

Assessment of the Perception of Security Based on Crime Prevention through Environmental Design in Bundaran HI

Siti Nurlaela¹, Sugiono², Nadhila Alda Ismiralda¹, Ardy Maulidy Navastara¹, Ema Umilia¹, Arwi Yudhi Koswara¹

Received: 10 December 2020

Accepted: 17 February 2021

Abstract: CPTED studies have been popular since 1960-1970s, however studies in Indonesian context showed limited references. This paper identified the need of CPTED study following the massive MRT development in Jakarta to promote CPTED implementation. The perception survey was developed to understand the perceived crime risk. Findings showed that maintenance and information have been the most significant but often ignored. These two components may underrate other CPTED components, weakening the territorial reinforcement and natural surveillance, alarming for a more comprehensive design of TODs. Findings from Bundaran HI station context showed that there was a variation in the perceived security among different respondents based on gender, time pattern, location pattern, and mode chosen for station access. However, the chi-square test found no associations between the perceived securities with the type of mode uses for station access. These preliminary findings suggested that Bundaran HI TOD station is perceived secure from crime risk; therefore little variation in the rating has given little information to draw any association with other important variables such as the station mode access. Taking measures on wider contexts at the TOD precinct, the ratings of CPTED consistently lower in all components, suggesting the urban design and LUTI intervention based on CPTED need to be implemented at wider areas to support the security of the station.

Keywords: Security Perception, CPTED, Transit Area, Jakarta

INTRODUCTION

The urban environment characteristics may impact the level of crime in an urban locality. International Center for Prevention of Crime (ICPC)'s study in 2012 showed the dynamic urban crime has significance impacted on the level of crime on public transportation system. The ICPC study has been aligned with other studies such that compare the level of crime took place on the network public transportation with the level of urban crime and showed a significant positive correlation (The international center for the prevention of crime., 2014).

Furthermore, a design characteristic of urban environment suggested to also impact on the level of crime. As experts in the field pointed out, crimes happened not only due to a chance and an intention, but also due to the environment situation that may support or disregard them to happen (Pauls et al., 2000; Steventon, 2012). An area with dark corners and high level of accessibility to detour from a crime scene may inspired criminals to do

¹ Institut Teknologi Sepuluh Nopember

² Universitas Brawijaya

Correspondence: nurlaela@urplan.its.ac.id

more crimes (Sorensen et al., 2013). Crime prevention through environmental design (CPTED) has been one field of research that believed in the association between crime and urban design. Design aspect provides amenities, aesthetic value, cultural preservation, and at the same time increases the sense of belonging among the community. The sense of belonging, according to William White, can reduce the risk of crime in which the community have higher motivation of doing activities on public space. While the participation in the public space increased, at the same time, created the eyes on streets for natural surveillance and may prevent those one who initially have crime intention to do such crime acts (Jane Jacobs, in (雨宮 & 樋野, 2005)).

The relationship between security from crime and the design aspect of CPTED has been implemented as one of Transit Oriented Development (TOD) sustainability principle. Gupta, 2017 specified 7 (seven) component of TOD sustainability principles, namely transit, walk and bike, shift, mixed uses, liveable, security, participate, and safety (Gupta, 2017). In accordance, Renne (2007) described the balancing value of economic, transportation, and environment in the sustainable TOD, in which, the safety and security aspect was part of the environment sustainability principle (in Brookings et al., 2002). The CPTED as applied in many of guidance and best practices throughout cities in the world, basically consisted of the design principles to increase natural surveillance, natural access control, territorial reinforcement, and maintenance, since these four aspects has been regarded to deter the act of crimes (APTA, 2010; Cozens & Love, 2015; Lee et al., 2016; Pauls et al., 2000; Queensland Government, 2007), explained below. In addition to these four components, the information component is added accordingly, as information can create situational crime prevention by reducing crime opportunities (Felson & Clarke, 1996). The five CPTED components explained as follows:

1. Natural surveillance

This strategy aims to observe the criminals that may intrude the public spaces. Design creativity has been applied to increase the visibility of building and open spaces. The design of windows in the building, lighting, layout or landscape all supported the ability to observe environment. Natural surveillance may be achieved when a good visualization existed between residential areas and commercial and open space areas such as park, parking areas, alleys, and so on.

2. Natural access control

Natural access control applied to building elements such as doors, gates, entrance and exit points to limit access the criminal and create perception among criminals about the high risks of caught on of doing crime.

3. Territorial reinforcement

The landscape design, pedestrian and other design component that separate the public and private areas can clearly define the property right and the territorial boundary. This concept influence criminals to avoid them to entrance or trespassed the territory

4. Maintenance

The continuation of maintenance to keep the function of a place is not only good to preserve the public health but also can increase the safety and security according to the standard. On the other hand, low quality place inspires and motivates more crimes.

5. Information

The clarity of information that provides signage, way of findings, and the identification of places can strengthened the place function and avoid confusion to people in the vicinity, especially those who bypassing or travelling by walking in the TOD area.

This paper was a feasibility study on public perception about the level sufficiency of CPTED implementation and the overall perceived security among people who used MRT and who conducted activities in the area of 800 meter of TOD station precinct. The case

study conducted in the Bundaran HI MRT Station. Bundaran HI station is part of the North-South corridor of MRT Jakarta that connects Lebak Bulus and KMP. Bandan. The corridor is 25km in length, covered some underground and elevated stations, included Bundaran HI as one of the underground station.

The overall study consisted of (1) the preliminary data on rapid assessment of CPTED implementation in Bundaran HI Station and its perceived security and (2) the extended survey of CPTED implementation in the TOD Bundaran HI Station precinct and its perceived security (3) the extended survey of CPTED and its perceived security, adjusting for population influx and diffusion of benefits. This paper covers only the first and second part of the research.

