

ASSESSING SAFETY LEVEL OF UTM CAMPUS BASED ON SAFE CITY CONCEPTS

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KEY WORDS: Safe City Concept, Safe City Spatial Indicators, Spatial Indicators, Campus Safety Level.

ABSTRACT:

Safety is an important aspect in today's living, in urban city, residential area, and also in campus area. Several initiatives were introduced to increase the safety level, and to prevent crime from happening in the campus area, known as Safe City Concept. These initiatives included the Safe City Index, Crime Prevention Through Environmental Design (CPTED), behavioural model, safe city urban area, safe city of smart city, and resident safety assessment. Some of this initiative focus on urban city area, or residential, besides only focus on crime prevention and not focus on the assessment of safety level for campus area. This study aims to assess the safety level for campus area, with case study of UTM Campus. To assess the safety level, a set 4 indicators, which is crime, environment, public health and emergency response, with 9 sub-indicators was identified in this study. These indicators and sub-indicators used to determine the safety level of campus area based on the Safe City Concept. The analysis used is spatial analysis on the indicator, and using weighted criteria matrix to evaluate safety level for each building in UTM campus. The results show that most the buildings in UTM are in good and high safety level, with 65% of buildings score more than 70%. For buildings was detected with highest score of 95% of safety level, while 3 buildings score lowest percentage of 53.7%. these results indicated that UTM campus area is a safe area, based on the Safe City Concept. These results can help authorities to use these indicators of Safe City Concept to assess the education campus area safety level.

1. INTRODUCTION

Safety has become an important concern in urban region, with urbanization process has raised many issues related to quality of life, especially on the safety level of their surrounding area. To encounter this issues, safe city concept has been launched by UN-Habitat with various involvement of agencies, such as United Development Programme (UNDP), United Nation Children's Fund (UNICEF) and United Nations Economic Social and Cultural Organization (UNESCO) to support this initiative (ECU, 2019).

Safe City Programme was introduced in Malaysia in 2004, as a strategy to prevent crime through prevention approach, and this programme is collaboration with Ministry of Housing and Local Government (KPKT) to be implemented in local authority. This initiative consists of 3 strategies and 15 steps to be taken to reduce the crime index in local authorities. Besides Safe City Programme, another initiative is defensible space and crime prevention through environmental design (CPTED) (Hedayati Marzbali et al., 2016). This initiative focused on restructured the physical layout to allow residents of the area to control their surroundings. Other than that, Safe Cities Index also being introduce to urban security and resilience in an interconnected world (The Economist Intelligence Unit, 2019).

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 for campus education area.

To assess the safety level of campus area, the aim of this study is to assess the safety level for campus area, based on the safe city concept at Universiti Teknologi Malaysia (UTM) campus.

2. SAFE CITY INDICATORS

2.1 Definitions of Safe City Concept

To understand better on the Safe City Concept, several definitions from previous studies has been identified, and listed in table 1 below.

Definition	Author(s)
Safe City is a city, that by the integration of technology and natural environment increases the effectiveness of processes in the field of safety, in order to reduce crime and terror threats, to allow its citizens life in a healthy environment and simple access to healthcare, and to achieve readiness and quick response to threatening or arising emergencies.	(Lacinák & Ristvej, 2017)
Safe city is a part of live-able cities concept focused on the crime problem in urban areas.	(Aris-Anuar et al., 2011)
Safe city concept is also to create a unified	(Vitalij et al.,

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response plan to major emergency situations.	(2012)
Essential aspects of the safety concept, first of all, the cross-sectoral definition of dangerous locations using gender-based assessment systems, remain outside the field of view of researchers.	(Fesenko et al., 2017)
A city can be defined as a safe city as a city free of violence that destroys property and lives, free from the threat of destruction due to natural disasters and disasters, independent of social and moral decline of the population, and the city also is said to be safe if the accidents were independently indoors or outdoors.	(Thani et al., 2016)

Table 1. Definition of Safe City Concept

From the previous definition, the concept of a safe city requires cooperative involvement from the communities with plan to reduce crime and terror threats, healthy environment, simple access to healthcare, reduce threat from natural disaster, and safe indoor and outdoor for a liveable city.

One way to achieve safe city environment, is via having proper management, planning, implementation and monitoring process. To make a better planning, several models, indicators, and framework has been developed.

