

Crime Prevention through Environmental Design: A Case Study of Thammasat University Rangsit Campus

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Abstract

Crime is considered as one of the major social problems in Thailand that causes huge impacts to society. In order for a crime to occur, three elements must coincide; desire, ability, and opportunity. Therefore, crime prevention method can be done by reducing crime opportunity as other factors; desire and ability cannot be controlled by an external party. According to the Royal Thai Police (2019), the demographic data indicated that Pathum Thani is the second most unsafe district in the Bangkok and Metropolitan Region (BMR) after Bangkok. The researcher, therefore, chose a part of Thammasat University Rangsit campus which consists of a residential, recreational and commercial zone as the study area for this research. Mapping and overlay analysis are used as an analytical tool to identify an unsafe location. Analytic Hierarchy Process (AHP) is used to identify both physical and non-physical attributes associated with such unsafe locations. The results of the analysis illustrate that the area at the back of the main stadium is the most unsafe place when considering physical and non-physical attributes. On the other hands, considering user's experiences, the area around Laan Payanak are seen to be the most unsafe place as well as is known of being a crime location. According to our survey, the correspondents strongly agree that lighting illumination on pedestrian walkway contributes to their feeling of fear for crime the most. The result from the AHP also shows that users choose the lighting issue as the first priority as well. Recommendations for urban design guideline for crime prevention include (1) changing the pedestrian lights to allow better lighting and visibility of the users (2) encouraging more activities on the area of Laan Payanak to crowd the area, giving more security to people in the area (3) providing gate, operation time sign at every entrance to control the accessibility of each area and route, and (4) providing emergency equipment and information for self-help or calling for help.

Keywords

Crime Prevention

Environmental Design

Thammasat University Rangsit Campus

1. Introduction

Crime is a social phenomenon that occurs by the actions of one person or more who commit to doing so (Pinijesak, 1983). Crimes are violent and harmful to society (Civilian Security Organization, 2016). As such, crimes should be prevented. Even though, there are laws and legal punishment that used to control crimes, yet, the legal actions are in affected only after crimes occurred. Victims still confront crimes, in which violates their safety. In order for a crime to occur, three elements must coincide; desire, ability, and opportunity (International Association of Campus Law Enforcement Administrators (IACLEA, n.d.). As for crime prevention, this is an action preventing the crime before it occurs by reducing the chance of crime opportunity. This means that even if a person is planning in committing the crime and having an ability to do so, the crime opportunity is still required. Thus, by preventing the crime opportunity would mean that crime would not be committed as there is no opportunity. Physical or environmental surrounding plays an important role in crime prevention as the opportunity for crime to occur depends on this.

According to Wekerle & Whitzman (1994); as cited by Chubumrung (1984), universities and campuses are one of the safe areas. For Thammasat University Rangsit campus, the area is surrounded by a lively neighborhood. However, there are still many unsafe environments. For example, a lack of lighting and security management to prevent crime. Furthermore, there are still crimes that occurred within the campus area, according to the campaign from League of Liberal Thammasat for Democracy (LLTD, 2016) called "Crime was here" as shown in Figure 1. The campaign was conducted through a questionnaire, focusing on Thammasat University students in order to identify the criminal area. The results show that crimes do not occur only the surrounding area of the campus, but also inside the campus itself. LLTD has made the data of crime location and other significant

data of crime from the campaign "Crime were here" to be accessible by everyone. Therefore, the method of mapping is chosen as the tool used in conducting this research, in order to indicate the location of unsafe places that are potentially criminal areas. Nevertheless, due to the limitation of times, it is impossible to conduct this research with the area of the whole Thammasat University Rangsit campus. Thus, the research will only focus on residential, recreational, and commercial zone (Figure 2) as they are parts where students and visitors usually visit after study and/or working hours, as well as during the nighttime.

This research is consisting of the section about crime, campus design and security management, together with alternative way findings as an urban designer, aiming to prevent crimes.

2. Research Questions

1. Where are places on campus that are considered unsafe?
2. What are physical and non-physical attributes of such unsafe places?
3. What would be physical development that could improve the unsafe conditions on the campus?

3. Research Objectives

1. To identify unsafe places on campus.
2. To identify physical and non-physical attributes associated with locations of crimes.
3. To propose an environmental design guidelines for crime prevention.

4. Literature Review

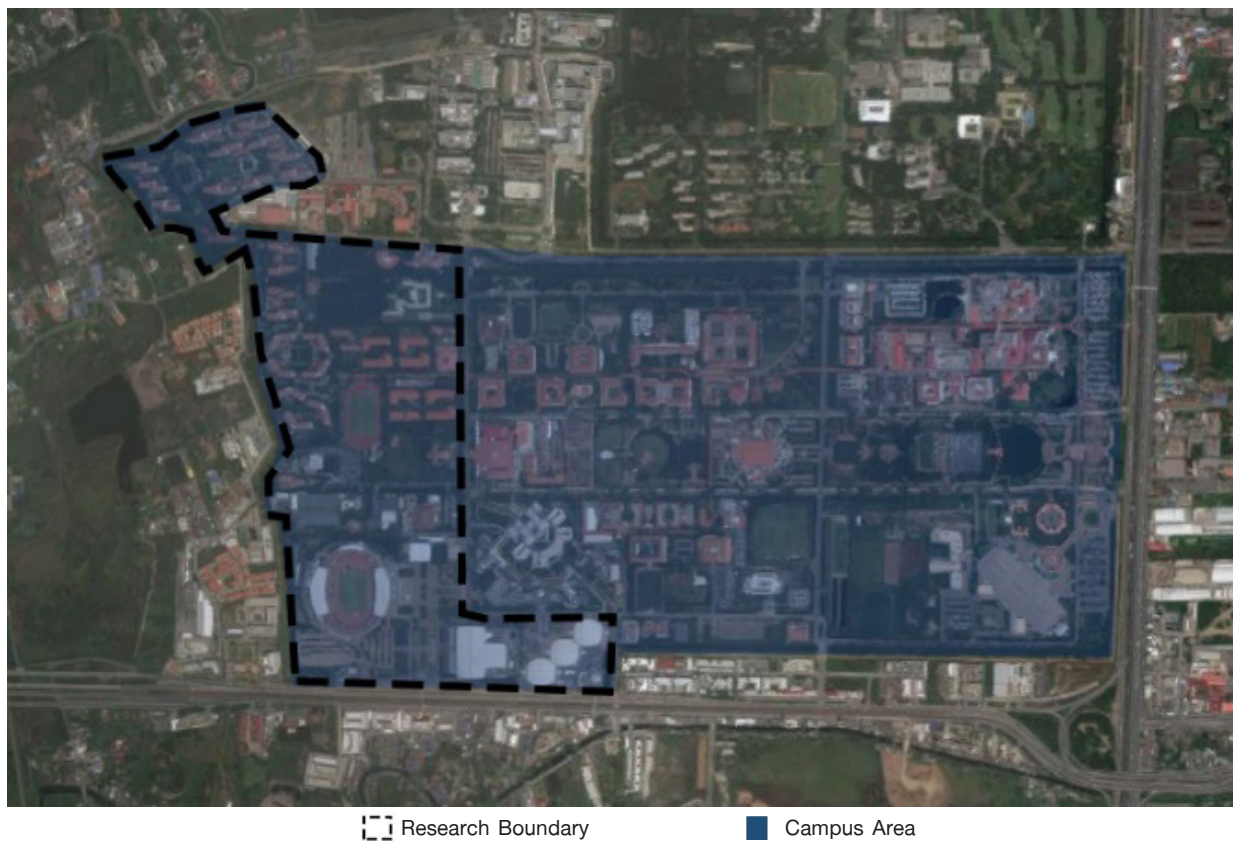
4.1 Crime Prevention through Environmental Design (CPTED)

Crime Prevention through Environmental Design (CPTED) is the "proper design and effective use of the built environment that can lead to a reduction in



Source: League of Liberal Thammasat for Democracy, 2016

Figure 1 Crime location map.



