or the daily local user of the area who lives-work-learn in Banthat Thong (tourists, locals, passer-by, visitors to attend events or run errands, workers and students in the area).

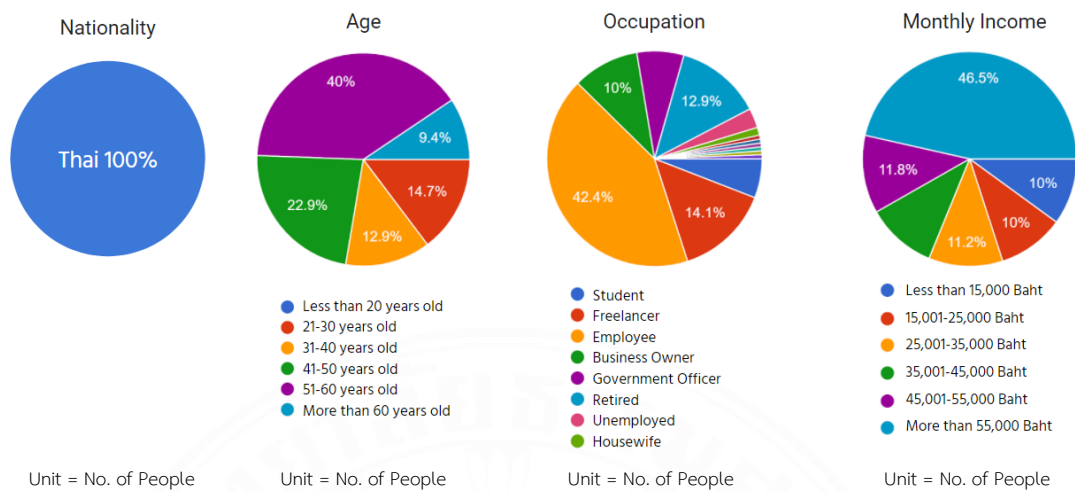


Figure 4.1 Questionnaire section 1: Respondents demographic information summary graphs

Source: Researcher, 2022

4.1.2 Site survey and on-site observation results

The collection of special qualitative data by utilising the Banthat Thong observation checklist: 15-Minute City framework has a very promising result; Banthat Thong area holds most of the characteristics that are aligned with the characteristic of a 15-Minute City in all dimensions. By looking at Table 4.1, it is clearly listed that the Banthat Thong area's characteristics fit entirely with the 15-Minute City framework in diversity, proximity and digitalisation. However, Banthat Thong is still lacking in some points for the density dimension; the study area does not meet the targeted population density of 80-120 people per rai and does not meet the optimum building density of FAR 10:1 even though located in the area with C-3 land use (commercial land use type 3 in Bangkok Comprehensive Master Plan).

Table 4.1

*Filled Banthat Thong site observation checklist: 15-Minute City framework***Banthat Thong Observation Checklist: 15-Minute City Framework**

Density	☐	Population Density 80-120 People Per Rai
	☐	Building Density FAR 10:1
	☒	OSR 3%
	☒	Maximum BCR 90%
Diversity	☒	Living: single-detached house, apartment, townhouse, condominium, hotel
	☒	Working: Employment centre, e.g. office, factory
	☒	Commerce: Market, local shops, department store
	☒	Healthcare: hospital, pharmacy, clinic
	☒	Education: Nursery, Primary & Secondary Schools, Tutorial School, University & Collage
	☒	Culture and Entertainment: Tourist attraction, Night Club, Cinema, Religious places (e.g. Temple, Church, Mosque)
Proximity	☒	800 metres to a playground & kindergarten - primary school (Education)
	☒	800 metres to a business-service cluster (Working-Healthcare)
	☒	800 metres to a local shop-store (Commerce)
	☒	800 metres to a park (Healthcare)
	☒	1,600 metres to a secondary school (Education)
	☒	1,600 metres to a religious place (Culture)
	☒	30-45 minutes to a hospital (Healthcare)
	☒	45 minutes - 1 hour to museum/theatre (Entertainment)
Digitalisation	☒	5G Coverage
	☒	CCTV
	☒	Charging Station (for EV)
	☒	Shared mobility application/service

Source: Researcher, 2022

Remarks regarding the site observation checklist, this checklist is only a layer of data that determines the availability of mentioned characteristics without going into detail on the quality of the available services or the current condition and effectiveness of each point. The checklist does not prompt the process of only tackling and focussing on the unchecked points in the density dimension in the development under the 15-Minute City framework in Banthat Thong. A more detailed and comprehensive analysis is required to see those details in each of the dimensions of 15-Minute City as a whole, together with data collected by questionnaire and secondary research on government records, law and regulatory research or review of past research findings in the area of Banthat Thong. The layering of data gathered information could potentially indicate the possible issues in density, diversity, proximity and digitalisation principle; it is crucial to look utilises different datasets and go through the data integration of spatial data, records and feedback from questionnaires,

essentially the combination of qualitative and quantitative data, to be able to study Banthat Thong with urban analysis methodology thoroughly.

Furthermore, Table 4.2 presents the findings by collectively highlighting the top 3 responses to each questionnaire question distributed and summarising the key findings from primary and secondary data collection. The table gives supporting information to the research objectives with findings relevant to the research methodology design in answering the research questions related to research objectives, data collection methods and the key findings from the datasets collected.

Table 4.2

Data collection summary

Research questions	Research objectives	Data collection	Findings
Can 15-Minute City framework be use as a design guideline for Banthat Thong?	Study and evaluate Banthat Thong road under the 15-Minute City framework	Method: Online questionnaire section 1/3: respondents' demographic information	• Total 170 Responses (100%) • Nationality: Thai (100%) • Top 3 Age group ○ 51-60 years old (40%) ○ 41-50 years old (22.9%) ○ 21-30 years old (14.7%) • Top 3 Occupation ○ Employee (42.4%) ○ Freelancer (14.1%) ○ Retired (12.9%) • Top 3 Monthly Income ○ More than 55,000 Baht (46.5%) ○ 45,001-55,000 Baht (11.8%) ○ 25,001-35,000 Baht (11.2%)

Table 4.2

Data collection summary (Cont.)

Research questions	Research objectives	Data collection	Findings
Can 15-Minute City framework be use as a design guideline for Banthat Thong?	Study and evaluate Banthat Thong road under the 15-Minute City framework	Method: Online questionnaire section 2/3: activities and attraction points in Banthat Thong	• Top 3 Frequency of Visit ○ 1-5 times per year (70%) ○ Once a month (20.6%) ○ Once a week (6.5%) • Top 3 Duration of Visit ○ More than 1 hour (30.6%) ○ 1-15 minutes (26.5%) ○ 45 minutes – 1 hour (15.3%) • Top 3 Time of Visit ○ Afternoon 12:00-17:00 (45.3%) ○ Evening 17:00-22:00 (41.2%) ○ Morning 07:00-12:00 (12.4%) • Top 3 Age Group ○ 51-60 years old (40%) ○ 41-50 years old (22.9%) ○ 21-30 years old (14.7%) • Top 3 Relationship to Banthat Thong ○ Only to attend activities and run errands (68.2%) ○ Tourist (11.8%) ○ Studies in the area (8.2%) • Top 3 Reason of Visit ○ Dining (67.6%) ○ Shopping (33.5%) ○ Pass by to other destination /Interchange (24.1%) • Top 3 Place of Visit ○ Restaurants (71.8%) ○ Samyan Market (58.2%) ○ Chulalongkorn University (31.8%) • Top 3 Desired Services and Activities ○ Parking Space (45.9%) ○ Bicycle/E-Scooter Rental Service (20.4%) ○ Co-Working Space (15.8%)

Table 4.2

Data collection summary (Cont.)

Research questions	Research objectives	Data collection	Findings
Can 15-Minute City framework be use as a design guideline for Banthat Thong?	Study and evaluate Banthat Thong road under the 15-Minute City framework	Method: Online questionnaire section 3/3: mobility and commute in Banthat Thong	• Top 3 Mode of Transport to Banthat Thong ◦ Personal Cars (85.3%) ◦ BTS (28.8%) ◦ Walk (22.4%) • Top 3 Mode of Transport in Banthat Thong ◦ Personal Cars (64.7%) ◦ Walk (58.2%) ◦ Taxi (13.5%) • Top 3 Cost of Transport to and During Visit ◦ More than 500 Baht (24.1%) ◦ 50-100 Baht (20.6%) ◦ 101-200 Baht (18.8%) • Top 3 Commuting Problems ◦ Parking Area (21.8%) ◦ Shading (18.0%) ◦ Temperature (17.7%) • Top 3 Suggestion of Development ◦ More organised parking space (public-free, low-price, convenient) (21.4%) ◦ Public Transport: Commuter bus/shuttle bus/Tram/ (around the area, from BTS/MRT) (18.3%) ◦ Improved pedestrian way/crossing (safe, clean, convenient, wider, no obstacles) (13.5%)
		Method: Secondary data collection + on-site observation	Integrated site analysis SWOT analysis (Site potential and constraints analysis)

Table 4.2

Data collection summary (Cont.)

Research questions	Research objectives	Data collection	Findings
How can we develop 15-Minute City framework as an urban design guideline for Thai city?	Create urban design guidelines from 15-Minute City framework for Banthat Thong	Method: Policy recommendations and action plan	• Promotion of adaptive reuse of old existing buildings • Promotion of mixed-use development and on ground activity • Transformation of conventional form-based codes to hybrid code system with mixed-use zoning and program • Smart city development incentive
	Propose a redesign for the Banthat Thong road where people can travel in the area seamlessly, safely and conveniently at any time of the day	Method: Physical urban design solutions	• Programming • Conceptual Masterplan Development • Mobility and Traffic Management Masterplan • Design Representation: Perspective sketch/collage, street section

Source: Researcher, 2022

4.2 User travelling and mobility pattern analysis

Data extracted from the three sections of the questionnaires, including the Demographic Information, Activities and Attraction Points in Banthat Thong, Mobility and Commute in Banthat Thong, are to study and analyse the user travelling and mobility patterns in Banthat Thong. The data collection results and key findings from the data analysis are discussed in two narratives: the user activity in Banthat Thong and the user mobility and commute in Banthat Thong.

4.2.1 User activity in Banthat Thong

In the questionnaire, the users in Banthat Thong are classified by age, occupation, monthly income and, most importantly, their relationship with Banthat Thong as in are they are outsiders visiting Banthat Thong or the daily local user of the area who lives-work-learn in Banthat Thong.

Regardless of the difference's groups of users, 70% of the respondents visit Banthat Thong 1-5 times per year, where one visit would usually last more than 1 hour (30.6%) in the afternoon from 12:00-17:00 (45.3% or 77 out of 170 respondents) or in the evening from 17:00-22:00 (41.3%). The most popular activities in Banthat Thong are undeniably dining (67.6% or 115 out of 170 respondents), as 71.8% of all respondents answer restaurants as the place they visit in Banthat Thong (see Figure 4.2).

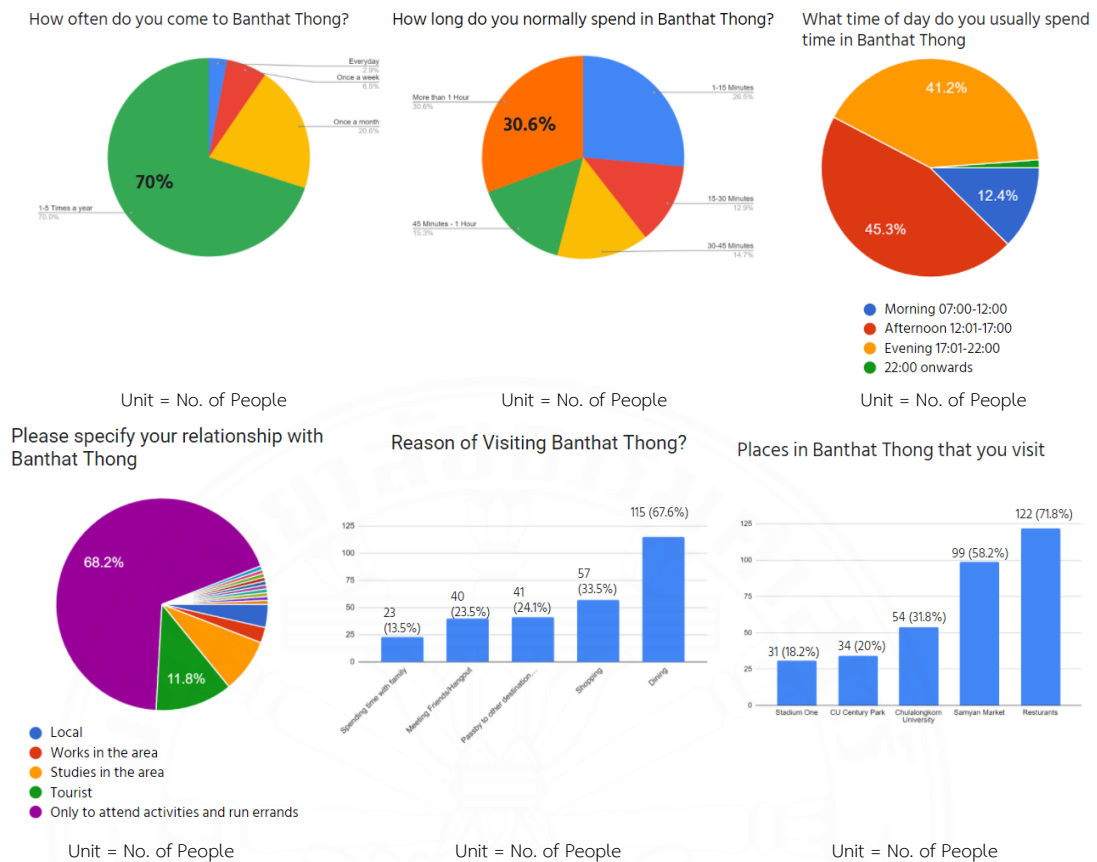


Figure 4.2 Questionnaire section 2: Activities and attraction points in Banthat Thong summary graphs

Source: Researcher, 2022

With the questionnaire question “What other services or activities do you want to see in Banthat Thong?” the top 3 desired services and activities are Parking Space (45.9%), Bicycle/E-Scooter Rental Service (20.4%) and Co-Working Space (15.8%).



Figure 4.3 Word cloud: What other services or activities you want to see in Banthat Thong?

Source: Researcher, 2022

4.2.2 User mobility and commute in Banthat Thong

The most popular transport is personal cars, with 64.7% of 170 respondents choosing personal cars as their choice of transport; walking ranks second with 58.2% (see Figure 4.4).