2.2 Models from Previous Studies

Most of the previous models, or indicators focus on the city, or urban area, and not focusing on the safety level of campus areas. But these models or indicators can become a based for safe city concept for campuses. Table 2 shows the previous studies on the models, indicators, or framework related to safe city concepts.

Safe City Concepts	Descriptions	Author (s)
Comprehensive threat assessment/ behavioral intervention model	Designed to reduce the potential risk posed by the inappropriate, disruptive or violent behavior of individuals in university and campus settings	(Keller et al., 2011)
Safe City Program that relates to the tourism industry	The effectiveness of the 19 crime prevention steps that applied in Putrajaya since 2004 are evaluated	(Aris-Anuar et al., 2011)
The features of urban areas with the use of feminist optics for the concepts of a safe city has been analyze	Developed gender-sensitive geo-information maps of Kharkiv through explication of the problem of urban infrastructure security and also develop a solution for integrating GIS data of gender-sensitive maps into the processes of managing the content of urban infrastructure projects and programs	(Fesenko et al., 2017)

Safe city model of smart city that is based on the safe city concept	The integration of technology and natural environment increases the effectiveness of processes in the field of safety, in order to reduce crime and terror threats, to allow its citizens life in healthy environment and simple access to healthcare	(Laciná k & Ristvej, 2017) (Ristvej et al., 2020)
Safe City Monitoring System	GIS web-based application that develops in aiding in crime monitoring in Malaysia	(Shamsudin et al., n.d.)
Assisting the safe city model effectiveness from the residents' perspectives	Crime Prevention Through Environmental Design (CEPTD) has six main components including the territoriality, surveillance, access control, target hardening, legitimate activity support and lastly, image management	(Shamsuddin et al., 2013)

Table 2. Previous studies on the safe city concepts.

These models, or framework of safe city mainly focus on urban city area, or residential area. To access the safety level of campus or educational area, is a little bit tricky, where there's an administration area, residential area (student's college), and other related landscape and design, beside environmental and tourism parts inside the same compact area. There a need to identify and integrated current safe city model with model to assess the safety level, focusing on campus environment.

2.3 Indicators for Assessing Safety Level of Campus Area

One of the methods to assess the safety level of campus area, is via having an indicator as a based. Many studies have identified the indicators, and its sub-indicators to assess the safe city model. This model also provides the method of assessment to assess the safe city model. Table 3 shows the indicators that can be used to assess the safety level of campus area based on the safe city concept.

Indicators	Sub-Indicators	Method for assessment	Authors
Crime	<ul style="list-style-type: none"> • Crime • Threats 	Crime Prevention Through Environmental Design (CPTED) has been selected as one of the methods of crime prevention initiatives in Malaysia The assessment of the risk of the potential threats	(Hedayati Marzbali et al., 2016; Risdiana & Susanto, 2019; Ristvej et al., 2020; Shamsuddin et al., 2013)

Environment/ Landscape	<ul style="list-style-type: none"> • Walkway • Lighting • Signage • Installation of CCTV • Provision of security alarms 	Evaluation of the importance of crime prevention steps in the safe city	(Shamsudin et al., 2013; Thani et al., 2016)
Public health	<ul style="list-style-type: none"> • Healthcare 	Simple access to healthcare	(Risidiana & Susanto, 2019; Ristvej et al., 2020)
Emergency response	<ul style="list-style-type: none"> • To achieve readiness and quick response to threatening or arose emergencies 	Identify the rise of emergency, to display actual state of situation on the map and to simulate its progress in real time or accelerated, while considering actual weather conditions	(Ristvej et al., 2020)

Table 3. List of indicators, sub-indicators, and it's descriptions.

Based on the models, indicators, and frameworks from the previous studies, the models, indicators and frameworks are indirectly related to each other which is more to safety and crime. Via having geospatial information and undergo spatial analysis; this model can be enhanced to assist the locations of each event or indicators that can be used to assess the safety level. Table 4 shows the indicators and sub-indicators that can assess the campus's safety level, with integration of geospatial information and analysis.

Indicators	Sub-indicators
Crime	<ul style="list-style-type: none"> • Number of Crime
Environment	<ul style="list-style-type: none"> • Walkway • Lighting • Signage • Installation of CCTV • Provision of security alarms
Public Health	<ul style="list-style-type: none"> • Clinic or Health Centre
Emergency response	<ul style="list-style-type: none"> • Police station • Fire station

Table 4. Indicators and sub-indicators to assess safety level, via integrating spatial information.