Source: Adapted from Google Earth, 2015

Figure 2 Research Boundary map.

the fear and incidence of crime, and an improvement in the quality of life.” (National Crime Prevention Council of Singapore, 2003) which may be inherent in the design of structure or the design of neighborhood by 3 main concepts with 4 principles as follows:

1) Design concepts

There are 3 main design concepts use in preventing the crime;

(1) The design which encourages public spaces to more people. The presence of people can be an important factor for both discouraging offenders together with increasing the sense of security for the users.

(2) The design of buildings and spaces that allow people to be able to experience what is happening within their environment. The users will be in the position where they are able to respond or call for help.

(3) The design that provides safety for the users and alternative choices where they can decide and respond to problems when emergency cases occurred.

2) Design principles

Four underlying principles with 3 concepts of CPTED are as follows:

(1) Natural Surveillance – the design strategy which allows the intruders to be under observation, providing eyes on the street from the people within the environment.

(2) Natural Access Control – a design strategy directed to decrease crime opportunity by using physical elements to keep unauthorized persons out of particular space.

(3) Territorial Reinforcement – a creation of a clear distinction or boundary between public and private property should be applied to the design as people will normally protect their own place or space.

(4) Maintenance and Management – in relation to territorial reinforcement, a well-maintained area is visible to the people as it has been taken care of by their owner. This provides no crime opportunity for offenders.

4.2 Thammasat University Rangsit Campus Master Plan 2034

A Thammasat University Rangsit campus master plan 2034 is a development project for 100 years of Thammasat University under the vision of “Joyful-Sustainable Living, Learning Society for People”. There are 5 roles being a key to develop the campus, including; (1) Thammasat centre which welcoming more people to come to the campus as well as able to hold more events and activities, (2) Learning community that creates a knowledge activity to support student learning on campus, (3) Joyful campus as a smart community, (4) Sustainable campus town, considered as smart mobility by providing a better purpose network with a connection of both road and pedestrian network, including bike lanes, aiming to create a compact walkable district and (5) Creative economy campus which supporting an upcoming red-line train station to support future socio-economic within the campus and surrounding area.

The research will only focus on physical and non-physical attributes associated with the insecurity sense of crime which are sightline, lighting, sign and information, network and connection, usage and activity, together with help and emergency equipment. The comparison is shown in Figure 3 and the details are as follows:

1) Sightline – a clearer line on the pedestrian walkway along the major route. This will prevent tree branches to protrude into the sidewalk.

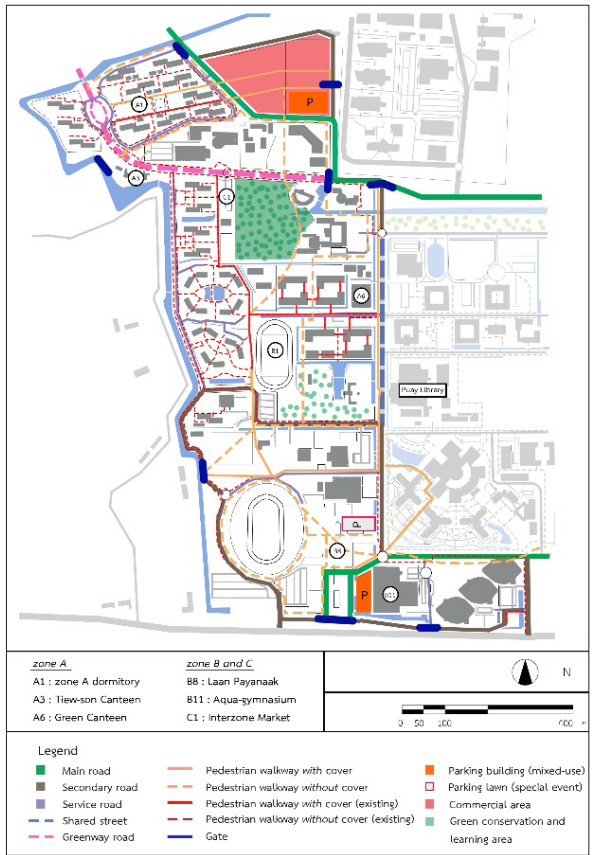
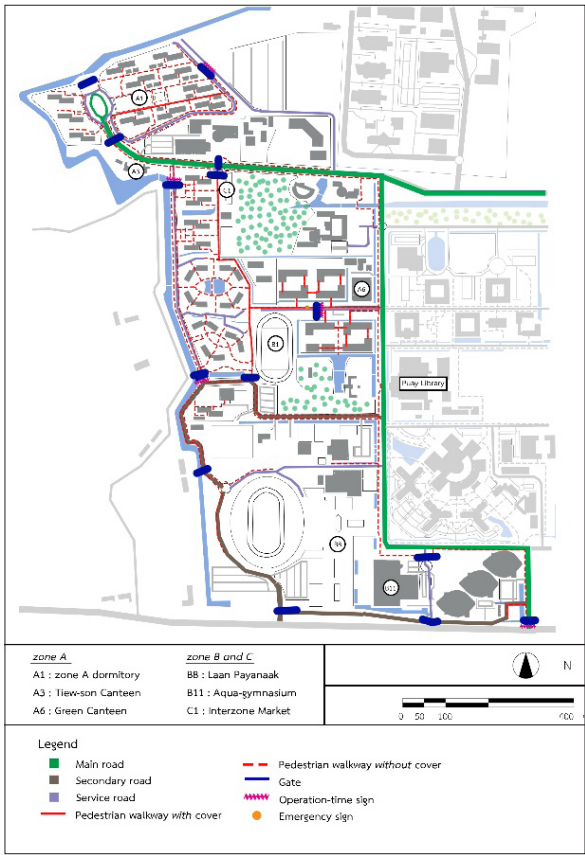
2) Lighting – 2 types of pedestrian lights according to the volume of traffic on the pedestrian walkway as shown in Figure 4. A bollard is for minor routes such as the pedestrian walkway within Laan Payanak and residential area for hospitable and relaxable feelings. On the other hands, the purpose of taller pedestrian lights are for a major route, uses to provide a better lighting illumination distribution to the high volume of traffic pedestrian walkway.

3) Sign and Information – using durable materials and unique design. The information/ directory sign and board are added and distributed to the entrance and main activity nodes, providing overall information for users especially visitors who are not familiar with the area.

4) Network and Connection – both road and pedestrian walkway network and connection have changed a lot from current conditions to support smart mobility and new red-line train station which are located next to the campus. The main road is changed and created a new route, presented in the green lines, as well as the proper pedestrian walkway, presented in light yellow lines, shown in Figure 3.