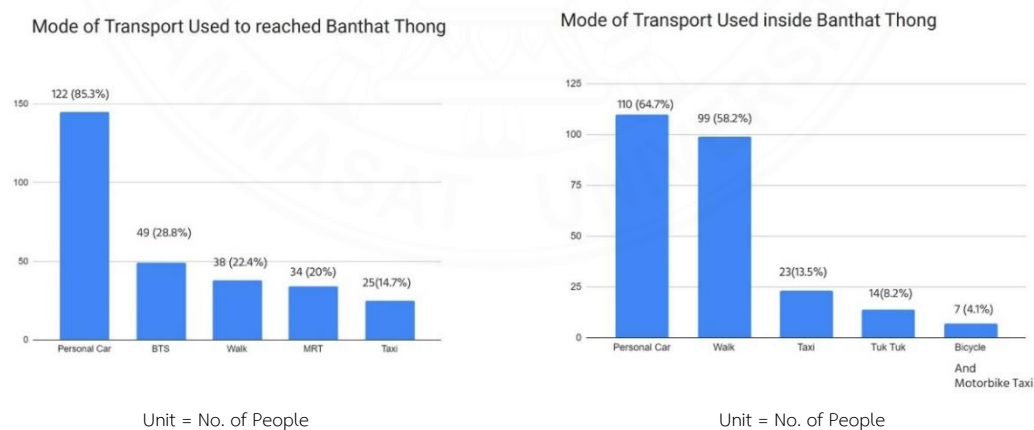


Figure 4.4 Questionnaire section 3: Mobility and commute in Banthat Thong summary Graphs (1/2)

Source: Researcher, 2022

The tables below show the transport choices for different groups of users (defined by age group, monthly income and relationship to Banthat Thong) who chose to travel to the Banthat Thong area.

Table 4.3 categorised the user's transportation choice to Banthat Thong based on the user's relationship with Banthat Thong. The results show that more outsiders (including users who come to Banthat Thong to attend events/run errands and tourists) come in to use the space than locals (users who live-studies-works in the area). The most popular modes of transport are personal cars, regardless of the user's relationship to the site. Tourist uses public transportation (Bus, BTS, MRT) more than locals.

Table 4.3

User's choice of transportation to Banthat Thong categorised by user's relationship with Banthat Thong

User: Relationship with Banthat Thong	Personal Car	Walk	Taxi	Tuk Tuk	BTS	MRT	Bus	Bicycle	Motorcycle Taxi	Motorcycle	MuvMI	CU Pop Bus
Local	2% (6)	1% (4)	0% (0)	0% (0)	0% (1)	0% (1)	0% (0)	0% (0)	0% (0)	1% (2)	0% (1)	0% (0)
Only to attend activities or run errands	33% (105)	4% (12)	5% (17)	1% (4)	10% (33)	6% (18)	2% (5)	1% (3)	0% (0)	0% (0)	0% (0)	0% (0)
Studies in the area	3% (10)	4% (12)	2% (5)	1% (3)	2% (6)	3% (10)	0% (1)	0% (0)	0% (0)	0% (0)	2% (6)	0% (1)
Tourist	6% (18)	2% (8)	1% (4)	0% (1)	3% (9)	1% (4)	1% (2)	0% (1)	0% (0)	0% (0)	0% (0)	0% (0)
Works in the area	2% (6)	1% (2)	0% (0)	0% (0)	0% (0)	0% (1)	0% (0)	0% (0)	0% (0)	0% (0)	0% (1)	0% (0)
Grand total (unit = no. of people)	45% (145)	12% (38)	8% (26)	2% (8)	15% (49)	11% (34)	2% (8)	1% (4)	0% (0)	1% (2)	2% (8)	0% (1)

Source: Researcher, 2022

When categorised by age groups, similarly, all age group prefer using personal cars to travel to Banthat Thong (shown in Table 4.4, personal cars rank first in the total number of responses in all age group). The user between the age of 21-30 tends to use shared mobility services such as MuvMi and CU EV Sharing service more than other age groups.

Table 4.4

User's choice of transportation to Banthat Thong categorised by age group

User: Age group												
	Personal Car	Walk	Taxi	Tuk Tuk	BTS	MRT	Bus	Bicycle	Motorcycle	Motorcycle Taxi	MuvMi	CU Pop Bus
21-30 years old	6% (18)	5% (16)	2% (6)	1% (4)	4% (13)	3% (10)	0% (1)	0% (0)	0% (0)	0% (0)	2% (7)	0% (0)
31-40 years old	5% (17)	2% (6)	1% (2)	1% (2)	2% (7)	1% (4)	0% (1)	0% (0)	0% (0)	0% (1)	0% (1)	0% (0)
41-50 years old	11% (34)	1% (3)	2% (8)	0% (0)	3% (11)	2% (5)	1% (2)	0% (0)	0% (0)	0% (0)	0% (0)	0% (0)
51-60 years old	19% (61)	3% (9)	2% (7)	1% (2)	5% (15)	4% (13)	1% (2)	1% (4)	0% (0)	0% (0)	0% (0)	0% (0)
more than 60 years old	5% (15)	1% (4)	1% (3)	0% (0)	1% (3)	1% (2)	1% (2)	0% (0)	0% (0)	0% (1)	0% (0)	0% (0)
Grand total (unit = no. of people)	145 (45%)	12% (38)	8% (26)	2% (8)	15% (49)	11% (34)	2% (8)	1% (4)	0% (0)	1% (2)	2% (8)	0% (0)

Source: Researcher, 2022

Table 4.5 presents the data through the categorisation of users' monthly income. In general, personal cars are the most popular choice of transport for all income groups. Walking is most popular for users in the low-income group (with an income of less than 15,000 baht) and users in the high-income group (income of more than 55,000 Baht). Users in the low-income group (less than 15,000 baht) have the most variety of transport choices, including a more significant number of users using MRT, Bus and MuvMi services. In addition, 6% of people from the high-income group (income more than 55,000 Baht) also uses BTS to travel to Banthat Thong, which

is three times more than other income groups, having only 1-2% of BTS users from other income groups.

In conclusion, middle to high-income groups prefer personal cars over public transportation. In contrast, low-income groups prefer the use of public transportation. The ratio of preference for public transport to personal cars is 16% to 8% in the low-income group. The middle-income group have a ratio of preference for public transport to personal cars of 8% to 10% and 15% to 27% in the high-income group.

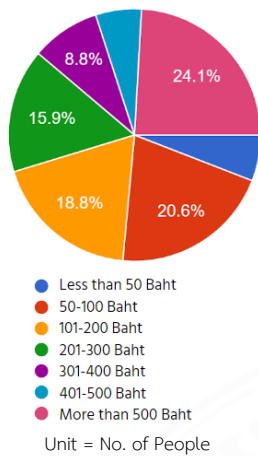
Table 4.5

User's choice of transportation to Banthat Thong categorised by user's monthly income

User: Monthly Income	Personal Car	Walk	Taxi	Tuk Tuk	BTS	MRT	Bus	Bicycle	Motorcycle	Taxi	Motorcycle	MuvMi	CU Pop Bus
Low income group	8% (26)	5% (15)	3% (10)	2% (5)	4% (14)	5% (14)	1% (4)	0% (0)	0% (0)	0% (0)	2% (6)	0%	
less than 15,000 Baht	3% (11)	3% (9)	2% (7)	1% (3)	2% (6)	3% (9)	1% (4)	0% (0)	0% (0)	0% (0)	2% (5)	0%	
15,000-25,000 Baht	5% (15)	2% (6)	1% (3)	1% (2)	2% (8)	2% (5)	0% (0)	0% (0)	0% (0)	0% (0)	0% (1)	0%	
Middle income group	10% (34)	2% (8)	2% (5)	1% (2)	3% (12)	2% (5)	1% (3)	1% (2)	0% (0)	0% (1)	0% (1)	0%	
25,001-35,000 Baht	5% (17)	1% (4)	2% (5)	1% (2)	2% (8)	1% (3)	0% (1)	0% (0)	0% (0)	0% (1)	0% (1)	0%	
35,000-45,000 Baht	5% (17)	1% (4)	0% (0)	0% (0)	1% (3)	1% (2)	1% (2)	1% (2)	0% (0)	0% (0)	0% (0)	0%	
High income group	27% (85)	5% (15)	3% (11)	0% (1)	8% (24)	4% (15)	0% (1)	1% (2)	0% (0)	0% (1)	0% (1)	0%	
45,001-55,000 Baht	6% (18)	2% (5)	1% (4)	0% (0)	2% (6)	2% (7)	0% (1)	0% (0)	0% (0)	0% (0)	0% (1)	0%	
more than 55,000 Baht	21% (67)	3% (10)	2% (7)	0% (1)	6% (18)	2% (8)	0% (0)	1% (2)	0% (0)	0% (1)	0% (0)	0%	
Grand Total (unit = no. of people)	45% (145)	12% (38)	8% (26)	2% (8)	15% (49)	11% (34)	2% (8)	1% (4)	0% (0)	1% (2)	2% (8)	0%	

Source: Researcher, 2022

Estimated costs of traveling to and during your stay in Banthat Thong area



What makes you feel **BAD** about the commute in Banthat Thong area?

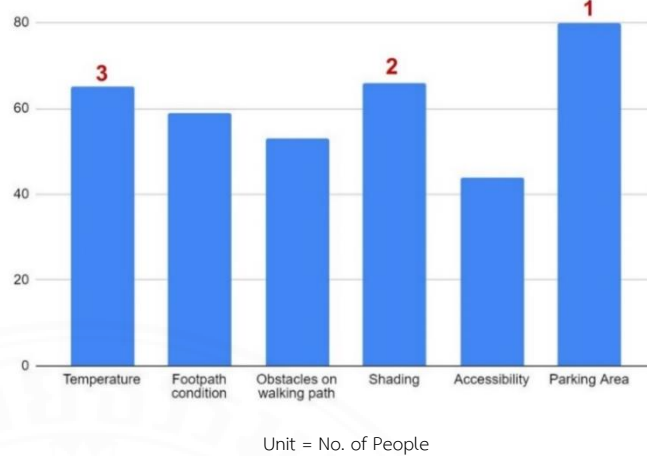


Figure 4.5 Questionnaire section 3: Mobility and commute in Banthat Thong summary graphs (2/2)

Source: Researcher, 2022

Lastly, the final questionnaire question, “What do you think will make commute within Banthat Thong better?” suggests some of the possible solutions to solve the mobility and walkability issues in the area and provide a new or improved program that the user wants to see input in Banthat Thong area. Figure 4.6 illustrate the responses in the word cloud format with the top 3 desired solutions are more organised parking space (for the public, free to low-price parking fee and with convenient access) (21.4%), development of public transport around the area with commuter-shuttle bus or tram from existing public transport station such MRT & BTS (18.3%) and improved pedestrian way/crossing paths that this safe, clean, convenient, wider paths with no obstacles (13.5%).

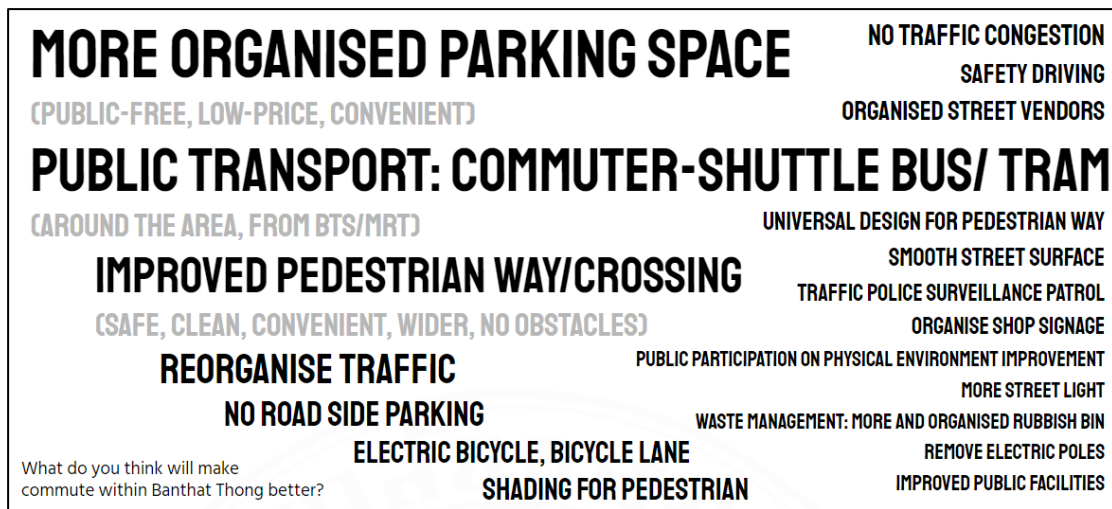


Figure 4.6 Word cloud: What do you think will make commute within Banthat Thong better?

Source: Researcher, 2022

The data imply that the choices of transport different groups of users (defined by age group, monthly income and relationship to Banthat Thong) chose to travel to and during the time they spend in Banthat Thong area varies by the convenience of the availability of transport they could access and the affordability of those services and transport choices. In addition, there are some other key findings to keep in mind for consideration in the design solution development process. The following point is concluded from Figure 4.5 above.

1) There is high demand for commuting to and in Banthat Thong, referencing the response from the estimated cost of travelling to and during the stay in Banthat Thong, which ranges from less than 50 baht to more than 500 baht. The top response is more than 500 baht spent on transportation, 24.1% of 170 respondents. This means that people are willing to pay a high price to come and visit Banthat Thong.

2) People shift to walking when commuting in the area because of the proximities to places in Banthat Thong are within walkable distance; however, the condition of the pedestrian path can be improved, with 34.7% and 31.2% of 170 respondents feeling negative about the pedestrian path and obstacles on walking path

respectively regarding the commute in Banthat Thong after the problem of shading (38.8%) and temperature (38.2%) (see Figure 4.5).

3) Insufficient parking space that is only limited to roadside parking is one of the leading causes of traffic congestion in the area, as 21.8% of 170 respondents feel most negatively about parking area regarding the commute in Banthat Thong (see Figure 4.5).

4.3 Integrated site analysis

4.3.1 Density

The area density is very low, only 1.5:1 when the law allows 10:1. The development of mixed-use high-rise buildings is a way to increase the density to Banthat Thong's full potential and increase the population resident in the area could increase the activities and improve safety as well.

For Banthat Thong, where there are less a percentage of people living in the area and density dimension should be focusing on increasing the number of people who live in the area by introducing affordable housing for university students and staff as well as restaurant workers in the area, as the area as a bustling with restaurant businesses. The new residential program could be incorporated into the existing underutilised shophouses and buildings along the street of Banthat Thong; having an affordable housing program on the upper floors and a commercial program on the ground floor will not only increase the population density in the area but also promote neighbourhood sustainability in keeping the activity running during day and night time.

