

# Review of Conceptual Model to Spatially Assessing Safe City Level of Affordable Housing in Malaysia

Salwa Najlaa Mohamad Ali<sup>1</sup>, Zakri Tarmidi<sup>1</sup>, Noorsidi Aizuddin Mat Nor<sup>2</sup>

<sup>1</sup>Department of Geoinformation, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310, Johor Bahru, Malaysia

<sup>2</sup>Department of Real Estate, Faculty of Built Environment and Surveying, Universiti Teknologi Malaysia, 81310, Johor Bahru, Malaysia

Corresponding Authors: zakritarmidi@gmail.com

**Abstract.** Safety of residential area has become major concern in urban area, especially in affordable housing area, with several safety measure was implemented. Several Governments also developed safe city program, focusing on preventing crime index. Several initiatives were conducted to assess safety, including Safe City Index 2019, Safe City Program, Defensible Space Concept, crime prevention through environmental design (CPTED), Smart Sustainable Cities, etc. Some of these initiatives focus only on crime, other focus on step to improve safety and other model that are broader focus but not specific to safety. Besides that, these models are less emphasis on the aspects of spatial assessment especially the safety level assessment based on affordable housing location in Malaysia. This study focuses on integrating spatial information and analysis to improve current initiatives, and come out with conceptual model to spatially assessing safety level of affordable housing in Malaysia. This conceptual model consists of 6 main indicators; crime, safety and security, infrastructure security, accessibility, natural disaster, and health security. With proper assessment model, further planning to improve current safety can be taken by government and affordable housing community.

## 1. Introduction

Nowadays, criminal behaviour is an issue the more individual or community get consideration and become current discussion material. Consistently, the mass media highlights various news-related news crimes that happen particularly in urban regions. This situation affects life society particularly in terms of safety. The process or urbanization has raised many issues in the region which are safety issues is the one of the issues increasingly threatening the quality of life of the city (UN-Habitat, 1996). Cummins (1999) claims that this situation will influence the aspirations of sustainable development to improve the quality of life society nowadays and also for the future generations. The important of this aspect of security has also been previously emphasized by Maslow (1954) placing it as the second measure after physiological achieve a good quality of life.

Therefore, one approach implemented to dealing with security issues at urban area are through the concept of safe city. Safe City means a city that are free from all the physical, social and mental threats [1]. The environment is always in protected state, not creating an atmosphere that can encourage incidents interferes with the well-being of the local people and their occupants are always in the most secure, prosperous, healthy and cheerful condition [1]. With such a situation, people will avoid danger and disaster, free from fear and able lead a safe and sound life.



In Malaysia, one of the government's initiatives in creating a safe city environment is through the Safe City Program. Safe City Program has been introduced by the Ministry Housing and Local Government (KPKT) during 2004. The Safe City Program is a crime prevention program aimed to ensuring that a city can reduce crime rates and enable the people to live in comfortable and safe environment. Safe City Program have 3 strategies and 15 steps to reducing the crime index [2].

Safety is an important function of the perceived quality of the environments. According to Tawil, Nawi, & Mydin (2014), the component of safety is include safety of a community, incidence of crime and presence of environmental problems. Safety is one of the needs of the individual and family. There is the relationship between the housing and safety. Crime in housing areas has become a fact of life, with road crime increase, violations against people and properties producing significant fear within community, making security an issue demanding basic consideration at both local and national level [4].

Place-based crime prevention organizes the interaction among physical and social environment through modification and manipulation between three main components which are the design, the management and the use of a place. In the place-based crime prevention methods, there are two theories that are defensible space and crime prevention through environmental design (CPTED) [5] which is the current practices and current policies in Malaysia: (1) Defensible Space Concept – This concept developed in the public housing environment by establishing a relationship between crime rates and urban design. This concept focused on restructured the physical layout of communities to allow resident to control their area. (2) Crime Prevention through Environmental Design (CPTED) – This concept is quite similar to Defensible Space Concept in terms of the element which focused on the environmental design in order to reducing or preventing crime.