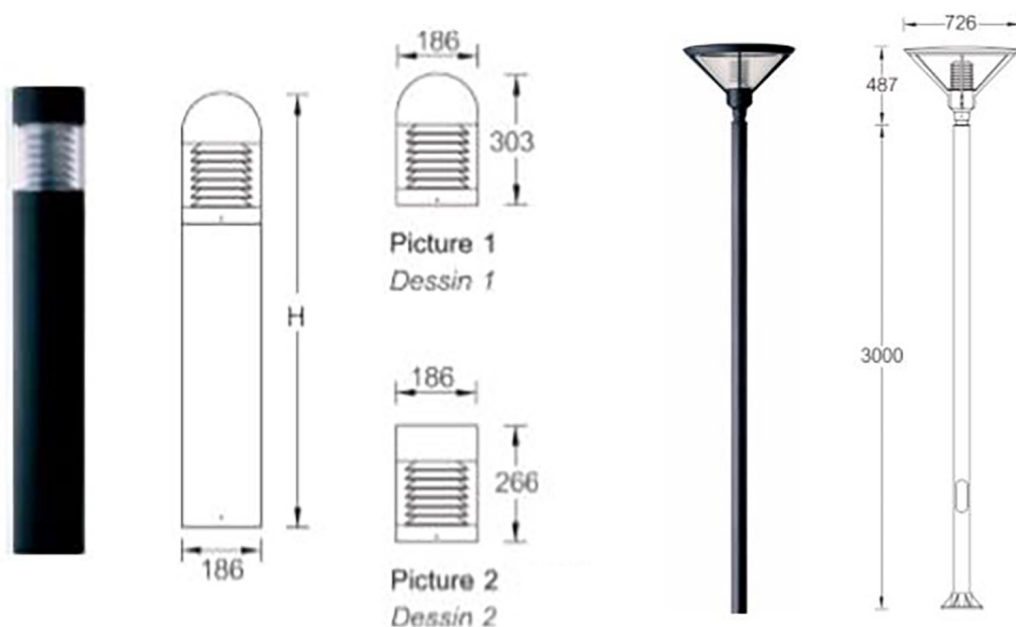
5) Use and Activity – new mixed-use buildings and commercial zone on the current neglect open space at the back of zone A dormitory. The purpose of this is to be a core commercial area to support socio-economy on the campus and surrounding area for the development of the new red-line train station.

6) Help and Emergency equipment – There is no security mechanism for help on the emergency situation have been discussed in the report. The master plan only discusses on gates and entrances which obviously smaller from the current conditions as the gate on the pedestrian walkway are excluded as shown in Figure 3.



Source: Researcher, 2019; Adapted from from Center of Innovative Design and Research (CIDAR, 2014)

Figure 3 The comparison between current (left) and master plan purposed conditions on the study area (right)



Bollard for minor route

Street lights for major route

Source: Center of Innovative Design and Research (CIDAR, 2014)

Figure 4 An example of Bollard and Street lights for minor and major pedestrian walkway route.

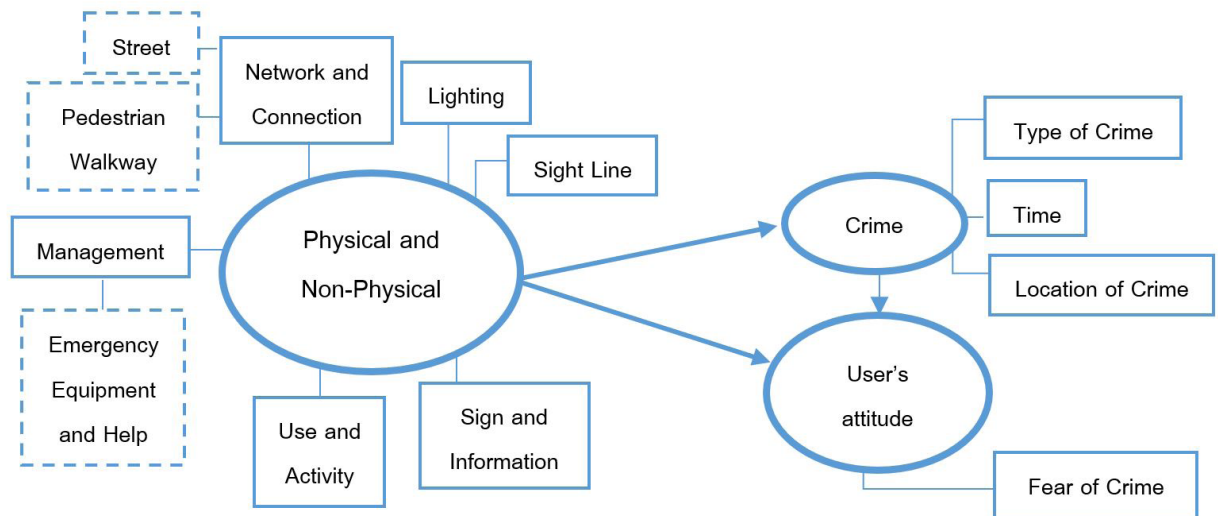
5. Research Variables

Physical and non-physical attributes associated with unsafe places is considered an independent variable that directly related to crimes, while the user's attitude is considered a dependent variable.

The relationship between independent and dependent variables are as shown in Figure 5. Physical and non-physical attributes; sightline, lighting, sign and information, network and connection, the management on providing help and emergency equipment, use and activity directly, are affecting the type of crime, time and location the crime occurred as well as the attitude of the user on the fear of crime.