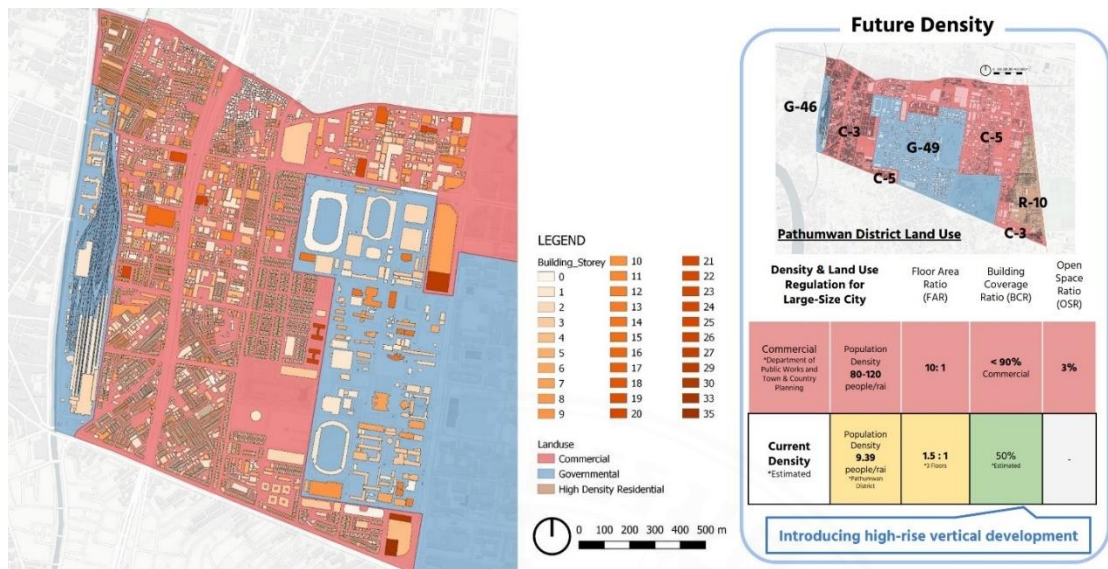


Figure 4.7 Integrated site analysis: Density

Source: Researcher, 2022

4.3.2 Diversity

Banthat Thong area has all six urban amenities, including living, working, commerce, healthcare, education and culture-entertainment. As the land use in the area is commercial, commercial nodes are quite prominent in the areas with multiple shops and restaurants and many department stores. The cluster of programs can be identified from some mixed-use development in the vicinity of Banthat Thong, such as Samyan Mitrtown and Chamchuri Square, with a mixture of residential, office and commercial programs.

The scarcity of residential land use in the Banthat Thong area can affect to 15-Minute City framework; whether there is a job and housing balance in this area should be considered to propose a redesign for the Banthat Thong road, as from the data collected through questionnaires and the on-site observation conducted suggested that there are more people from outside coming in than living and working in the area. Looking at the relationship with Banthat Thong, from the data collected excluding the passer-by, which is the majority of people's relationship with Banthat

Thong, people who are most likely to spend the most time in the area are the one who studies or works in the area.

With fewer people staying in the area during night time, if there were to increase the number of people who lives in the area, it would make the neighbourhood more sustainable as people living there will keep the local business alive; the neighbourhood will be more sustainable than only relying on visitors. There should be more programs that attract more people to stay in the area during night time to avoid the dark and empty streets, which are very dangerous at night. A solution may include developing affordable housing for the potential residents, which could be university students and workers.

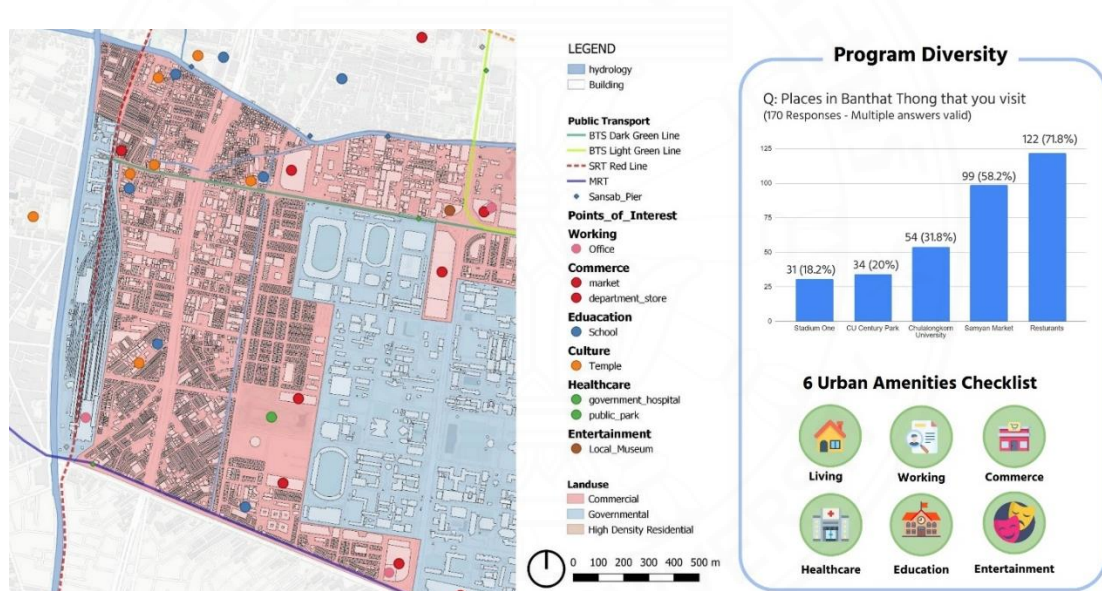


Figure 4.8 Integrated site analysis: Diversity

Source: Researcher, 2022

4.3.3 Proximity

Even though communities in the Banthat Thong area are in very good proximity to all urban amenities, the commute to those places is the biggest constraint. As shown in the map below, the traffic on Banthat Thong road is the heaviest during weekday nights. Reorganisation of the traffic pattern and street pattern may need to consider as well.

The shading indicates the layering of the service radius compared with the whole district. The Banthat Thong have a deeper shade of blue, indicating good proximity to many program and services around the area at suitable distances.

According to the Goodwalk Thailand database, Siam or Pathumwan area ranks number one in the district with the highest potential in developing a walkable city with a score of 82, connectivity of sidewalks and skywalk under the BTS sky train system, making the connection of the pedestrian way more prominent than other areas in Bangkok.

Traffic in the area is mainly caused by the high number of primarily passers-by and locals using personal cars and the high number of roadside parking. To solve this from the proximity dimension perspective, developing the public transportation network and feeder system, providing more transport choices, and seamless connectivity could help ease the traffic problem.



Figure 4.9 Integrated site analysis: Proximity

Source: Researcher, 2022

4.3.4 Digitalisation

In digitalisation, the area is sufficient with CCTV, and digital technology in cellular data networking coverage is excellent. There are some EV charging stations, but there are fewer fleet operators and smart street lights.

However, when looking at the results from the questionnaire, only a few people use smart mobility services or shared mobility; only 2% use this and the majority are younger people aged 21-30. This implies that the service may be more popular for the younger generation with less income and not owning a car.



Figure 4.10 Integrated site analysis: Digitalisation

Source: Researcher, 2022

4.4 Data analysis summary

4.4.1 Can 15-Minute City framework be use as a design guideline for Banthat Thong?

Data analysis in Chapter 4 is the process to study and evaluate Banthat Thong road under the 15-Minute City framework and answers to a research question: Can the 15-Minute City framework be used as a design guideline for Banthat Thong? Yes, from the data analysis questionnaire, observation, and the conduct of integrated analysis know that 15-Minute City can be used as a guideline for Banthat Thong as Banthat Thong analysis in each dimension have the elements of the 15-Minute City characteristics in the four dimensions, and to fill in the gaps, there are possible solutions to improve the site and adding in the missing aspect that would help Banthat Thong achieved a 15-Minute City compacity and convenience.

4.4.2 Site potential and constraints

Site potential and constraints are concluded based on the SWOT analysis where the strengths and the opportunities support the site potential, whilst the site constraints are comprised of the weaknesses and the threats. The key findings from the integrated site analysis and the questionnaire responses are listed in the table below as the data analysis summary to show Banthat Thong's readiness to develop along with the 15-Minute City development concept.

Table 4.6

15-Minute Banthat Thong Key Findings

15-Minute Banthat Thong key findings	Density	Diversity	Proximity	Digitalisation
Consideration aspect: People's behaviour and demand for mobility infrastructure in the area				
User analysis on travelling and mobility pattern	There are more visitors than local residence	People usually come the area for dining and mostly visit restaurants	Travelling pattern for the user are highly dependent on personal car	Only small percentage use application like MuvMi and are CU EV sharing the generation from age 21-30 years old
Consideration aspect: Physical environment readiness				
<u>Site potential</u> Physical condition (existing strengths)	Underutilised shophouses	Develop mixed-use buildings	CU pop bus service Location near multiple modes of public transportation services	Increasing use of EV motorbike for motorbike taxi and rider
Future development policy	Mixed-use complex			Samyan Smart City

Table 4.6

15-Minute Banthat Thong Key Findings (Cont.)

15-Minute Banthat Thong key findings	Density	Diversity	Proximity	Digitalisation
Consideration aspect: Physical environment readiness				
Site constraints What are the major concerns in the area? What is missing?	Rundown and abandon shophouse buildings	Along the road are in active during day time and at night in front of abandoned buildings	Organised save footpath Infrastructure support for future mobility and its route (e.g. bike/scooter lane)	Usage of smart mobility choices are not widely spread
	Low built density	Building programs and usage are mainly commercial	Road and footpath condition are uneven with many obstacles in some parts	Not enough infrastructure to support future mobility
	Build middle to high rise buildings	Demand for affordable housing for future population such as students and workers	Disconnection of public transport stations	Less shared mobility station and services (e.g. bike/scooter station)
			Road side parking is a big problem causing traffic congestion	Lack of shared EV charging station
			Transportation hub, park & ride infrastructure, Logistic Hub	No smart street light + CCTV for safety and as obstacles detector and accidents, traffic monitoring

Source: Researcher, 2022

4.4.2.1 Site potential (SWOT analysis: Strengths and opportunities)

Banthat Thong site potential will include the strengths and the opportunities in the area found in the existing elements that could be maintained or enhanced to support the development and fit the 15-Minute City framework requirement for Banthat Thong.

One of the site strengths in the proximity dimension is the existing connected road networks. There are footpaths and crossing in the area; however, it is not in the best condition with obstacles and uneven surfaces; there are rooms to improve walkability in the area without having to change a lot of the major infrastructure. The location of the area is another strength; Banthat Thong is accessible and within walking distance from multiple public transportation services, including MRT Samyan Station, Speedboat/ferry stops, BTS National Stadium Station, Bus stops and CU Pop Bus Route/Station. In the diversity dimension, the site's key strength is the availability of all urban amenities with diverse activities. Local EV charging station and high-speed internet is the existing asset that could be enhanced in the development of the digitalisation dimension of 15-Minute City in Banthat Thong.

There is an opportunity to develop the vacant-underutilised shophouses along the street to have a fruitful program and socio-economic activities which support the objective of the 15-Minute City framework in density and diversity dimensions. Furthermore, the future development plan in the area of BLOCK 34 - Futurium & Exhibition Centre and BLOCK 33 - Residential and Wellness Centre will densify the built and population density in Banthat Thong area by utilising the vacant plots of land to develop a high-storey mixed-use building.

Lastly, Banthat Thong has a strong advantage in stakeholder networking and partnerships; with the land owned and managed by PMCU, one of the most prominent stakeholders will be Chulalongkorn University. The well-rounded knowledge and professional practitioners in urban and mobility development from Chulalongkorn University will be a valuable partner in the research planning, designing and implementation of the development. Together with the government sector involvement in the acceleration of the development project in the area to achieve 15-

Minute City principles that promote a good environment and mobility is supported by the existing government initiative's Samyan Smart City; the alignment of goals allows government engagement and contribute in the funding and policy support for the development.

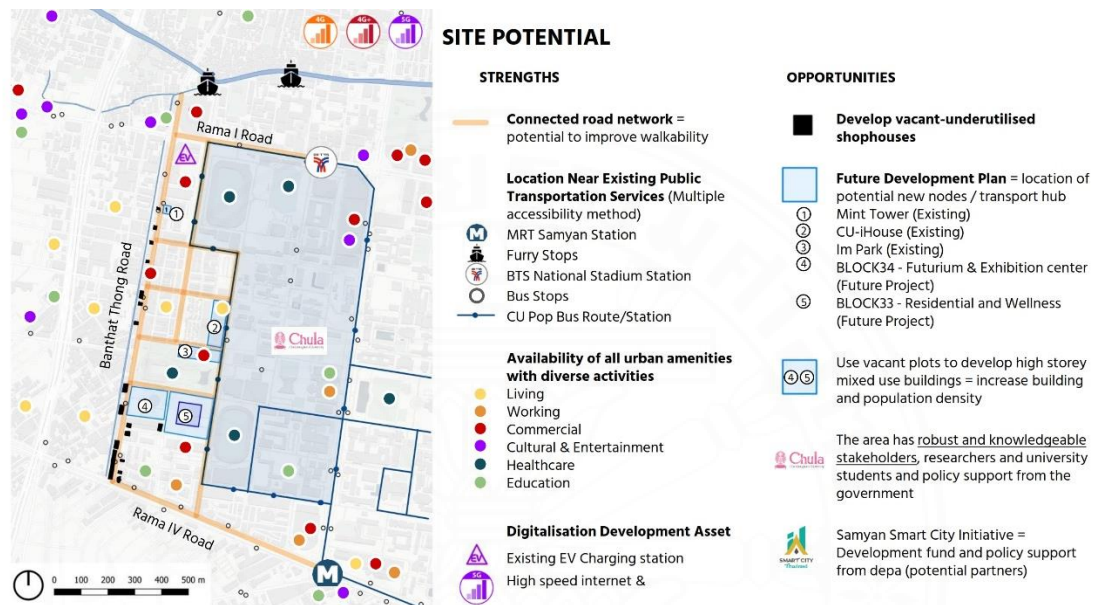


Figure 4.11 Site potential (SWOT analysis: Strengths and opportunities)

Source: Researcher, 2022

4.4.2.2 Site constraints (SWOT analysis: Weaknesses and threats)

The site constraints map combined the weaknesses and the threats that could be the barriers and the problems to address in the design development phase.

In the density dimension, there is a low building density of FAR 1.5:1 that is conflicting with the land use commercial c-3 allowance of FAR 10:1. Even though this shows the opportunity to develop more high-rise buildings, the commercial land use of c-3 aimed to serve commercial activity for outsider rather than locals, resulting in low residential building use. As the residence will help drive the activities and promote economic sustainability in the neighbourhood according to the 15-Minute

City principles, more residential programs will have to be provided. The condition of the environment is a mix of new and old buildings; however, the underused buildings can hinder neighbourhood safety as they could be a place for crime, especially at night.

To develop the proximity dimension, the problem of unpleasant walking environment, parking and traffic congestion should be addressed. Currently, there is no designated lane for bicycle, some section of the street is dark and inactive at night, there are wet and uneven surfaces of the footpath, as well as unorganised waste management with garbage scattered in multiple piles throughout the street. Insufficient parking and the increase in food delivery services are some of the causes of traffic congestion in the area. With higher demand for road usage and parking space, many decided to park on the side of the street. Traffic congestion and roadside parking are presented as a threat in Banthat thong as they can also lead to pedestrian inconvenience and increase the risk of road accidents. In digitalisation, there needs to be more EV charging stations and transit hubs for shared mobility services to input to the area; there needs to be more infrastructure to support the targeted future mobility trends of using shared electric vehicles.