Other than Defensible Space Concept and CPTED, there is another current practice in Malaysia which is Safe City Program where it is the government's initiatives to crime preventing steps program to ensure the crime rate in the city could be reduced and allow the residents live safely [1].

Sustainability is necessary for affordable housing. Part of sustainability is safety based on Sustainable Development Goals which is Goal 11: Sustainable Cities and Communities (Make cities inclusive, safe, resilient and sustainable) [6]. Besides that, according to National Housing Policy (2018), there are statement from DRN indicate the social indicator in sustainability of affordable housing is the implementation of 'Safe City' concept that related with residential housing. So, to improve the safety aspect, there are several models developed such as CPTED, Safe City Index 2019, Safe City Program and others. Some of these models focus only on crime, other focus on step to improve safety and other model that are broader focus but not specific to safety. Besides that, these models are less emphasis on the aspects of spatial assessment especially the safety level assessment based on affordable housing location in Malaysia.

## **2. Literature Review**

There are several concepts and current practices that are related to the safety indicator where they are Safe City Index 2019, Safe City Program, Defensible Space Concept and Crime Prevention through Environmental Design (CPTED). Furthermore, there are other previous studies and policies from the other countries in the assessment and indicator for housing affordability and smart sustainable cities.

### *2.1. Safe City Concept*

A safe city is one that is free from all kinds of physical threats, social and mental threats and protected from any tendencies that can threaten the welfare of society and contribute to creating a prosperous, secure and comfortable environment. A city should be a safe place to live, work and play. (Power, 2000 supported by Ian Colquhoun, 2004) claims that there are three aspects that are related to each other that influence the success of a city and a society which are housing, public facilities such as schools and shops and urban environment that influences the behaviour of the local community. The idea of Safe City is started on 8 January 2004, whenever the former Malaysian Prime Minister put the concern and worry of the rising number of crimes in the country forward. So, to overcome the problem, the safe city concept was created in the country. All 38 local authorities including Kuala Lumpur City Hall were

identified to incorporate the Safe City concept in the implementation of their planning policies. The 23 crime prevention steps are contained in the Paper Work of The Safe City Implementation Program that was presented in the Municipalities Cooperation Consultant Committee of Malaysia, on 10 August 2004 consists of 23 crime prevention steps that are divided into 3 main strategies [2].

The concept of a safe city requires the involvement and cooperation of every layer community and government and private agencies in creating a safe environment. Crime prevents measures that are emphasized to achieve a quality and prosperous life.

### 2.2. *Safe City and Affordable Housing*

Home is a basic need for everyone in addition to other basic needs. A comfortable home ensures a happy, shared and productive life. Affordable housing is one of the major agendas for every country in the world [7]. Based on the country's Affordable Housing, the concept of affordable housing in the context of affordable housing has 17 criteria to consider in order to achieve the real goal of affordable housing, but one of these criteria defines security as one of the criteria considered in affordable housing, which is the security.

A safe city is one that is free from all kinds of physical threats, social and mental threats and protected from any tendencies that can threaten the welfare of society and contribute to creating a prosperous, secure and comfortable environment. Safety is an important function of the perceived quality of the environments. According to Canadian Criminal Justice Association (1989), better social housing is the key of crime prevention. When people live in well-designed well-manage affordable housing, they will be safer themselves, and will actively contribute to the well-being of those around them and also good affordable housing will prevent crime and disorderly behavior [8].

### 2.3. *Previous Study on Assessing Housing Safety Level*

One of the best methods for assessing the level of safe city criteria for affordable housing is by using indicators. This indicator can become the parameter or measurement for assessment. This subtopic will discuss and identify the safety indicator that is from the current concept and previous studies framework that related to the safety indicator for affordable housing in Malaysia and other country.