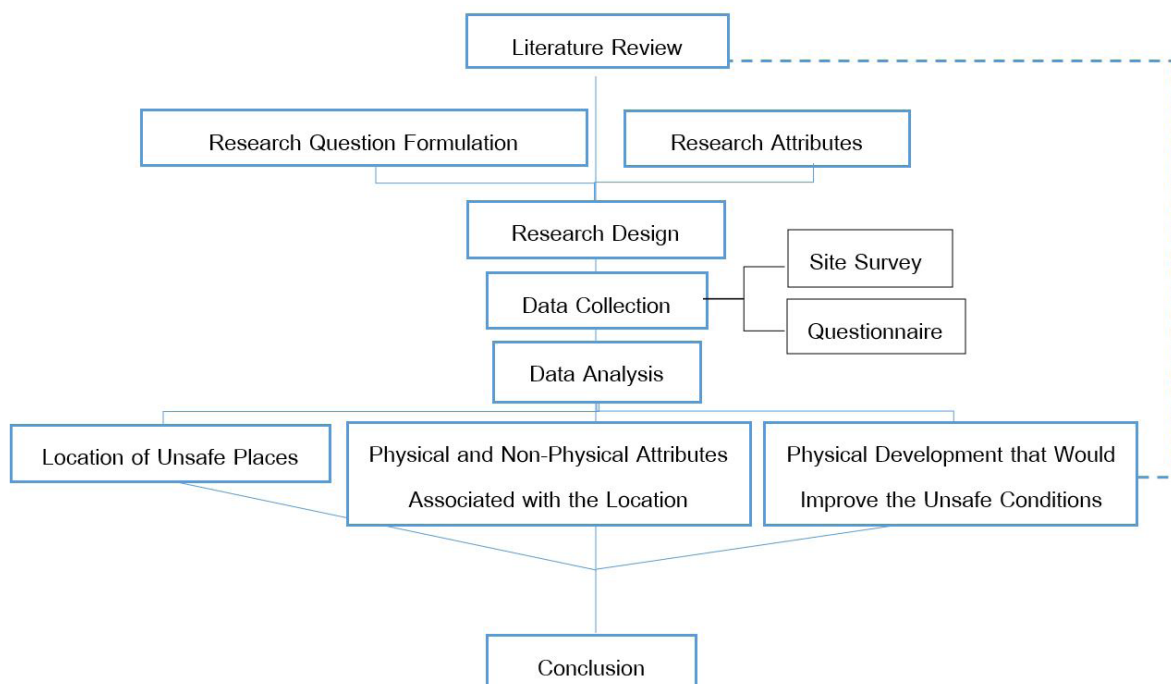
6. Research Process

The process of this research is shown in Figure 6. A literature review provides basic information for further study as well as formulate the research questions and crime attributes for data collections and tools for data analysis. In addition, the collection and analysis of the current conditions of the study area are conducted by a site survey, illustrating unsafe locations according to physical and non-physical disorders. Moreover, it also accumulates user's opinion on (1) the safety of the study area and (2) the elements that make them feel safe to walk alone at night in the crime location that they have been heard. A set of questions are distributed to the users. As Thammasat University Rangsit campus has proposed a new campus master plan 2034, the comparison of current and new proposed conditions are also presented before making a conclusion and recommendations for crime prevention.



Source: Researcher, 2019

Figure 5 The relationship between independent and dependent variables.



Source: Researcher, 2019

Figure 6. Research process.

7. Site Survey Results

According to crime attributes and research variables, physical and non-physical attributes are; (1) street section which clarifies the vision line on the road and pedestrian walkway, (2) lighting location and illumination, (3) road and pedestrian network, (4) sign and information, (5) use and activity, and (6) emergency equipment, which are collected for examining the current conditions on physical and non-physical disorders (Figure 7) that contribute to an unsafe environment of the study area. The results on the physical and non-physical disorders with detail are shown in figure 8:

7.1 Physical attributes

1) Sightline - Users should have the ability to see what occurs along a route, in order to provide the feeling of being safe. The physical elements should be clear and able to allow users to see and be seen, leading to less crime opportunity. The study area has a clear sightline in the daytime; wide pedestrian walkway with none of the obstructions along the route. During the night, however, there are some areas that lighting has been blocked by big trees. Insufficient lighting illumination disturbed an ability to see and be seen at night as shown in figure 9.

2) Lighting - Sufficient lighting is necessary for visibility of people. Lighting illumination on the main road is mostly sufficient. However, on the pedestrian walkway, there is an insufficient lighting illumination.

3) Sign and information - Good location and colors are served in the study area. The users can easily notice the general information by the colors and its vivid location. Moreover, general information signs are well-distributed in every particular spot in the study area.

4) Road and pedestrian network - Road and pedestrian networks are well connected. Main pedestrian walkways are located along the major roads. However, informal pedestrian walkways also exist in some public open spaces areas which are

neglected such as Laan Payanak. Moreover, there are 5 dead-ends existed in the study which 4 out of 5 are isolated and predictable.

7.2 Non-physical Attributes

1) Use and Time-related activities - the study area consists of the residential, recreational and commercial zone. The use of building and spaces are mostly used for the purpose of living and relaxing as shops and canteen are available in this area. Furthermore, the time related to users' activities on the buildings and spaces in this area is on the duration time of 5 – 9 pm. However, there are 4 main areas where are not active after 5 pm. as follow: (1) the area at the back of zone A dormitory, (2) the area at the back of zone C dormitory, (3) Buddha hall area and, (4) Laan Payanak and the area surrounding the main stadium. The area which has a low number of people around provides an opportunity for offenders to commit crime as there is a higher risk that people would not be able to get help.

2) Security and help - People feel safer in the area that is visible for help. The existing conditions on the security issue in the study area are insufficient and need more consideration. The residential zone, however, has been provided with well-control security, having a clear operation time at every gate and pedestrian walkway. On the other hand, the recreational zone has only gates but there is no security guard and operation time as well as has no security mechanisms available for self-help or call for help during the emergency.

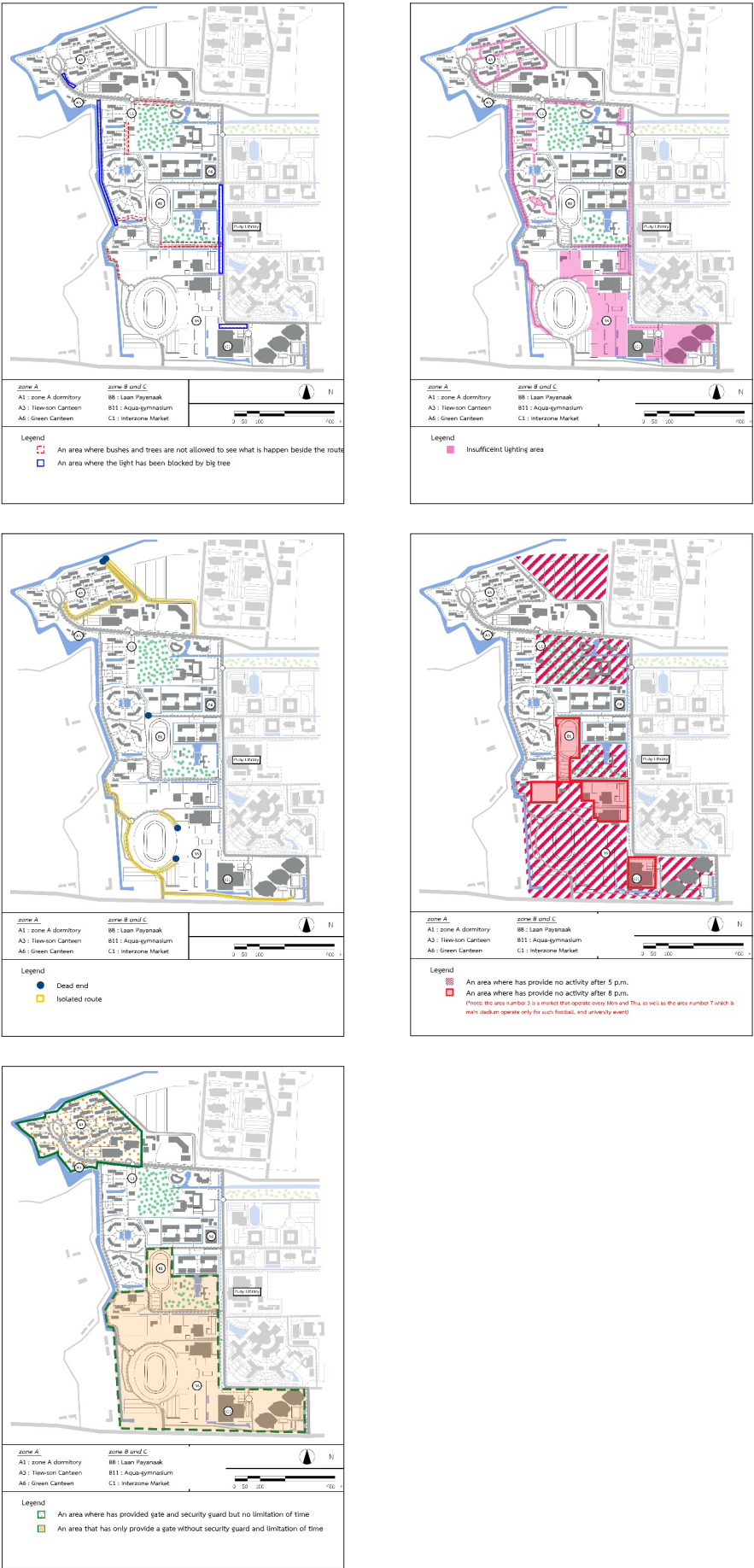
However, as shown in Figure 10, the result of physical and non-physical disorders from overlaying every aspect on one map shows that the majority of the study area are unsafe but at different levels.

