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CLEANLINESS INSPECTION OF THE ABLUTION SPACES OF THE FEDERAL TERRITORY MOSQUE

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Abstract

Muslims go to mosques to congregate in prayers; some Malaysian mosques carry historical value, whereas some are simply fine works of art. The term "Iconic Mosque" has been defined by the Islamic Tourism Centre in Malaysia as "having a design which represents the modern architecture and the cultural identity of the country". Some evidence shows that the ablution spaces in Malaysian Mosques encountered many issues regarding their cleanliness. Three methods of study were used to analyse the Federal Territory Mosque ablution spaces: physical observation, architectural drawing analysis, and interview. The research aims to improve the cleanliness of the ablution areas by studying their design aspects. The study's significance is to evaluate the cleanliness of ablution spaces at the Federal Territory Mosque. The findings of this research revealed that using a natural ventilation system could significantly improve the cleanliness of the ablution areas if accompanied by a mechanical system. The investigation analysis discovered that a smaller ablution room design could result in an unhygienic space. The users' abuse is one of the crucial factors that impact the ablution room cleanliness.

Keywords: Architectural drawing analysis, Federal Territory Mosque, Malaysian iconic mosques, physical observation, space cleanliness and hygiene

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INTRODUCTION

Ablution is a ritual activity that requires a Muslim to clean specific parts of the body in a sequence, and it is required before each prayer (Zakaria, Salleh, Harun, & Rashid, 2015). Cleanliness is one of the essential aspects of Islam; it has physical and mental attributes for the human being. The wholesome concept of purity and cleanliness is one of the most important values that must be practised in order to form a healthy and dynamic community and environment (Rahim, 2005). The research of Hamid, Taib, Wahab and Alias (2015) summarised that Islam encourages environmental factors such as cleanliness, good hygiene, and proper maintenance of prayer spaces. Neglecting any of these can result in inadequate ventilation, bad odours, and in overall, unhealthy area. In any design or facility, proper ventilation, which includes exposure to sunlight, significantly improves a space's hygiene and sanitation (Kumar, 2015). These qualities are essential for any human environment, especially for spaces that include the use of water (Sapri, Muin, Sipan, & Adjei Twum, 2014). An unclean space could be created by a lack of designer's knowledge about users' movement inside a mosque and its facilities (Das, Qureshi, Chowdhury, & Alam, 2012). Therefore, the scope of this study focusses on analysing the design layout of the Federal Territory Mosque ablution rooms using three approaches: physical observation, architectural drawing analysis and interview. The investigation helps to evaluate the cleanliness of the ablution rooms in the case study. Understanding the drawing layout assists with calculating the floor area and openings to be compared to Uniformed Building By-Laws (UBBL). The interview provides enough information from the management and the expertise to highlight the current issue at the Federal Territory Mosque.

RESEARCH BACKGROUND

Zain et al. (2015) stated that Malaysian mosques require more attention in terms of cleanliness; urgent improvements are needed to improve their facilities. Moreover, environmental factors such as humidity and airflow are also determining prayer-space space hygiene because they can cause bad smells, fungi, and bacterial accumulation (Sapri et al., 2014). Another report by (Zulkifli, 2016) mentioned that Muslim communities should pay more attention to the ablution room's cleanliness and hygiene of mosques overall. There are several factors such as inexperienced workers and users' mistreatment that are also affecting the hygiene of the religious spaces. Moist ventilation and space accessibility have also been highlighted as an important factor of Malaysian mosques hygiene (Zain et al., 2015). Additionally, more investigation of the ablution rooms has found (Maher, 2016; Suhaimi, 2010) that the issue of ventilation is epidemic in Malaysian's mosques and has caused poor ventilation, black footprints, and repulsive ablution rooms. These result in public concern. Maher also stated that besides these issues, the location of the ablution room in a

dingy basement, poor ventilation, and improper treatment of space have also been reported by users. Other research (e.g. Haraty & Utaberta, 2018) depicted an unclean ablution area during the peak of the congregational hour in one Malaysian iconic mosque. However, most of the studies have dealt with smaller ablution spaces and *suraus*[1]*;* there is a lack of research that investigates the cleanliness of the ablution rooms in grand mosques in Malaysia. The study recommends further inspection regarding the ablution areas in the Malaysian iconic mosques.

METHODOLOGY

This study uses a qualitative approach that involves physical observation, architectural drawing analysis, and interviews. According to the Ministry of Tourism, Art and Culture Malaysia (MOTAC) and the Islamic Tourism Centre (ITC), there are 53 Malaysian mosques considered to be iconic mosques in Malaysia (Islamic Tourism Centre, 2013). Yin (2013) explained that the way to find proper case studies for any research is to have a sufficient amount of data that can be accessible. The research sample was taken from this group. Capturing visual records during fieldwork can provide rich information for the research. Visual images can be part of the research and its method of data collection sometimes (Payne & Payne, 2004). Architectural drawing analysis is the method of extracting information from drawings that helps to analyse the shape and the size of the sample (Dosch, Tombre, Ah-Soon, & Masini, 2000; Roosli, O'Keefe, & Mydin, 2013).

Physical Observation

The researcher observed one iconic mosque in Malaysia, which is the Federal Territory Mosque. The investigation included three ablution rooms, which were at Gate-A, B, and C. The physical observation includes inspecting the condition of the ablution areas' cleanliness. It also involves investigating the type of ventilation system used, which has a direct impact on hygiene.

Architectural Drawing Analysis

Architecture drawing analysis includes studying the design form by hand sketching the selected ablution spaces. A software application AutoCAD was used to demonstrate the spatial organisation of the ablution areas. Uniform Building By-Laws (UBBL) are used to compare the findings from architectural analysis to the Malaysian standards. Architectural drawing analysis is further used to understand if the ablution spaces have achieved the minimum requirement, which is not less than 10% of the total floor area for space with a natural ventilation system as stipulated in the Uniform Building By-Law 1984

[1]surau is a small prayer space or a small building used for prayer. It does not have the same status as a mosque

(UBBL). The following equation is used to compare the results from the architectural drawing analysis to UBBL:

$$\frac{Total\ area\ of\ openings\ (natural\ ventilation)}{Total\ floor\ area\ of\ the\ ablution\ area} \geq 10\%\ of\ the\ floor\ area$$

Structured Interview

Boyce & Neale (2006) stated that conducting structured interviews is usually done with a small number of respondents to explore their perspectives regarding an issue or situation. A structured interview is a qualitative type of research technique, and it helps to generate understanding about an existing issue and evaluate a specific phenomenon by transcribing, analysing, and planning a good interview (Mason, 2002). An interview[1] was conducted with the management office of the Federal Territory Mosque to understand the obstacles and complications regarding the ablution rooms.

FEDERAL TERRITORY MOSQUE

The construction of this mosque started in 1996 and was completed in 2000. It has been serving Muslims as a community centre, research and educational complex. It is located near the MATRADE building and Jalan Duta's government complex. The Sultan Ahmed Mosque in Turkey influences the mosque design. A combination of traditional Malay and Middle East design elements are also implemented in the design.

Physical Observation

The investigation was conducted on three different days: February 21st, and the 3rd and 5th of March 2018 and covered three ablution areas: Gate-A, Gate-B, and Gate-C. The complexity of the design of this mosque was evident during the physical observation. The ablution areas are scattered around four gates and designed in smaller spaces.

During the usual hours, the mosque was not crowded. It was noticed that all users are required to remove their shoes at the entrance gates to show their respect and for cleanliness purposes. Worshippers must walk barefoot inside the mosque and the ablution areas. Ablution Gate-A was the first one to be examined in this research; the location of the ablution area is close to the women's toilet area, which has a direct impact on the smell of the ablution room. A person can undoubtedly smell the odour coming from the toilet. According to the observation, the ablution areas use both mechanical and natural ventilation. Extractor fans have been installed on some sides of the walls. Although all

[1]The interview questions which were given to the participant are available upon request.

ablution rooms have artificial lighting, natural light during the day is sufficient. Moreover, the Gate-A ablution room has 22 windows that provide the room with natural sunlight and airflow. The ablution room also has a few ceiling fans and extraction fans to maximize ventilation inside the space. The location of this ablution room is important because it is very close to the prayer hall. The researcher captured the following photographs during the physical observation of the mosque. The photographs show the entrance of Gate-A ablution room and the interior of the room.

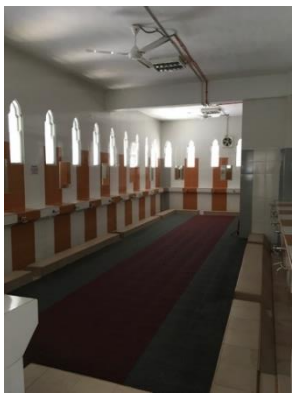



Figure 1 Natural ventilation of Gate-A ablution room
Source: Author

The Gate-B ablution room uses a natural ventilation system. During the inspection, animal waste was spotted on the floor of the ablution room. The trash bin was placed with no attention to its cleanliness; many insects such as flies, and cockroaches were spotted. Additionally, the area was smelly, resulting from the animal waste. There were dark spots on the floor of the ablution room which can easily be traced. The design of the room and the location provides this space with enough access to natural ventilation. This ablution area is close to the main entrance, and the design of the walls are fully penetrating the exterior of the mosque. No obstacles like a door on any other elements block the airflow inside the space.

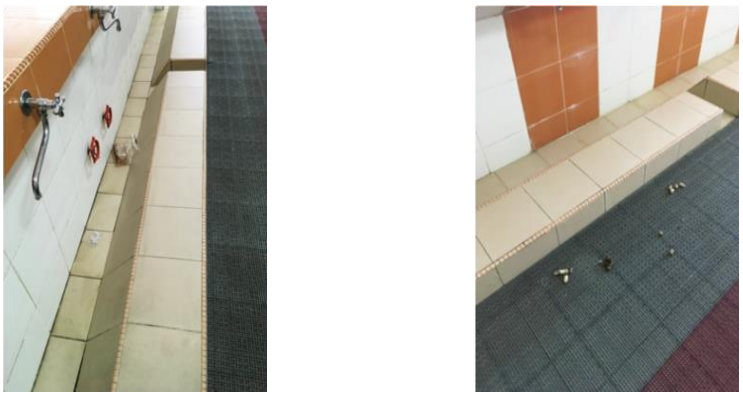


Figure 2 The condition of Gate-B ablution room
Source: Author

However, few mechanical ventilation ducts are installed in this room. The ducting system was not well maintained. It was dusty and unclean, as shown in Figure 3. In addition, the water drain area needs further cleaning because it showed unhygienic signs such as water stains, trash, and fungus.

Figure 3 Unclean ducting system and stained floor, ablution room Gate-B
Source: Author

Additionally, the ablution area located close to Gate-C had no ventilation system, neither natural nor mechanical. A lattice side wall with decorative elements is the only opening in this room, which looks into the indoor corridor of the mosque. Gate-C needs extra attention; the inspection revealed issues like dark spots, shabby flooring, and stained walls. Furthermore, the investigation during the daylight showed that without the use of artificial lights, the space is dark and not well ventilated.