The indicators consist of 4 main indicators; (1) Crime, (2) Environment, (3) Public Health and (4) Emergency Response. The indicators for crime focus on number of crimes in the campus. The indicators of environment focus on assessment on the existence of walkway, lighting in the area, signage, CCTV installation, and the security alarms for the area. For Public Health indicators, it focusses only on the distance between the building with the Health Centre inside and outside campuses. And for Emergency response indicators, it consists of distance to police station, fire station or campus's security division.

3. RESEARCH METHODOLOGY

In order to assess the safety level of the campus, this study using Analytic Hierarchy Process (AHP). This being done via determining the indicators using weighted criteria, that evaluates a set of choices against a set of weighted factors. In this study, it consists of 3 main phases, (1) identifying the Safe City Concept from previous studies, (2) integrating the indicators from previous studies into indicators for safety level for campus, and (3) assessment of the safety level.

3.1 Identifying Safe City Concept

The first phase is to study and identify the previous model, framework or indicators that related to Safe City Concept. From previous studies, 5 main model/indicators were identified, which is Safer Cities Programme, Safe City Program in Putrajaya Malaysia, Safe City and Community Safety of Safe City, Assessment model of threats on college campus, and Crime Prevention and perception of safety in campus. From these model or indicators, several indicators and sub-indicators was identified as listed in Table 3.

3.2 Integrating Safe City Indicators for Campus

The listed indicators and sub-indicators that was identified in the previous studies in table 3 then being integrated with spatial information and analysis. The final indicators and sub-indicators that being used in this study then being listed in table 5. The indicators and sub-indicators were integrated with spatial information, the condition of each sub-indicators, and the score for each condition. Table 5 shows the indicators, sub-indicators, the conditions for sub-indicators, and the score related for each condition.

Based on the indicators and sub-indicators, the next part of second phase is data collection. Data collected in this study is from various sources. For data of Crime (number of cases), this data was collected from Security Department, UTM. The data given is crime data from 2020, and the data is not in digital form, and need data processing and clean-up. Data of CCTV area also being given by Security Department, UTM. Figure 1 shows the data given by UTM's Security Department. Other data such as location of Health Centre, Police Station, and Fire Station was cross-checked with satellite and attribute data that self-collected.

Indicators	Sub-indicator	Condition	Score
Crime	(Number of cases)		
	Crime	Well below average	5
		Below average	4
		Average	3
		Above average	2
	Well above average	1	
Environment	(Item Present)		
	Walkway	Yes	1
		No	0
	Lighting	Yes	1
		No	0
	Signage	Yes	1
		No	0
	CCTV	Yes	1
		No	0
	Fire alarms	Yes	1
No		0	

Public Health	(Distance)		
	Distance to Health Care	0-800m	3
		801-1499m	2
>1500	1		
Emergency Response	(Distance)		
	Police Station	0-800m	3
		801-1499m	2
		>1500	1
	Fire Station	0-800m	3
		801-1499m	2
>1500		1	

Table 5. Indicators, sub-indicators, condition and scoring to assess the safety level for campus.

Besides that, data for Environment’s indicators was collected inside UTM, self-collected. This included the walkway, lighting and signage.

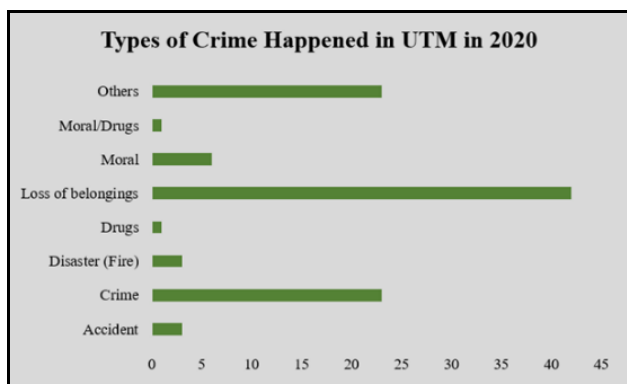


Figure 1. Graph of Types of Crime Happened in UTM in 2020.

3.3 Assessment of the Campus Safety Level

In this study, the safety level for campus areas is determined by using the weighted criteria. The weighted criteria matrix is a valuable decision-making tool that is used to evaluate program alternatives based on specific evaluation criteria weighted by importance. By evaluating alternatives based on their performance with respect to individual criteria, a value for the alternative can be identified. Table 6 shows the calculation on the weighted criteria matrix used in this study.