The area of dormitory zone is partially safe, especially zone C dormitory. The area of the dormitory has well-provided security guards with gate, provides the well-control accessibility of visitors, students and staffs who lived in a dormitory. Moreover, there are convenient shops and canteen which provide activities



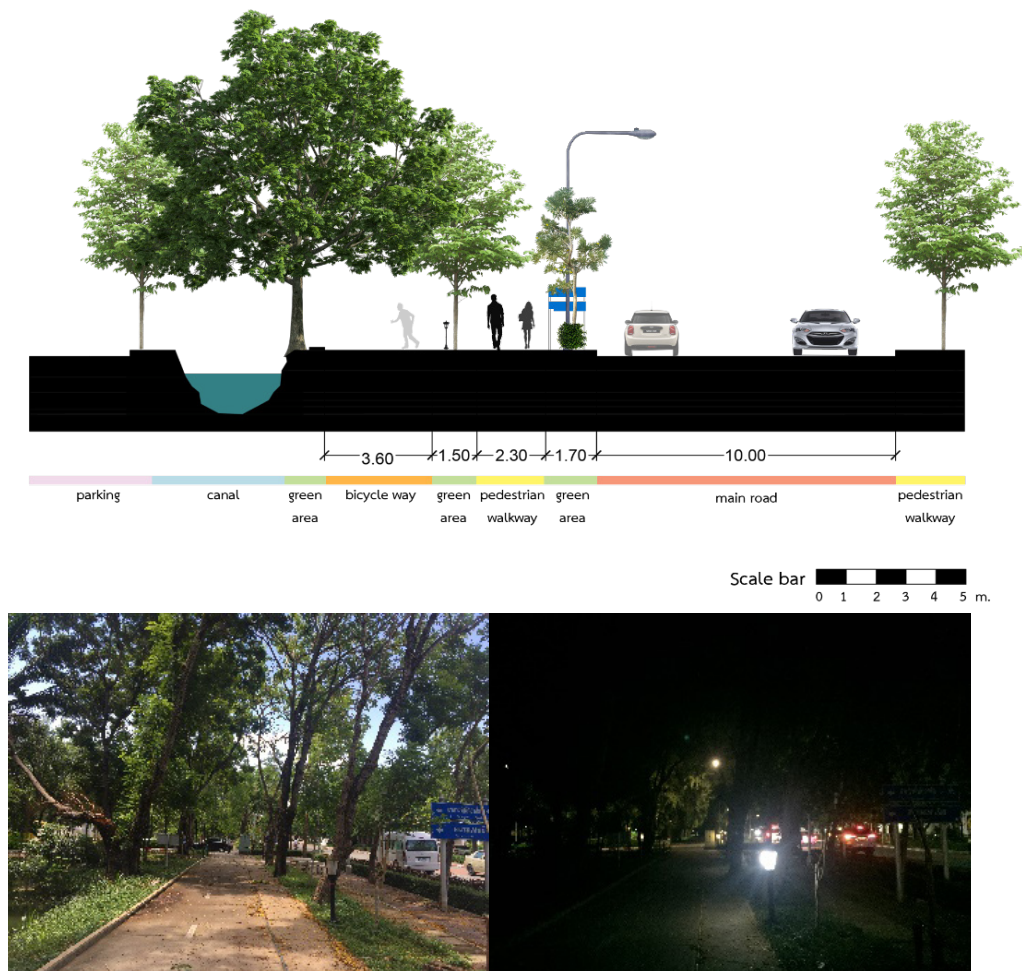
Source: Researcher, 2019

Figure 7 Current conditions of the study area.



Source: Researcher, 2019

Figure 8 Site survey results.



Source: Researcher, 2019

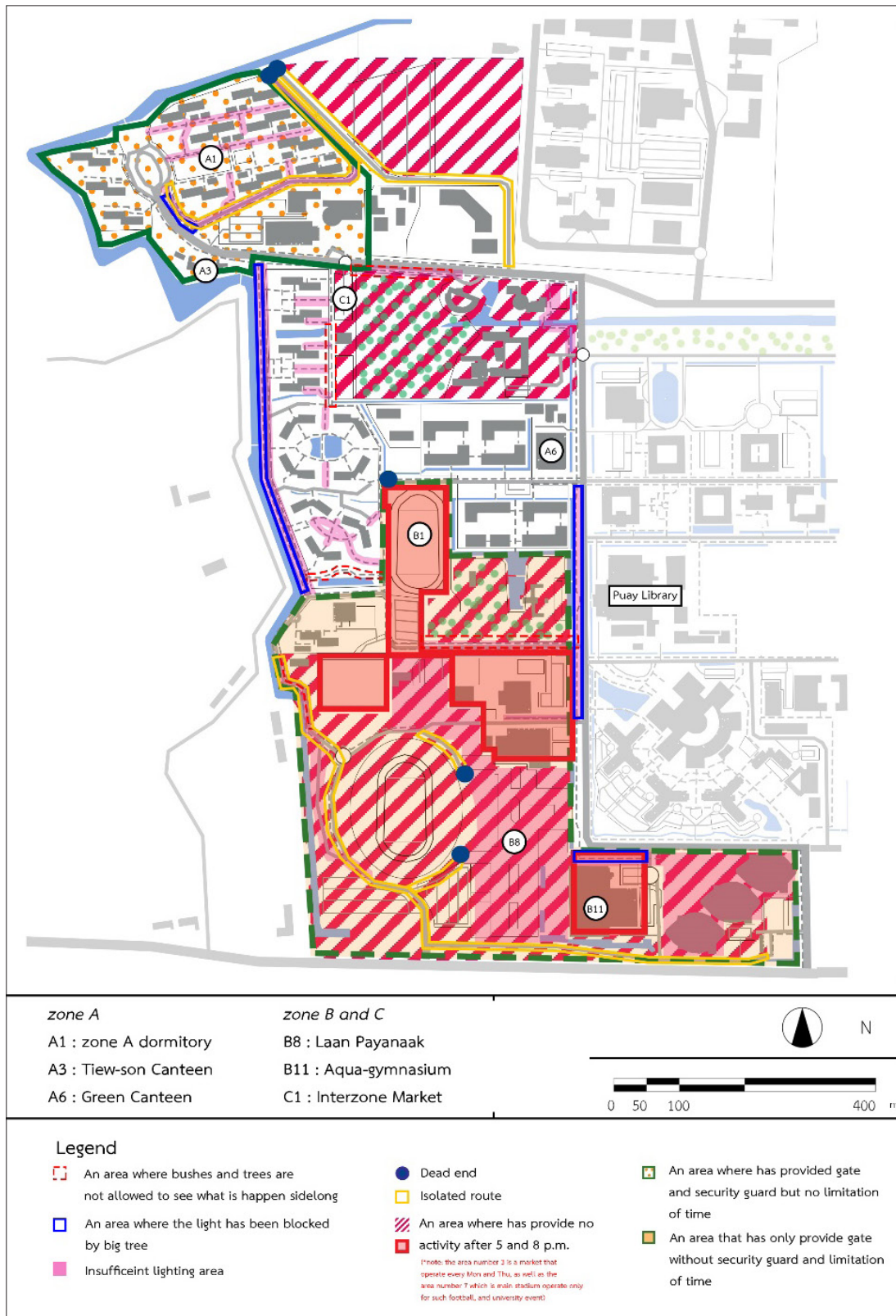
Figure 9 Talad Wicha street section and day and night perspectives.

for people, as well as eyes on the street at night. However, the lighting is still insufficient on every pedestrian walkway in the area which affects the sense of security and the visibility of users during the nighttime.