Furthermore, after rapid urban development, there could be potential adverse effects from urban gentrification when unaware of or not monitored during the planning process. In addition to threats, COVID-19 or political unrest could have a socioeconomic effect on the neighbourhood.

Source: Researcher, 2022

In this section, the key findings from statistical data derived from the questionnaire and the site integrated analysis and the SWOT analysis will conclude the potential development directions under the two aspects of 15-Minute City consideration: the physical environment readiness and the people's behaviour and demand for mobility infrastructure in the area.

1) From questionnaires responses and site observation, Banthat Thong's physical environment does not meet the demand, with crowded paths and uneven surfaces and a lack of shading needed to be solved with universal design development.

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4.4.3.2 The people's behaviour and demand for mobility infrastructure

1) People shift to walking in the area from personal cars to travel to the area, but the main obstacle is the temperature, shading and footpath conditions.

2) People know there are ways to make it easier to travel with questionnaire suggestions of the top providing EV shared and bike service and feeder system (when people find it hard to travel with cars to the area, many suggest the feeder system to access the area).

3) Moreover, with most visitors staying in the area and walking, the suggestion of integrating other soft mobility, such as bikes and scooters, is in high demand.

4.4.3.3 Development priority for the 4 dimensions

Should follow in this order of importance.

1) Digitalisation: Among all of the dimensions, Banthat Thong has the most potential to develop in the digitalisation dimension because it is implementable and facilitated by many feeder's operational systems, the rising popularity of EVs and accompanied by the law that would promote the Samyan Smart City. The transformation in this dimension will support the required infrastructure for future ability, whether it is personal-driven or shared autonomous.

2) Proximity: Diverse programs and how to commute to those places are essential, with the current condition of the pathways does not ease the walking experience. The suggested design recommendation for proximity dimension is to develop a universal design footpath with smooth surfaces and clear separation between motorised and non-motorised modes of transport, putting soft and active mobility in the highest priority.

3) Diversity: In the means of increasing the diversity of people in the community, more mixed programs and increasing the social activities and amenities in closer proximity or cluster with mixed-use development.

4) Density: See that the shophouse is one of the opportunities; adaptive use of the shophouse will be more appealing to the people who walk along the street. From the questionnaire findings, the data supported that people will commute in the area by walking, and lower buildings will be more pedestrian friendly. As well as to increase the people who live in the area, the program indicates a large number of university students, staff and workers who work and study in the area; they would be able to afford on a friendly budget, while the development of new High-rise building will be too high of a price range and the renovation of the old building will be much easier as the building structure is already strong.



CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

After identifying the main potential and constraints of Banthat Thong by the qualitative and quantitative data gathered in Chapter 3, Chapter 4 formed a site analysis of layering to spatial analysis of the site. The previous chapter concluded the development priority in Banthat Thong in the 15-Minute City framework. Chapter 5 will look deeper into the development plan and implementation process through physical development guidelines and policy recommendations; the details in the chapter will explain the conceptual master plan, action plan and stakeholder analysis.

This chapter will answer the last research question of “How can we develop 15-Minute City framework as an urban design guideline for Thai city?”. The first objective is to create urban design guidelines from the 15-Minute City framework for Banthat Thong will be answered by the policy recommendation and action plan. The chapter will identify and recommend any aspect that would support the development of the 15-Minute City design concept in Thailand or provide a critical reflection on the effectiveness of the 15-Minute framework and provide a critical assessment of the 15-Minute City framework and how much it can promote Seamless Mobility through a case study design development at Banthat Thong road.

At the same time, this chapter will also answer the last research objective of proposing a redesign for Banthat Thong road where people can travel in the area seamlessly, safely and conveniently at any time of the day with the physical urban design solutions that would provide a new perspective in solving mobility problems with the urban design solution. This chapter will also include Research limitations and recommendations for further research on the topic.

5.1 15-Minute Banthat Thong

5.1.1 Physical urban design solution

5.1.1.1 Programming

Table 5.1 below lists the proposed physical development program for 15-Minute Banthat Thong, which is derived from the missing element integrated analysis identified, site potential and constraints analysis, solutions for the site's environmental problems concerning traffic, unpleasant and unsafe walking experiences and suggestions from the interview feedbacks. The columns and rows clearly specify the connection between the key issues found in the analysis phase and the development objectives and detail for each dimension in the 15-Minute City framework.

Table 5.1

15-Minute Banthat Thong program

15-Minute Banthat Thong programming	Density	Diversity	Proximity	Digitalisation
Objective	Increase urban density to support future population growth	Promote mixed use neighbourhood with six essential urban social functions	Facilitate convenient routes to basic amenities in the proximity with pedestrian oriented design	Integrating digital tools and develop infrastructure to enhance safety and efficiency of future transportation
Key findings from site analysis – key issues to solve	Vacant and rundown shophouses, low built and population density	Lack of residential building program, the streets are dark and inactive at night	Unpleasant walking experiences, lack of convenient transport choices such as soft mobility for the first-and-last mile	Not enough EV charging stations and transport hub for shared mobility services

Table 5.1

15-Minute Banthat Thong program (Cont.)

15-Minute Banthat Thong programming	Density	Diversity	Proximity	Digitalisation
Physical design development	Improve Building condition	Develop mixed-use buildings	Improve road and footpath condition with universal design to improve walkability and connectivity	Smart Mobility application
	Build middle to high rise buildings	Support on ground activity (24hrs)	Future mobility route (e.g. bike/scooter lane)	Shared mobility station and services (e.g. bike/scooter station)
		Encourage affordable housing development within the mixed of program	Reorganise traffic flows and direction e.g. entrance/ roadside parking restriction during certain day/time CU Pop Bus Extend service hours to 23.00 (from 19.00)	Shared EV charging stations
			Transportation hub, park & ride infrastructure, Logistic Hub	Smart street lights
			Provide green corridor for shading and connection of green spaces	CCTV for obstacles detector and accidents, traffic monitoring

Source: Researcher, 2022

5.1.1.2 Conceptual master plan

The programming process provides solutions that could be implemented to solve the targeted issues. The following figure of maps is the representation of the proposed program for the 15-Minute Banthat Thong design implementation. Each will highlight and categorise the program according to the 15-Minute City framework of Density, Diversity, Proximity and Digitalisation.

1) Density

The objective of this dimension is to prepare the urban space to support future population growth and density. Some future mixed-use projects in the area, such as the development of BLOCK 33, will support the objective of this dimension by supplying more residential programs for the future population. In addition, the proposed solution to improve the building condition through the renovation of the old shophouses and adaptive reuse of the underutilised shophouses along Banthat Thong road will create an opportunity to develop mixed programs such as on-ground commercial programs with affordable housing at higher levels for university staff and students. Furthermore, redeveloping the existing underutilised shophouses is more cost and time efficient as it costs less with renovation than demolishing and building new buildings from the ground up. In the beginning stage of urban revitalisation, the renovation will quickly revive the space with a smaller budget by utilising the current assets the place offers.

2) Diversity

From the integrated analysis, the six essential urban functions are scattered in the area and concentrated in the mixed-use project, such as the area around Stadium One, Samyan Mitrtown and Chamchuri Square. However, Banthat Thong road, with its abandoned shophouse and single-use building program, cause an unpleasant walking environment, raising safety concern and do not answer to the mixed-use neighbourhood concept that 15-Minute City are working towards. With this adaptive reuse solution, the area will become safer, reducing the number of abandoned buildings and making the area have more activity, especially on ground level. The new on-ground program would also be a new attractive activity for many

different types of users with different lifestyles who are looking for a place to stay, eat, work or relax in the modern urban city.

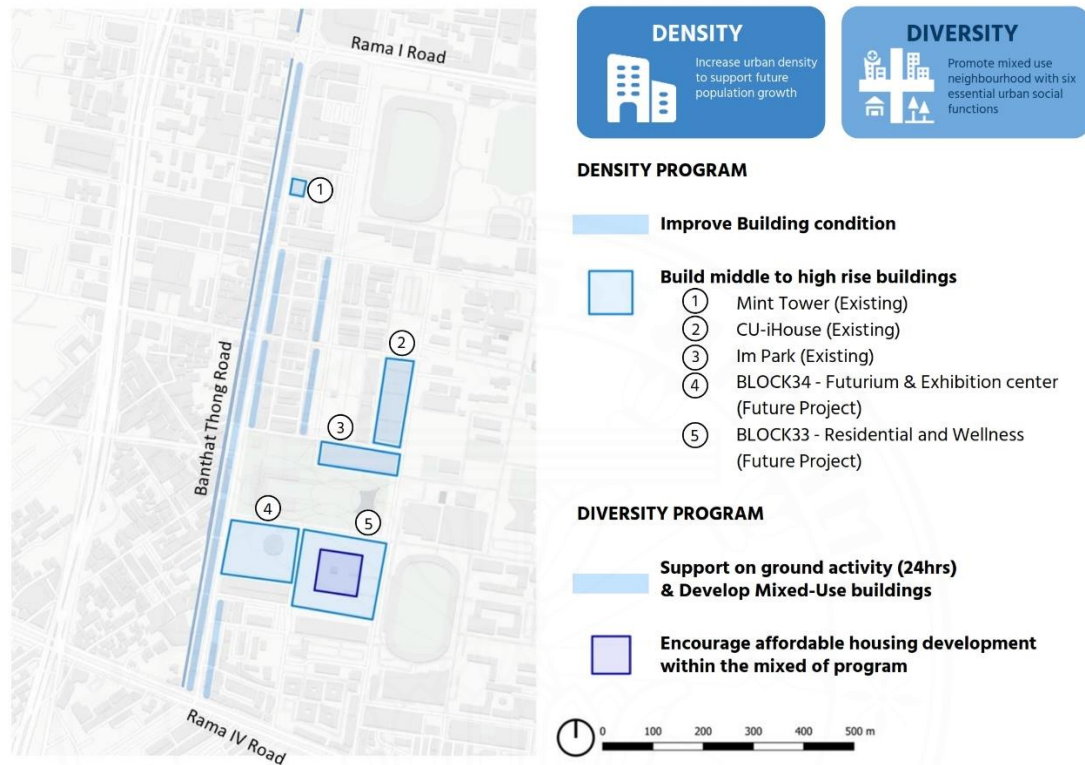


Figure 5.1 Density and diversity conceptual master plan

Source: Researcher, 2022

3) Proximity

In the proximity dimension, the objective of the design development is to provide a program that would facilitate convenient routes to basic amenities within 15-Minute City proximity with a pedestrian-oriented design. The proposed design in proximity dimension aims to improve the walking experience with universal design and greenery at the main Banthat Thong road and Chula Alley with shared street design, to improve the connectivity of Banthat Thong to the public transportation node and extension of CU pop bus operating hours from 19.00 to 23.00

will help facilitate the user in Banthat Thong at the busiest time from afternoon until evening.

The changes and the implementation of new design elements hope to encourage users in the area to walk or bike instead of using private cars when coming to and travelling around the area.

To solve the problem of roadside parking of private cars and food delivery riders' motorbikes and traffic congestion in the area, roadside parking restrictions are placed.

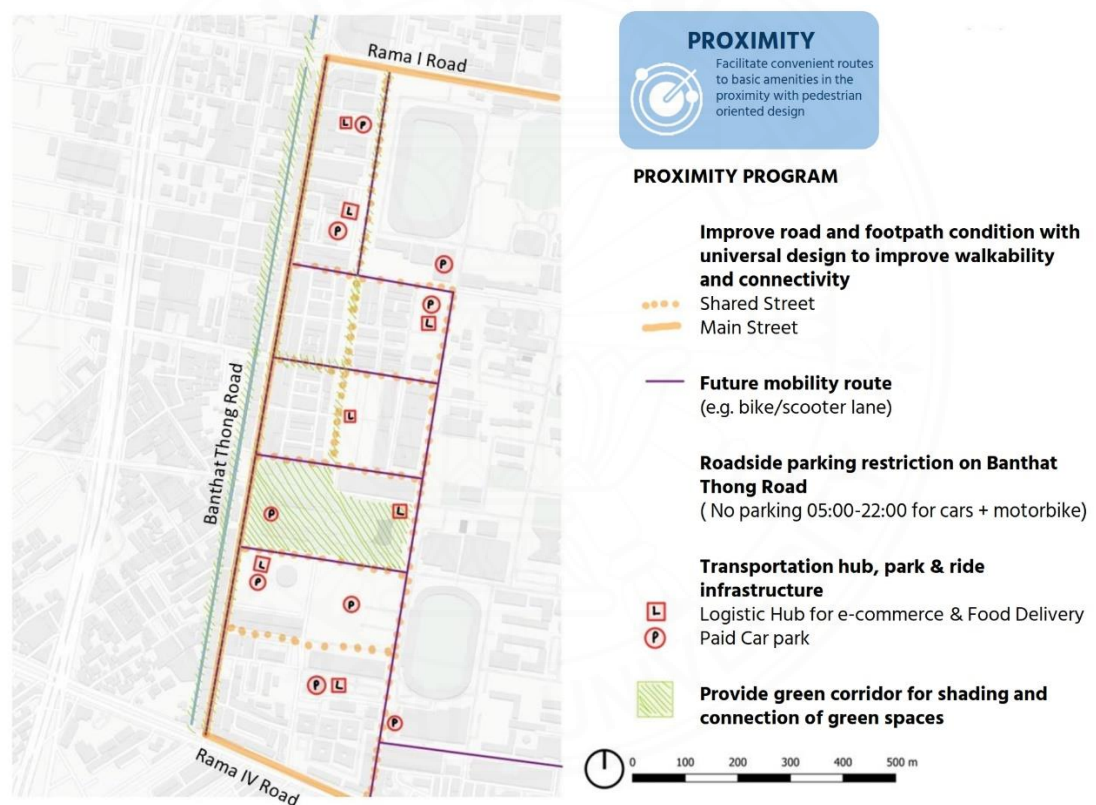


Figure 5.2 Proximity conceptual master plan

Source: Researcher, 2022

A point to highlight in the mobility development is the increasing availability of the EV charging stations that will be placed in all paid public parking space, logistic hub and the location of future development of mixed-use buildings, with this the equipment are being looked over and maintained by the place management team in case of any facilitation of the repair are required or when the machines need any mechanics attention.