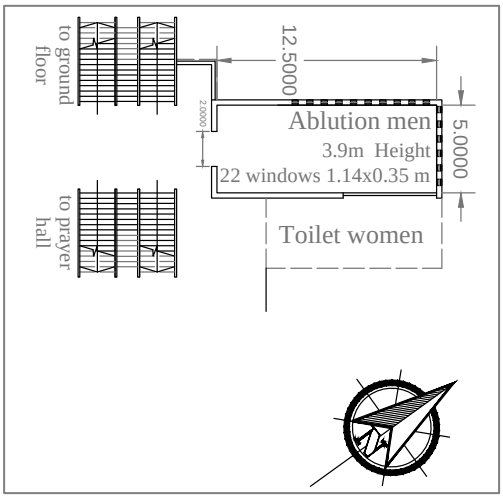

Figure 4 The situation of ablution room Gate-C with no ventilation system
Source: Author

ARCHITECTURAL DRAWING ANALYSIS

This part of the analysis involved systematic steps in redrawing the layout of each ablution room. The researcher manually sketched the layout of the ablution rooms after conducting the physical observation to get the actual dimensions of each of them. The results from the measurements would significantly assist in generating more accurate architecture drawings. The architectural drawing is then transformed into digital records by utilising AutoCAD software. This is done to compare the result of the total area of each ablution room to the UBBL, which is 10% of the total floor area. The following analysis is the findings of the three ablution rooms.

Gate-A Ablution Room

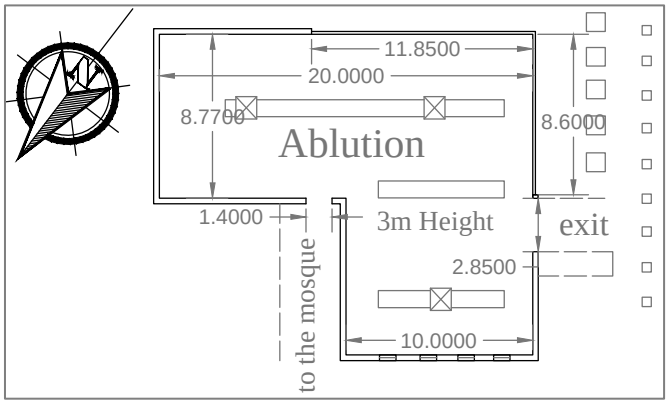
This area is located between two areas and is connected by two stairs that lead to the prayer hall and the ground floor. It is the most accessible room for worshipers because it is close to the prayer hall. The ablution room is 12.5 x 5.0 metres and has 62.5 square metres. There are 22 windows with 1.14 x 0.35 metres and covering 8.778 square metres. The entrance is 2 x 3.9 = 7.8 square metres and a total of 16.5 square metres. The formula 16.5 / 62.5= 0.264 achieves the required percentage by UBBL.



Drawing 1 Gate-A Ablution room
Source: Author

Gate-B Ablution Room

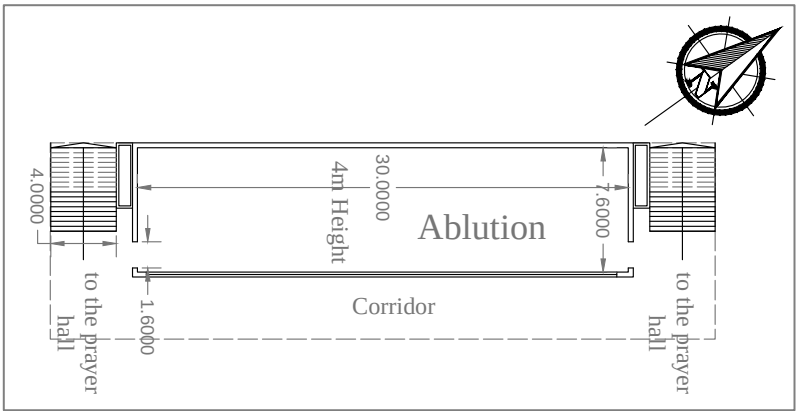
This ablution room is close to Gate-B and is around 60 metres far, its design could be one of the suitable rooms in term of area. However, there are no stairs that lead to the prayer hall. A person is required to walk along the corridor to the stairs area. The area of the ablution room can be calculated as following: (20 x 8.77) + (10 x 8.6) = 261.4 square metres, the area of the opening is as the following: windows ((22.85 x 2) + (8.6 x 2)) + doors ((1.4 x 2.85) + (1.4 x 3)) = 44.49 square metres. The percentage of the opening to the total area is 44.49 / 261.4 = 0.170, which is above the requirement by UBBL.



Drawing 2 Gate-B Ablution room
Source: Author

Gate-C ablution room

Results show that this room is one of the more questionable ablution rooms in this case study. The room is located beneath the prayer hall with two main stairs connecting it. There were no windows nor access to natural ventilation designed for it (see physical observation part). The area was calculated as follows: 30m x 7.60 m = 228 square metres, the area of the doors is 2x (2m x 1.65m) = 8.91 square metres. The percentage is 8.91 / 228 = 0.039, which means it does not achieve the minimum percentage required by UBBL.



Drawing 3 Gate-C Ablution room
Source: Author

Interview

An interview was conducted with Participant 1[1], who is one of the management staff at Masjid Wilayah, on March 3, 2018. The participant manages and supervises the mosque's facilities. The following statement was given during the interview:

> *The ablution areas are using a natural ventilation; however, some mechanical blowers and fans will be used to dry up the area. It was mentioned that mixing between the natural ventilation system and the mechanical systems is recommended to speed up the drying process. Moreover, during the peak hour, the situation of the ablution area is terrible, and the cleaning is not enough. The ablution area gets overcrowded in the Friday congregation prayers. The other issue is the lack of cleaning staff. We had to let go half of the cleaning members to cut the budget of the mosque. The official working hours for the mosque's staff*

[1] The interviewee requested not to show a name in any publication; however, you may contact the corresponding author for verification

is from the early morning to 4:30 p.m., so there are no workers during the night prayer. Some other mosques have volunteered to offer two cleaners to help out the situation. There had been some issues regarding the users' mistreatment of the ablution areas. One problem is that users are throwing trash onto the floor. There have been other incidents where they urinate in the ablution area or even defecate. It was recommended to separate the toilet area and the ablution area for hygiene purpose. Another issue is that there are no standards for the ablution area cleaning and cleanliness. Mostly the instruction is given by the management and the mosque staff. The fact is the ablution area belongs to the mosque and people. Therefore, it should be treated carefully.

DISCUSSION OF THE FINDINGS

The Federal Territory Mosque or "Masjid Wilayah" is one of the most challenging cases to study. The designer intended to have smaller ablution rooms distributed between four gates namely. This distribution of the ablution spaces is to cover each gate. Although the designer placed several ablution rooms to cover the area of the mosque, the overall cleanliness was questionable. Moreover, the ablution rooms are using natural ventilation system, and fewer fans are installed to increase the airflow. Among the issues of the ablution areas of Masjid Wilayah is the smell. The physical observation revealed this crucial issue in the three spaces observed. Likewise, the cleanliness of the ablution rooms was also below standards. Footprints covering the floor, leakage of water, fungus and insects are among the critical issues. Additionally, the findings from the architectural drawing analysis discovered that only two ablution areas meet the UBBL standards, which are Gate-A and Gate-B. Conclusively, the interview part of the analysis contributed significantly to the findings of this case study. Participant 1 addressed some critical points that need to be addressed urgently. Among the issues are limited working hours, insufficient cleaners, users' mistreatment, and improper design.

CONCLUSION

To summarize, although a natural ventilation system is a proper mechanism for spaces that involve using water, it is recommended to use separated mechanical blowers during the peak hours to increase the efficiency of the ventilation. The other important point is the users' mistreatment. It is crucial to share the awareness among worshippers and users to comply with the hygiene considerations of the ablution area spaces. The ablution areas are sacred spaces which should be appropriately treated to respond to the Islamic teaching and the health requirement. Lastly, designers should provide the ablution areas or any spaces using water with enough ventilation systems to prevent any future diseases that could result from improper planning. Authorities should pay more attention

to provide enough regulations and standards to generate healthier spaces that respond to users' needs.

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INCOME INEQUALITY ACROSS STATES IN MALAYSIA

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Abstract

This paper examines income differentials across the 16 states/territories in Malaysia, using quantile regression of income per capita on a nationally representative sample of 24,463 households in 2014. The results show that the vast differentials in income per capita across states are attenuated after taking into account urban-rural and ethnic distribution, but remain significant. Income differentials across states vary at different levels of income, being more pronounced at the lower ends of the distributions. States and territory in the central region had the highest income. The three states in the southern regions fared better than those in the northern region (except Penang), and the eastern region as well as East Malaysia. Other variables such as level of urbanisation, the educational level, migration, employment structure, and female labour force participation may also affect income differentials across states.

Keywords: Income, distribution, differentials, inequality, states, regions, ethnicity, urban-rural, Malaysia, quantile regression

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INTRODUCTION

Malaysia consists of 13 states (11 in Peninsular Malaysia, and two on the Borneo Island across the South China Sea) and three Federal Territories. The Northern region comprises Perlis, Kedah, Penang, and Perak, the Central region includes Selangor and the Federal Territories of Kuala Lumpur and Putrajaya, the Southern region comprises Negeri Sembilan, Malacca, and Johore, the Eastern region comprises Pahang, Terengganu, and Kelantan, while East Malaysia comprises Sabah, Sarawak and the Federal Territory of Labuan.

Since independence in 1957, rapid socio-economic development has transformed Malaysia from a low-income rural agricultural society to an increasing reliance on the manufacturing and services sectors, with three-quarters of its population living in the urban areas. The economy was growing at around 8% per annum for more than three decades before the Asian Financial Crisis in 1997. Apart from the recessions in 2001 and 2008 due to the global financial crisis, the Malaysian economy has been growing at between 4.5% and 6% per annum since 2002.

The GDP per capita rose from Ringgit Malaysia (RM) 20,870 (US$6,480) in 2005 to RM38,853 (US$9,721) in 2016 (DOSM, 2017c). Malaysia is an upper middle-income high Human Development Index (HDI) country (ranked 59th in the world). Between 1970 and 2014, development efforts had eradicated absolute poverty and reduced general poverty from 49.3% in 1970 to just 0.4% in 2016. The Gini coefficient has come down from 0.513 in 1970 to 0.401 in 2014 (Economic Planning Unit, 2015).