**2.3.1. *Safe City Index 2019.*** The Safe City Index 2019 also known as SCI2019 is a report from The Economist Intelligence Unit, sponsored by NEC Corporation which is about urban security and resilience in an interconnected world [9]. This report is depending on the third cycle of the index, in which 60 cities are ranks with the 57 indicators covering and divide into 4 categories, which are personal security, infrastructure security, health security and digital security [9]. Each category has their own indicator that is group into inputs of safety and output. Outputs measures how safe a city currently while the inputs show which cities are doing the right things to enhance the safety. Output and input are important to understand the security level. Table 1 shows the categories of security and also the input and output of the Safe City Index 2019.

**Table 1.** Categories, Inputs and Outputs of Safe City Index 2019 [1].

<b>Categories</b>	<b>Inputs</b>	<b>Outputs</b>
Digital Security	<ul style="list-style-type: none"> <li>• Privacy policy</li> <li>• Citizen awareness of digital threats</li> <li>• Public-private partnerships</li> <li>• Level of technology employed</li> <li>• Dedicated cyber-security teams</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of local malware threats</li> <li>• Percentage of computers infected</li> <li>• Percentage with internet access</li> </ul>
Infrastructure Security	<ul style="list-style-type: none"> <li>• Disaster management/business continuity plan</li> <li>• Enforcement of transport safety</li> <li>• Pedestrian friendliness</li> </ul>	<ul style="list-style-type: none"> <li>• Deaths from natural disasters</li> <li>• Road traffic deaths</li> <li>• Percentage living in slums</li> </ul>

---

Health security	<ul style="list-style-type: none"> <li>• Environmental policies</li> <li>• Access to healthcare</li> <li>• No. of beds per 1,000 population</li> <li>• No. of doctors per 1,000 population</li> <li>• Access to safe and quality food</li> <li>• Quality of health services</li> </ul>	<ul style="list-style-type: none"> <li>• Number of attacks on facilities/infrastructure</li> <li>• Catastrophe insurance</li> <li>• Disaster-risk informed development</li> <li>• Air transport facilities</li> <li>• Road network</li> <li>• Power network</li> <li>• Rail network</li> <li>• Cyber-security preparedness</li> <li>• Air quality (PM 2.5 levels)</li> <li>• Water quality</li> <li>• Life expectancy years</li> <li>• Infant mortality</li> <li>• Cancer mortality rate</li> <li>• No. of biological, chemical, radiological weapons attacks</li> <li>• Emergency services in the city</li> </ul>
Personal security	<ul style="list-style-type: none"> <li>• Level of police engagement</li> <li>• Community-based patrolling</li> <li>• Available street-level crime data</li> <li>• Use of data-driven techniques for crime</li> <li>• Private security measures</li> <li>• Gun regulation and enforcement</li> <li>• Political stability risk</li> <li>• Effectiveness of the criminal justice system</li> <li>• Hazard monitoring</li> </ul>	<ul style="list-style-type: none"> <li>• Prevalence of petty crime</li> <li>• Prevalence of violent crime</li> <li>• Organised crime</li> <li>• Level of corruption</li> <li>• Rate of drug use</li> <li>• Frequency of terrorist attacks</li> <li>• Severity of terrorist attacks</li> <li>• Gender safety (female homicide)</li> <li>• Perceptions of safety</li> <li>• Threat of terrorism</li> <li>• Threat of military conflict</li> <li>• Threat of civil unrest</li> </ul>

---

2.3.2. *Safe City Program in Malaysia.* Safe City Programme is a crime prevention steps program to ensure the crime rate in the city could be reduced and allow the city residents could live comfortably and safely [10]. Safe City Programme was introduced in 2004 by introducing 3 strategies and 23 steps of implementation by the Local Authorities. To reduce crime under the Government Transformation Program (GTP), in the 11<sup>th</sup> Malaysia Plan (RMK11), a Safe city program is given priority to implement as outlined in Focus Area C: Chapter 14 Improving People's Well-Being: Creating Safer Environment for a sustainable and peaceful community. 3 strategies and 15 steps have been re-introduced. The 3 strategies are: (1) Strategy 1: Environmental Design Initiatives, (2) Strategy 2: Target Hardening, and (3) Strategy 3: Management and Community.