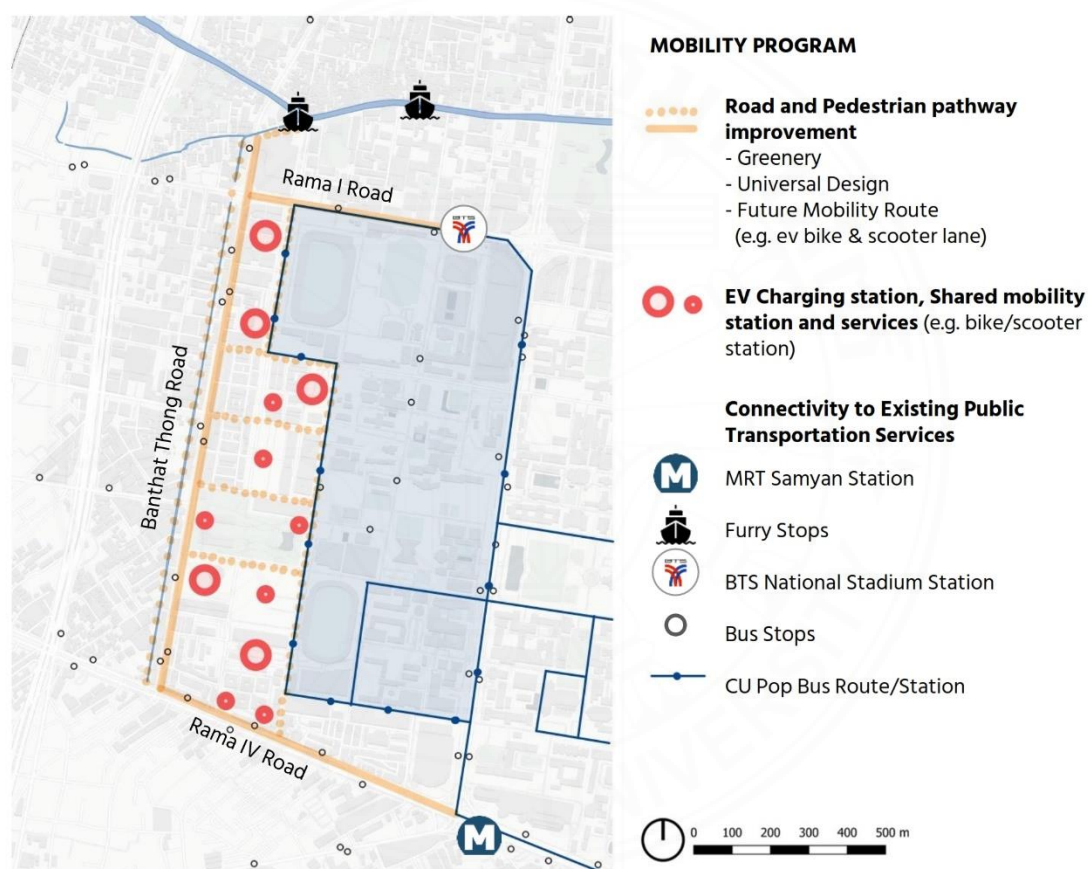


Figure 5.3 Proximity conceptual master plan (mobility program)

Source: Researcher, 2022

4) Digitalisation

The digitalisation dimension will play another essential part in 15-Minute Banthat Thong development as the program would aim to integrate digital tools and develop infrastructure to enhance the safety and efficiency of future transportation. The innovative solutions are also aligned with the Samyan Smart City vision and existing smart city promotion program in the area of smart mobility.

Some design solutions that could be implemented are smart mobility application service, installation of shared mobility stations for bike and scooter sharing, development of EV charging stations and smart street lights with CCTV for obstacles detector and traffic monitoring.

The location of all future mobility infrastructure will be placed in the same area of existing public parking space, the new mixed-use development of BLOCK33-34 and other places of attractions in the area, including CU Century Park, Stadium One, Samyan Market, Dragon Town, ZY walk, CU Sports Zone, BLOCK28 – creative startup village and most importantly, near the public transportation (BTS-National Stadium station and MRT Samyan Station).

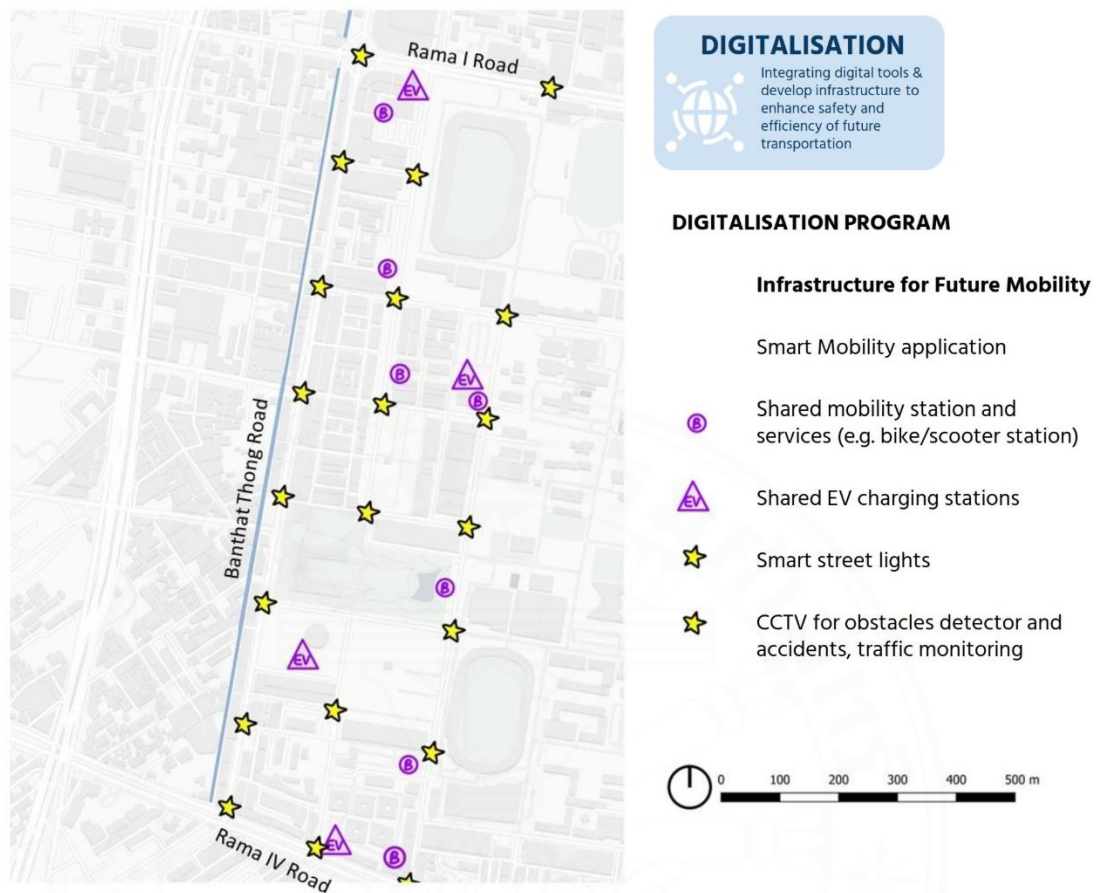


Figure 5.5 Digitalisation conceptual master plan

Source: Researcher, 2022

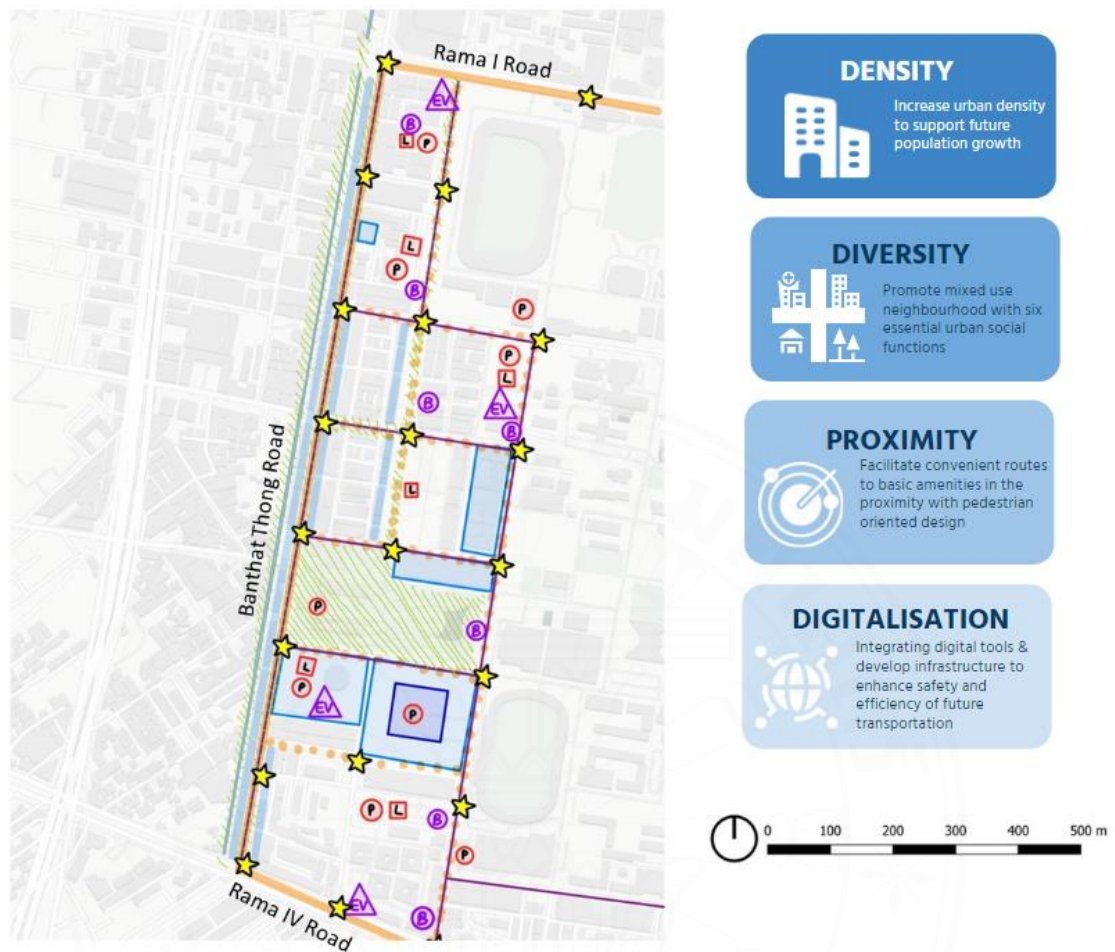
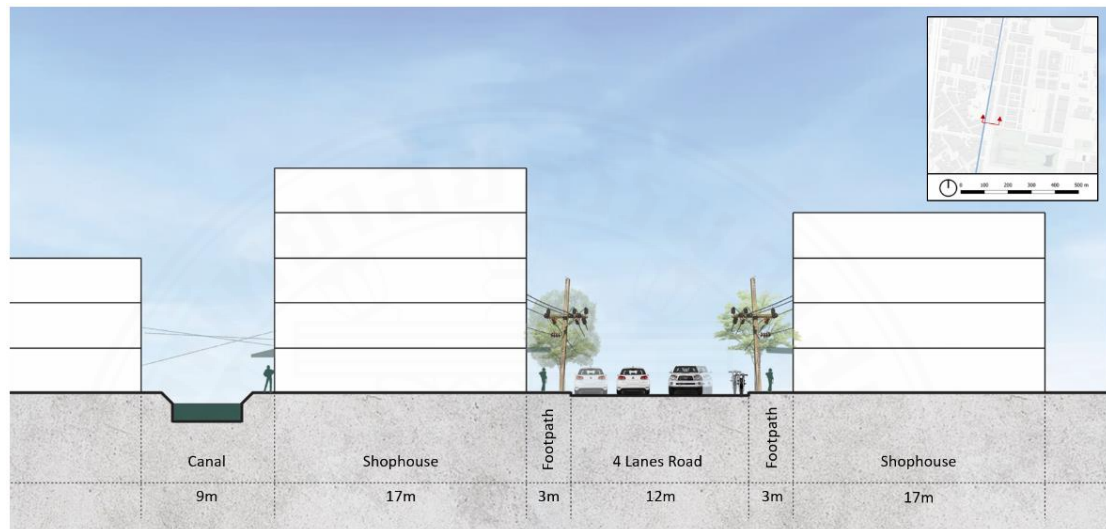


Figure 5.6 15-Minute Banthat Thong conceptual master plan

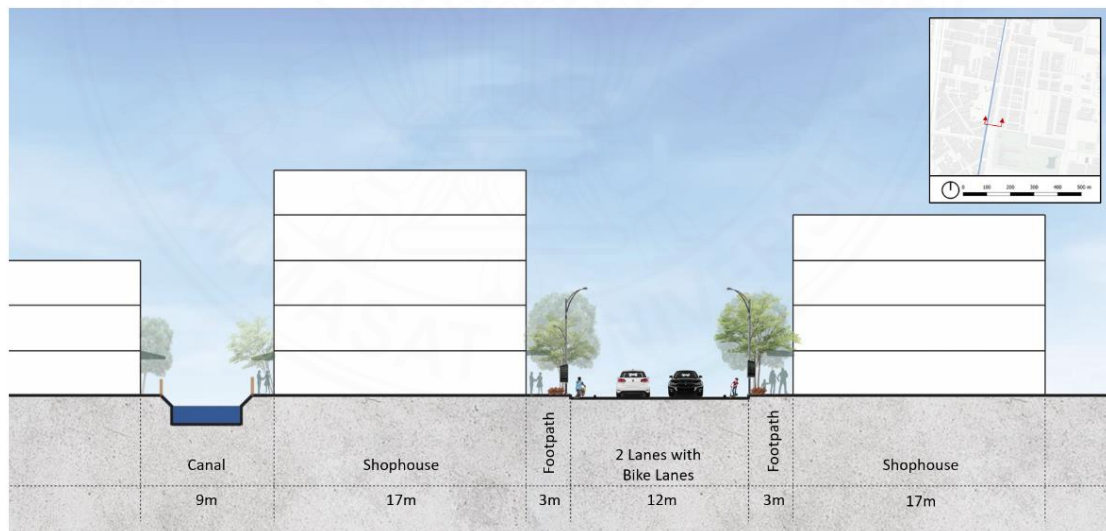
Source: Researcher, 2022

5.1.1.3 Design representation

Figure 5.7 and Figure 5.8 below illustrate the change in the physical environment of Banthat Thong road according to the proposed program in developing under the 15-Minute City framework by comparing the before and after street section and perspective collage.



Before



After

Figure 5.7 Street section: canal development with railings and greenery, footpath quality development with universal design and greenery, bicycle lane with barrier, smart street light and CCTV

Source: Researcher, 2022



Before



After

Figure 5.8 Perspective collage: pedestrian walkway with adaptive reuse of old shop houses, universal design and bicycle lane

Source: Researcher, 2022

5.1.2 Policy recommendation and action plan

To address the barriers to developing Banthat Thong under the 15-Minute City framework and to achieve the suggested design in the prior section (Section 5.1.1), see details below. The biggest barrier to development is the rigid existing zoning and land use and the lack of stakeholder engagement process.

Where the first barrier could be solved by the transformation of conventional form-based codes to hybrid code systems with mixed-use zoning and program, which then allows planners and developers to design the urban space to promote the mixed-use development and on-ground activity or adaptive reuse of old existing buildings with specific plan development for Banthat Thong road as well as Mobility and Traffic management plan. To clearly explain these policy recommendations, the details are concluded directly respond to each dimension of the 15-Minute City framework for Banthat Thong (see Table 5.2).

5.1.2.1 Policy recommendation

1) Density dimension

The density dimension with the objective to increase urban density to support future population growth and promote adaptive reuse of the existing shophouse buildings is recommended. Moreover, even though the building density are not developed more into higher buildings especially on the west side of the street. The 3-4 storey high building also promotes human scale development making the street friendly in the vertical sense as well. This is great for a street with a high pedestrian density as Banthat Thong. Adaptive reuse can also function for affordable housing, commercial and more communal space according to the people's demand.