The Malaysian economic policies pursued since the 1970s have been underpinned by the development philosophy of growth with distribution, focussing on poverty eradication to reduce economic imbalances between ethnic groups and across regions. While the development programmes have succeeded in reducing the incidence of poverty, wide economic disparities persist to this day. In pursuing a more balanced regional development, the government has created five development corridors in the northern, southern and eastern regions in Peninsular Malaysia, as well as Sabah and Sarawak during the 9th Malaysia Plan period (2006-2010). However, these efforts at redirecting employment opportunities have so far not resulted in significant population redistribution. The population continues to grow much more rapidly in the central region than in the regions with the development corridors. There are still wide variations in income across states. In 2016, the median and mean monthly household income ranged from RM3,037 and RM4,214 in Kelantan to RM9,073 and RM11,692 in Kuala Lumpur respectively (DOSM, 2017a).

There is a rather sizeable literature on income distribution and inequality in Malaysia (Jomo, 2004; Khalid, 2011; Milanovic, 2006; Ragayah, 1999, 2008, 2009; Saari, Dietzenbacher, & Los, 2014; Shari & Ragayah, 1990; Shireen, 1998). Most of these earlier studies had focussed on ethnic differentials in

income, as it was the main objective of the New Economic Policy (1970-1990) to reduce economic disparities between the ethnic groups. A few recent studies have explored regional income inequalities (Abdullah, Doucouliagos, & Manning, 2015; Ali & Ahmad, 2009; Habibullah, Dayang-Afizzah, & Puah, 2012; Habibullah, Smith, & Dayang-Afizzah, 2008; Hooi, Nguyen, & Jen, 2011). A significant finding by Abdullah (2012) based on meta-regression analysis and panel data econometrics, is that regional income inequality has a positive effect on growth; and that while income inequality has declined in general, there is a tendency to increasing inequality between Malaysian states.

Past studies on income distribution and poverty in Malaysia have consistently found significant ethnic and urban-rural differentials in income, even after adjusting for other socioeconomic variables (Ismail & Jajri, 2012; Khalid, 2011; Ragayah, 2008; Rodríguez-Pose & Tselios, 2009; Saari, Dietzenbacher, & Los, 2014). However, to our knowledge, no research has been done on the moderating effects of these two variables on state differentials in income in Malaysia. Hence, this article seeks to analyse income inequality across states, taking into account the ethnic and urban-rural distribution. Because income data are not normally distributed, and the income differentials across states may not be the same at different income level, quantile regression was used in this analysis instead of the ordinary least square (OLS) method used in previous local and international studies (Estudillo, Sawada, & Otsuka, 2008; Ismail & Jajri, 2012; Ismail & Noor, 2005; Kajisa & Palanichamy, 2006; Milanovic, 2006; Onyebinama & Onyejelem, 2010; Ragayah, 2008; Schafgans, 2000).

An analysis of the income differentials across states at different income level, and the relevant factors affecting income differentials are needed to provide some inputs to inform policy on reducing regional income disparity. This article also aims to contribute to the literature on relative poverty and income distribution in developing countries.

METHODOLOGY

Data

Data for this article came from the Household Income and Basic Amenities Survey conducted by the Department of Statistics, Malaysia (DOSM) in 2014. The sampling frame for the selection of sample for this survey used the updated Household Sampling Frame, making up of urban and rural Enumeration Blocks (EBs) created for the 2010 Population and Housing Census. The two-stage stratified sampling design was adopted to select 10,432 EBs in the first phase, and then systematic sampling was used to select 81,632 living quarters, covering 81,137 households to produce a representative sample of all the households in the country. The Department of Statistics Malaysia provided raw data for a sub-sample of 24,463 households for this analysis. At the time of the writing of this

report, the Department of Statistics Malaysia has not released the sample data for the latest round of survey conducted in 2016.

The survey collected information on household income for twelve months. The sources of income comprise paid employment, self-employment, property, and investment income and current transfers received, received by all members of households, both in cash and in kinds which repeatedly occur within a year. The mean monthly gross household income for the sample in this study was RM6,141, with relative standard error (RSE) of 0.4% or a standard error of RM25.

Methods

The dependent variable for this study is monthly income per capita (monthly income divided by household size). The income per capita was found to be not normally distributed, and hence the regression analysis used the logarithm term of income. The urbanisation level and ethnic distribution vary across the states. The regression analysis included urban-rural and ethnic distributions as these two variables are closely associated with income. Other relevant variables such as migration, education, urbanisation, and employment structure were not included in the regression model, as these variables refer to the characteristics of the individuals, while the dependent variable is at the household level. Instead, this paper examines the median household income for each state by selected socio-demographic and economic conditions.

The differentials in monthly income per capita across states, taking into account the level of urbanisation and ethnic distribution, were estimated using quantile regression. As compared to OLS that merely estimates the conditional mean of income, quantile regression has the advantage of allowing the estimation of the parameter differentials across quantiles of the income distribution. The quantile regression model, adapted from Koenker and Basset (1978), is shown as follows:

$$y_i = x_i\beta + \varepsilon_i \tag{1}$$

where y_i is monthly income per capita for household i, i = 1, 2, …, n, x_i is the vector of independent variables, β is the parameter, and ε_i is the disturbance term. The estimators for a quantile θ, $0<\theta<1$, is obtained by minimizing the objective function F over β_θ, as shown below:

$$F(\beta_\theta) = \sum_{i\epsilon\{i:y_i\geq x_i'\beta_\theta\}}^{N} \theta\left|y_i - x_i'\beta_\theta\right| + \sum_{i\epsilon\{i:y_i<x_i'\beta_\theta\}}^{N} (1-\theta)\left|y_i - x_i'\beta_\theta\right| \tag{2}$$

Data were analysed using Eviews 9, based on the QREG method. The standard errors of the estimators were estimated through bootstrapping, with 100 replications. The inverse variance-weighted average method was used to

overcome under- or over-representation of each state, based on the "weight" variable constructed for the 2014 Household Income and Amenities Survey.

RESULTS

Income Differentials across States

In 2014, the national mean and median monthly income per capita was estimated at RM1,706 and RM1,197 respectively. Figure 1 and Table 1 show that income per capita is not normally distributed and highly skewed to the right. Transforming the income data into the logarithm term reduces the skewness substantially, but the extreme values are still present in both tails. Hence, quantile regression is more appropriate than OLS regression for analysing the income differentials.

The skewness, kurtosis and the vast difference between the mean and median values indicate the skewed distribution of the income data, and the large standard deviation shows the wide dispersion of the data (Table 1). The Breusch-Pagan-Godfrey test for constant variance (test statistic = 1742.35, p-value = 0.0000) indicates the presence of the problem of heteroscedasticity, and this further justifies the use of quantile regression.

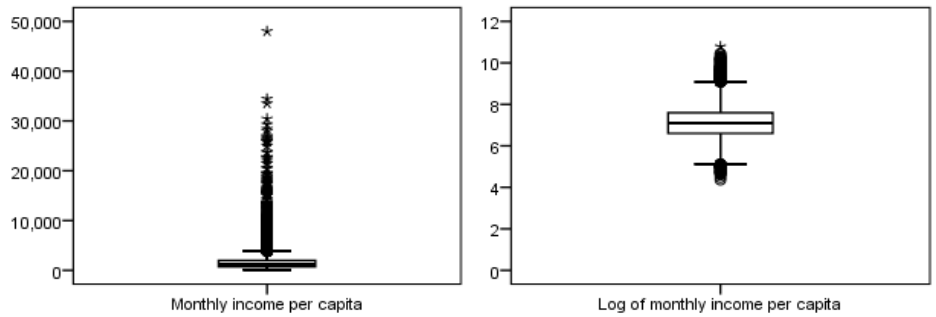

Figure 1 Box plot

Table 1 Summary statistics for monthly income per capita

	Monthly income per capita	**Log of monthly income per capita**
Mean	1705.8	7.12
Median	1197.0	7.09
Maximum	48007.6	10.78
Minimum	78.3	4.36
Std. Dev.	1863.1	0.77
Skewness	5.7	0.29
Kurtosis	62.0	0.33

The monthly income per capita varied widely across states, as shown in Table 2. The mean income per capita in Kuala Lumpur and Putrajaya was 3.3-3.5 times that of Kelantan, the least developed state. Neighbouring state Selangor was not too far behind. The three states in the southern regions fared better than those in the northern region (except Penang), and the eastern region as well as East Malaysia (except Federal Territory Labuan). Apart from Penang in the north and Labuan in East Malaysia, the income variations across the states in the northern, eastern and East Malaysia (Sabah and Sarawak) are relatively small.

The income per capita in the urban areas was about 1.8 times higher than that in the rural areas. Despite the various programmes to reduce the ethnic disparity in income, income per capita of the non-Bumiputera (comprising mainly the Chinese and Indians) remained much higher than that of the majority Bumiputera (comprising the Malays and other indigenous populations), at 1.5:1.

Table 2 Mean, median and standard deviation of income per capita by state

Variable	n	%	Monthly income per capita (RM)			
			Mean	Median	Std. Dev.	Gini coefficient
Total	24,463	100.00	1705.78	1197.00	1863.05	0.397
States						
Johore	2,196	8.98	1613.14	1262.13	1421.91	0.329
Kelantan	1,523	6.23	936.55	662.50	945.10	0.386
Kedah	1,579	6.45	1235.04	871.56	1104.98	0.359
Malacca	783	3.20	1594.15	1252.68	1335.29	0.303
N. Sembilan	935	3.82	1600.07	1210.53	1536.39	0.354
Pahang	1,264	5.17	1173.86	899.90	965.86	0.343
Penang	1,481	6.05	1716.56	1293.78	1607.48	0.357
Perak	1,873	7.66	1297.24	988.08	1184.95	0.363
Perlis	485	1.98	1203.51	900.18	944.48	0.328
Selangor	2,729	11.16	2229.31	1636.00	2087.73	0.379
Terengganu	1,154	4.72	1136.04	861.67	892.49	0.341
Sabah	2,835	11.59	1337.33	888.39	1593.43	0.383
Sarawak	3,659	14.96	1414.15	997.42	1473.24	0.388
Kuala Lumpur	1,599	6.54	3300.92	2185.08	3663.80	0.399
Labuan	212	0.87	2039.47	1334.65	2640.32	0.423
Putrajaya	156	0.64	3008.49	2179.13	2176.95	0.369
Strata						
Rural	7,546	30.85	1034.54	769.86	980.63	0.348
Urban	16,917	69.15	1907.05	1372.54	2011.91	0.386
Ethnicity						
Bumiputera	17,021	69.58	1450.44	1044.67	1441.34	0.384
Non-Bumiputera	7,442	30.42	2186.60	1531.67	2396.05	0.402

The overall Gini coefficient stood at 0.397. The Gini coefficients are generally higher in the more urbanized states, and also among the non-Bumiputera as compared to the Bumiputera.