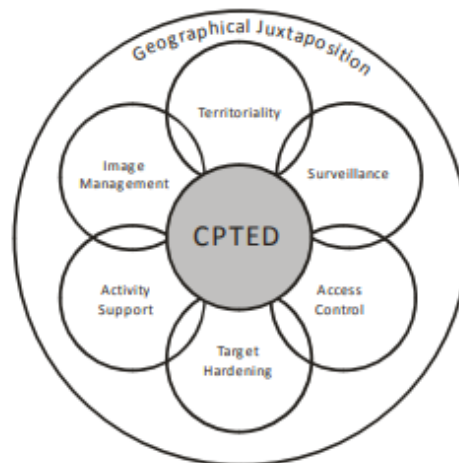
2.3.3. *Defensible Space Concept.* Other than indicator and strategies from SCI2019 and Safe City Program, there is another concept that can be used to assess the level of a safe city for affordable housing that is a Defensible Space Concept which has the element and indicator that related to this study. In 1972, Oscar Newman has introduced the defensible space concept and defined as “model for residential environments which inhabits crime by creating the physical expression of social fabric which defends itself”. The purpose of the defensible space concept is to restructure the physical structure and make a strong bonding with the community that can strengthen their social interaction and also preventing crime in the residential area.

According to [11], there are three elements in the defensible space concept, which are the territoriality, surveillance, and image. Territoriality is including a group of people and other territorial units. This group forms its surveillance to monitor their home environment. Every individual in that unit has territorial characteristics. Surveillance is an element that is related to an element of the territorial in which the breadth of a territorial community area will affect the environmental aspects of surveillance in those communities. Image is referring to the location of the area that does not appear vulnerable to crime and not isolated from the surrounding view. Table 2 shows the element and indicator of defensible space concept.

**Table 2.** The element and indicator of defensible space concept [11].

Element	Indicator
Territoriality	<ul style="list-style-type: none"> <li>• Public space</li> <li>• “Sense of belonging” environment</li> <li>• Safe environment for activities</li> <li>• Presence of dark spot at night</li> </ul>
Surveillance	<ul style="list-style-type: none"> <li>• Surveillance element</li> <li>• Lighting element</li> </ul>
Image	<ul style="list-style-type: none"> <li>• Landscape manages</li> <li>• Barrier-less jogging track</li> </ul>

2.3.4. *Crime Prevention through Environmental Design (CPTED)*. CPTED also is known as Crime Prevention through Environmental Design is the result of the Safe City Programme Unit under the Urban and Rural Planning Department that is conducted to achieve the first NKRA of reducing the crime rate. CPTED is the concept that is to preventing crime through the initial stages.



**Figure 1.** CPTED and component concepts [12].

CPTED is a multi-disciplinary approach drawing on criminology, planning, and environmental psychology and is specifically located within the field of environmental criminology, deriving theoretical support from opportunity theory [12]. CPTED focused on seven key concepts which are territoriality, surveillance, access control, target hardening, activity support, and image management and geographical juxtaposition.

According to Hedayati Marzbali, Abdullah, Ignatius, & Maghsoodi Tilaki (2016), the theoretical framework is based on four dimensions which are surveillance, access control, territoriality, and maintenance. The items were developed based on the operationalization of each indicator. Table 3 shows the dimensions, indicators and items in CEPTD concept.