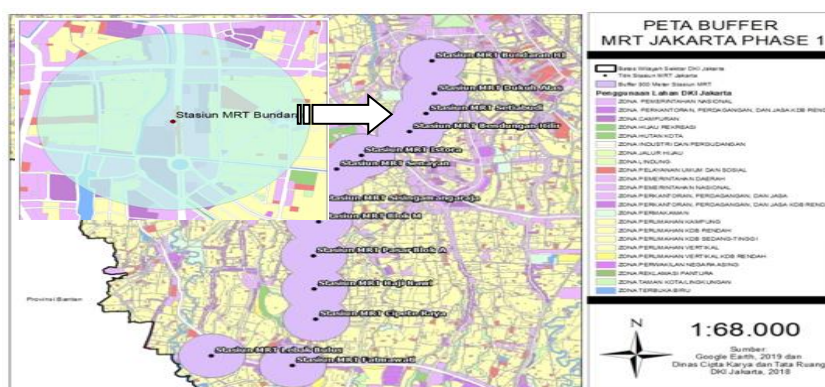


Figure 1. Map of North-South Corridor of the MRT Jakarta

METHODS

This paper covers two discussion on implementation of CPTED according to the scope of location. The first one is the assessment of CPTED in the TOD station area, a 800 meter radius from Bundaran HI station, refers as dataset 1. The second one is the assessment of CPTED that focuses especially inside the Bundaran HI MRT Station, refers as dataset 2.

The first dataset consisted of data from a primary survey that was conducted on 2 - 4 Febuari 2020. The survey located on the entry and exit gate of Bundaran HI Stasiun, resulting in 100 participants by accidental survey method. The second dataset collected during the observation survey on 20 to 22 June 2019 inside the Bundaran HI station and continued with the online survey on 22 June to 3 July 2019, recorded in 45 participants.

The perception survey conducted based on 1 to 5 Likert Scale. The Likert method used in this study followed the Asian Development Bank (ADB)'s study (Leather et al., 2011) which used the standard 5 point scale Likert to survey the perception on crime aspect. The criteria is explained as follows:

- Scale 1: Environment feels very dangerous – pedestrians are highly susceptible to crime
- Scale 2: Environment feels dangerous – pedestrians are at some risk of crime
- Scale 3: Difficult to ascertain perceived degree of security for pedestrians
- Scale 4: Environment feels secure – pedestrians at minimal crime risk
- Scale 5: Environment feels secure – pedestrian at virtually no risk of crime

The perception on crime was collected to assess the overall perceived security and the role of the CPTED components had to increase the security feeling toward crime as perceived by the respondents.

On the first dataset, survey was collected to assess the overall perceived security about the TOD area of Bundaran HI station and the role of the CPTED components had, to

increase the security feeling toward crime as perceived by the respondents. On this first dataset of the perception survey, respondents were asked questions on the perception of security level on the station precinct or TOD area. Questions are listed as follows, for which each of this question has been accompanied with a photo taken from the TOD area.

Table 1. The Crime Perception Survey for the First Dataset

No. of question	CPTED components and lists of questions: I feel secure from crime when I live or work or doing activities in the vicinity of...				
# parameters	Natural surveillance (ns)	Natural access control (nac)	Territorial reinforcement (tr)	Maintenance (mat)	Information (inf)
1.	Offices/commercial with natural landscape as physical barrier along the Arterial corridor	Visible aesthetic fence for house building	A wide pedestrian territory with a clear sightline	Good quality office material made from concrete	The building Icon for station entry with signage
2.	Offices/commercial with natural landscape as physical barrier along the secondary (collector road) corridor	Fortress semi-visible style fence for house building	A narrow to no-pedestrian territory with obstruction of sightline	good quality office material made from cheramic	Signage on public building with greenbelt as territory
3.	Offices/commercial with natural landscape as physical barrier along the tertiary (local road) corridor	Fortress non-visible style fence for house building	A narrow pedestrian alley territory with obstruction of sightline and non-formal activity	Good quality office material made from glasses	Signage on public building with greenbelt as territory and fence
4.	Lighting on street un-obstructed	Office or bank without fence	A narrow active alley in housing area (kampong) with on-street parking	Vandalism on passive (quiet) wall	
5.	Lighting on street obstructed	Visible aesthetic fence for commercial/bank building	A medium wide active alley in formal housing area with on-street parking	Rubbish on the passive (quiet) corridor	
6.	Busy commercial area at night with sufficient lighting	Fortress semi-visible style fence for office building	A medium wide quiet alley in formal housing area with on-street parking	Rubbish on active public area	
7.	Active residential area at night with sufficient lighting	Mechanic/automatic portal at entry gate of office/commercial area	An Informal communal parking with no portal, but with staff on patrol		
8.	Quiet residential area at night without portal	Manual portal at entry gate of office/commercial area	An formal communal parking with portal and with staff on patrol		
9.	Quiet residential area at night with portal	No-portal available at entry gate of office/commercial	A formal building parking with portal, CCTV, and with staff on patrol		

No. of question # parameters	CPTED components and lists of questions: I feel secure from crime when I live or work or doing activities in the vicinity of...				
	Natural surveillance (ns)	Natural access control (nac)	Territorial reinforcement (tr)	Maintenance (mat)	Information (inf)
10.	Transparent physical barrier for offices building		An individual (informal) parking in quiet alley in residential area		
11.	Transparent physical barrier for public area (park)		An individual (informal) parking in quiet alley in residential area with landscaping semi-public area		
12.	Transparent physical barrier for retail inside the building		A busy informal (street merchant) commercial activity on a tertier (local road) corridor		
13.	Transparent physical barrier for retail shop along the street		A busy formal commercial activity (market) on a tertier (local road) corridor		
14.	Area with CCTV		A busy open public space in primary (arterial road) corridor dedicated for car free day		
15.	Public area without CCTV		A busy commercial center (mall) at night on parking corridor at semi-public area		
16.	Supporting activity: traditional market		An open space (plaza) at night with sufficient lighting, no patrol, no signage, and quiet		
17.	Supporting activity: warung (traditional shop) in residential mix		An open space at night with sufficient lighting, with signage, and active		
18.	The presence of security officer		An open space at night with sufficient lighting, with signage, active, and with staff on patrol (security staff)		
19.	The presence of police office		An open space at night with sufficient lighting, with signage, and quiet		

Source: Analysis, 2019

On the second dataset of the perception survey, respondents were asked questions on the perception of security level inside the station that are listed as follows:

1. The overall perceived security
 - ✓ I feel secure from crime when I walk around and inside the area of station
 - ✓ I feel secure from crime during travelling inside the MRT train
2. Security perception due to the CPTED “natural surveillance”
 - ✓ I feel secure from crime due to the instalment of the CCTV in the station
 - ✓ I feel secure from crime due to patrols and security staffs on duty in the station
3. Security perception due to the CPTED “lighting”
 - ✓ The level of lighting in the station before you get on to platform is sufficient
 - ✓ I feel secure from crime due to (the above stated) level of lighting in the area before the platform
 - ✓ The level of lighting in the station on the platform is sufficient
 - ✓ I feel secure from crime due to (the above stated) level of lighting on the platform
4. Security perception due to the CPTED “territorial reinforcement”
 - ✓ I feel secure from crime due to the instalment of queueing line (ribbon) during queueing for ticket
 - ✓ I feel secure from crime due to the instalment of barrier to entry during tap card in and out
5. Security perception due to the CPTED “information level”
 - ✓ The level of information and signage in the station is sufficient
 - ✓ I feel secure from crime due to sufficiency of information and signage inside the station
6. Security perception due to the CPTED “maintenance”
 - ✓ The number of rubbish bin facility inside the station is sufficient
 - ✓ I feel secure from crime due to the sufficiency of cleanliness inside the station

As for dataset 1, statistical descriptives in terms of spider graphs were used to compare between CPTED parameter in each CPTED component, and compare then compare the scale or rating between the CPTED components.

As for dataset 2, statistical descriptives in terms of spider graphs were used to compare the scale values between set of categories of respondents. To fulfil a fair comparison, a statistical test of ANOVA and t-test were carried out on the basis to compare between categories as follows (table 2).

Table 2. The Type of Statistical Test for Comparison Among Two Population in The Design of Perceived Security Responses

Dependent variable	Independent variable	Comparison category	Independent variable
Crime perception	Pattern of travel time when using MRT	1 = daytime 2 = night time	Paired samples t-test analysis
	Gender	1 = male 2 = female	Independent sample t-test analysis
	Pattern of location when access the station	1 = station as origin 2 = station as destination	Independent sample t-test analysis
	Modes type for station access	1 = private vehicles 2 = online paratransit 3 = public transport	One-way ANOVA

Source: Analysis, 2019

FINDINGS

1. Dataset 1: Crime perception survey in the vicinity of TOD station precinct of Bundaran HI

Results from dataset 1 collected from 100 respondents on the entry and entrance gate of the station were depicted in figure 2 and 6. Dataset 1 assessed the rate of security in the Bundaran HI TOD precinct based on CPTED. There were 5 components CPTED, in which each component described by set of parameters as discussed in table 1. Figure 2 consisted of the comparison of parameters in within each of CPTED components, while figure 3 compares each of the components and the overall CPTED rating for Bundaran HI TOD station precinct.

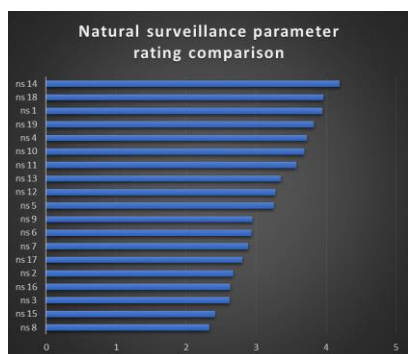


Fig. 2.a. CPTED rating for NS parameters

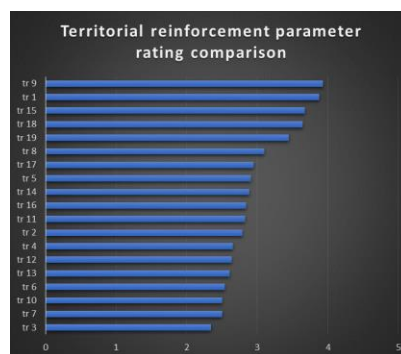


Fig. 2.b. CPTED rating for TR parameters

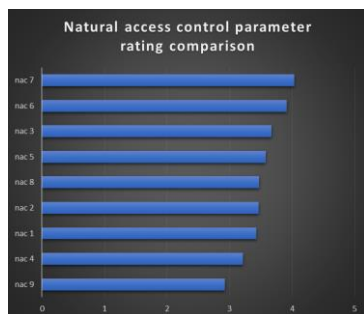


Fig. 2.c. CPTED rating for NAC parameters

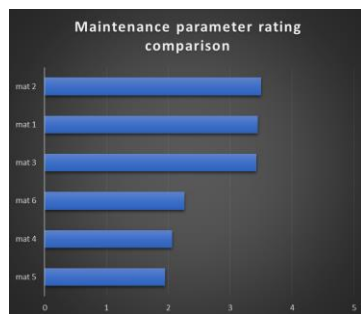


Fig. 2.d. CPTED rating for MAT parameters

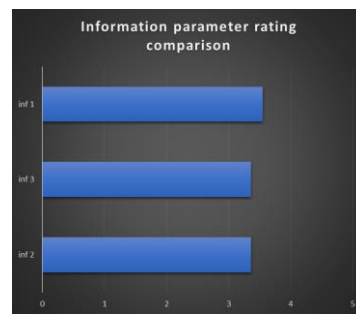


Fig. 2.e. CPTED rating for INF parameters

Figure 2. CPTED Rating for Each Security Parameters

Figure 2, informs that for natural surveillance component, 10 out of 19 parameters has been rated above 3, means residents, workers and bypasser are likely to feel secure in doing activities in the area of Bundaran HI station precinct. The lowest rating scored for parameter quiet residential area without portal and public area without CCTV, both have scored below 2.5. The rest of parameters rated below 3 have shown similar patterns, i.e. for all land use types (residential, market, commercial/offices), the disturbance of the role/function of the places with illegal activities has found to be a cause for feeling insecurity in the vicinity. This happened, for example (see figure 3), the obstruction such as road side friction due to intensity of road side activities had created obstruction for surveillance and reduce the capability of having a clear sightlines along the office and commercial corridor, especially at/along the tertiary (local road) and secondary (collector road) corridor. Illegal parking activities especially motorcylces and also illegal street

merchant has also created obstruction for surveillance, although, for example, the office/commercial/residential building already has landscaping as physical barriers. On the other hand, the study for NS showed that transparent physical barriers score better than landscape physical barriers. All remaining parameters that rated above 3 have showed the pattern of a good and sufficient lighting, and other organisational or mechanistic surveillance such as the presence of security officers/policeman/police offices, and CCTV camera. Primary corridor such as corridor along the arterial road had advantages on wide pedestrian, clear sightlines, and free from the obstruction due to illegal street merchant or illegal parking along the corridor, thus simple landscaping as physical barrier still created a good level of secure feeling (rating above 3).