Table 3 The estimated weighted least square (WLS) and quantile regression

	WLS	q10	q25	q50	q75	q90
States						
Kelantan (ref.)						
Johore	0.4387***	0.5440***	0.5606***	0.4656***	0.3182***	0.2430***
Kedah	0.1835***	0.1929***	0.2400***	0.1874***	0.1676***	0.1137**
Malacca	0.3899***	0.4828***	0.5294***	0.3987***	0.3228***	0.2111***
Negeri Sembilan	0.4131***	0.4362***	0.5064***	0.4311***	0.3669***	0.2417***
Pahang	0.2064***	0.2530***	0.3012***	0.2233***	0.1277**	0.0637
Penang	0.3735***	0.4997***	0.5117***	0.3899***	0.2923***	0.2021***
Perak	0.1685***	0.2035***	0.2328***	0.1819***	0.1458***	0.0659
Perlis	0.2529***	0.3267***	0.3711***	0.2660***	0.2323**	0.1668
Selangor	0.6340***	0.6046***	0.6509***	0.6485***	0.6160***	0.6370***
Terengganu	0.1937***	0.2081***	0.2509***	0.2455***	0.1800***	0.0604
Sabah	0.1966***	0.0617	0.1547***	0.2116***	0.2469***	0.2881***
Sarawak	0.3087***	0.2746***	0.3277***	0.3010***	0.2998***	0.2863***
Kuala Lumpur	0.9146***	0.8383***	0.9232***	0.9065***	0.8996***	0.9995***
Labuan	0.5128***	0.4144***	0.5348***	0.5286***	0.5697***	0.5845***
Putrajaya	1.0809***	1.2740***	1.1706***	1.0139***	1.0386***	1.0500***
Strata						
Rural (ref.)						
Urban	0.3347***	0.3139***	0.3210***	0.3347***	0.3484***	0.3396***
Ethnicity						
Bumiputera (ref.)						
Non-Bumiputera	0.2274***	0.2224***	0.2146***	0.2302***	0.2171***	0.2455***
Constant	6.3872***	5.5642***	5.8801***	6.3331***	6.8360***	7.3279***
Pseudo R^2	-	0.1322	0.1264	0.1172	0.1046	0.1068
Adj. R^2	0.2082	0.1316	0.1258	0.1166	0.1040	0.1061

Notes:
(a) Dependent variable is log of monthly income per capita.
*(b) *** p<0.001, ** p<0.01, * p<0.05.*
(c) WLS was used instead of OLS to take into account the effect of the "weight" variable.

Results from the weighted least square (WLS) show that after adjusting for urbanisation and ethnic composition, the monthly income per capita was highest in Kuala Lumpur and Putrajaya (about twice that of Kelantan), followed by Selangor and Labuan (63% and 51% higher than Kelantan respectively). The three states in the southern region – Johore, Negeri Sembilan, and Malacca had an income level of about 40% higher than Kelantan (Table 3).

Table 3 shows the coefficients for the quantile regressions. The impacts of each of the three predictors (state, urban-rural location, and ethnicity) in income per capita are not the same at different quantiles, especially across the states. Generally, state-level income differentials tended to be more pronounced

at the lower income levels (q10 and q25), as compared to higher income levels, except Sabah and Labuan where the income differentials with other states were less pronounced at q10 and q25 than at upper quantiles. Except for Kuala Lumpur, Labuan, Sabah, and Putrajaya, q25 provides the most significant income differentials across the states in Malaysia.

There are significant income differentials between the different ethnic groups (Table 3). The non-Bumiputera had a higher income than the Bumiputera in all quantiles, and the differential was most notable at q90. The urban-rural income disparity was even more pronounced. Households in urban areas had a much higher income than those in the rural areas in all the quantiles, and the most significant differential was at q75.

Explaining the Income Differentials across States

Several factors such as urbanisation, ethnic distribution, education level, internal migration, employment structure, female labour force participation, and household size may affect the income differentials across the states. Some of these variables are closely associated with one another. For instance, the propensity to migrate among the higher educated is much higher than those who have fewer years of schooling, and the Bumiputera are much more likely than the non-Bumiputera to reside in the rural areas. The following sections examine the association between the median income per capita and these variables by states, as shown in Table 4.

Urbanisation

The urbanisation level varies from 47% in Kelantan to over 93% in Penang and Selangor and 100% in Kuala Lumpur and Putrajaya. The median income per capita is higher in the more urbanized states (Table 4). The 2017 Salaries and Wages Survey Report shows that the average earning of a worker in the rural areas, at RM2,040 (median RM1,400), was much lower than that of their urban counterparts at RM3,038 (median RM2,260) (DOSM, 2018). The large income differentials between urban and rural areas were in turn due to other factors such as higher educational level, the availability of higher paid jobs as well as higher female labour force participation rate in the urban areas. There are two conflicting policies concerning migration in the 11th Malaysia Plan. While propelling sectoral migration towards high-value-added and knowledge-intensive activities in the cities, the Government has also taken initiatives to enable the mobilisation of rural youths in entrepreneurship activities to minimise migration to urban areas (Economic Planning Unit, 2015).

Education

The educational level of workers varies widely by states. Tabulation of the 2% sample data from the 2010 Population Census shows that the proportion of population aged 20-60 years who had a post-secondary education was lowest in Sabah and Sarawak (at around 16%-17%) and highest in Putrajaya (63%), followed by Kuala Lumpur (45%) (Table 4). The income per capita is strongly associated with the proportion of prime working age population with post-secondary education. Higher education has a substantial premium in the remuneration of the workers. The 2017 Wages and Salary survey showed that the mean earned income ranged from RM1,649 among those with primary education to RM2,055 among those with secondary education and RM4,300 among those with tertiary education (DOSM, 2018).

Internal Migration

Migration tends to be selective of the high-skill workers. Being the administrative, commercial, business, the industrial and educational hub of the country, the central region comprising Kuala Lumpur, Putrajaya and Selangor has been the main destination of migrants from all over the country. Data from the 2010 Population Census show that more than 60% of the working population aged 20 to 60 years in Kuala Lumpur and Selangor were born outside the state (Table 4). In comparison, only 9% of the people in Kelantan and 14% in Sarawak were born outside the state. The economic opportunities in the more developed states have acted as a pull factor for migrants in the receiving states, and the inflows of highly educated and trained migrants have contributed to the higher income level of the receiving states. On the other hand, the sending states are further disadvantaged by the outflow of the more resourceful segments of the population, thus exacerbating the regional income inequality. Table 4 depicts the close association between internal migration and income level.

Occupation

The managers/administrators and the professionals are among the highest paid workers, with a mean salary of RM7,847 (median RM5,800) and RM5,084 (median RM4,467) respectively, as compared to the national average of RM2,880 (median RM2,160) as of 2017 (DOSM, 2018). Hence, the higher income level in Kuala Lumpur, Putrajaya and Selangor can be explained by the much higher proportion of managers/administrators and professionals, as shown in Table 4.

Table 4 Median monthly income per capita and selected socio-demographic and economic variables by state

	Median monthly income per capita (RM)	**% Urban**	**% with post-secondary education (aged20-60)**	**% born out of state (aged 20-60)**	**% managerial or professional (age 20-60)**	**Female labour force participation rate (%)**
States						
Kelantan	662.50	46.90	20.17	9.00	10.96	48.80
Johore	1262.13	75.60	27.94	26.49	9.34	50.80
Kedah	871.56	68.00	18.46	21.55	11.64	50.70
Malacca	1252.68	91.90	28.38	33.17	14.48	55.40
Negeri Sembilan	1210.53	72.00	23.60	39.42	13.38	50.00
Pahang	899.90	55.20	23.52	38.45	9.87	50.30
Penang	1293.78	93.90	22.72	31.50	14.78	60.60
Perak	988.08	74.50	20.94	18.58	14.15	44.40
Perlis	900.18	59.90	20.32	28.21	14.39	44.10
Selangor	1636.00	93.00	35.02	63.96	22.41	60.30
Terengganu	861.67	63.50	21.47	16.02	13.30	44.30
Sabah	888.39	57.90	16.22	28.61	9.33	53.00
Sarawak	997.42	57.10	16.53	14.13	10.26	54.70
Kuala Lumpur	2185.08	100.00	45.02	61.48	23.88	59.30
Labuan	1334.65	85.10	18.58	67.18	13.35	48.80
Putrajaya	2179.13	100.00	62.97	100.00	26.93	80.90
Spearman correlation coefficient[#]		0.873	0.665	0.765	0.668	0.653

Notes:
(a) Data sources: DOSM (2011, 2017b).
(b) # Refer to the Spearman rank correlation coefficient between the median monthly income per capita with each of the socio-demographic and economic variables.

Female Labour Force Participation

With rising education and cost of living, more and more women are working to pursue their career and to contribute to the family's finance. The female labour force participation rate had risen from 46.4% in 2009 to about 54.1% in 2016 (DOSM, 2017b). In the 11th Malaysia Plan, the Government has taken several measures to create job opportunities for women to increase the female labour force participation rate to 59% by 2020 (Economic Planning Unit, 2015). The higher female labour force participation rate in Putrajaya, Kuala Lumpur and Selangor has contributed to the higher income per capita in these states/regions (Table 4). On the other hand, the relatively larger family size in the less developed states has resulted in lower income per capita. In 2016, the total fertility rate ranged from 1.5 in the Federal Territory Kuala Lumpur to 3.2 in Kelantan and Terengganu (DOSM, 2017a).

DISCUSSION

This analysis shows that the wide income differentials across states and regions are attenuated after taking into account the urbanisation level and ethnic composition of the states. Both the urbanisation and ethnic variables are closely related to the employment structure and income. Jobs in the services and manufacturing sectors in the urban labour market tend to command a higher pay due to the higher skill required. Perrela-Tallo (2017) argued that the growing income inequality is due to biased technological change, as it increases the income share of the wealthy households at a faster rate than the poorer households. The urban services sector, the driver of Malaysia's economic growth, has been transforming rapidly toward more capital intensive and knowledge-based activities that yield a higher premium. In terms of ethnicity, the non-Bumiputera, in particular, the Chinese community has dominated the businesses in Malaysia. Hence, states with a higher concentration of Chinese tend to have a more developed business sector, which generates more wealth.

Malaysia's substantial investment in education and skills training and the creation of high paying jobs have been the key factors behind the rapid economic growth and social development. With the provision of free education up to the upper secondary level, and the liberalization of the education policy since the late 1990s, tertiary enrolment ratio has exceeded 40%, and females have overtaken the males in higher education (World Bank, 2018). The higher educated youths tend to seek jobs in the capital cities in the central region, depleting the human resources in the sending areas. While increased female labour force participation rate will result in raising the household and national income, such an increase is likely to concentrate in the big cities where there is a higher demand for skilled workers. All these trends will exacerbate regional inequality.

With the eradication of absolute poverty, the focus is now on raising the income level of the bottom 40% of the income categories. Since 2012, the government has been providing annual cash assistance to the poor. In the 2019 Budget, the government provided a yearly cost of living assistance (BSH) of RM1,000 to households with a monthly income of RM2,000 and below, RM700 to households with monthly income from RM2,001 to RM3,000, and RM500 to households with monthly income from RM3,001 to RM4,000. Hakim (2000) found that a large portion of the total inequality in Malaysia was attributable to labour income. The adoption of a minimum wage of RM1,100 in 2019 would reduce the income gap between the rich and the poor. Efforts such as the development corridors have also been made to create jobs in the less developed states/regions.