**Table 3.** CPTED dimension with respective indicators and items.

Dimensions	Indicators	Items
Surveillance	Visibility (1= extremely not satisfied, 5 = extremely satisfied)	<ul style="list-style-type: none"> <li>• Entire passage from gate to door is visible from the street</li> <li>• All door and window at the front façade visible from the street</li> <li>• All places are concealed by fences in the yard from the main entrance</li> <li>• All space between houses are visible</li> <li>• Shrub are kept to a maximum of 3 feet in height</li> </ul>
	Lighting (1= very poor, 5 = very good)	<ul style="list-style-type: none"> <li>• Lighting facilities at the main entrance</li> <li>• Lighting around the building</li> <li>• The level of lighting in the yard area</li> <li>• Street light on the street block</li> <li>• House-level lighting maintenance</li> <li>• Street lighting maintenance</li> </ul>
Access Control	Physical barrier (0= no, 1= yes)	<ul style="list-style-type: none"> <li>• A barrier (wall/hedge/fence) exists continuously</li> <li>• A continuously extra physical element exist</li> </ul>
	Security system	Number of item present
Territoriality	Markers	Number of item present
	Landscaping (1 = extremely not satisfied, 5 = extremely satisfied)	<ul style="list-style-type: none"> <li>• Overall, aesthetic condition of the landscape is excellent.</li> <li>• Additional landscaping is performed immediately outside the territory.</li> <li>• Landscaping is well maintained.</li> <li>• The proportion of the soft-scape compared to the built-up area is high.</li> </ul>
Maintenance	Front house maintenance (1 = low quality, 5 = high quality)	<ul style="list-style-type: none"> <li>• The condition of the exterior walls.</li> <li>• The condition of doors and gates.</li> <li>• The condition of windows.</li> <li>• The condition of roofs.</li> <li>• The condition of property boundaries.</li> <li>• Prevention activities in the presence of incivilities such as graffiti.</li> <li>• General appearance of the house.</li> </ul>
	Backlane maintenance (1 = not at all satisfied, 3 = extremely satisfied)	<ul style="list-style-type: none"> <li>• Backlane is well maintained.</li> <li>• Basic lighting is provided in the backlane.</li> <li>• General appearance of the house is in good condition (at the rear of the property).</li> <li>• There is no evidence of litter/graffiti within the vicinity of the property.</li> </ul>

2.3.5. *Smart Sustainable Cities in Cagliari, Italy.* The other study on concept of Safe City was studied in Italy, that focus about the indicator and assessment tools for smart sustainable cities which can relate to the safety indicator for affordable housing. Smart cities are developed urban areas designed with a perspective of creating a high quality of life and also sustainable economic development [14]. There are 7 categories that contain their own indicator but 3 out of 7 that are related to the safe city criteria. The selected indicators are sub-divided into sub-indicator which correspond to the categories of the evaluation. Table 4 shows the categories with the indicator and sub-indicator from the studied.

**Table 4.** Categories, indicators and sub-indicators from study in Italy [14].

Categories	Indicators	Sub-Indicators
Use and fruition	Accessibility	<ul style="list-style-type: none"> <li>• Traffic accessibility</li> <li>• Pedestrian accessibility</li> <li>• Accessibility for people disable</li> </ul>
Health and wellbeing	Emotional wellbeing	<ul style="list-style-type: none"> <li>• Quality of street lighting</li> <li>• Easy mobility services</li> <li>• Environmental maintenance</li> </ul>
	Quality of life	<ul style="list-style-type: none"> <li>• Urban traffic noise pollution</li> <li>• Air pollution</li> </ul>
Safety and Security	Security System	<ul style="list-style-type: none"> <li>• Lighting and security control</li> </ul>
	Smart Crime Prevention	<ul style="list-style-type: none"> <li>• Social Security level</li> </ul>
	Risk of natural disaster	<ul style="list-style-type: none"> <li>• Probability of natural disaster</li> </ul>

2.3.6. *Studies on attributes determine housing affordability in Merseyside and Cheshire, United Kingdom.* According to Suarez & Suarez (2017), the concept of housing affordability is a contested issue, but a pressing and widespread problem for many countries. In this study, the authors posit the housing affordability assessments must take a more suitable view of the wide-ranging criteria that affect households not typically assessed by economic criteria which sometimes important factors such as location, quality of life and sustainability are ignored. This study also identifies the attribute which influence housing affordability and explain the criteria of housing affordability that could be assessed and measure.