The result illustrates that the areas around the main stadium are unsafe as it is located on an isolated route at the back of Laan Payanak. It has no connection to the main road where it can be accessed publicly. Also, there are no activities that would draw people to use space except for football events. The dead-end route and big trees which are the main lighting blockages, as well as the few numbers of streetlights, provided an unclear vision for the users, especially at night. Moreover, there is no security guard that people could call for help during the emergency.

8. Results from Questionnaires

The questionnaires are distributed to 3 groups; users live in residential, commercial, and recreational zones. The questions consist of 4 parts which are; (1) general behavior in the study area, (2) an opinion on safety and the insecurity sense of crime in the study area, as well as the identification of current unsafe and crime locations, (3) an opinion on environmental design and management for crime prevention by using a general ranking and pair-wise analysis; analytics hierarchy process (AHP); and, (4) user's general information. The results from questionnaires are elaborated below:



Source: Researcher, 2019

Figure 10 Unsafe map according to physical and non-physical disordered.

8.1 Users' general information and behavior

The result from the cross-tabulation table in table 1 shows that women (83.3%) are most likely to feel an insecurity sense of crime more than men. The chi-square test rejects the null hypothesis; the insecurity sense of crime is not independent of the gender, which means the insecurity sense of crime is depending on the gender of the users.

The integration of a set of information of familiarity and the insecurity sense of crime shows that most of the users experience a fear of crime; even they are familiar with the area as shown on table 2. However, the result of a chi-square test rejects the null hypothesis. So, the insecurity sense of crime is not independent of the user's familiarity. In other words, the insecurity sense of crime depends on the user's familiarity.

8.2 Unsafe / crime locations

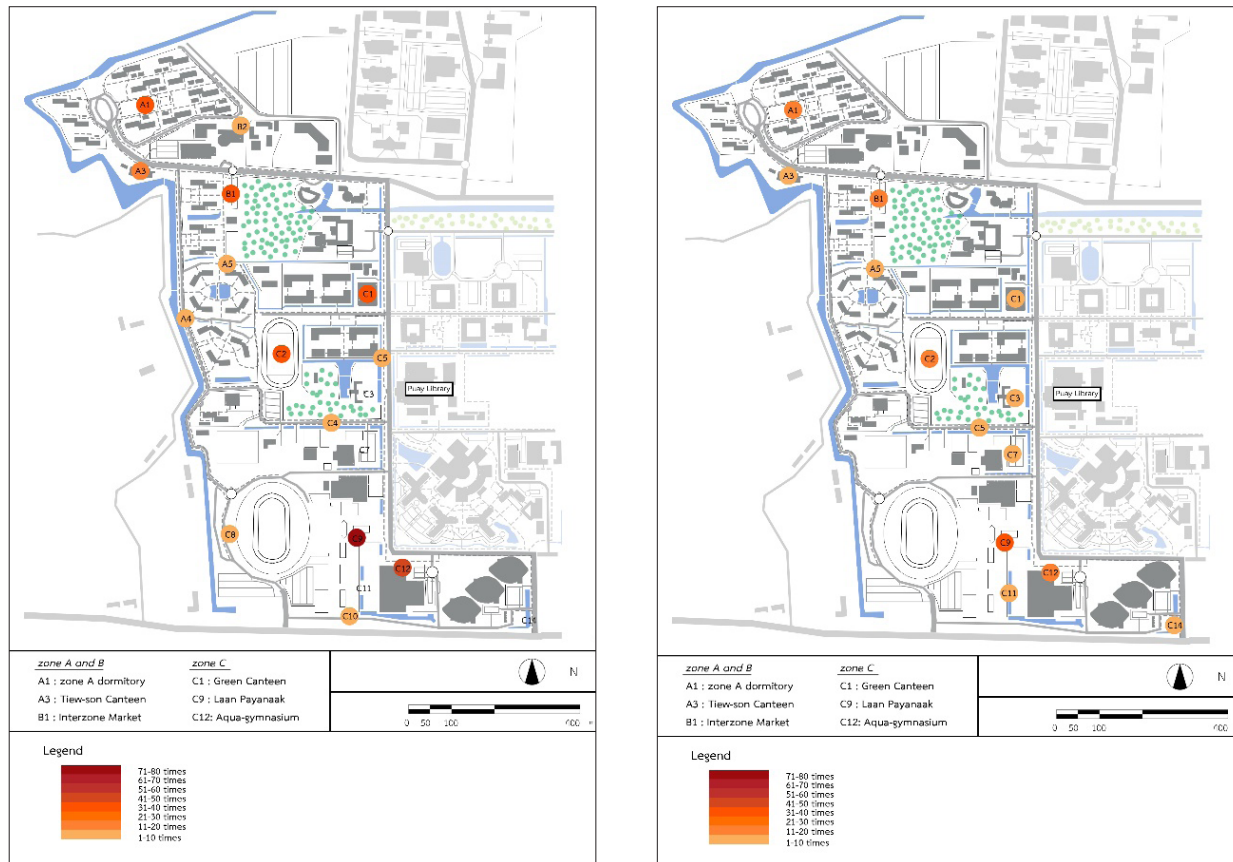
The results from unsafe and crime mapping, which are the frequency of the location that user pointed out shows that both of unsafe and crime locations are the same place, which is Laan Payanak as shown in figure 11. Laan Payanak is a big open space in front of the main stadium, where it mostly unused, except for festival or football events. Moreover, aqua-gymnasium, Interzone market, zone A dormitory, zone A sports field, and Tiew-Son canteen are unsafe locations (from most to least) that have been pointed out by users.

Table 1 Gender and the insecurity sense of crime cross tabulation table (Researcher, 2019)

		the insecurity sense of crime			Total
		No	Yes	NA	
Gender	female	26 (51%)	70 (83.3%)	4 (2.86%)	100 (71.43%)
	male	25 (49%)	14 (16.7%)	1 (0.71%)	40 (28.57%)
Total		51 (36.43%)	84 (60.00%)	5 (3.57%)	140 (100%)

Table 2 Familiarity and the insecurity sense of crime cross tabulation table (Researcher, 2019)

		the insecurity sense of crime			Total
		No	Yes	NA	
Familiarity	Most unfamiliar	0 (0.00%)	13 (9.29%)	0 (0.00%)	13 (9.29%)
	Unfamiliar	6 (4.29%)	18 (12.86%)	0 (0.00%)	24 (17.15%)
	Familiar	39 (27.85%)	41 (29.29%)	5 (3.57%)	85 (60.71%)
	Most familiar	6 (4.29%)	12 (8.57%)	0 (0.00%)	18 (12.86%)
Total		51 (36.43%)	84 (60.00%)	5 (3.57%)	140 (100%)



Source: Researcher, 2019

Figure 11 Unsafe mapping (left) and Crime mapping (right) from users' identification.