As regional inequality remains an important policy issue, there is a need for an assessment of the effectiveness of the various policies and programmes in narrowing the regional income disparity for appropriate intervention strategies to be undertaken. This analysis has explored some plausible reasons for the

persistence of income inequality across the states. More detailed studies are needed to find out the underlying causes, and more effective programmes need to be formulated and implemented. The effectiveness of the development corridors in population and labour redistribution remains to be seen. While Malaysia takes pride in the full employment situation, there is a concern about the continued influx of migrant workers, who make up about one-fifth of the workforce. There is a need to provide the necessary support and assistance to enable more women and men to have a work-life balance while pursuing their career to increase the household income. Policymakers and employers may consider a more flexible employment structure and greater use of technology.

In conclusion, income inequality across states remains wide despite various efforts to bring about a more balanced regional growth and development. This analysis has shown that state-level differentials in ethnic and urban-rural population distribution, educational level, migration pattern, and employment structure are closely associated with income per capita. More detailed analysis is needed to assess the impact of individual characteristics on their earning, as data become available.

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THE QUANTIFICATION OF URBAN LITTER LOAD AT GROSS POLLUTANT TRAP ALONG SUNGAI BATU, SELANGOR

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Abstract

The massive amount of urban litter in Malaysia is influenced by rapid population growth, development, economic growth and unsustainable lifestyles. Few studies have assessed the amount of urban litter load and its composition at gross pollutant trap (GPT), significantly contributing to lack of historical data. This study is aimed to assess the amount of urban litter load in wet basis condition at individual GPTs along Sungai Batu, Selangor in 2015. The urban litter collection data at each GPT in 2015 were sourced from Department of Irrigation and Drainage (DID). Samples were manually collected once a month, stored in plastic bag and immediately weighed and recorded by following the ASCE standard method. The result shows that the total amount of urban litter load in 2015 was 3761.72 kg/year (Mean ± SD; 313.4767 ± 141.9105 kg/year). In such situations, further study on urban litter load and its composition trapped at GPTs is urgently required as it is crucial to establish baseline data information during the decision making process, holistically improving stormwater management and urban litter management in Malaysia.

***Keywords*:** Downstream defender; drainage; gross pollutant traps; quantification; urban litter

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INTRODUCTION

Urban litter is commonly known as the trash, debris, flotsam, jetsam, floatables, gross pollutants, rubbish or solid waste (Armitage, 2007). The technical definition of urban litter is a visible solid waste arising from urban environment (Armitage, Rooseboom, Nel, & Townshend, 1998). In fact, the rising levels of urban litter composition and quantity load are the most challenging environmental issues to be addressed due to the various factors such as the growth of the human population, type of development, anthropogenic activities through littering; excessive of packaging; inefficient service of street sweeping; lack of disposal facilities and lack of enforcement from authorities (Hall, 1996). The high population and the areas with high levels of commercial activity produced massive amount of urban litter in terms of quantity (Purcell & Magette, 2009). The abundance of urban litter derived from residential and commercial areas have a high tendency to be visible at the drainage and river that might be due to lack number of disposal bins or individual behaviour in managing the waste. Ab Ghani et al. (2011) stated that the rising urban population and developed areas also can influence hydrological processes through stormwater runoff and characteristics of peak flow. Impervious surfaces increase due to rapid development in urban areas, which subsequently can generate more surface runoff which conveys urban litter into receiving water bodies such as rivers.

Furthermore, the rising urban litter composition and quantity load at GPT is also derived from the characteristics of catchment, management practices including law enforcement and services, the efficiency and effectiveness of litter removal by local authority (Marais, Armitage, & Pithey, 2001); environmental awareness among the communities (Sidek, Basri, Lee, & Foo, 2016); types of land use (Lariyah, Norazli, Nasir, Hidayah, & Zuleika, 2011); and climate conditions and rainfall patterns (Mohd Shah et al., 2016; Alam, Anwar, Sarker, Heitz, & Rothleitner, 2017). Therefore, in such a situation, the factors described above contribute to the various types of litter composition in the stormwater system, which encompasses plastic, paper, metal, glass, metal, vegetation, sediment and others (Marais et al., 2001) illegally dumped nearby or directly into the drainage system through the littering activities or transported by wind or surface runoff.

GPT IN STORMWATER MANAGEMENT PRACTICES IN MALAYSIA

There are several types of GPTs available for urban stormwater management and treatment applications in Malaysia, such as Type 1 (floating debris trap; trash racks and litter control devices); Type 2 (sediment basin and trash rack (SBTR) traps); and Type 3 (oil and grease interceptor) (Jabatan Pengairan dan Saliran, 2012).

In this study, the Department of Irrigation and Drainage (DID) has introduced the GPTs with a downstream defender as a hydrodynamic deflective

separation device (Fitzgerald & Bird, 2011) with hydrodynamic vortex separator system for stormwater treatment applications (Faram, Lecornu, & Andoh, 2000) to trap litter at the drainage conveyance along Sungai Batu, Selangor. The mechanism of this device can be described as diverting the incoming flow and associated pollutants away from the main flow stream of the pipe or waterway into a pollutant separation and containment chamber. Generally, GPTs are vital in stormwater management practices where GPTs act as devices to control water quality by trapping and removing gross pollutants which commonly greater than five millimetres (>5mm) such as urban litter washed into stormwater system and reduce the effect of pollutants loads from entering the receiving water bodies (Madhani & Brown, 2015). However, Alam et al. (2017) stated that the periodic cleaning process of GPTs is challenging and ineffective for removal of pollutants less than 5 millimetres (<5mm). The estimation performance of GPTs efficiency to remove the urban litter is about 10% to 30% (Fletcher, Duncan, Poelsma, & Lloyd, 2004). High proportions of pollutants including gross pollutants, sediments, and nutrients will be transported from the contributing catchment area to the receiving water bodies during the higher runoff volume.

In such situations, the size of catchment, pollutant load, type of drainage system and cost are the main factors in operating the gross pollutant devices (Sidek et al., 2016) prior to installation of GPT at the selected site. The installation and maintenance costs, and costs of gross pollutant disposal can also affect the efficiency of GPTs indirectly through the budget and capacity of the management, as the conditions of gross pollutant vary during the different season in terms of load and its composition. Generally, a trap with a dry load condition is easier to operate and deliver to the landfill as compared to traps with wet load, which are more expensive to operate due to difficulty in the cleaning process (Fitzgerald & Bird, 2011).

There are limited studies in assessing the amount of urban litter load and its composition at GPTs, and this significantly contributes to the lack of historical data. Thus, this study is aimed to assess the amount (quantity) of urban litter load on a wet basis condition at individual GPTs along Sungai Batu, Selangor in 2015. The types of urban litter composition data were not tested and analysed in this study. Further investigation on urban litter composition trapped at GPTs is strongly required as it is crucial to providing baseline data and information for stakeholder agencies. These data are one of the main environmental indicators for improving the GPT performance and maintenance, which subsequently gives informative input during the decision-making process and make a better improvement in stormwater management practices.

RESEARCH METHODOLOGY

Study Area

The total area of Sungai Batu catchment is about 103.50 km^2 and covers a small part of south area in Selangor State (upstream) to Federal Territory of Kuala Lumpur (downstream) before entering Sungai Klang. The Sungai Batu catchment in Selangor was selected as a study area due to the dense population and developing areas, including both residential and industrial areas. The DID has installed 18 GPTs (K1 to K18) with downstream defenders at upstream area of Sungai Batu (Figure 1) in order to trap the urban litter in drainage, subsequently minimises the amount of urban litter from being transported into water bodies.

Selection of installation sites was based on several factors such as topography, soil and geology, groundwater, space availability and road accessibility. Other social factors, such as odour, health and safety, visual/aesthetics and vermin, were also considered as the GPT sites are usually in close proximity to residential area.

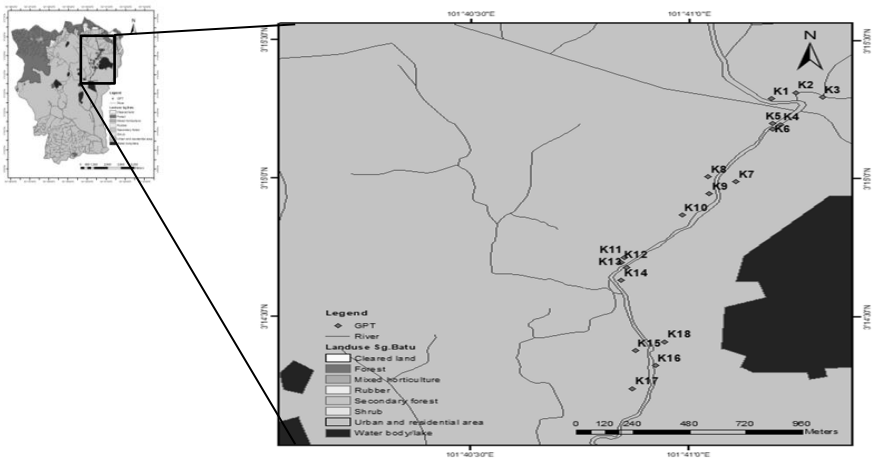

Figure 1 The location of GPTs along Sungai Batu, Selangor

Field Sampling and Data Collection

The downstream defender (Figure 2) components and functions can be described in terms of general operation of this unit. The tangential inlet pipe will receive water and enter the treatment chamber which subsequently induces a rotating fluid field. As the water initially flows around the outer annular space between the dip plate cylinder and manhole wall, the floatable contaminant and oil will accumulate on the water surface at the outer annular space. The sediment will be deposited in the bottom centre of the unit, known as isolated sediment storage zone, as the water continues to flow downward. Then, the water exits the unit by

passing under the dip plate and moving upward through the inner annular space and subsequently to the outlet pipe. The function of the centre cone is to direct flow into the inner annular space and protect the accumulated sediment from being incorporated and swept along in its flow.