Criteria	Indicators 1	Weight	Indicator 2	Weight	Total	Total Weight	Safety Level (%)
Choice A							
Choice B							
Choice C							
Total Score							
Total Max Score							

Table 6. Matrix to calculate the total weight and safety level in this study.



Figure 2. Example of buffer analysis (distance to UTM Health Centre)

The criteria of each factor are weighted relative to their perceived importance and each factor is scored against each criterion. To identify and acquire the scoring of the indicators in order to decide the safety level, several spatial analyses need to be performed based on the condition of each sub-indicator. Figure 2 shows example of buffer Analysis of the faculty, college, facilities & others less than 800m from UTM Health Centre.

4. RESULTS AND DISCUSSIONS

4.1 Indicators Analysis

The results from the analysis are according to the campus safety level, that is Crime, Environment, Public Health, and Emergency Response. The results are present in the table 7 and figure 3 to figure 8

4.1.1 Crime Indicator: Figure 3 shows the results of analysis for crime indicator. From the analysis, the highest percentage for this Crime Indicator based on faculties, colleges, facilities & others are 100%. Meanwhile, the least percentage of safety level for this indicator is 20% for C_4 which are Kolej Datin Sri Endon (KDSE) and the college which obtain 40% of Crime Indicator is C_5 which is Kolej Dato Onn Jaafar (KDOJ). The scores are based on the total numbers of crime that occurred in that particular faculty, college, facilities & others. Most of the results have the highest score which is 100% that indicates the locations are safer compared to others that received low percentage.

4.1.2 Environment Indicator: For Environment indicator analysis, there are 5 sub-indicators being analyse. From the analysis, the highest percentage for this Environment/Landscape Indicator based on faculties, colleges, facilities & others are 80%. Meanwhile, the least percentage of safety level for this indicator is 20%. The indicators are based on the presence of walkway, lighting, signage, CCTV and fire alarms for that particular location. Figure 4 shows the results of this analysis.

4.1.3 Public Health Indicator: Figure 5 shows the results from the analysis for Public Health Indicator. There only 1 sub-indicators, which is distance from building to the nearest UTM’s Health Centre. From the analysis, the highest percentage for this Public Health Indicator based on faculties, colleges, facilities & others are 100%. Meanwhile, the least percentage of safety level for this indicator is 33.33%. The scores are based on the distance from Health Centre to the particular location. The highest percentage shows the distance from the location is less than 800m to Health Centre.

4.1.4 Emergency Response Indicator: For Emergency response indicator, there are 2 sub-indicators, which is the distance from police station, and distance from fire station. From the analysis, there is an equal score for all the faculty, college, facilities & others located in UTM campus where the score is 33.33% for safety level based on Emergency Response Indicator. This is because both the Police Station and Fire Station are located outside the campus area which is in Taman Universiti. Therefore, the distance from particular locations to both stations are more than 1500m hence the percentage for this indicator is low. Figure 6 shows the results of this indicator.

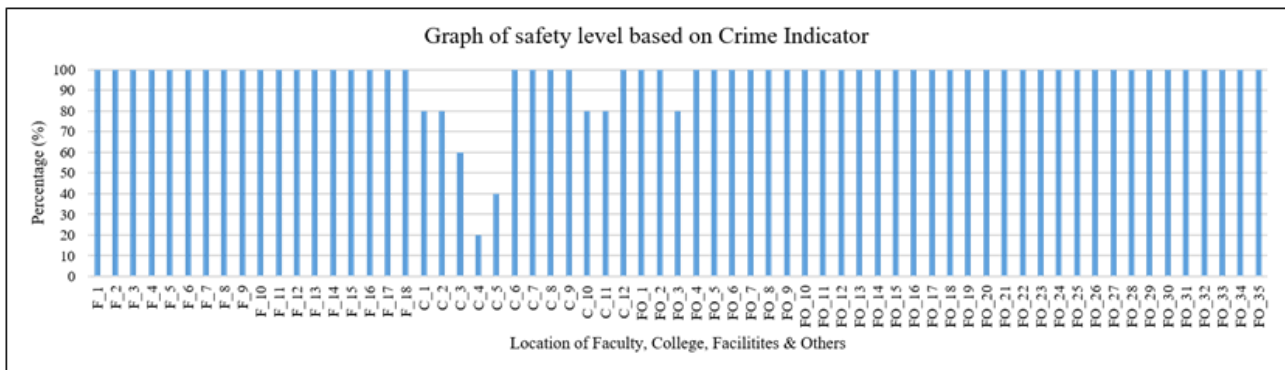


Figure 3. Results of Crime Indicator.