8.3 Physical and non-physical attributes associated with unsafe / crime locations.

According to the result from user's identification on unsafe and crime locations, Laan Payanak, the disordered of physical and non-physical attributes consists of these following issues. Firstly, the area with insufficient lighting, as the number of street and pedestrian lights on the area is not enough to provide good lighting for big open space. Secondly, there are such areas without any usage and activities during the normal days. The area will be used only on special occasions or football event with no specific programs after the events finished. Lastly, the management on providing more security, help, and emergency equipment on the area. Laan Payanak have neither security guard nor mechanisms that the users can ask for help during the emergency.

8.4 Physical and non-physical attributes contribute to the insecurity sense of crime.

The result illustrates that users strongly agreed in that lighting illumination on the pedestrian walkway is an attribute which contributes to the insecurity sense of crime the most, along with (1) blinded spot, (2) light illumination on road, (3) an area where no security guard is provided (4) an area that are unmaintained, (5) a number of pedestrian lights, (6) a number of street lights and (7) an unsafe area. The indication of the effectiveness of lightings on the sense of insecurity of crime for the users indicated that lighting affected the majority of users' insecurity sense of the crime. According to what the users strongly agreed, which are both road and pedestrian lighting illumination, the number of lights also contributed to their insecurity sense of the crime. However, there are 1 out of 24 attributes that users disagreed, stating that the pedestrian walkway under the roof or cover ways do not affect the insecurity sense of crime of users.

8.5 The ranking of physical and non-physical attributes on the design development for crime prevention

A pair-wise comparison was used in this part of the questionnaire to identify the most important attributes to concern on design development for crime prevention as the design guideline. The results from analytics hierarchy process (AHP) shows that users considered lighting as the most important attribute to concern in design development for crime prevention, along with sightline, network and connection, management, information and signage, and use also activity.

Lighting illumination on the pedestrian walkway is ranked number one. However, the pedestrian under the cover ways or roof ranked on the lowest as it has to concern on design development for crime prevention as same as the attributes that contributed to the insecurity sense of the crime. So, the design guidelines should consider mainly on lighting, especially on the lights of the pedestrian walkway as the most important attribute in order to prevent and decrease the insecurity sense of the crime.

However, according to the result of the site survey, it shows that sign distribution is well-distributed in every particular spot by its' vivid color and location. Thus, this may affect the rank of sign and information that ranked on the lowest, referring to the main attributes. This leads to the concern of development, as it is already well-designed and clearly distributed the information to the users.

9. Discussion

As Thammasat University has purposed a master plan 2034. This will be discussed on the new master plan of Thammasat University Rangsit campus, based on the safety and crime prevention. Furthermore, the analysis of current conditions, user's opinion from site survey and questionnaire results will be used for the further design recommendations. The details of each attribute are mentioned as follows;

9.1 Sight line

1) New pedestrian walkway by the main route which is a pedestrian walkway under the cover ways will provide more visible line of vision. The comparison of current and new vision lines from road and pedestrian walkway section drawings are shown in figure 12.

2) The big trees may block streetlight in the pedestrian walkway in the minor routes. So, lighting should be brighter for clearer visibility during the night.

9.2 Lighting

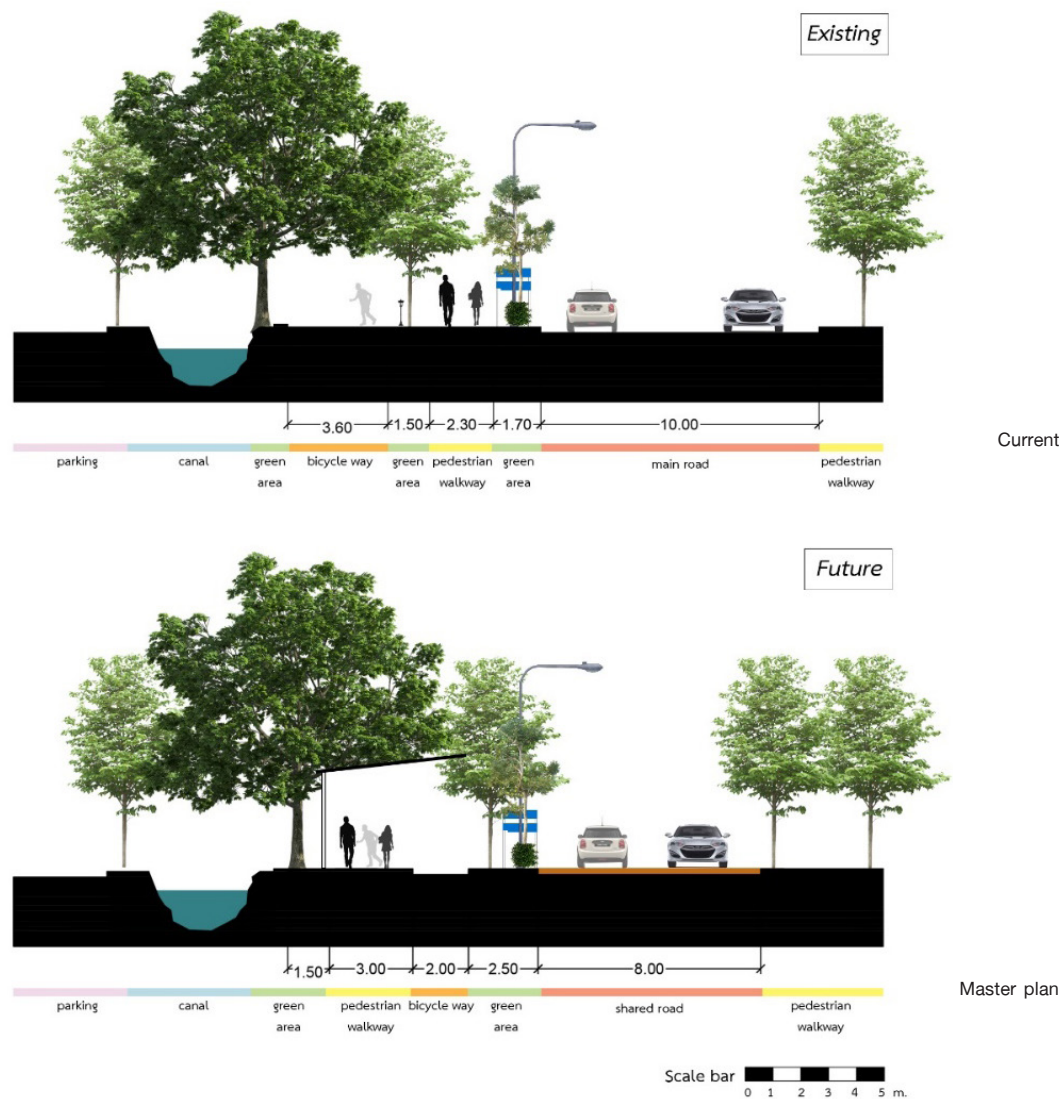
1) Pedestrian walkway lights on TU master plan 2034 is still the same as the existing as shown in figure 13. The result from users' opinion on the questionnaire illustrated that user is unsatisfied as it is contributed to the insecurity sense of crime as if the types of pedestrian walkway lights should be changed for better lighting illumination.