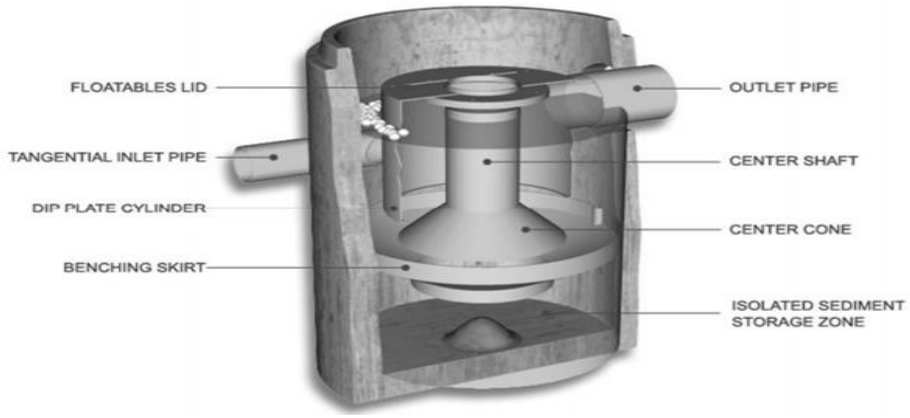

Figure 2 The illustration of downstream defender components
Source: Osei, Faram, & Iwugo (2007)

In this study, the amount of urban litter collection data at each GPT along Sungai Batu in 2015 was sourced from DID and used in the analysis. Field sampling was performed once in a month during cleaning operation at each GPT along Sungai Batu. However, there is no recorded data on the amount of urban litter collection in February due to the absence of cleaning operation during that month. As litter was left some days with monthly interval in an area until the day of cleaning operation, field sampling for urban litter collections at GPT under wet basis conditions was performed accordingly to American Society of Civil Engineers guidelines under the litter section for Wet Best Management Practices (BMPs) (ASCE, 2007). In order to obtain the precise weight of litter in wet basis condition at each GPT, litter was manually collected using nets to filter the excess water content prior to storage in plastic bags. Each bag was immediately weighed and recorded (Alam et al., 2017).

Statistical Data Analysis

Descriptive statistical analysis has been performed in this study in order to obtain and describe the urban litter load trapped at GPTs along Sungai Batu. Since the sample size was only 18, the Shapiro-Wilk test was used in this study for normal distribution test, as it is generally sensitive and recommended by Ghasemi and Zahediasl (2012) for a sample size of less than 50. However, the small sample size of data applied in this study was not strong enough to be used in parametric

statistical analysis. Therefore, as a decision for normality test, the null hypothesis was rejected as the data was not normally distributed. The Kruskal-Wallis test was applied in this study in order to test the significance differences in total urban litter load between individual GPT along Sungai Batu and months in 2015.

RESULTS AND DISCUSSION

Quantification of Urban Litter Load Trapped at Individual GPT

Based on Table 1 and Figure 3, the results show that the urban litter collection in August contributed to the highest amount of urban litter load with 510.00 kg/month (Mean ± SD; 28.3333 ± 18.9426 kg/month), followed May with 435.00 kg/month (Mean ± SD; 24.1667 ± 14.9755 kg/month). Meanwhile, urban litter collection in March was the lowest with 121.00 kg/month (Mean ± SD; 6.7222 ± 11.9029 kg/month). There is no recorded data on the amount of urban litter load in February due to the absence of cleaning operations during the month. The amount of urban litter load trapped at GPTs generally derived from several factors including the growth of human population; type of development; characteristics of the catchment area; management practices including law enforcement and services; environmental awareness among the communities (Sidek et al., 2016); types of land use (Lariyah et al., 2011); and climate conditions and rainfall patterns (Mohd Shah et al., 2016; Alam et al., 2017).

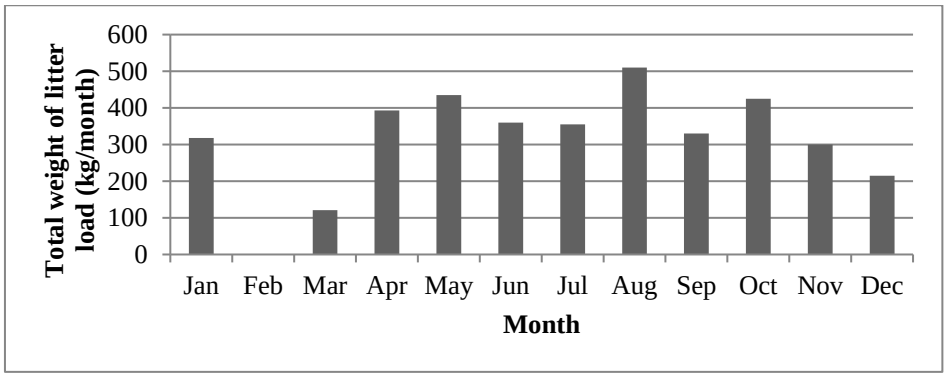

Figure 3 Total litter weight trapped at 18 GPTs along Sungai Batu in Year 2015

Table 1 Descriptive statistics for total urban litter weight (by month) in 2015 for 18 GPTs along Sungai Batu

Month	Min	Max	Sum	Mean ± SD	Skewness	Kurtosis
Jan	0.00	88.66	317.72	17.6511 ± 31.3192	1.6467	1.2779
*Feb	0.00	0.00	0.00	0.0000 ± 0.0000	N/A	N/A
Mar	0.00	37.48	121.00	6.7222 ± 11.9029	1.9665	2.8610
Apr	3.00	85.00	393.00	21.8333 ± 17.8696	2.7934	9.6823
May	5.00	55.00	435.00	24.1667 ± 14.9755	1.0525	0.1796

June	0.00	50.00	360.00	20.0000 ± 12.7187	0.6272	0.6919
July	0.00	45.00	355.00	19.7222 ± 11.3075	1.0384	1.5589
Aug	15.00	95.00	510.00	28.3333 ± 18.9426	2.8389	9.4201
Sept	5.00	30.00	330.00	18.3333 ± 7.0711	-0.4523	-0.3574
Oct	10.00	60.00	425.00	23.6111 ± 11.9811	1.5234	4.0701
Nov	10.00	40.00	300.00	16.6667 ± 7.0711	2.6984	7.5221
Dec	5.00	20.00	215.00	11.9444 ± 3.8877	0.8377	0.5168

Note: *There is no recorded data on the amount of urban litter collection in February due to the lack of cleaning operations during that month

Comparison by Month: Total Urban Litter Load at GPT along Sungai Batu

The Shapiro-Wilk test was applied in this study. The results show that the statistic value for the total urban litter load come as 0.821 corresponds to p-value = 0.000. Since the p-value is 0.000 < 0.05, as a decision for normality test, the null hypothesis was rejected as the data was not normally distributed. The Kruskal-Wallis test was applied in this study in order to test the significance differences in total urban litter load between months in Year 2015. The result revealed a statistically significant difference in total urban litter load between each month at 18 GPT along Sungai Batu, χ^2 (11) = 85.516, p = 0.000. The total urban litter load in May 2015 recorded a highest mean rank at 158.03, corresponding to the highest total weight of urban litter load (Table 2).

The total urban litter load is significantly influenced by the seasonal variation through the rainfall pattern throughout the year. Alam et al. (2017) have proved in their study where the urban litter load during wet season was significantly higher as compared during the dry season due to factors of rainfall-runoff in carrying these pollutant loads through a large volume of stormwater that could convey the gross pollutant into water bodies. Allison, Chiew and McMahon (1997) found that most of the load was conveyed during high flow condition. The types of gross pollutant composition which are able to be captured within a catchment also can be influenced through rainfall and runoff pattern, rate of infiltration, and stormwater system connectivity (Fitzgerald & Bird, 2011).

Lun, Gasim, Toriman, Rahim and Kamaruddin (2011) described the high distribution of rainfalls significantly increased the water level, which caused the higher volume of discharge. Ab Ghani et al. (2011) stated that the floatable gross pollutants are easily transported into the downstream during high flow conditions, as this process is significantly influenced by the efficiency of GPTs. The efficiency of trapping at GPTs can be less effective during the high flow condition and high water depths. Hydrological parameters such as rainfall intensity, depth and discharge were very important indicator to ensure the efficiency of GPTs (Ab. Ghani et al., 2011).

Table 2 Kruskal-Wallis test of monthly urban litter load at 18 GPT along Sungai Batu

Month	Mean Rank	df	χ^2	p – value
Jan	73.11			
Feb	19.00			
Mar	62.94			
Apr	127.56			
May	139.39	11	85.516	0.000
June	126.56			
July	127.17			
Aug	158.03			
Sept	128.83			
Oct	144.78			
Nov	111.31			
Dec	83.33			

Comparison by GPT: Total Urban Litter Load at GPT along Sungai Batu

The result derived from Kruskal-Wallis test revealed a statistically significant difference in total urban litter load among individual GPTs along Sungai Batu, χ^2 (17) = 34.255, p = 0.008. The total urban litter load in K2 recorded a highest mean rank with 163.25 than the other GPTs which correspond to the highest total weight of urban litter load (Table 3).

Table 3 Kruskal-Wallis test of urban litter load at individual GPT along Sungai Batu

GPT	Mean Rank	df	χ^2	p – value
K1	69.46			
K2	163.25			
K3	102.33			
K4	85.92			
K5	106.92			
K6	85.88			
K7	111.29			
K8	132.79	17	34.255	0.008
K9	104.58			
K10	83.79			
K11	88.58			
K12	117.92			
K13	92.88			
K14	114.63			
K15	138.75			
K16	113.50			
K17	152.79			
K18	87.75			

The urban litter weight trapped at GPT varied and influenced by the types of urban litter composition which mainly derived from land-based sources. The types of urban litter composition data were not analysed in this study, as there is a lack of historical data on urban litter composition which can be used as baseline data information. However, previous studies conducted by Sidek et al. (2016) and

Alam et al. (2017) on types of urban litter composition found at GPTs in different regions in Klang River catchment and Gosnells Western, Australia, respectively, show that both plastics and vegetation such as leaves are the most commonly found in GPTs during the cleaning operation. The amount of urban litter generation and its composition are fundamental information strongly required for urban litter management systems in terms of planning, operation and optimization (Beigl, Lebersorger, & Salhofer, 2008). The characteristics of litter differ with time and are exaggerated by socio-economic conditions (Buenrostro, Bocco, & Vence, 2001; Gómez, Meneses, Ballinas, & Castells, 2009). In addition to the structural method applied in this study to filter the gross pollutants, including urban litter, from flowing into water bodies, environmental education programs, cleaning operations and law enforcement play crucial roles in mitigating the urban litter management issue, which indirectly affects the stormwater quality.

CONCLUSION

This paper has demonstrated the quantification of urban litter load trapped at 18 GPTs along Sungai Batu, Selangor in 2015. The growing issue of urban litter in drainage systems is mainly influenced by the growth of the human population, lack of environmental awareness in waste disposal, littering, law enforcement and policy, type of development, land use changes, and rainfall patterns. The result shows that the total amount of urban litter load in 2015 was 3761.7200 kg/year (Mean ± SD; 313.4767 ± 141.9105 kg/year). DID has installed GPTs with downstream defender at selected sites along Sungai Batu which are functioning as hydrodynamic vortex separator systems for stormwater treatment to trap litter at drainage conveyances before it enters the main river. A significance difference in total urban litter load between individual GPT along Sungai Batu obtained in this study were mainly influenced by various type of urban litter composition derived from land based sources including the human activities; consumption and production; and types of development. The different types of development and land use will generate different urban litter compositions. However, the urban litter composition at individual GPT was not evaluated in this study due to unavailability of baseline data. Moreover, a significant difference in total urban litter load for each month at 18 GPTs along Sungai Batu also were mainly influenced by seasonal condition through rainfall pattern throughout the year, as the efficiency of trapping at GPTs can be less effective during the extreme storm event and high flow conditions, and tend to be more effective during low-flow conditions.