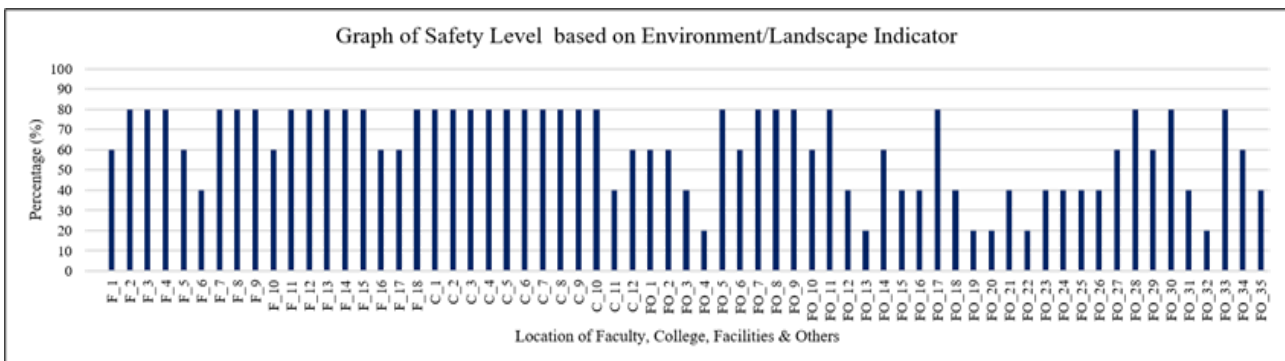


Figure 4. Result of analysis for Environment Indicator.

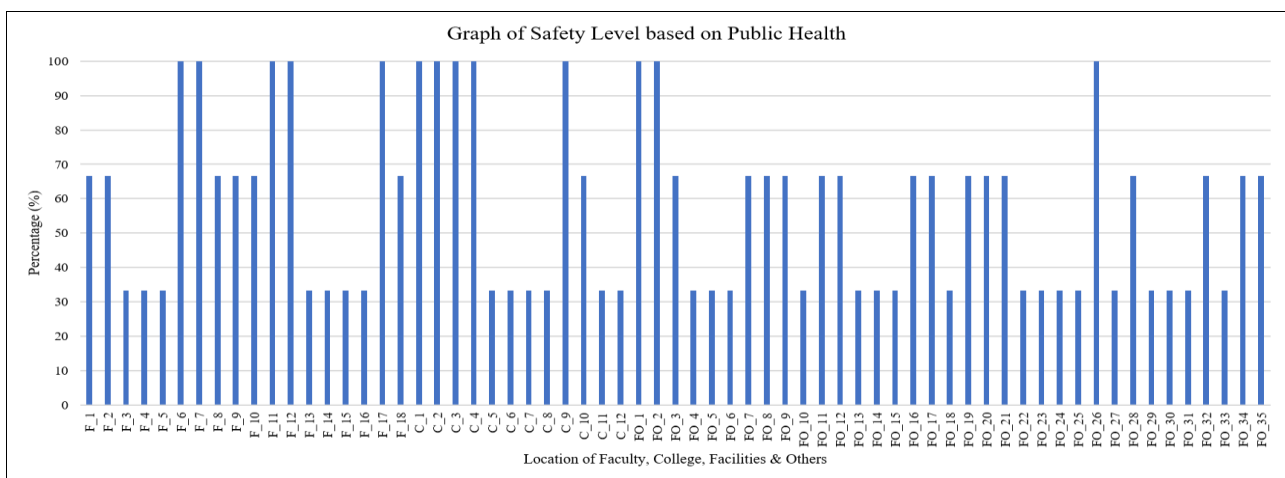


Figure 5. Result of analysis for Public Health Indicator.