Example of corridor with many obstruction from road-side activities, obstructed sightlines and weaken natural surveillance



Example of corridor with illegal street merchant, illegal parking could obstructed sightlined and weaken natural surveillance



Figure 3. CPTED Rating Below 3 for Natural Surveillance Parameters (Example)

As for the territorial reinforcement parameters, 13 out of 19 parameters rated below 3, suggested residents, workers and bypasser are likely to feel insecure in doing activities in the area of Bundaran HI station precinct due to the weakness in territorial reinforcement. The territorial reinforcement mainly discussed the security in vehicle parking. Parking without sufficient territorial reinforcement is likely to expose to more risks. For example, parking on street for individual in the residential area with typically narrow alley, supposed to be more vulnerable, especially residential area with no portal, and no security officer on patrol (see figure 4). Informal communal parking also scored low although staff was presence, but the design and conventionality of the parking area with no portal has created insecure feeling in the mind of residents for the presence of threat (see figure 4). The remaining TR parameters that rated well comprise for full measures in types of securing elements in TR, such as the presence of portals, security officers on patrol, and CCTV altogether, especially to secure parking areas. Accompanied these measures also the presence of sufficient lighting and a clear signage for information.

Natural access control rated mostly high (more than 3 in score), only 1 parameter rated below 3 out of 9 parameters. Most of measures that perceived as sufficient access control showed by the presence of territorial reinforcement in any types of measures that furthermore will allow for access control (figure 5). For example, in residential buildings, any types of fence rated above 3 (aesthetic, semi-fortress, and fortress-like fence). For commercial area, any types of portals (manual or automatic portal) also rated above 3. The full or complete measures also preferable, especially providing staff at patrols and CCTV can strengthened the implementation of access control.

Example of territory along the tertiary corridor (neighborhood street or alley) which lack of maintenance and informal activity along the corridor weaken the ownership of territory and territorial reinforcement.



Example of narrow pedestrian territory that is obstructed by parking and rubbish carts that weaken the territorial reinforcement



Example of individual vehicle parking in residential zone without portal or fence weaken territorial reinforcement



Example communal parking with conventional design without portal weaken territorial reinforcement



Figure 4. CPTED Rating below 3 for Territorial Reinforcement Parameters (Example)

Example of natural access control with fully measures: automatic portal, security post and CCTV



Example of natural access control with partial measures: with manual portal and without portal, the presence of security officer



Example of natural access control with fencing in residential zone: type of aesthetic fencing



Example of natural access control with fencing in residential zone and offices: type of semi-fortress and fortress fencing



Figure 5. CPTED Rating Above 3 for Natural Access Control Parameters (Example)

The last two components (maintenance and information) only measures in limited way. However, these two components actually the most important one in supporting the implementation of other CPTED components. Area with rubbish and illegal vandalism created the lowest rating compare to the overall CPTED parameters in comparison. Noted that from NS, TR, and NAC findings, the poor design aspects (no portal, no barrier for illgal activity, no patrol) actually leads to poor maintenance; the area became neglected since no maintenance established. Furtermore, these may create low sense of belonging, low sense of place, and people are likely to avoid, thus no active place in surrounds and altoghter weaken the abilty for natural surveillance and weaked the ability for territorial reinforcement so it is difficult to avoid ‘outsider’ and if there were criminal intention, it would be difficult to detect prior or eliminate the risk faster.

The overall CPTED rating for each component describes in figure 6. Figure 6.a. presents the rating for all 56 parameters among the 5 components; while figure 6.b. presents the overall rating for each of the CPTED component. Noted that 47.4% of natural surveillance parameters rated below 3, while the territorial reinforcement 68.4% were rated below 3, and for maintenance 50% were rated below 3. On the other hand, only 11% of natural access control parameters were rated below 3 and no parameters for information rated below 3. Overall, the rating averaged for all parameters were (from the lowest mean to the highest mean values): maintenance (2.7), territorial reinforcement (2.9), natural surveillance (3.2), information (3.4), and natural access control (3.5).

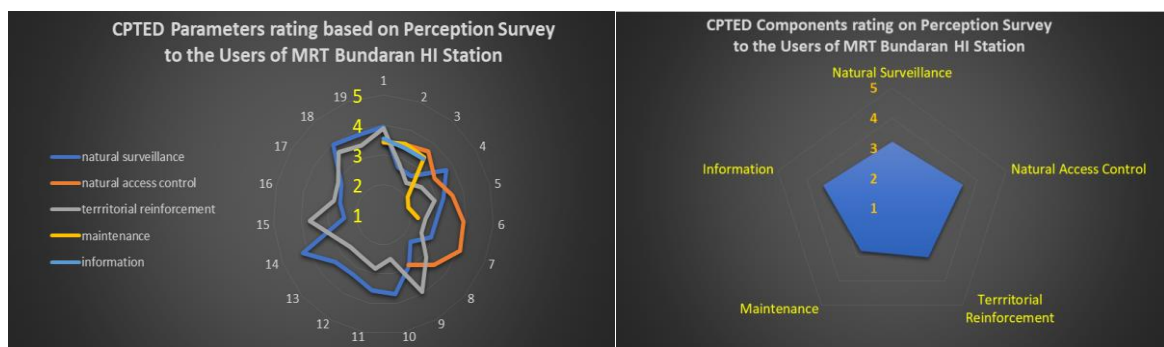


Fig. 6.a. CPTED rating for each parameter of the components

Fig. 6.b. The overall CPTED rating for each of the CPTED components

Figure 6. The Overall CPTED Rating

2. Dataset 2: Crime perception survey inside the Bundaran HI station

The first analysis applied the Likert Scale on each of the perception toward crime and on the role of CPTED component had to reduce risk of crime. The results are listed in the following table (table 3). The table compares and contrasts the rating based on nighttime and daytime activities; and from within the CPTED component and between component comparison. The result showed all perception rated above 3 (between no dangerous to almost feels secure),