Due to the high amount of urban litter load in year 2015, this study suggests that environmental education program encompasses the field of knowledge, attitude and practices (KAP) is highly required as it can be a medium to improve and enhance public awareness on how to dispose the urban litter in proper way. Besides, urban litter compositions at GPTs also need to be studied as

this information is crucial for GPT efficiency in trapping urban litter and other pollutants. This information will serve as baseline data for knowledge contribution and informative input during the decision-making process, subsequently improving stormwater management and urban litter management in a comprehensive way.

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URBANISATION BEYOND ITS CORE BOUNDARY AND ITS IMPACT ON THE COMMUNITIES IN GEORGE TOWN CONURBATION, MALAYSIA

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Abstract

Rapid urbanisation has raised major issues, especially in cities in developing nations. In Malaysia, for example, the urbanisation rate is at 74%, but the size of urban land is less than 10%. This phenomenon has caused urban expansion to encroach on to its fringe areas. At present, although much has been said about the economic benefits of urban expansion to the fringe areas, yet little is known about its impact on the local communities. This paper aims to highlight the spatial expansion of George Town Conurbation and to investigate how local inhabitants perceive urban development. This study used satellite images and GIS techniques to identify the spatial expansion of urbanisation in George Town. Quantitative and qualitative approaches of data collection were employed to investigate the impact of urbanisation on the communities. The findings indicated that the inhabitants in less urbanized states welcome urban expansion, as they perceive that urban growth generates more jobs and brings economic opportunities. On the contrary, those who have experienced a longer period of urban development did not fully welcome urbanisation. Therefore, inclusive development policies are required to ensure that urban growth will benefit dwellers in the urban area as well as in its surroundings. In addition, they are required to safeguard the environment.

***Keywords*:** conurbation, GIS, land use changes, urban economy, urbanisation, Malaysia

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INTRODUCTION

Urban areas worldwide are experiencing rapid urbanisation. In 1950, the urban population was less than one billion. Meanwhile, in 2009 it has increased to 3.4 billion, and is estimated to reach 5.0 billion and 6.4 billion in 2030 and 2050, respectively (United Nations, 2014). According to Knieling (2014), the global urban population is anticipated to increase by 1.5% per year, that is, increasing roughly at 60 million per year between 2025 and 2030. These figures reflect not only an increase in urban citizens, but also a shift in the relative share of people living in urban versus rural areas. The share of the urban population grew from just about 30% in 1950 to 54.4% in 2016 (UN-Habitat, 2016). Knieling predicted that this growth rate is expected to reach 70% by 2050. Knieling also commented that this extraordinary increase has led some scholars to name this century as "urban age". More important is that urbanisation is growing more rapidly in developing countries than in developed nations (Jedwab & Vollrath, 2015; McGee, 2009), with 95% of urban expansion in the next decades will be occurring in the developing countries (UN-Habitat, 2016). It would be a huge challenge for planners and urban managers to ensure that urbanisation and urban spatial expansion will bring positive economic and developmental impact on the communities, and to safeguard the environment (Elhadary, Samat, & Franklin, 2013).

Presently, however, the new trend of urban development in developing countries is no more confined to the formal administrative borders of core cities; the urban population is pushing towards urban fringe areas of neighbouring communities (McGee, 2009; Samat, Ghazali, Hasni, & Elhadary, 2014). This phenomenon can be explained by using the concept of conurbation and agglomeration, as suggested by McGee (2009) when two spatial processes will dominate the growth of urban places. First, the growth of central cities in mega-urban regions, and second an ongoing process of horizontal urban expansion into surrounding hinterlands creating peri-urban regions that will comprise up to 70% of mega-urban region population by 2050. In the era of the "urban age" the number of rapidly growing megacities or megaregions with population of 10 to 20 million people have emerged primarily in Africa, America and Asia (Knieling, 2014). Thus, addressing urban challenges require a broader spatial focus that extends beyond the city limits.

Many have mentioned that urbanisation brings positive and negative benefits to the communities as well as to the country. New developments brought about by urbanisation have important implications for the livelihoods and socioeconomic conditions of local communities (Elhadary et al., 2013). Through good infrastructures and access to basic facilities and amenities, the urban areas have become more productive economically than the rural areas. This implies that the poor performance of the economy is linked to the increase in rural areas. In addition to the economic benefits, urbanisation provides better access to basic

facilities such as health, education, water, and electricity. Urbanisation brings more employment opportunities and offers modern lifestyles in the city (Su, Jiang, Zhang, & Zhang, 2011) and these facilities are positively correlated with human development. For example, major cities become megacities which can handle major international commercial activities (Cavallier, 1996).

Some empirical evidence has shown that there is a link between city size and poverty eradication. According to Knieling (2014), poverty is more widespread and deeper in very small and small towns than in large or very large cities. For example, poverty in metropolitan cities, in particular, are considerably lower than poverty in other urban areas. This claim is supported by UN-Habitat (2016), which stated that cities have higher productivity, stronger economies and more employment opportunities, and the rapid pace of urbanisation has helped millions to escape from extreme poverty.

However, the abovementioned positive views are debatable and do not always have a linear relationship. Urban conurbations pose a challenge to urban planners and decision makers. Malaysia, for example, is classified as among the most urbanized countries with the urban population rising rapidly, especially in major urban centres of Kuala Lumpur, Johor Bahru and Georg Town. This phenomenon has created major challenges to local authority in handling the increasing number of urban population and in providing access to better services. Regardless of the emphasis on whether urbanisation has positive or negative outcomes, empirical research on urban conurbation is still lacking (Samat et al., 2014).

This paper aims to identify and map out urban expansion in the George Town Conurbation, and evaluate its impact on the communities living in this conurbation. In addition, the paper seeks to understand the impacts of urbanisation from the perspectives of the local communities.

BACKGROUND OF THE STUDY

Penang, along with Kuala Lumpur, Selangor and Johor, has experienced rapid urbanisation since the 1970s, mostly due to industrial activities (Ghazali, 1999). Penang has contributed 6.6% of Malaysia's Gross Domestic Product (GDP) in 2015 after Selangor (22.6%), Kuala Lumpur (15.1%), Sarawak (10.0%), Johor (9.3%) and Sabah (6.6%) (Department of Statistics Malaysia, 2016). Since the 1970s, Penang has focused on industrial and commercial activities to boost its economy and has invested in improving public infrastructures that can attract multinational corporations and international investors (Samat et al., 2014).

Industrialisation and commercial activities have provided wide employment opportunities that consequently led to the migration of the rural population into the Penang state (Ghazali, 1999). Thus, the demand for land for housing and related activities has increased. Furthermore, Penang has the highest urban population density in Malaysia with 4,800 people per square kilometre

(Demographia World Urban Areas, 2017). Urbanisation in Penang has spilled over to its neighbouring regions (Hasni & Samat, 2015). Good road network, cheap land prices, peaceful environment and less densely populated areas are among the major factors that have attracted new developments, especially housing areas to the neighbouring regions. In addition, the North-South Highway and Butterworth-Kulim Highway connecting Penang and its neighbouring regions have attracted people to stay in the neighbouring regions and commute to work daily. New constructions of residential and business units and administrative complexes foster the economy in the regions. This development, however, brought some consequences to the community living in the surrounding regions (Su et al., 2011). The urbanisation experienced by George Town and its neighbouring regions, has attracted this paper to examine the expansion of George Town, besides the perception of its community on the development and the consequences that arose in their surroundings.

MATERIALS AND METHODS

The Study Area

George Town Conurbation is located in the north of Peninsular Malaysia with Pulau Pinang (George Town and Butterworth) as the centre. The Northern Region urban conurbation stretches from Sungai Petani in the north to Kulim in the east and Sg. Bakap in the south (Figure 1). The Census 2000 statistics estimated that the Northern Region urban conurbation has a population of at least 1.2 million or 23% of the region's total population (PlanMalaysia, 2016).

Spatial Data

Spatial data are mainly used to identify areas undergoing high development pressure. This study used satellite images of the year 2002, 2006, 2010 from Landsat 7, and year 2014 from Landsat 8, available from the United States Geological Survey (USGS) website to locate urban expansion within the study area (USGS, 2015). These images were processed using Erdas Imagine 2014 software and referenced on UTM-47N with Upper Left, X = 630210, Lower Right, X = 706680, Upper Left, Y = 648900, Lower Right, Y = 550860 and have a spatial resolution of 30 meters x 30 meters. The images were then classified using maximum likelihood supervised classification into four major land covers, namely Agriculture, Forest, Urban and Water Body. The overall accuracy of the classified images was 80%. These classified images were exported into ArcGIS 10.1 shapefile and used to map land cover and identify urban development pressure.

Household Survey

The main objective of this study is to investigate how local communities perceive urban development in Malaysia. To achieve this objective, the study employed a mixed methods approach (qualitative and quantitative approaches) to capture the communities' views towards urban conurbation. A sample of 12 respondents living in George Town Conurbation were identified for in-depth interview to express their responses to issues and impact of the development on their livelihoods.

Figure 1 George Town Conurbation

A household survey involving 550 respondents clustered within three districts were selected using convenience sampling. A questionnaire was conducted on the sample to evaluate the perspective and impacts of urban development on the local communities. Three neighbouring regions were identified as the study areas, namely Kerian (in Perak), Kuala Muda (in Kedah), and Bayan Lepas in Penang. Bayan Lepas was selected to evaluate the perspective of Penang's community about the Penang, and to assess if there are any differences in views among the communities. The study was designed to understand the views and situations experienced by the local communities. Of the 550 respondents, 208 or 41.6% were from Kerian, 214 or 42.8% from Kuala Muda and 128 or 25.6% from Bayan Lepas. In addition, other key relevant data such as meetings with city planners from Kerian (Kerian District Council) and Kuala Muda (Majlis Perbandaran Sungai Petani) were also used to examine the preparations and actions taken by local authorities to manage the rapid development of the study areas.

LAND COVER CHANGES 2002 – 2016

Analysis on the time series satellite images (Table 1) showed that land cover in the study areas has experienced significant changes during the observed period (Figure 2). Built-up area has increased from 1,398.12km^2 to 1,704.47km^2,a total increase of more than 300km^2 during observed period. Similarly, agriculture area has increased of more than 1500km^2, while forest area experienced a reduction of more than 1700km^2. Furthermore, land cover changes indicated that urban areas and agricultural are growing at the expanse of forested area. As stated by FAO (2016), agriculture is still the major driver of deforestation globally. Based on this observation, this study identified areas undergoing urban development pressure namely south of Seberang Perai Selatan and North of Seberang Perai Utara. Kerian District received spill-over demand for housing and other related services from rapid urbanisation in the south of Seberang Perai Selatan. For example, the development of Penang second bridge connecting Batu Kawan in Seberang Perai Selatan and Batu Maung in Bayan Lepas has spurred urban development around these regions ("Penang second bridge to spur", 2012). Although Bayan Lepas has experienced urban development pressure since 1970s, it has become more intense as more infrastructure and industrial sites being developed (Samat et al., 2014). Similarly, more development moved towards Kuala Muda district due to spill over development of Sungai Petani area.