To achieve the development in density dimension, a public-private-partnership model or a PPP model for building renovation could be used where public and private entities provide financial support. In this situation, the PMCU, as the leader of the renovation project and a landlord, can provide renovation grants, contractor-material resources, and plan consultancy. At the same time, private business owners/developers as project partners can come up with design and business

proposals and contribute to the development capital. Finally, regulatory support such as extended or discounted rental/leasing agreements and contracts, proofing legal document submission and necessary paperwork to local authorities can be approved and assisted by the Pathumwan district office.

2) Diversity dimension

The diversity dimension provided an opportunity for Banthat Thong to showcase its uniqueness by promoting street-level activities and restaurants; the development and the promotion of the street fit in the context where there are high flow pedestrian activities and essentially enhance the objective of mixed-use neighbourhood promotion with six essential urban social functions.

A PPP model for developing a mixed-use complex could be used for the PMCU to work as a project lead with real estate developers, property management and private businesses as partners. Unlike the renovation project in the density dimension, financial incentives will be used to persuade developers to invest in mixed-use building complexes in Banthat Thong. The incentives could be the property/income tax exemption for buildings with on-ground commercial-active programs, together with FAR bonuses for building that provide affordable housing. To ease the process, proofing legal document submission and necessary paperwork to local authorities: the revenue office, Pathumwan district office, will be done by the working group.

3) Proximity dimension

The focus of the proximity dimension is to facilitate convenient routes to basic amenities in proximity, with pedestrian-oriented design as the main objective. To achieve the beautifully designed pathways with greenery and safe environment that support multiple modes of transportation, the urban development of city blocks and public open space has to be designed and developed together with the transport and mobility management infrastructure, as the walkability elements and the availability of the transport infrastructure will be in support to each other in the urban settings.

The recommended policy that would support the development in this direction in the Banthat Thong area is the transformation of conventional form-based codes to a hybrid code system with mixed-use zoning and program. It will present a pathway in communicating the design development and allow the implementation of those schemes overlaying the existing building codes and land use regulations.

Stakeholders that will be involved in the development of the specific plans are CUURP and PMCU as the project lead in master planning, supported by the development funding from Samyan Smart City and depa, legal support and approval will be done by the Department of Public Works and Town & Country Planning as well as the Pathumwan District Office.

The following lists are the suggested overlaying specific plans in a specified development area of 15-Minute Banthat Thong.

(3.1) A Specific Plan Development for Banthat Thong Road (see the conceptual master plan for 15-Minute Banthat Thong under four main dimensions: Density, Diversity, Proximity and Digitalisation)

(3.2) Mobility and Traffic Management Plan (see conceptual master plan for 15-Minute Banthat Thong: Mobility program, Proximity and Digitalisation Dimension)

(3.3) Urban Street Design Plan and Guideline (see design representation: Perspective Sketch/Collage: Pedestrian walkway with adaptive reuse of old shop houses, universal design and bicycle lane)

4) Digitalisation dimension

With the objective of integrating digital tools and developing infrastructure to enhance the safety and efficiency of future transportation, Smart city promotion incentives can be one of the policy mechanisms that provide financial incentives to the possible investor through tax incentives for smart and clean mobility service providers (part of smart city infrastructure systems and intelligent network development under Smart Mobility). In detail, an 8-year corporate income tax

exemption is possible (100 % of the total investment without land cost and working capital is eligible for an exemption from corporate income tax).

The lead in this initiative will be the Samyan Smart City committee, funds and incentives will be provided and approved by the Thailand Board of Investment (BOI) and Digital Economy Promotion Agency (depa), legal and local approval of infrastructural development will be given by Pathumwan district office and other related agencies involved is the Metropolitan Electricity Authority and PMCU.



Table 5.2

Policy recommendation and stakeholder roles

15-Minute Banthat Thong programming	Density	Diversity	Proximity	Digitalisation
Objective	Increase urban density to support future population growth	Promote mixed use neighbourhood with six essential urban social functions	Facilitate convenient routes to basic amenities in the proximity with pedestrian oriented design	Integrating digital tools and develop infrastructure to enhance safety and efficiency of future transportation
Policy recommendation	Promotion of adaptive reuse of old existing buildings	Promotion of mixed-use development and on ground activity	Transformation of conventional form-based codes to hybrid code system with mixed-use zoning and program	Smart city promotion incentive
	PPP model for building renovation	PPP model for developing mixed-use complex	Specific plan development for Banthat Thong road (see conceptual master plan for 15-Minute Banthat Thong under 4 main dimensions: Density, Diversity, Proximity and Digitalisation)	<u>Financial incentive</u> Tax incentive for smart and clean mobility service provider (part of Smart city infrastructure systems and intelligent network development under Smart Mobility)
	<u>Financial support</u> PMCU: Renovation grant, contractor-material resources, plan consultancy Business and private sector, Private developer: design and business proposal, development capital	<u>Financial incentive</u> Property/Income tax exemption for building with on ground commercial-active program FAR bonus for building that provide affordable housing	Mobility and traffic management plan (see conceptual master plan for 15-Minute Banthat Thong: Mobility program, proximity and digitalisation dimension)	8-year of corporate income tax exemption (100 % of the total investment without land cost and working capital is eligible for an exemption from corporate income tax)

Table 5.2

Policy recommendation and stakeholder roles (Cont.)

15-Minute Banthat Thong programming	Density	Diversity	Proximity	Digitalisation
Objective	Increase urban density to support future population growth	Promote mixed use neighbourhood with six essential urban social functions	Facilitate convenient routes to basic amenities in the proximity with pedestrian oriented design	Integrating digital tools and develop infrastructure to enhance safety and efficiency of future transportation
Policy recommendation	Promotion of adaptive reuse of old existing buildings	Promotion of mixed-use development and on ground activity	Transformation of conventional form-based codes to hybrid code system with mixed-use zoning and program	Smart city promotion incentive
	Regulatory Support Extended or discounted Rental/Leasing Agreement and Contract Proofing legal document submission and necessary paperwork to local authorities	Regulatory Support Proofing legal document submission and necessary paperwork to local authorities	Urban street design plan and guideline (see design representation: Perspective Sketch/Collage: Pedestrian walkway with adaptive reuse of old shop houses, universal design and bicycle lane)	
Stakeholder				
Lead	PMCU		CUURP, PMCU	Samyan Smart City
Partner	Developer, property management, private businesses			
Fund	PMCU, Business and private sector		Samyan Smart City, depa	Thailand Board of Investment, depa
Legal Support	Pathumwan District Office	The Revenue Office, Pathumwan District Office	Department of Public Works and Town & Country Planning, Pathumwan District Office	Pathumwan District Office
Other			Pathumwan Police Station	Metropolitan Electricity Authority, PMCU

Source: Researcher, 2022

5.1.2.2 Stakeholder engagement and ecosystem analysis

The urban development projects for the development of 15-Minute Banthat Thong will require active engagement with various stakeholders from all sectors for the development and implementation of the framework to be successful. To ensure participation from relevant parties building consensus is also essential. In order to see all of the potential stakeholders' relationships and their main roles, the stakeholder ecosystem (Figure 5.9) and list of stakeholders are listed below.

15-Minute Banthat Thong stakeholders are separated into three main hierarchies determined by the level of interest and involvement in the development of 15-Minute Banthat Thong.

1) Target users

Target users have the highest stake in the development project as they are the target groups of people who will be interacting and doing activities in the space; they are the beneficiaries of this development project. The target users' involvement in the development is early and highly valuable, as demonstrated in this research process; engaging with the target users to ensure a clear understanding of the situation through observation and conducting questionnaires is a way to extract insights and empathise with them. It is crucial to involve the beneficiary group in any development project as their contribution will be most beneficial to developers as well.

The target users are Banthat Thong locals and generation X and Y visitors.

2) Target industries (businesses)

The target industries will include stakeholders involved with the development of the project, primarily partners organisation that, with different inputs, will work together to realise the project development plans. In this stakeholder group specifically for 15-Minute Banthat Thong, the entities include shared mobility companies, clean mobility companies and Chulalongkorn University.

(2.1) Shared mobility company: shared mobility company will supervise the system and manage the fleet operation. With the provided multiple

locations of the new transit hub, those companies can utilise it for their rental station. Some of the possible companies may include, Shared EV companies such as Haupcar and Volt, shared bicycle companies such as Anywheel or state-owned PunPun Bike Share, shared e-scooter companies such as neuron.

(2.2) Clean mobility company: Car and motorbike will benefit from this as a vehicle provider by selling or partnering with the shared mobility company, their supplies of EV vehicles at the same time can promote their cars to the public as well.

(2.3) Chulalongkorn University: Property Management of Chulalongkorn University (PMCU), as the landlord and the development lead in the project, will have to oversee progress and make decisions with coordination from the working group and all of the involved stakeholders, Department of Urban & Regional Planning, Faculty of Architecture, Chulalongkorn University, together with Urban Design and Development Center (UddC) can provide academic input and database, help come up with conceptual and detailed design solutions and provide consultancy.

3. Supporting organisations

The last stakeholder groups are the supporting organisations. Although they do not have direct contributions, their authorities, products and services are in support of the development program. Engagement with this group of stakeholders is also important in realising the implementation of the development.

(3.1) Local Authorities: Bangkok Metropolitan Administration (BMA), Pathumwan District Office (PR & Regulatory support), Pathumwan Police Station (crime prevention and traffic monitoring), Department of Public Works and Town & Country Planning (development plan authorisation and consultancy), Metropolitan Electricity Authority (EV Charging station, smart street light)

(3.2) Smart city-mobility accelerator: gives policy support and potentially provides funding for the project development. The main entity is Digital Economy Promotion Agency (depa), which drives the Smart City Thailand and Samyan Smart City initiatives.

(3.3) Internet service provider: potential partners in providing data and other technological platforms such as WIFI, GPS, and application that will be used to support the future state of mobility with shared EV to autonomous vehicles. Businesses that lie in this group may include True Corporation Public Company Limited (TRUE), Advanced Info Service Public Company Limited (AIS), Total Access Communication Public Company Limited (dtac), CAT Telecom Public Company Limited, National Telecom Public Company Limited (NT) and TOT.

(3.4) Future mobility infrastructure provider: potential partners in setting up EV charging stations, mostly will be located in the petrol stations such as PTT, ESSO, SHELL and SUSCO

(3.5) Mobility maintenance: maintenance service provider and possible partners to set up maintenance stations and service centres, which may include local garages and big chains service providers such as B-Quik or Goodyear Autocare.

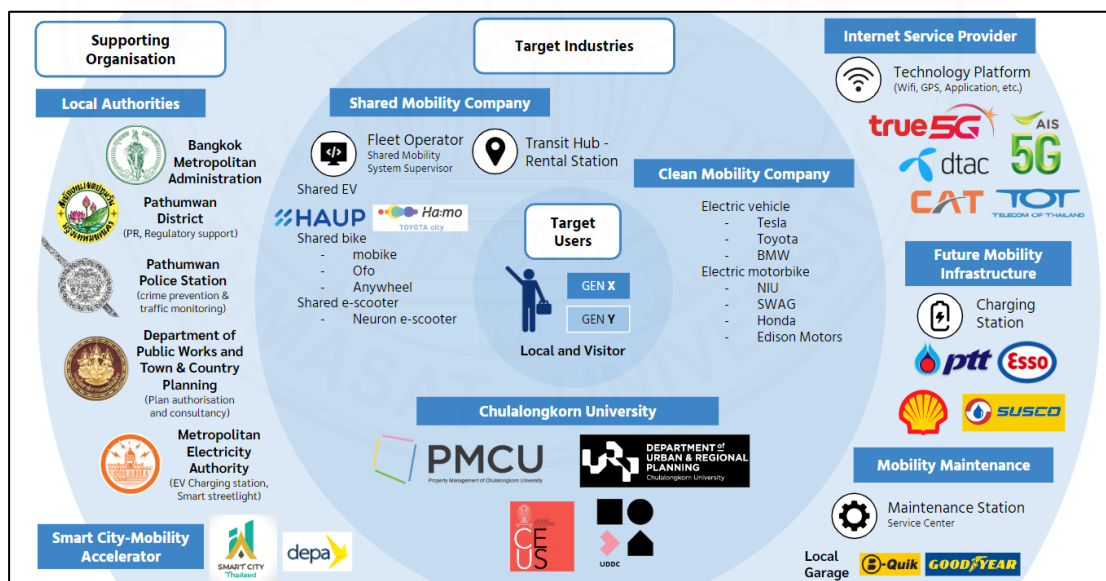


Figure 5.9 Stakeholder ecosystem

Source: Researcher, 2022

5.1.2.3 Action plan

The final research question from this research, by looking at Banthat Thong as an example. The recommendation for applying is to identify and recommend any aspect that would support the development of the 15-Minute City design concept in Thailand or provide a critical reflection on the effectiveness of the 15-Minute framework.

In order to make these proposal designs useful and can be implemented in actual development, the development team must develop clear roadmaps and action plans for the 15-Minute Banthat Thong project development. As demonstrated in the research, once the process has gone through project initiation and study process to determine the area's characteristics and needs, forming of a specialised framework by adapting from the 15-Minute City principles, visioning and designing phase, the next step of action planning is the stakeholder analysis including all parties, primarily local entities, that would be involved in the development and implementation of the 15-Minute City framework. To avoid miscommunication and to ensure that the work is distributed among partners, the details of the action plan should follow the following recommended process.

- 1) Set up an action plan to follow through with an indication of the roles of the involved party to work together.
- 2) Form working groups and sign a consensus or Memorandum of Understanding (MoU) to officialise commitment to the project.
- 3) Hold regular update meetings to track the development process, allowing the time to discuss any problems faced and come up with solutions together as a team. Meetings should be held appropriately and timely in a manageable amount of time. The making of the meeting agenda is recommended.
- 4) Working through established project development committees and working groups is another method to work on a project which requires a different set of skills and ideas.
- 5) With support from the local authorities, the development plan should be proposed and asked for implementation approval.

6) At the same time, the development proposal with supported evidence and clear development direction and goals can be used to find funds from agencies such as Digital Economy Promotion Agency (depa) and prospective development partners.

7) Once the funds and the plan are approved, construction for physical improvement according to the design can start.

8) Development completed.

9) Development evaluation to see and assess the project's success by looking at how many goals set at the beginning are being fulfilled. For example, if the goals are to reduce traffic congestion in the area, there should be less congestion on the road after the development.

10) Set up a maintenance plan similar to the development plan. Maintenance is also essential in assuring development sustainability; clear roles and responsibilities should be identified.

Following this step-by-step action plan will develop clear key action pathways for 15-Minute City Banthat Thong Development, which will be finalised by involved stakeholders and community which can lead to the achievement of the project.

5.2 Research conclusion

To answer the last research question of “How can we develop 15-Minute City framework as an urban design guideline for Thai city?” the following will discuss aspects that would support the development of the 15-Minute City design concept in Thailand, how can it promote seamless mobility through a case study design development at Banthat Thong road.