Table 3. CPTED Rating Inside TOD Bundaran HI Station Based on Daytime and Night Time Travelers' Crime Perception

The Perception Survey on CRIME Based on CPTED Rating	Daytime	Night time
I feel secure from crime when I walk around and inside the area of station	4.2	3.94
I feel secure from crime during travelling inside the MRT train	4.074	4.3125
Mean of the overall perceived security score	4.13	4.125
The level of lighting in the station before you get on to platform is sufficient	4.22	4.25
I feel secure from crime due to (the above stated) level of lighting in the area before the platform	4	4.25
The level of lighting in the station on the platform is sufficient	4.185	4.3125
I feel secure from crime due to (the above stated) level of lighting on the platform	4.074	4.25
Mean of the perceived security score due to CPTED "LIGHTING"	4.037	4.25
I feel secure from crime due to the instalment of the CCTV in the station	3.963	4.375
I feel secure from crime due to patrols and security staffs on duty in the station	4.52	4.5
Mean of the perceived security score due to CPTED "NATURAL SURVEILLANCE"	4.24	4.44
I feel secure from crime due to the instalment of queueing line (ribbon) during queueing for ticket	4.074	4.188
I feel secure from crime due to the instalment of barrier to entry during tap card in and out	3.815	3.94
Mean of the perceived security score due to CPTED "TERRITORIAL REINFORCEMENT"	3.94	4.0625
The level of information and signage in the station is sufficient	3.78	4.125
I feel secure from crime due to sufficiency of information and signage inside the station	3.74	4.125
Mean of the perceived security score due to CPTED "INFORMASI"	3.76	4.125
The number of rubbish bin facility inside the station is sufficient	3.33	3.3125
I feel secure from crime due to the sufficiency of cleanliness inside the station	3.815	4.188
Mean of the perceived security score due to CPTED "MAINTENANCE"	3.574	3.75

The second analysis applied these Likert scale in the classification of responses based on time pattern, location pattern, and the gender-based subject pattern. Based on time pattern (figure 4.a), respondent that travelled during daytime scored “4.13” on “the overall perceived security”. This score came from 37% respondent that gave responses “5” on the scale, 48% respondents scored “4”, 11% respondents scored “3”, and only 3.7% respondents scored “2”. The derived scores on each CPTD components were as followed: Natural Surveillance” was scored “4.24” on average, then “Lighting”, “Territorial”, “Information”, and “Maintenance” were scored “4.04”, “3.94”, “3.76” and “3.57” on Likert scale respectively.

By the same method, analysis on respondents that travelled on night time resulted scored “3.93” on “the overall perceived security”. The scores on each CPTD components were collected as such that “Natural Surveillance” was scored “4.44” on average, then “Lighting”, “Information”, “Territorial”, and “Maintenance” were scored “4.25”, “4.13”, “4.06” and “3.75” on average in Likert scale respectively.

Comparison of the perceived security scores based on the location pattern (only for respondents travelling during daytime) was performed in figure 4b. Location of station defined as point of origin or point of destination. It was assumed that people who travelled from the residential area would board on station as their origin point, and people who

arrived to non-residential area would align on station as their destination point. The results showed that the overall perceived security and the score for each of the CPTED component were scored higher for station as origin than that of station as destination. On the overall perceived security, station as origin scored 4.23 compared to 4.14 for station as destination. "Natural Surveillance" scored 4.3 (origin) as compared to 4.18 (destination). Subsequently, "Territorial reinforcement" was scored 4.115 (origin) compared to 3.786 (destination), "Lighting" was scored 4.07 (origin) compared to 4.0 (destination); "Information" was scored 3.80 (origin) compared to 3.71 (destination), and lastly, "Maintenance" was scored the lowest from all respondents, i.e. 3.80 (origin) compared to 3.36 (destination).

Comparison of the perceived security scores based on the subject pattern (only for respondents travelling during daytime) was performed in figure 4.c. Subject pattern defined as gender of respondents, i.e. category 1 (female) and category 2 (male). While the score of overall perceived security was higher for male than female, the score pattern of each component of CPTED from each gender category was inconsistent. Male scored 4.33 compared to female 4.14 in regard with the overall perceived security. Male scored higher on some CPTED compared, such as "Lighting", i.e. 4.25 compared to female that scored 3.98; and "Maintenance" was scored 3.58 (male) as compared to 3.57 (female). On the other hand, female scored higher on "Natural surveillance", "Territorial reinforcement" and "Information", whereas the score subsequently were 4.3, 3.95 and 3.8 (female) compared to 4.0, 3.92 and 3.50 (male). Illustration on the findings is presented in figure 7.