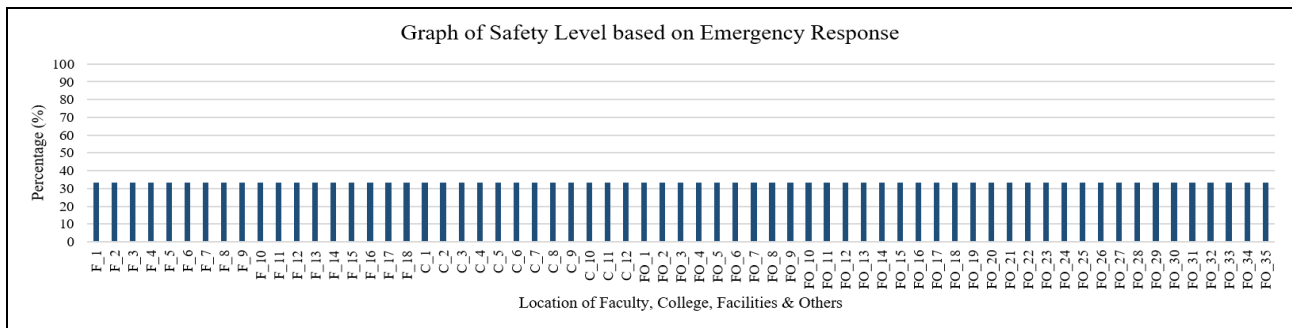


Figure 6. Result of Analysis for Emergency Response Indicator.

ID	Location	Score													Total	Safety Level (%)
		C	TW	EL					TW	PH	TW	ER		TW		
				W	L	S	CC TV	FA				PKU	P S			
F_1	Akademi Bahasa	5	0.30	1	1	0	0	1	0.21	2	0.133	1	1	0.1	0.743	74.30
F_2	FABU	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
F_3	FBME T02	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
F_4	FBME V01	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
F_5	FGHT T06	5	0.30	1	1	0	0	1	0.21	1	0.067	1	1	0.1	0.677	67.70
F_6	FK	5	0.30	0	1	0	1	0	0.14	3	0.200	1	1	0.1	0.740	74.00
F_7	FKA	5	0.30	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.950	95.00
F_8	FKE	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
F_9	FKM	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
F_10	FKT	5	0.30	1	1	0	0	1	0.21	2	0.133	1	1	0.1	0.743	74.30
F_11	FP	5	0.30	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.950	95.00
F_12	FS	5	0.30	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.950	95.00
F_13	FS T05	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
F_14	FSSK T08	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
F_15	FTI T07	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
F_16	Makmal Penyelidikan T03	5	0.30	0	1	0	1	1	0.21	1	0.067	1	1	0.1	0.677	67.70
F_17	Pusat Kokurikulum	5	0.30	1	1	0	1	0	0.21	3	0.200	1	1	0.1	0.810	81.00
F_18	SPS	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
C_1	Kolej Rahman Putra	4	0.24	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.890	89.00
C_2	Kolej Tun Fatimah	4	0.24	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.890	89.00
C_3	Kolej Tun Razak	3	0.18	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.830	83.00
C_4	Kolej Datin Seri Endon	1	0.06	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.710	71.00
C_5	Kolej Dato Onn Jaafar	2	0.12	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.637	63.70
C_6	Kolej Tunku Cancellor	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
C_7	Kolej Perdana	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
C_8	Kolej 9&10	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70