5.2.1 Application of 15-Minute City framework in Thailand context

The 15-Minute city framework is a popular comprehensive urban development principle that many cities reference as a guideline for urban planning goals and guidelines. It focuses mainly on the principles of how to create a complete, compact, mixed-use neighbourhood. However, the listed principles are too broad and lack specific details. In order to adapt the concept into strategic planning and design implementation tool for Banthat Thong or any other neighbourhood around the world, contextualised framework or localised principles and criteria are formed and regulated to fit with the context of the area.

There are many variables to consider in adapting the 15-Minute City framework to tailor to Bangkok, Thailand, to utilise the principle and form a specific guideline which could lead to a clear action plan and solution for the specific site. Below are some of the variables considered in framing the 15-Minute City Framework as an Urban Design Guideline for Banthat Thong.

1) Regional climate: Hot climate is another factor that is unencouraging for walking and biking. Walkable distance for Thai compared to the standard of 400-800 metres are within a shorter distance of 200-400 metres.

2) User mobility behaviour: Bangkok is still a car-dependent city with dense and congested road networks, so facilities such as parking spaces or park-and-ride facilities are still necessary.

3) Transportation infrastructure: More public transportation development and improvement would support the implementation of the 15-Minute City framework in Bangkok as it will provide efficient and widespread coverage of mobility options apart from private vehicles.

4) Banthat Thong characteristic of a 15-Minute City: The urban design guideline proposed for this research is highlighted on the proximity and digitalisation dimensions because Banthat Thong lacks the infrastructure and physical space design necessary to support future mobility and transportation. Different areas would have their development prioritisation that would fit the context and the situation each area faces.

5) The existing condition of the environment: When other physical problems are identified even though it is not applicable directly following the development framework. Those issues should be addressed and incorporated into the development plan as well because the urgent issue, when left untouched or overlooked, will be a hindrance later in any urban development project. One of the prominent examples from Banthat thong is the problem of the cleanliness of the footpath and rundown shophouses; without solving this issue, a walkable and safe neighbourhood cannot be achieved as there is the risk of crime and the abandoned building condition will discourage walking in the area.

6) Stakeholder engagement: Implementing a 15-Minute City model requires active engagement with stakeholders from all sectors, including residents, businesses, community organisations, and local government agencies. It is essential to establish an agreement to ensure the involvement and participation of all relevant parties in the earlier stage for the process to achieve successful development and implementation of the framework.

For example, the leading actor in the 15-Minute Banthat Thong project is the Property Management of Chulalongkorn University (PMCU). As the land owner and Samyan Smart City initiative manager, PMCU has the role of overseeing progress and making decisions with coordination from all sectors, including Chulalongkorn University with academic and database input, private companies with products and services aligned with the targeted industry of mobility development such as MuvMi, Toyota Ha:mo and other shared mobility services such as Anywheel for shared bicycle and e-scooters. Other than provided by the partner developers, funding support is provided by Digital Economy Promotion Agency (depa) as a smart city – smart mobility accelerator, together with support from local government bodies such as the Pathumwan district office and police station. The stakeholder ecosystem is supported by one another for the same purpose of achieving the development goals.

5.2.2 Discussion on 15-Minute City framework: A comparative analysis

With the aim to study and apply the 15-Minute City framework to the Thai cities' context, this paper explores the framework from previous studies on three foreign cities in different parts of the world - Paris, France, Melbourne, Australia and Portland, USA - that have employed and adapted the concept theory of 15-Minute City to the real-world urban development initiatives as case studies.

In this section, a discussion of the similarities and differences of each approach will be compared with the 15-Minute City promotion conceptual project in the case study area of Banthat Thong road. The differences identified could contribute to the discussion point of new development opportunities and ways to incorporate the framework into the urban implementation process.

Table 5.3 below summarises the key characteristics of the approach under five categories: type of urban initiative, main aim/goals, scale of development, development priorities and development process.

Table 5.3

Comparative case study of 15-Minute City framework adaptations

Case study of 15-Minute City framework adaptation	Paris en Commun 2020	Melbourne 20-Minute City	The Portland Plan 2012	15-Minute Banthat Thong
Type of urban initiative	Comprehensive urban development initiative	Planning and urban development concept	Comprehensive strategic plan (long-term plan)	Urban design guideline
Aim/ Goals	To create a more sustainable, equitable, and citizen-centred urban environment.	To create self-sufficient and vibrant neighbourhoods where residents can meet most of their daily needs within a 20-minute walk from their homes.	To create an inclusive, sustainable, and prosperous city. To achieve a 'complete neighbourhood'	To create an active neighbourhood with seamless, safe and convenient transportation
Scale of Development	City level: The city of Paris, France	Neighbourhood level: The city of Melbourne, Australia	City level: The city of Portland, Oregon, USA	Neighbourhood level: The city of Bangkok, Thailand

Table 5.3

Comparative case study of 15-Minute City framework adaptations (Cont.)

Case study of 15-Minute City framework adaptation	Paris en Commun 2020	Melbourne 20-Minute City	The Portland Plan 2012	15-Minute Banthat Thong
Development Priorities	- Enhanced Public Transportation, Pedestrian-Friendly Infrastructure - Mixed Land-Use - Access to Essential Services - Green Spaces and Environment	- Neighbourhood-Centred Development - Access to Local Amenities - Active and Sustainable Transportation - Local Economic Development	- Neighbourhood Planning and Vitality - Equitable Access - Mixed-Income Housing - Community Engagement	- Integrating technologies to enhance safety and efficiency of future transportation - Universal street design; pedestrian-oriented design - Active mobility - Mixed-use development
General development process	- Vision and Goals - Stakeholder Engagement - Data Collection and Analysis - Strategy Formulation - Implementation and Monitoring	- Research and Planning - Community Consultation - Neighbourhood Plan Formulation - Pilot Projects - Citywide Coordination	- Vision and Goals - Community Engagement - Policy Formulation - Implementation and Integration - Monitoring and Updates	- Data collection and site analysis - Formulation of specialised development framework - Visioning and Designing - Stakeholder engagement - Design development and implementation - Monitoring and maintenance plan

Source: Researcher, 2023

The main differences of each urban initiative have a distinct scope and scale of development. While Paris en Commun and The Portland Plan cover the entire metropolitan area, Melbourne's 20-Minute Neighbourhood and 15-Minute Banthat Thong have a more localised focus on individual neighbourhoods within the respective cities.

The similarities showcase the prominent process of urban development under the 15-Minute city framework to ensure sustainable and inclusive growth. All of the four initiatives incorporate community engagement and collaboration between different administrative levels to achieve their development goals.

Furthermore, the three foreign case studies highlight the importance of policy guidelines in the application of the 15-Minute City framework. Even though the physical design results of the planned and realised development from the three case study cities of Paris, Melbourne, and Portland are different, the approach of the three cities implementing the 15-Minute City framework in their urban planning guideline clearly demonstrates the crucial role of top-down urban planning regulation that is aimed towards the development of 15-Minute City concept. Similar to the Smart City Thailand initiatives, where the 15-Minute Banthat Thong initiative can fit under the driving of the Samyan Smart City project with the alignment of smart mobility development, Smart City Thailand provided clear criteria and guidelines for smart city development as well as regulations and privileges program that would promote smart city development by attracting different investors and partners to realise the development initiative in the governmental provision of guidelines and goals.

In summary, each of these urban initiatives is tailored to the specific environment and challenges of its respective city. While they share common themes such as liveability, sustainability, community engagement, and inclusivity by focusing on proximity, access to amenities, and reducing the need for long commutes, but each approach has its unique focus areas and strategies to improve the quality of life for their residents by adapting principles of the 15-Minute City framework.

5.2.3 15-Minute City and seamless mobility

Table 5.3 below compares Banthat Thong's physical condition under seamless mobility criteria before and after the design and regulatory implementation of 15-Minute City as an urban design guideline in Banthat Thong.

Table 5.4

Comparison of Banthat Thong physical condition under seamless mobility criteria before and after design and regulatory implementation of 15-Minute City framework as an urban design guideline in Banthat Thong

Seamless mobility criteria	Implementation of 15-Minute City framework in Banthat Thong	
	Before	After
High convenience: more point-to-point trips in the area	- sidewalks are hard to walk with many obstacles and uneven surfaces	- smoother walking and biking experience making it more convenient to travel on foot
	- roadside parking cause traffic congestion and could leads to accidents	- with restrictions, open up space for bike/scooter lane, making it more convenient for cyclist
Sufficient and abundant availability of transport system: passenger-kilometre per year	- Bus, CU Pop Bus, MuvMi	- additional transportation system: EV car sharing, EV bike and scooter rental stations, better connection to MRT and BTS
Travel time is fast and efficient: less time consuming and less average time per trip	- Traffic congestion and finding a parking spot is time consuming	- Less traffic = less travel time
Affordable: less expensive cost per trip	- Private cars pays for petrol, parking fee	- encourage walking and provide, pedestrian centred design = free
High sustainability: fewer emissions of greenhouse gases per year	- Private cars emits 4.6 metric tons of carbon dioxide per year (https://www.epa.gov)	- Provide more sustainable transport choices with electric power buses, shared electric vehicles and bicycle
		- Promotion the use of public transportation in traveling to and out of the area reduce the use of private vehicles
		- Urban space encourage walking = exercise, no greenhouse gases emission from private vehicles

Source: Researcher, 2022

As a result, it is notable that the design implemented according to the 15-Minute City framework helps improve seamless mobility in the area.

5.3 Research limitation

Firstly, as the research is done in a period of time when the spread of coronavirus (COVID-19) situation in Thailand is happening, there are strict measures issued by the government and the health department recommendation to control the spread of covid-19 such as social distancing and lockdown procedures. Data collection processes are limited by the pandemic situation, where site observation cannot be done frequently, and onsite interviews are inconvenient.

Secondly, the research result is focused on the development and policy recommendation on specific areas with unique characteristics - Banthat Thong, so it would be a more complex process to implement the recommended action plan and contextualised framework as a default template development model to integrate the development of the other areas.

5.4 Future research recommendations & remarks

As the final remarks of this research, the following are points gathered throughout the process of conducting this research paper that addressed some of the limitations faced and other points regarding how to improve this paper as future research recommendations.

- 1) In the data collection process, especially with the questionnaire, gathering more responses from an equal sample size in demographic aspects (e.g. similar data size from all age groups) would make the data more reliable.
- 2) Conduct more interviews with the local community and local authorities, especially with Property Management of Chulalongkorn University (PMCU).
- 3) Banthat Thong site observation checklist could develop to include more details regarding the level of quality of each checkpoint, not just the availability of the program and services.

4) As demonstrated in the methodology of the spatial data analysis, the layering of qualitative and quantitative data in various aspects will be of assistance to the researcher, as it could clearly specify the intensity of the main issues in the study areas and see new development opportunities. The complex analysis allows us to innovate new ideas and simultaneously support those ideas with solid evidence. In any urban and development research, the use of both qualitative and quantitative data is immensely encouraged.

5) Considering design for e-commerce and logistics in the site, as the movement of goods is also important to achieve the 15-Minute City concept.

6) Physical environment design recommendations with clear diagrams, perspectives, sections or pictures can help deliver the message easier than a descriptive explanation because it can communicate the design as a visual aid.

7) Uncontrollable threats such as COVID-19 or political unrest will have a socioeconomic effect on the neighbourhood, so to make the plan for 15-Minute City Banthat Thong to be more sustainable and comprehensive, planners may have to consider incorporating a contingency plan or add more details such as how can the proposed program help ease the COVID-19 situation for business owners and residence or how technology such as smart CCTV can ensure the neighbourhood safety during political unrests.

8) Regarding the implementation of the modified contextualised framework, 15-Minute City for Banthat Thong, while it is easier to apply the same methodology in city development under 15-Minute City to a commercial area in the land that is owned by one entity in the context of Thailand (similar to Banthat Thong), implementing the framework to other areas is not impossible as shown in the case studies from multiple countries in Chapter 2. Without following the identical development priorities or focuses of what is suggested in this research paper, by integrating the key elements of the 15-Minute City framework and extracting the methodology suggested for Banthat Thong road, the 15-Minute City framework could be applied extensively to any place wish to achieve the main goals of a walkable and compactly designed neighbourhood. The implementation of the framework

throughout multiple neighbourhoods could amplify the urban sustainably and lead to a seamless mobility development as a whole, such as city-wide transit-oriented development, interconnecting transportation infrastructure development and the development of feeder systems which focuses on the first-and-last mile mobility in the city.



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The seal of Thammasat University is a circular emblem. It features a central five-petaled lotus flower. Above the lotus is a horizontal bar with five lines, and above that is a crown-like structure. The lotus is flanked by two crossed swords. The entire emblem is enclosed in a circular border. The top half of the border contains the university's name in Thai script, and the bottom half contains the name in English, "THAMMASAT UNIVERSITY".