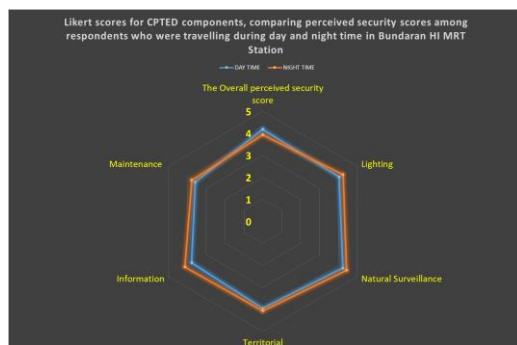


Figure 7.a

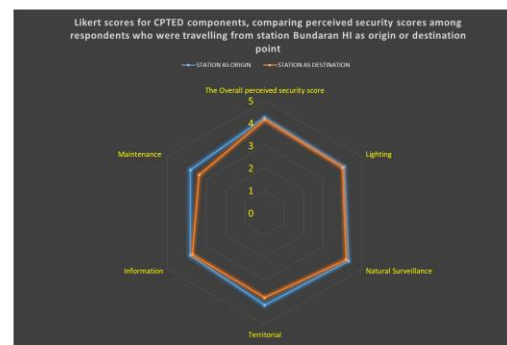


Figure 7.b

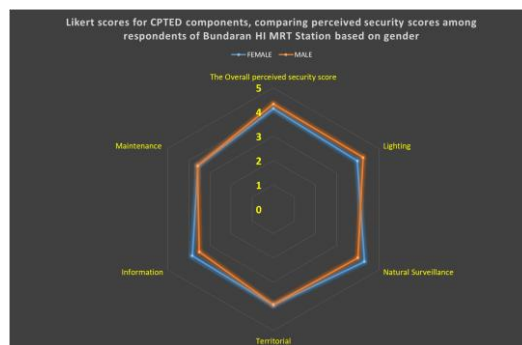


Figure 7.c

Source: Primary survey, 2019

Figure 7. Comparison Between CPTED Elements in Relation with the Responses Classification for the ((7.a) Time Pattern; (7.b) Location Pattern; (7.c.) Subject Based on Gender)

The third analysis tested the statistical differences in the responses among respondents to determine the significance of statistics of comparing the mean value among two population. The perceived overall security among night time and daytime travellers were compared. The paired t-test sample showed on 95% level of confidence, there was no statistical difference on the perceived security score among the two respondents. Similarly, the t-test and the one-way ANOVA conducted to test differences in the perceived security scores among responses based on location pattern and subject pattern found no significance statistical differences.

The fourth analysis conducted the influence of perceived security on the type of modes being used for station access. For the fourth analysis, many data are incompleting (missing), therefore the data only pictured for 27 responses. The descriptive data on the perceived security based on type of mode being used is described in the following graph (figure 8). Descriptive data showed 51% of respondents used private vehicles to access station, 18% used online paratransit, while the amount of 30% used Transjakarta. This figure may subtle a good intermodal connectivity between MRT Bundaran HI and Transjakarta Busway. However, the crosstab analysis (chi-square test) gave insignificant results. The value of chi-square was 7.34. The p-value as showed in the “asymptotic significance (2-sided)” showed the value 0.29 has resulted in the p-value higher than the standard alpha value (0.05), therefore the null hypothesis was not rejected that asserted that the perceived security scores was independent (no-association) with the type of mode chosen for station access. There was no influence of the level of security as perceived by respondents about the MRT station on the type of mode uses to access the MRT Station at Bundaran HI.

DISCUSSION

Findings from dataset 1 highlighted the implementation of CPTED component in rather in different natures and nuances as compared to the original concept formulated in developed cities in USA cities. There are at least two reasons comprises the differences. *First*, literatures in CPTED suggested that the three most importance CPTED component has been always found consisted of access control, natural surveillance, and territorial reinforcement (Jeffery, 1972; Sorensen et al., 2013; Steventon, 2012). These components rooted from the same source about “eyes on street” concept developed by Jane Jacobs in 1961, and later modified and developed as Defensible Space theory by Oscar Newman in 1970s and Jeffrey in 1972 (Cozens & Love, 2015). The idea of defensible space was to able to create the transition between public area and private area by creating semi-public and semi-private space (Sorensen et al., 2013). However, findings from this study suggested that as one could acknowledge, there are problems of poor territorial re-inforcement in TOD precinct. These have emerged particularly in the second and third layer of the TOD precinct, root-caused from the limited and rare space of the city. Provision of semi-private and semi-public space in between the private and public area has become a “no man’s island” issue as no clear direction who should provide these area since the private property owners and residents especially in local neighbourhood area and kampung are still competing space for vehicle parking and other utilities. Narrow alley, narrow to almost zero pedestrian are often found in most of local roads in neighborhood area. Thus, as found in this study, poor territorial re-inforcement in the study area assigned with the rating only 2.9 and almost 70% out of 19 parameters rated below 3. Therefore, the important problem in design aspect of TOD precinct has laid on the ideas of re-claimed more space for public uses and for the provision of semi-public and semi-private space. In addition, another important problems is to ordering the clear place function and

utilization based on strengthening the zoning and its implementation to avoid illegal use for example illegal street merchant or parking.