C_9	Kolej Tun Hussein Onn	5	0.30	1	1	0	1	1	0.35	3	0.200	1	1	0.1	0.950	95.00
C_10	Kolej Tun Dr. Ismail	4	0.24	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.823	82.30
C_11	KLG Campus Residence	4	0.24	1	1	0	0	0	0.14	1	0.067	1	1	0.1	0.547	54.70
C_12	Scholars Inn	5	0.30	1	1	0	1	0	0.21	1	0.067	1	1	0.1	0.677	67.70 0
FO_1	Arked Cengal	5	0.30	0	1	0	0	1	0.14	3	0.200	1	1	0.1	0.740	74.00
FO_2	Arked Meranti	5	0.30	0	1	0	1	1	0.21	3	0.200	1	1	0.1	0.810	81.00
FO_3	Bahagian Keselamatan	4	0.24	0	1	0	0	1	0.14	2	0.133	1	1	0.1	0.613	61.30
FO_4	Balai Cerapan	5	0.30	0	0	0	1	0	0.07	1	0.067	1	1	0.1	0.537	53.70
FO_5	Bangunan Canselori	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
FO_6	C - FIRST S44 S45	5	0.30	1	1	0	0	1	0.21	1	0.067	1	1	0.1	0.677	67.70
FO_7	CICT D07	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_8	Dewan L50	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_9	Dewan N24	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_10	Dewan P19	5	0.30	0	1	0	1	1	0.21	1	0.067	1	1	0.1	0.677	67.70
FO_11	Dewan Sultan Iskandar	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_12	JHB	5	0.30	0	1	0	0	1	0.14	2	0.133	1	1	0.1	0.673	67.30
FO_13	Kolam Renang U1a	5	0.30	0	0	0	0	1	0.07	1	0.067	1	1	0.1	0.537	53.70
FO_14	Kompleks Sukan U01	5	0.30	1	1	0	0	1	0.21	1	0.067	1	1	0.1	0.677	67.70
FO_15	KOR SUKSIS U10	5	0.30	0	1	0	0	1	0.14	1	0.067	1	1	0.1	0.607	60.70
FO_16	Markas Palapes M44	5	0.30	0	1	0	0	1	0.14	2	0.133	1	1	0.1	0.673	67.30
FO_17	Masjid	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_18	Padang Kawad	5	0.30	0	1	0	1	0	0.14	1	0.067	1	1	0.1	0.607	60.70
FO_19	Pejabat OSHE M41	5	0.30	1	1	0	0	1	0.21	2	0.133	1	1	0.1	0.743	74.30
FO_20	Pertahanan Awam N25	5	0.30	0	1	0	0	0	0.07	2	0.133	1	1	0.1	0.603	60.30
FO_21	Pintu 1	5	0.30	0	1	0	1	0	0.14	2	0.133	1	1	0.1	0.673	67.30
FO_22	Pintu 2	5	0.30	0	1	0	0	0	0.07	1	0.067	1	1	0.1	0.537	53.70
FO_23	Pintu 3	5	0.30	0	1	0	1	0	0.14	1	0.067	1	1	0.1	0.607	60.70
FO_24	Pintu 4	4	0.24	0	1	0	1	0	0.14	1	0.067	1	1	0.1	0.547	54.70

FO_2 5	Pintu 5	5	0.30	0	1	0	1	0	0.14	1	0.067	1	1	0.1	0.607	60.70
FO_2 6	PKU	5	0.30	0	1	0	0	1	0.14	3	0.200	1	1	0.1	0.740	74.00
FO_2 7	PRZS	5	0.30	0	1	0	1	1	0.21	1	0.067	1	1	0.1	0.677	67.70
FO_2 8	PSZ	5	0.30	1	1	0	1	1	0.35	2	0.133	1	1	0.1	0.883	88.30
FO_2 9	Pusat Kaunselin g	5	0.30	1	1	0	0	1	0.21	1	0.067	1	1	0.1	0.677	67.70
FO_3 0	Pusat Latihan UTM XB4	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
FO_3 1	Rumah Alumni	5	0.30	0	1	0	1	0	0.14	1	0.067	1	1	0.1	0.607	60.70
FO_3 2	Rumah Tropika	5	0.30	1	0	0	0	0	0.07	2	0.133	1	1	0.1	0.603	60.30
FO_3 3	Stadium UTM U1b	5	0.30	1	1	0	1	1	0.35	1	0.067	1	1	0.1	0.817	81.70
FO_3 4	Student Union Building	5	0.30	1	1	0	0	1	0.21	2	0.133	1	1	0.1	0.743	74.30
FO_3 5	UTM CC L51	5	0.30	1	0	0	0	1	0.14	2	0.133	1	1	0.1	0.673	67.30
	Total Score														48.87 6	
	Total Max Score	5		1	1	1	1	1		3		3	3		19	