The measurement of the criteria is from the perspective of assessing the affordability of the different areas. There 20 criteria and 1 of the criteria is related to the safety that is Criterion 7: Safety/Crime (determine the level of crime rate). This attribute will be assess using police crime statistics, which scale crime from low to high. The level of crime in an area is compared with the resident to identify the crime rate. The 'crime rate' for a given area is the number of crimes per 1000 people in that area. For each area, these are calculated by dividing the actual number of crimes by the population and then multiplying by 1000. Each crime level/banding will then be given an associated score (where a higher score is worse for the assessment):

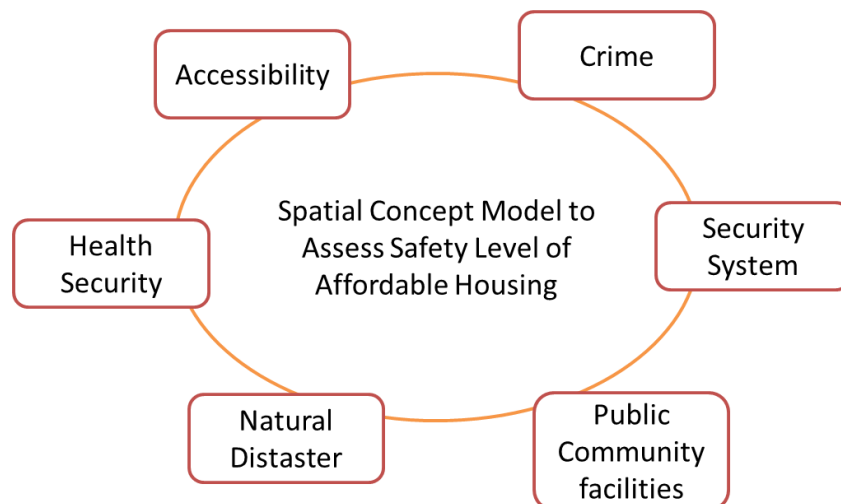
**Table 5.** Categories, indicators and sub-indicators from study in Italy.

Crime rate	Level	Score
Top 20% of areas with the highest crime rate	High	5
Next 14% of areas	Above average	4
Middle 68% of areas	Average	3
Next 14% of areas	Below average	2
Bottom 2% of areas with the lowest crime rate	Low	1

### 3. Conceptual Model to Assess Safety Level of Affordable Housing in Malaysia

Based on the models and indicators from the previous study, the models and the indicators are indirectly related to each other which is that is more to safety and crime. Safe City Index 2019 focused on the urban security and resilience in an interconnected world and has 4 categories while Safe City Program, Defensible Space Concept and Crime Prevention through Environmental Design (CPTED) is more focused on the strategies of environmental design that prevent the crime from happening in the residential area which are safe city program is the initiatives from the government and have 3 strategies while defensible space concept has 3 element and 8 indicators and CPTED has 4 dimensions and 8 indicators.

By using geospatial information and undergo spatial analysis, it can assist in identify the location of affordable housing and at the same time capable to assess the level of safe city criteria for affordable housing based on the safe city concept of each location of affordable housing. However, the framework from the previous study needs to be improved, especially in developing geospatial information into an identified indicator. Figure 2 shows the conceptual model to assess safety level, via integrating spatial information and analysis.



**Figure 2.** conceptual model to assess safety level, via integrating spatial analysis.

The conceptual model to assessing the safety level of affordable housing with spatial element, consists of 6 main indicators, (1) crime, (2) security system, (3) public community facilities, (4) natural disaster, (5) health security, and (6) accessibility. The indicators of crime focus on the number of crime, or crime index, including the locations of burglary, snatch thief, and thieves. The indicators of security system focus on assessment of any system to enhance the surrounding area of affordable housing, including locations of CCTV placement, safety mirror and security alarm. For public community facilities indicators, this one focus on the location of safety pedestrian path, and street lighting.