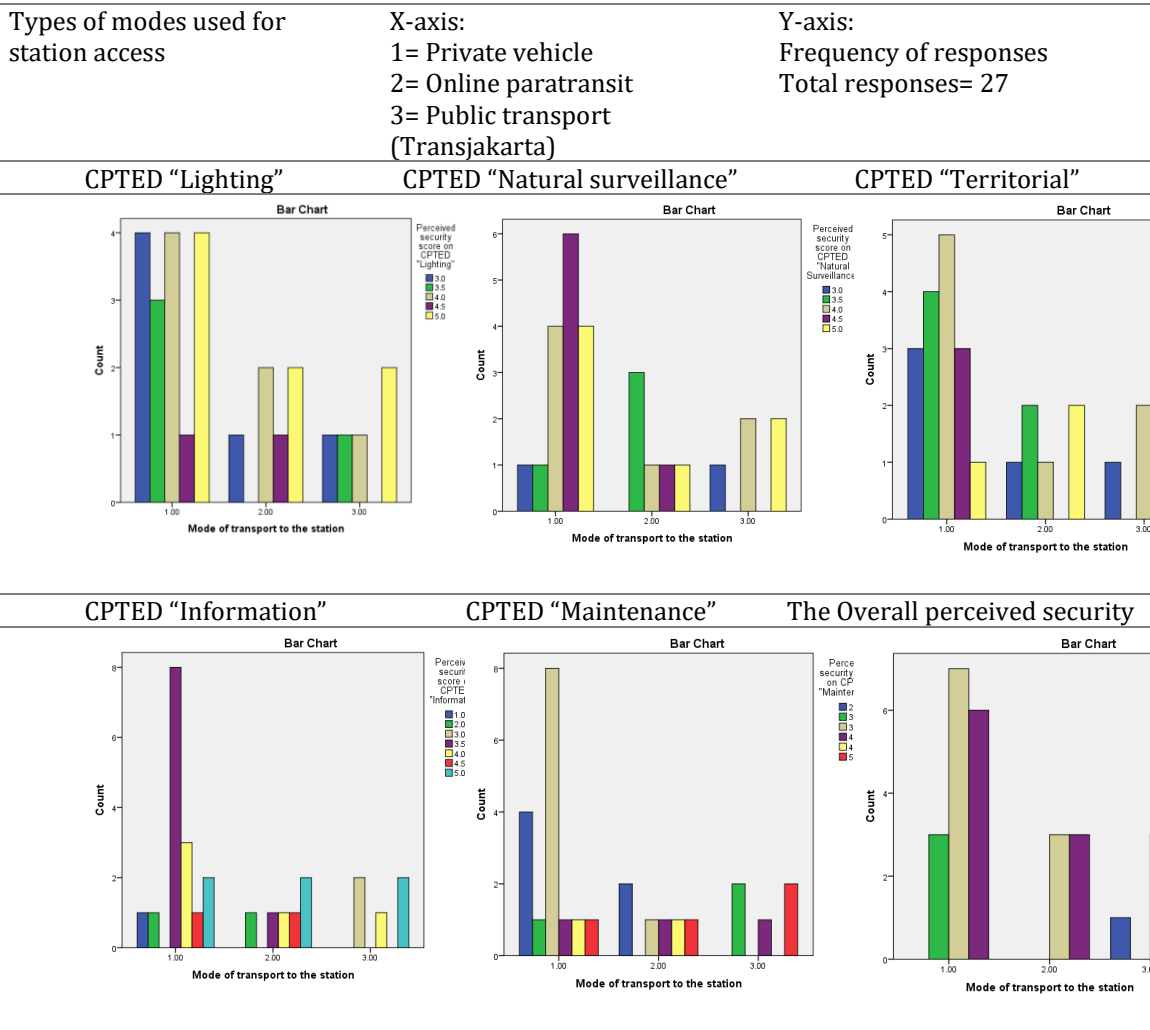


Figure 8. CPTED Rating Based on Score Responses on Types of Modes Uses to Access Station

Second, the uniqueness of local nuisance in the implementation of CPTED in this study is low maintenance. Low maintenance can come from low property ownership or sense of belonging in the neighbourhood. The root cause for these issues can be again a complex social-cultural issues that hard to be handled. As we found, the secondary or tertiary layer of TOD, for example, in Bundaran HI precinct are comprised of informal settlement or Kampung that sometimes has problems of poverty and slums. However, this informal sector has actually living side-by-side with the urban life in metropolitan Jakarta as it also give provision for services and cheap resources (labors, foods, etc) for the core area. Jakarta that invites many migrants can create a vulnerability as well in terms of low sense of belonging of the neighborhood area. As we found from the study, maintenance component has rated the lowest, i.e. only 2.7 among all other CPTED components. Noted that poor maintenance leads to the area became neglected and furthermore people are likely to avoid, thus no active place in surrounds and altogether weaken the ability for

natural surveillance and weakened the ability for territorial reinforcement. Therefore, low maintenance may lead to weaken other CPTED components. It is difficult to avoid 'outsider' and if there were coming with some criminal intention, it would be difficult to detect prior or eliminate the risk faster.

Finding from dataset 1 has resulted in at least two recommendation. *First*, territorial reinforcement need to be strengthened in order that a place can have a clear of property and ownership. This can be enhanced by providing a transition elements from private building to semi private, and semi public to public building based on zoning regulation. The transtition elements could be created by allowing more spaces that are signaged by a clear information about who can/cannot allow to do what types of activities in the vicinity; and to where bypassers should be directed in wayfinding in order not to intervene or disturb the private property. More importantly, a strict zoning implementation should be promoted especially to avoid unintended use of places due to illegal road side activities or illegal public space utilization. *Second*, the promotion of place maintenance at community level can be supported by local government by providing funding support or other form of capacity buildings. These supported can be directed to local schools, local organization, traditional markets, and many kampong that surroundings the city core, especially in the vicinity of 800 meter radius from the station precinct. A collaborative planning based on community development may help in the realization of ideas for example to design an aesthetic Kampongs that are well maintain, clean, in a good order of place allocation and function. All efforts could create a good degree of sense of belonging and active space for natural surveillance.

Dataset 2 has focussed on the CPTED implementation in the MRT station itself. Dataset 2 explored the perceived security among MRT users and found that all the CPTED components have rated above 3 and some of the scored are 4 or more. The study also explored the variation in the rating based on time pattern, place pattern, and subject that travelled. It was interesting that based on the overall perceived security score, respondents who travelled during night time have given lower scored on the overall perceived security compared to those who travelled during daytime. This finding aligned with other study that suggested the perceived security is lower at night compared to daytime especially in the urban transit area (The international center for the prevention of crime., 2014). Nevertheless, the score received on each CPTED component from night time travellers were slightly higher than that of received from daytime travellers. These results implied a higher appreciation or probably a higher need of night-time travellers toward instalment and fulfilment of each of CPTED component to support a secure feeling from crime as compare to their patron of daytime travellers. Night time travellers scored 4.4 for "Natural Surveillance" as compared to 4.24 from daytime travellers. Subsequently, "Lighting" was scored 4.25 compared to 4.04, "Information" was scored 4.13 compared to 3.76; "Territorial" was scored 4.06 compared to 3.94, and lastly, "Maintenance" was scored the lowest from both respondents, i.e. 3.75 from night time travellers compared to 3.57 from daytime travellers.

The statistic descriptives according to the variation of time pattern, location pattern, and subject based on gender from this study suggested that while they was variation on the perception scores, nevertheless they had not been significance when statistically being tested. However, the variation maybe regarded still important as other studies found the similar results. According to the time pattern of crime may take place, certain types of crime may take place in different time pattern. For example, theft often happened on busy daytime, while violence often take place at nigh time on a quiet location such as public transport or station. This classification may suggest the importance to differentiate the time pattern of crime according to certain type of crime situation, for example, theft,

violence, or sexual assault (The international center for the prevention of crime., 2014). Nonetheless, this research recorded only perception on general crime.