Table 7. Results of Safety Level Assessment analysis for Building in UTM Campus

***Notes:**

C: *Crime*

CCTV: *CCTV*

EL: *Environment/Landscape*

ER: *Emergency Response*

FA: *Fire Alarms*

FS: *Fire Station*

L: *Lighting*

PKU: *Pusat Kesehatan Universiti*

PS: *Police Station*

S: *Signage*

TW: *Total Weight*

W: *Walkway*

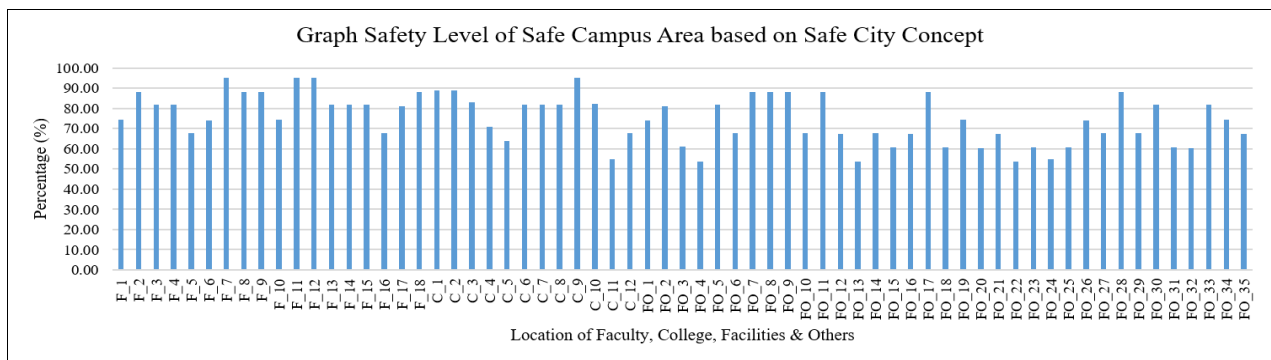


Figure 8. Graph of percentage of Safety Level for UTM Campus.

4.1.5 Overall Indicators Analysis: The overall analysis is a combination of all indicators analysis form this study. From the analysis, it shows that, most of the building in UTM Campus have high safety level, with the 35% of the building score 70-80% safety level, 21% are between 60-70%, 4% is more than 90% safe, and only 4% are between 50-60% safe. Figure 7 shows the graph of the analysis.

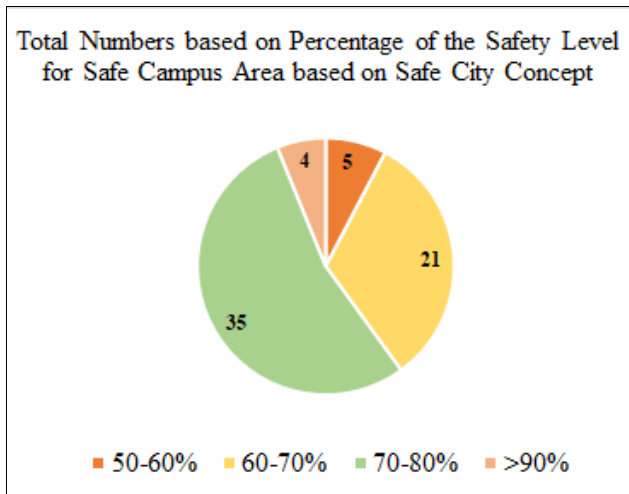


Figure 7. Percentage of building with Safety Level percentage in UTM Campus.

Table 7 and figure 8 shows the results for Safety Level percentage for all the building in UTM Campus.

4.2 Discussion

The results shows that most of the locations for UTM Campus reach safety percentage level above 70% of the safety level. Out of the total of 65 SC_ID there are 25 SC_ID that are below 70% for overall scores, and 5 buildings that are in 50-60% range and 21 buildings that are in 60-70% range. Most of the buildings are in range of 70-80% of safety level, which is 35 of the 65 total buildings. And there are only four buildings that are above 90%. The highest percentage of safety level (95%) is for 4 buildings, which is building F_7, F_11, F_12, and C_9. And the lowest percentage is (53.7%) buildings FO_4, FO_13, and FO_22.

From the results of all the analysis, it's show that most of the building and area inside UTM Campus are more than 50% in term of safety level assessment. This show that UTM Campus can be consider as a safe campus based on the Safe City Concept. Besides that, the indicators and sub-indicators that being used in this study can be part of the Safe City Concept or Indicators to assess the safety level of Education Campus. Some improvement of this model is via having more sub-indicators, or enhancing the scoring and validation of the indicators process.

5. CONCLUSION

This study focuses on assessing the safety level of campus area, with UTM as case study. The analysis done based on the building inside UTM area. The results shows that most of the building in the study area score more than 50% safety level. This study can facilitate stakeholders related to safety of the campus, including Security Department, or Police Station near the campus, and university's management to improve the safety

level, via study the policies related to safety inside the campus. Some enhancement to the indicators also can be made, such as improving the scoring, or including more sub-indicators such as landslide or flooding, to identified the areas that prone to such disaster.

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 Q.J130000.2552.21H07. Besides that, authors would also like to express gratitude to UTM's Security Division, and UTM's Property Department for the support and assistant throughout this study.

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