2) The master plan has purposed to provide a hospitable and relax-able light on the area of Laan Payanak, where it currently the most unsafe area by using a bollard, which is identical to the existing pedestrian lights, to allow users to stay longer in the area. However, due to current conditions of Laan Payanak, there is no activity served to draw people to come. So, the landscape design should be well-design as well as an activity generator, in order to create natural surveillance. Also, the security and emergency equipment should be available for the users at every spot provided.

9.3 Sign and Information

1) The addition of information and directory sign in the master plan will be useful in providing information to newcomers or visitors who do not familiar with the area.

2) Site survey stated that sign and information are already well distributed around the area by its vivid color and location as it ranked at the lowest on the concern of design development for crime



Source: Researcher, 2019

Figure 12. The comparison of current and master plan design of road and pedestrian sections



Source: Researcher, 2019; Center of Innovative Design and Research (CIDAR, 2014)

Figure 13 The comparison of current pedestrian walkway lighting pole and bollard.

prevention, meaning that the concern on the sign and information on the current situation is at the lowest. The result of the importance of each attribute to concern on design development may vary depends on the existing conditions.

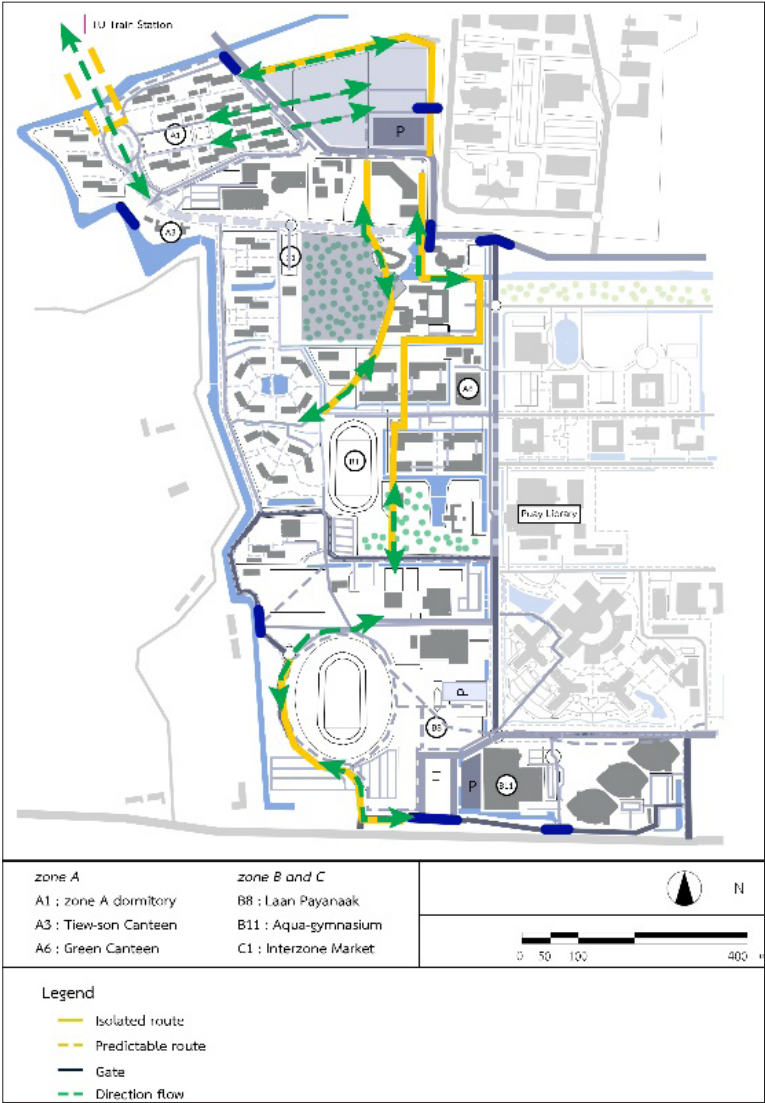
9.4 Network and Connection

1) The master plan has arranged the circulation route of the campus, eliminating some of existing isolated routes. Nevertheless, it also creates a new isolated and predictable route to the area as well. So, the accessibility of both existed and new isolated route need be controlled at the any entrance, as shown in figure 14.

2) New pedestrian walkway network allows users to have a proper pedestrian walkway route. However, a new pedestrian walkway that extend from zone A dormitory to new commercial area are directly connected the residential area to new commercial zone, which may affect to the privacy and security of students and staff who lived in the area.

3) Information and directory sign should be provided at every entrance and each starting point of the isolated routes.

4) Gate and operation time help in controlling accessibility.



Source: Researcher, 2019

Figure 14 Isolated route and direction flow.

9.5 Use and Activity

1) New innovative commercial area at current isolated area may provide lots of activities to the place. Moreover, one out of the two new parking buildings at the back of aqua gymnasium and next to Laan Payanak would help in attracting people in using the retail shops at ground level.

2) Laan Payanak is located in strategic location between new parking building and academic area. However, as Thammasat University master plan only purposed the area to be parking space on special event, students may directly walk from parking building to academic area, vice versa. This suggested that the landscape design should be considered more to prolong users to stay and use the space longer.

3) A well-design of public open space within dormitory zone A provides natural surveillance as well as eyes on the street. This should be considered as the new pedestrian network and new program; commercial activity may also draw visitors to a private area.

9.6 Management (Help and Emergency equipment)

1) None of emergency information and equipment has been considered in the new master plan. So, emergency equipment should be well-provided in the study area; especially, isolated routes.

2) High security should be given at zone A dormitory as the new commercial area may affect the safety of students and staffs who lived in the residential area.

3) Gate and operation time should be provided for security purpose and control the accessibility.

10. Recommendations

To improve the safety conditions, the physical and non-physical attributes associated with unsafe places should be more concerned and the existing should be improved:

1) Provide a clearer vision, both day and nighttime by,

- Changing the pedestrian lights type to allow a better lighting illumination on the pedestrian walkways.

- Cutting tree branches or bushes that protrude into sidewalks to allow a clear sightline to the user, including the light from road lighting pole to the pedestrian walkways.

2) Isolated route should be eliminated. If any, clear signage of operation time and information about the alternative route should be provided at the entrance.

3) Encouraging more activities on the area of Laan Payanak and public open space in front of dormitory zone A to activate the area and allow natural surveillance in the area.

4) Provide operation time sign at every entrance to control the accessibility.

5) Emergency equipment and information must be well-provided and distributed at all spots for both help and self-help.

According to the new Thammasat University Rangsit campus master plan, the connecting area between zone A dormitory and the new commercial area would consider the area with the highest risk as the safety and privacy of students and staff living in the dormitory might be violated by the outsiders. Thus, this area should be provided with a safe design at the very first phase of the development. Sufficient lighting on the pedestrian walkways must also be provided for better visibility of the users. In addition, sightline, network and connection, the management on providing help and emergency equipment, information and signage, as well as use and activity should be implemented on the next phase of development. According to the user's responses in the ranking of the importance of each attribute on the questionnaire, the ranking of the importance of each attribute to concern on design development may vary depends on the existing conditions. All strategy implemented in the development must be sure that all of these are done to preventing the crime.

Acknowledgement

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