On the other hand, a research conducted by Calgary Transit showed 20% of the community perceived lower security during nigh time (The international center for the prevention of crime., 2014). This finding similar to this study that found perceived security during nigh time was lower than that of daytime. In addition, this study found that perceived security during nigh time in the area inside the station had been lower than the area inside the MRT Jakarta train. Similar finding also reported in other studies, for example, in Bogota, 95% respondent said the route along the transit was not secure, while the route to access the transit point was not secured as perceived by 79% of respondent, while 68% feel insecurity inside the public transport vehicle (International Centre for the Prevention of Crime, 2012, Camara de Comercio de Bogota, 2015 in CIPC, 2016). The finding by CIPC also implied the differences in the perceived security according to location pattern.

In terms of the perceived security among the subject according to gender type, this study found mix results, reported that while the overall perceived security was higher among male and the perceived security due to CPTED lighting and maintenance were higher among male, but the perceived security due to CPTED natural surveillance, territorial reinforcement and information were higher among female. Other study suggested that although women in general had lower security perception (feel insecure), data showed male frequently become the victim of crime than female (CIPC 2016).

Finally, the theoretical hypothesis as stated in some studies that stated the perceived of crime about public transport environment and TOD station would influence the choice of mode to access the station (Ferrell. et al., 2015), had not been proven true in this study.

CONCLUSION

Finding from the first dataset at a wider context of CPTED implementation, out of 56 parameters, 26 parameters or almost halve have rated below 3, alarmed for a more comprehensive design and intervention at the TOD neighbourhood level that emphasizes on the implementation of CPTED principles. Finding from the Bundarin HI station context showed that under the Likert scale 1 (the lowest risk) to 5 (the highest risk), most of the CPTED rated from 4 – 5. There were a variation in the perceived security among different respondents based on gender, time pattern, location pattern, and mode chosen for station access. This study found perceived security during nigh time was lower than that of daytime, and specifically found that perceived security during nigh time in the area inside the station had been lower than the area inside the MRT Jakarta train. In terms of the perceived security among the subject according to gender type, this study found mix results, reported that while the overall perceived security was higher among male and the perceived security due to CPTED lighting and maintenance were higher among male, but the perceived security due to CPTED natural surveillance, territorial reinforcement and information were higher among female. However, aside from these variations, there was no significant differences in the perception among groups of MRT users when statistically being tested. Furthermore, the theoretical hypothesis of whether perceived of crime on public transportation environment would influence the choice of modes to access the station, has not yet been confirmed. These preliminary findings suggested that the Bundaran HI TOD station is secured from crime risk according to perception of MRT users; therefore little variation in the rating of perceived security gave little information to draw any association with other important variables such as the mode choice for station access. However, taken the measures on wider context at the TOD precinct, the rating of CPTED

consistently lower in all components, suggested the urban design and land use zoning-and transportation intervention that consider CPTED principles to be emphasizing at wider area to support the security of the station.

REFERENCES

- APTA. (2010). Crime Prevention Through Environmental Design (CPTED) for Transit Facilities. *Transportation*.
- Brookings, T., Policy, M., From, O., To, H., Belzer, E. D., Autler, G., Economics, S., Prepared, D. P., Great, T., Station, A., & June, F. (2002). Transit Oriented Development : *Interfaces*, June.
- Cozens, P., & Love, T. (2015). A Review and Current Status of Crime Prevention through Environmental Design (CPTED). *Journal of Planning Literature*, 30(4), 393–412. <https://doi.org/10.1177/0885412215595440>
- Felson, M., & Clarke, R. V. G. (1996). The Limits of the Sovereign State: Strategies of Crime Control. In *Police Research Series No. 98*.
- Ferrell, C. E., Mathur, S., & Appleyard, B. S. (2015). Neighborhood Crime and Transit Station Access Mode Choice – Phase III of Neighborhood Crime and Travel Behavior. *Mineta Transportation Institute*. <https://rosap.nsl.bts.gov/view/dot/29211>
- Gupta, S. (2017). Integrated Land use and Urban Transport Planning:Principles and Practices. *UNESCAP Capacity Building Workshop*.
- International Centre for the Prevention of Crime. (2012). *The 2012 International Report on Crime Prevention and Community Safety*.
- JEFFERY, C. R. (1972). Crime Prevention Through Environmental Design. *Criminology*, 10(2), 191–191. <https://doi.org/10.1111/j.1745-9125.1972.tb00553.x>
- Leather, J., Fabian, H., Gota, S., & Mejia, A. (2011). Walkability and Pedestrian Facilities in Asian Cities State and Issues. *Asian Development Bank Sustainable Development Working Paper Series*, 17, 69.
- Lee, J. S., Park, S., & Jung, S. (2016). Effect of crime prevention through environmental design (CPTED) measures on active living and fear of crime. *Sustainability (Switzerland)*, 8(9). <https://doi.org/10.3390/su8090872>
- Pauls, T., Zywna, D., Prochilo, K., White, S., Christie, F., & Hainer, C. (2000). Crime Prevention Through Environmental Design : General Guidelines for Designing Safer Communities. *Prevention*.
- Queensland Government. (2007). Crime Prevention through Environmental Design guidelines for Queensland Part a: Essential features of safer places. In *The State of Queensland*. <https://www.police.qld.gov.au/programs/cscp/safetyPublic/Documents/CPTEDPartA.pdf>
- Sorensen, S. L., Hayes, J. G., & Atlas, R. I. (2013). Understanding CPTED and situational crime prevention. *21st Century Security and CPTED: Designing for Critical Infrastructure Protection and Crime Prevention, Second Edition*, 59–90. <https://doi.org/10.1201/b15046>
- Steventon, G. (2012). Crime prevention through environmental design. *International Encyclopedia of Housing and Home*, 280–284. <https://doi.org/10.1016/B978-0-08-047163-1.00559-2>
- The international center for the prevention of crime. (2014). Preventing crime on urban public transport. *5th International Report on Crime Prevention and Community Safety: Cities and the New Urban Agenda*, 100–125.
- 雨宮護, & 樋野公宏. (2005). 英国の防犯まちづくりのガイドライン“Safer Places.” *Shin Toshi*, 59–12.