APPENDICES

APPENDIX A

DATA COLLECTION TOOL: QUESTIONNAIRE

แบบสอบถามประเภทกิจกรรมและการเดินทางในย่านบรรทัดทอง Banthat Thong's Activities and Commute Questionnaire

คำชี้แจงในการตอบแบบสอบถาม

แบบสอบถามนี้จัดทำขึ้นเพื่อศึกษาและวิจัยสภาพของบริบทพื้นที่ย่านบรรทัดทอง เพื่อการศึกษาเป็นแนวทางในการจัดทำวิทยานิพนธ์ หัวข้อเรื่อง "การส่งเสริมการออกแบบเมืองตามกรอบการพัฒนาเมือง 15 นาที: กรณีศึกษา ถนนบรรทัดทอง กรุงเทพมหานคร (Promotion of 15-Minute City Framework as an Urban Design Guideline: A Case Study of Banthat Thong Road, Bangkok)" ภายใต้หลักสูตรปริญญาโท โครงการหลักสูตรการออกแบบพัฒนาชุมชนเมือง (หลักสูตรนานาชาติ) คณะสถาปัตยกรรมศาสตร์และการผังเมือง มหาวิทยาลัยธรรมศาสตร์

จึงเรียนขอความอนุเคราะห์ข้อมูลเพื่อการศึกษาใน 3 หัวข้อ ได้แก่

1. การใช้พื้นที่ กิจกรรม และจุดสนใจในพื้นที่บรรทัดทอง
2. การสัญจรในพื้นที่บรรทัดทอง
3. ข้อมูลส่วนบุคคลเบื้องต้น

ข้อมูลที่ได้จากการตอบแบบสอบถามของท่านจะถูกรวบรวมไว้เป็นความลับและจะเป็นประโยชน์อย่างยิ่งในการพัฒนาและปรับปรุงให้มีความเหมาะสมต่อไป

ติดต่อสอบถามข้อมูลเพิ่มเติม

นางสาวธนวรา ชวลีชัย นักศึกษาปริญญาโทหลักสูตรการออกแบบพัฒนาชุมชนชนเมืองมหาบัณฑิต (หลักสูตรนานาชาติ) ชั้นปีที่ 2 เบอร์โทรศัพท์มือถือ 083-439-5888 หรือ อีเมล tanavara_chaw@dome.tu.ac.th

* Required

จดหมายขอความอนุเคราะห์ข้อมูลเพื่อการศึกษา



File # 67.35/275

คณะสถาปัตยกรรมศาสตร์และการผังเมือง มหาวิทยาลัยธรรมศาสตร์
FACULTY OF ARCHITECTURE AND PLANNING, THAMMASAT UNIVERSITY

14 กุมภาพันธ์ 2565

เรื่อง รอคอยอนาคตที่สดใสเพื่อการศึกษา

เขียน ผู้ใช้พื้นที่ถนนบวรทิศของ กรุงเทพมหานคร

ด้วยโครงการหลักสูตรการออกแบบพัฒนาชุมชนเมือง (หลักสูตรนานาชาติ) คณะสถาปัตยกรรมศาสตร์และ
การผังเมือง มหาวิทยาลัยธรรมศาสตร์ ได้เปิดวิชา อบ.800 วิทยานิพนธ์ จำนวน 12 หน่วยกิต ให้แก่นักศึกษาระดับ
ปริญญาโท ภาคการศึกษาที่ 2/2564 นี้

ในการนี้ นางสาวกรรมา ขาวขี้ยัง เลขทะเบียนนิติศึกษา 6316125055 เบอร์โทรศัพท์มือถือ 083-499-5888 นักศึกษาคณะรัฐประศาสนศาสตร์ สาขารัฐการปกครอง มหาวิทยาลัยราชภัฏวไลยอลงกรณ์ จังหวัดปทุมธานี ซึ่งเป็นที่ 2 มีความประสงค์จะขอใช้ประโยชน์ที่ดินบริเวณสวนสาธารณะ เพื่อการศึกษาเชิงนิเวศวิทยาและการจัดทำวิทยานิพนธ์ หัวข้อเรื่อง "การส่งเสริมการท่องเที่ยวเชิงนิเวศในสวนสาธารณะที่มีพื้นที่ 15 นาที กรณีศึกษา สวนนกพิราบทอง กรุงเทพมหานคร (Promotion of 15-Minute City Framework as an Urban Design Guideline: A Case Study of Banhat Thong Road, Bangkok)" โดยนิตยสารเมืองสี ต่อต่อไป

- 1) การใช้พื้นที่ กิจกรรมและจุดสนใจในบรรทัดทอง
- 2) การสัญจรในพื้นที่บรรทัดทอง
- 3) ข้อเสนอส่วนบุคคล

จึงมีบทบาทเพื่อลดความรุนแรงทางวัฒนธรรมเพื่อการศึกษาด้วยรายละเอียดข้างต้น จักรลงคนนี้

(ผู้ช่วยศาสตราจารย์ ดร. ศิวพร กลิ่นมาลัย)

รองศาสตราจารย์วิชากร

ปฏิบัติกิจการแทนตนเองที่คณะกรรมการศาสตร์และการพัฒนา

การใช้พื้นที่ กิจกรรมและจุดสนใจในบรรทัดทอง (Activities and Attraction Points in Banthat Thong)

1. คุณมาใช้พื้นที่บรรทัดทองบ่อยแค่ไหน (How often do you come to Banthat Thong?) *

Mark only one oval.

- ☐ ทุกวัน (Everyday)
- ☐ ทุกอาทิตย์ (Once a week)
- ☐ ทุกเดือน (Once a month)
- ☐ ไม่ค่อยบ่อย ประมาณปีละครั้งหรือน้อยกว่า (Not often, about once a year or less)
- ☐ Other: _____

2. ปกติคุณใช้เวลาในพื้นที่บรรทัดทองนานเท่าไร (How long do you normally spend in Banthat Thong?) *

Mark only one oval.

- ☐ 1-15 นาที (1-15 minutes)
- ☐ 15-30 นาที (15-30 minutes)
- ☐ 30-45 นาที (30-45 minutes)
- ☐ 45 นาที - 1 ชั่วโมง (45 minutes to 1 hour)
- ☐ มากกว่า 1 ชั่วโมง (more than 1 hour)

3. ปกติคุณใช้พื้นที่บรรทัดทองในช่วงเวลาไหนของวัน (What time of day do you usually spend time in Banthat Thong?) *

Mark only one oval.

- ☐ ช่วงเช้า 07:00-12:00
- ☐ ช่วงบ่าย 12:01-17:00
- ☐ ช่วงเย็น 17:01-22:00
- ☐ 22:00 เป็นต้นไป

4. โปรดระบุความสัมพันธ์ของท่านกับย่านบรรทัดทอง (Please specify your relationship with Banthat Thong) *

Mark only one oval.

- ☐ คนในพื้นที่ (Local)
- ☐ คนทำงานในบริษัท/หน่วยงานแถวนี้ (Works in the area)
- ☐ นักเรียน/นักศึกษา ที่มาเข้าโรงเรียน/วิทยาลัย แถวนี้ (Studies in the area)
- ☐ นักท่องเที่ยว (Tourist)
- ☐ ขาจรร่วมกิจกรรมหรือทำธุระ (Only to attend activities or run errands)
- ☐ Other: _____

5. เหตุผลที่มาบรรทัดทอง (Reason of Visiting Banthat Thong?) ตอบได้หลายข้อ Multiple answers valid *

Check all that apply.

- ☐ รับประทานอาหาร (Dining)
- ☐ มาเจอเพื่อน (Meeting Friends/Hangout)
- ☐ มาทำกิจกรรมนันทนาการ กีฬา ออกกำลังกาย (Walking/Exercise)
- ☐ มาซื้อของ เดินดูของช้อปปิ้ง (Shopping)
- ☐ เดินทางผ่าน/ต่อรถ (Pass by to other destination/Interchange)
- ☐ มาทำงานบริษัท/หน่วยงานในพื้นที่ (Working)
- ☐ พาสัตว์เลี้ยงมาเดินเล่น (Walking Pets)
- ☐ มาใช้เวลากับครอบครัว (Spending time with family)
- ☐ เที่ยวเล่นคนเดียว/ชมวิว (Walking, Site seeing)
- ☐ มาเข้าร่วมกิจกรรมทางวัฒนธรรม ศาสนา การแสดงต่างๆ (Attending cultural activities, religious activities, show and exhibition etc.)
- ☐ มาเรียน (Study)
- ☐ มาใช้บริการ Co-working space

Other: ☐ _____

6. สถานที่ที่คุณมาในพื้นที่บรรทัดทอง (Places in Banthat Thong that you visit) ตอบได้หลายข้อ Multiple answers valid *

Check all that apply.

- ☐ สวนจุฬาร้อยปี (CU Century Park)
- ☐ ร้านอาหาร (Restaurant)
- ☐ จุฬาลงกรณ์มหาวิทยาลัย (Chulalongkorn University)
- ☐ สเตเดียม วัน (Stadium One)
- ☐ ตลาดสามย่าน (Samyan Market)

Other: ☐ _____

7. คุณอยากให้อ่านบรรทัดทองมีบริการหรือกิจกรรมอะไรเพิ่มเติม (What other services or activities you want to see in Banthat Thong?) ตอบได้หลายข้อ Multiple answers valid *

Check all that apply.

- ☐ สถานที่อยู่อาศัย (หอพัก คอนโด ห้องเช่า) (Accommodation)
- ☐ สถานที่ทำงาน (Workplace)
- ☐ สถานที่ co-working (Co-working Space)
- ☐ สถานพยาบาล/ร้านขายยา (Healthcare Facilities/ Pharmacy)
- ☐ ที่จอดรถ (Parking Space)
- ☐ บริการเช่าจักรยาน, e-scooter (Bike/E-Scooter Rental Service)

Other: ☐ _____

การสัญจรในพื้นที่บรรทัดทอง (Mobility in Banthat Thong)

8. รูปแบบการเดินทางที่คุณใช้ในการเดินทางมาย่านบรรทัดทอง (Mode of Transport Used to reached Banthat Thong) ตอบได้หลายข้อ Multiple answers valid *

Check all that apply.

- ☐ เดิน (Walk)
☐ ปั่นจักรยาน (Bicycle)
☐ รถยนต์ส่วนตัว (Personal Car)
☐ BTS
☐ MRT
☐ รถโดยสารประจำทาง/รถเมล์ Bus
☐ รถตู้ Van
☐ เรือด่วน Ferry
☐ แท็กซี่ (Taxi)
☐ วินมอเตอร์ไซด์ (Motorcycle Taxi)
☐ ตุ๊กตุ๊ก (Tuk Tuk)
☐ MuvMi
☐ รถป๊อป CU Pop Bus
☐ รถไฟฟ้าแบ่งปันขนาดเล็ก CU Shared EV

Other: ☐ _____

9. รูปแบบการเดินทางที่คุณใช้ภายในย่านบรรทัดทอง (Mode of Transport Used inside Banthat Thong) ตอบได้หลายข้อ Multiple answers valid *

Check all that apply.

- ☐ เดิน (Walk)
☐ ปั่นจักรยาน (Bicycle)
☐ รถยนต์ส่วนตัว (Personal Car)
☐ รถไฟฟ้าแบ่งปันขนาดเล็ก CU Shared EV
☐ ตุ๊กตุ๊ก (Tuk Tuk)
☐ MuvMi
☐ รถโดยสารประจำทาง/รถเมล์ (Bus)
☐ แท็กซี่ (Taxi)
☐ วินมอเตอร์ไซด์ (Motorcycle Taxi)

Other: ☐ _____

10. โปรดระบุค่าใช้จ่ายที่ใช้ในการเดินทางมาและระหว่างใช้พื้นที่ในบรรทัดทองโดยประมาณของคุณ (Estimated costs of traveling to and during your stay in Ban Thong Thong area) *

Mark only one oval.

- ☐ น้อยกว่า 50 บาท (less than 50 Baht)
☐ 50-100 บาท (50-100 Baht)
☐ 101-200 บาท (101-200 Baht)
☐ 201-300 บาท (201-300 Baht)
☐ 301-400 บาท (301-400 Baht)
☐ 401-500 บาท (401-500 Baht)
☐ มากกว่า 500 บาท (more than 500 Baht)

11. คุณรู้สึกอย่างไรกับการเดินทางในบริเวณย่านบรรทัดทอง (How do you feel about the commute in Banthat Thong area?) *

Mark only one oval per row.

	แย่มาก (Very Bad)	แย่ (Bad)	ไม่แน่ใจ (Unsure)	ดี (Good)	ดีมาก (Very Good)
อุณหภูมิ (Temperature)	☐	☐	☐	☐	☐
สภาพทางเท้า (Footpath Condition)	☐	☐	☐	☐	☐
การเดินสะดวกไร้สิ่งกีดขวาง (Clear walking path with no obstacles)	☐	☐	☐	☐	☐
สิ่งกันลมกันฝน (Shading)	☐	☐	☐	☐	☐
อิสระในการเข้าใช้พื้นที่ (Accessibility)	☐	☐	☐	☐	☐
ที่จอดรถ (Parking Area)	☐	☐	☐	☐	☐
สภาพการจราจร (Traffic Condition)	☐	☐	☐	☐	☐

12. คุณคิดว่าอะไรจะทำให้การเดินทางภายในบรรทัดทองดีขึ้น (What do you think will make commute within Banthat Thong better?)

ข้อมูลส่วนบุคคล (Personal Information)

13. สัญชาติ (Nationality) *

Mark only one oval.

- ☐ ไทย (Thai)
☐ Other:

14. อายุ (Age) *

Mark only one oval.

- ☐ น้อยกว่า 20 ปี (less than 20 years old)
☐ 21-30 ปี (21-30 years old)
☐ 31-40 ปี (31-40 years old)
☐ 41-50 ปี (41-50 years old)
☐ 51-60 ปี (51-60 years old)
☐ มากกว่า 60 ปี (more than 60 years old)

15. อาชีพ (Occupation) *

Mark only one oval.

- ☐ นักเรียน/นักศึกษา (Student)
☐ อาชีพอิสระ (Freelancer)
☐ พนักงานบริษัทเอกชน (Employee)
☐ นักธุรกิจ/เจ้าของกิจการ (Business Owner)
☐ พนักงานในหน่วยงานของรัฐ (Government Officer)
☐ เกษียณอายุ (Retired)
☐ ว่างาน/อยู่ในระหว่างการหางาน (Unemployed)
☐ Other:

16. รายได้ต่อเดือน (Monthly Income) *

Mark only one oval.

- ☐ ต่ำกว่า 15,000 บาท (less than 15,000 Baht)
- ☐ 15,000-25,000 บาท (15,000-25,000 Baht)
- ☐ 25,001-35,000 บาท (25,001-35,000 Baht)
- ☐ 35,001-45,000 บาท (35,000-45,000 Baht)
- ☐ 45,001-55,000 บาท (45,001-55,000 Baht)
- ☐ มากกว่า 55,000 บาท (more than 55,000 Baht)

ข้อเสนอแนะเพิ่มเติม

17. ข้อเสนอแนะเพิ่มเติมของท่านในการเดินทางเข้ามาใช้พื้นที่บรรทัดทองให้มีความสะดวกสบายมากขึ้น

ขอขอบพระคุณทุกท่านที่ให้ความอนุเคราะห์ตอบแบบสอบถามฉบับนี้เป็นอย่างยิ่ง

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Google Forms

APPENDIX B

DATA COLLECTION TOOL: SITE SURVEY AND ON-SITE OBSERVATION CHECKLIST

Banthat Thong Observation Checklist: 15-Minute City Framework

Density	☐	Population Density 80-120 People Per Rai
	☐	Building Density FAR 10:1
	☐	OSR 3%
	☐	Maximum BCR 90%
Diversity	☐	Living: single-detached house, apartment, townhouse, condominium, hotel
	☐	Working: Employment centre, e.g. office, factory
	☐	Commerce: Market, local shops, department store
	☐	Healthcare: hospital, pharmacy, clinic
	☐	Education: Nursery, Primary & Secondary Schools, Tutorial School, University & Collage
Proximity	☐	Culture and Entertainment: Tourist attraction, Night Club, Cinema, Religious places (e.g. Temple, Church, Mosque)
	☐	800 metres to a playground & kindergarten - primary school (Education)
	☐	800 metres to a business-service cluster (Working-Healthcare)
	☐	800 metres to a local shop-store (Commerce)
	☐	800 metres to a park (Healthcare)
	☐	1,600 metres to a secondary school (Education)
	☐	1,600 metres to a religious place (Culture)
	☐	30-45 minutes to a hospital (Healthcare)
Digitalisation	☐	45 minutes - 1 hour to museum/theatre (Entertainment)
	☐	5G Coverage
	☐	CCTV
	☐	Charging Station (for EV)
	☐	Shared mobility application/service

BIOGRAPHY

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Scholarship	Year 2020: 2020 P Landscape Academic Scholarship for Master of Urban Design, UDDI

Publications

Chawanid, T. (2022). *Promotion of 15-Minute City Framework as an Urban Design Guideline: A Case Study of Banthat Thong Road, Bangkok, Thailand*. Paper presented at the 8th International Young Researchers' Round Table 2022 on Global Risk – Local Resilience Conference, Fusio, Switzerland, May 29, 2022.