For natural disaster indicator, this indicator focus on the any disaster happen in surrounding area of affordable housing, including flood and landslide locations. For health security indicator, this on focus on the location of any disease outbreak, such as malaria, tuberculosis (TB), dengue, or Influenza. The last indicator is accessibility, that focus on the location of police station, and also open space.

### 4. Conclusion

Safety has become one of the major concern in urban area, especially for affordable housing. To ensure safety of affordable housing area, Malaysian government has come out with several initiatives, but there's a need to assess the safety level of this area. Several models were studied, and these model have



different purposes, and lack of spatial information to assess the safety level of affordable housing. This study conducted to enhance current assessment, with integrating spatial information, with spatial analysis to assess safety level, with case study of affordable housing. With proper assessment, future planning in enhancing surrounding area of affordable housing can be made, to improve the safety level of affordable housing.

### Acknowledgements

Authors would like to express our gratitude to Universiti Teknologi Malaysia for funding this project under the Universiti Teknologi Malaysia, UTM Grant, UTM Fundamental Research Grant (UTMFR), and vote number 21H07.

### References

- [1] E. I. U. ECU, "Safe City," 2019. [Online]. Available: <https://safecities.economist.com/safe-cities-index-2019/>.
- [2] S. B. Shamsuddin, N. Azim, and B. Hussin, "Safe City Concept and Crime Prevention Through Environmental Design (CPTED) for Urban Sustainability in Malaysian Cities," *Am. Trans. Eng. Appl. Sci.*, vol. 2, no. 3, pp. 223–245, 2013.
- [3] N. M. Tawil, M. N. M. Nawi, and M. A. O. Mydin, "Criteria for Affordable Housing Performance Measurement : A Review," vol. 01003, 2014.
- [4] M. Mohit and H. Elsawahli, "Crime and housing in Malaysia : Case study of Taman Melati terrace housing in Kuala Lumpur CRIME AND HOUSING IN MALAYSIA : CASE STUDY OF TAMAN MELATI TERRACE HOUSING," no. January 2010, 2015.
- [5] M. H. Marzbali, "A Review of the Effectiveness of Crime Prevention by Design Approaches towards Sustainable Development," vol. 4, no. 1, pp. 160–172, 2011.
- [6] U. N. Sustainable, "Ph\_Ls\_1\_7."
- [7] Jabatan Perumahan Negara, "Dasar Perumahan Mampu Milik Negara," 2019.
- [8] C. F. M. Program, "Home Safe Home Affordable Housing and," 1989.
- [9] The Economist Intelligence Unit, "Safe Cities Index 2019," 2019.
- [10] "Safe City Programme | Official Portal of Seremban Municipal Council (MPS)." .
- [11] P. Volume, "THE DEFENSIBLE SPACE CONCEPT IN NEIGHBOURHOOD PARK," vol. 16, no. 3, pp. 274–284, 2018.
- [12] P. Cozens and T. van der Linde, "Perceptions of crime prevention through environmental design (CPTED) at Australian railway stations," *J. Public Transp.*, vol. 18, no. 4, pp. 73–92, 2015, doi: 10.5038/2375-0901.18.4.5.
- [13] M. Hedayati Marzbali, A. Abdullah, J. Ignatius, and M. J. Maghsoodi Tilaki, "Examining the effects of crime prevention through environmental design (CPTED) on Residential Burglary," *Int. J. Law, Crime Justice*, vol. 46, pp. 86–102, 2016, doi: 10.1016/j.ijlcj.2016.04.001.
- [14] C. Garau, "Evaluating Urban Quality : Indicators and Assessment Tools for Smart Sustainable Cities," 2018, doi: 10.3390/su10030575.
- [15] P. Suarez and P. Suarez, "LJMU Research Online," 2017.