Table 1 Area of classified land cover between 2002 and 2014

Year	Agriculture (km^2)	Forest (km^2)	Urban (km^2)
2002	1,266.65	3,006.08	1,398.12
2006	2,354.18	1,889.49	1,504.61
Change	*+1,087.53*	*-1,116.59*	*+106.49*
2006	2,354.18	1,889.49	1,504.61
2010	2,799.28	1,306.01	1,502.74
Change	*+445.10*	*-538.48*	*-1.87*
2010	2,799.28	1,306.01	1,502.74
2014	2,815.06	1,212.54	1,704.47
Change	*+15.78*	*-93.47*	*+201.73*
Total Change	*+1,548.41*	*-1,793.54*	*+306.35*

Note: Calculation shown in this table was based on calculation from classified satellite images generated by authors.

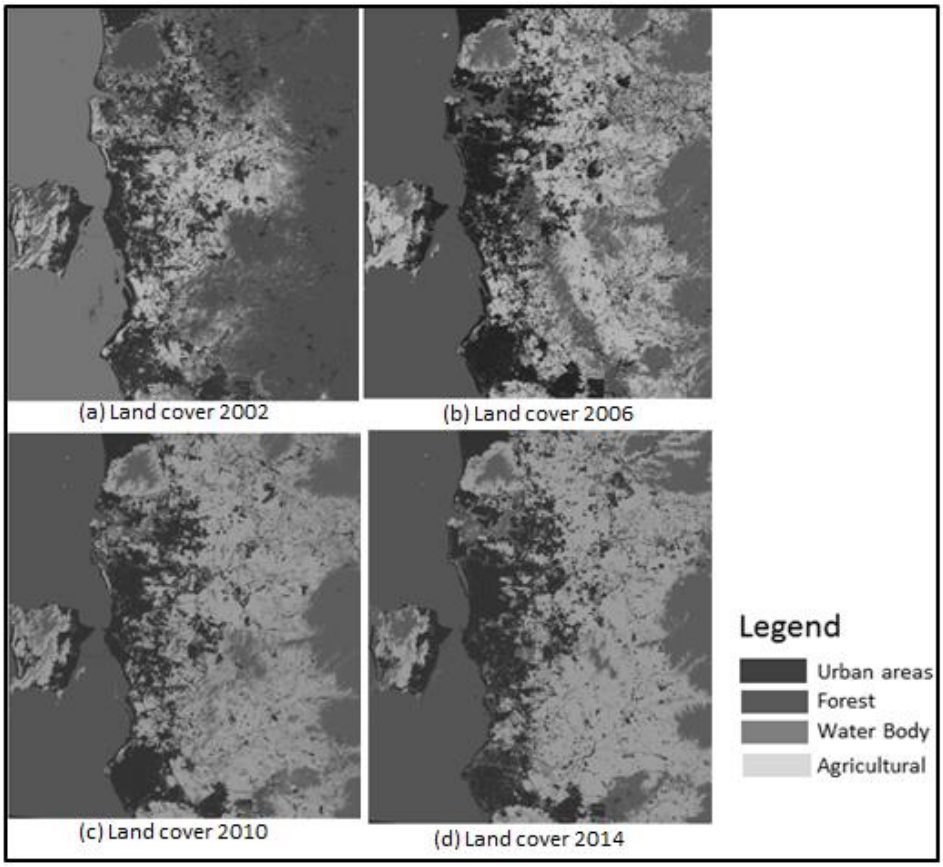

Figure 2 Land cover 2002, 2006, 2010 and 2014 produced using maximum likelihood supervised classification method

Table 1 shows that urban development has caused a reduction in forest area by 7.2% between the year 2010 to 2014. Agricultural area, on the other hand, has increased to 55%. The reason could probably be that the majority of the local community were still working on their agricultural land, especially in Kerian and Kuala Muda areas. This finding should serve as an alert signal to planners and policymakers that the forest areas have to be managed more efficiently by controlling the spread of newly-developed urban areas. Table 1 shows that urban area has increased by 13.4% from the year 2010 to 2014. This is the highest contribution to the total change in the urban area. This could be due to the spill over effect of the development of George Town city that has expanded into the neighbouring regions. The reason could be that the construction of Penang 2nd bridge has spurred urban development particularly housing in the south of Seberang Perai Selatan (Hasni & Samat, 2015; "Penang second bridge to spur", 2012).

PERCEPTION OF LOCAL COMMUNITIES

Negative Adaptation: Declining Development

The study findings indicated that the communities living in Kerian and Kuala Muda (newly developed areas) welcomed urban development around their areas with 49% and 49.6% respectively agreeing to the idea. However, only 32.1% of respondents in Bayan Lepas (developed urban area) agreed with the urbanisation around their area (Table 2). This might be due to the communities in Bayan Lepas have experienced some negative consequences such as congestions and rise of housing rentals and residential land prices in their area (Ghazali, 1999). Besides welcoming development, further analysis indicated that 64.1% of respondents in Bayan Lepas agreed that migration of newcomers to their area has occurred and 34.4% agreed that residents have sold their land or house because they were getting high offers from urban developers. On the other hand, Elhadary et al. (2013) found that average agriculture land size has decreased, and farmers were selling their lands and moving out into neighbouring states. To further explore the perception of the community, in-depth interviews was conducted, especially to those living in the Bayan Lepas area since they have seen urban development in the past 40 years. Similar to the findings of the study by Samat et al. (2014), respondents highlighted some negative impacts of the development, namely environmental degradation, traffic congestions and reduction of agriculture land size.

Table 2 Perception of local community on urbanisation

			Residents welcome urbanisation around their residence area					Total
			Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Study Area	Kerian	Count	6	24	76	46	56	208
		%	2.9%	11.5%	36.5%	22.1%	26.9%	100.0%
	Kuala Muda	Count	9	16	83	53	53	214
		%	4.2%	7.5%	38.8%	24.8%	24.8%	100.0%
	Bayan Lepas	Count	12	31	44	24	17	128
		%	9.4%	24.2%	34.4%	18.8%	13.3%	100.0%
Total		Count	27	71	203	123	126	550
		%	4.9%	12.9%	36.9%	22.4%	22.9%	100.0%

Source: Fieldwork (December, 2016)

The in-depth survey results showed that respondents living in all the three study areas mentioned environmental degradation as one of the main issues. In an in-depth interview in Bayan Lepas, one of the respondents mentioned,

> *….. the dust and road construction work were too bad, with trucks' noise and heavy traffic. It occurred over a long period of time. The development project was not completed within the prescribed time. (Respondent 1, Male, 60 years old, pensioner).*

The community in Bayan Lepas also thought that the development near their residential area has caused housing price to increase. In other words, development has no direct benefit to the local communities. According to one of the respondents,

> *The housing projects developed are unaffordable to the locals. Mostly they are owned by Singaporeans and Chinese. Development pressure caused local residents to sell their land, but the compensation paid was quite low. (Respondent 2, Male, 47 years old, factory worker).*

The development in Bayan Lepas also has negative impacts on students and parents in nearby schools. This was attributed to the development of road widening projects that caused disruptions to some schools in the district. The study found that some schools in the area have been deprived of their fields for their sports activities. This situation gave a negative impact on the development of sports among students. A respondent said,

> *The road widening project disrupted the school area. The school was affected and causing the site for school to become narrower and no field facility. It caused heavy congestion daily when school start and return time. (Respondent 3, male, 33 years old, public service).*

The in-depth interviews also revealed that the community in Bayan Lepas is less likely to welcome development projects around their residential area. The reason is that they considered development as having a negative impact on the local community, but not to outsiders. Only one of the respondents considered that development in residential areas had a positive impact on those living outside the Bayan Lepas area. The respondent said,

> *Development projects such as road widening, and second bridge are good. But housing and hotel projects do not benefit the locals. Houses are very expensive and it affected us as more people who moved here. (Respondent 4, Female, 39 years old, factory worker).*

Overall findings indicated that the development in the Bayan Lepas area brought more negative than positive impacts on the local community. Similarly, the study by Ghazali (1999) and Samat et al. (2014) in Penang State also indicated that respondents experienced negative impacts from urban development. For example, respondents were selling their agriculture land and moving to neighbouring states due to the high land and housing prices, besides avoiding congestion. Although development brought environmental problems, congestion and high land price, few respondents have claimed that the development also had a positive impact on the community. The positive effects identified are discussed in the following section.

Positive Adaptation: Accepting Development

Even though most respondents felt that development had negative impacts on the local community, there are also some positive impacts from development. Urban development has brought positive impacts to the economy in terms generating more job opportunities, enhanced transportation and communication systems, and improved public amenities, and the living standards of the community. As one of the respondents said,

> *Housing projects will increase the population. They will bring more business to local food traders. They can create more job opportunities and will increase the income among locals. (Respondent 5, Female, 46 years old, public service).*

The findings are in line with the studies by Elhadary et al. (2013) and Samat et al. (2014), that showed that residential development has caused middle-income residents to move into the peri-urban areas and has brought new job opportunities such as child care, tailoring services and other businesses to the region. The findings also showed that development and urbanisation has brought positive impacts to the local communities by bringing in more job opportunities in the non-agricultural sector, enabling the locals to earn better incomes (Ghazali, 1999). One of the respondents said,

> *...since the new road was constructed, access to our business has increased. It also reduced traffic congestion, increased tourist arrivals, and provided a greater market for local business. (Respondent 6, Female, 21 years old, factory worker).*

This study found that most of the respondents in Kuala Muda and Kerian (less developed areas compared with Bayan Lepas) welcomed new development into their areas. Ghazali (1999) found that women were able to earn income as more middle-class workers moved to their neighbourhood. This has allowed the local communities to provide childcare services, tailoring services and hawking food by the roadside. The study by Elhadary et al. (2013) also emphasised on the positive impacts that development has brought a market to the people living within new residential areas being developed at the urban fringe. Analysis of the study results shows that; well planned development is essential to ensure that development brings more positive impact not only to the country but also to the communities living within the areas.

CONCLUSION

As a conclusion, this study finds that the communities in Kerian and Kuala Muda were quite positive with the spillover effects of rapid development from Penang when compared with the community in Bayan Lepas. This study has shown that the physical development of towns within George Town Conurbation has spilled over to the neighbouring regions, affecting the communities. Therefore, a more effective policy response to address the circumstances for Kerian and Kuala Muda should be adopted such as an integrated policy approach to be implemented by the City Council of Penang Island and Seberang Perai Municipal Council to manage the rapid urban development. This finding should be further explored with respect to policy formulation such that urbanisation can be planned and the well-being of communities are safeguarded. More important is that conurbation is essential for the economic growth of developed and developing countries.

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THE TRAFFIC VOLUME AND LEVEL OF SERVICE (LOS) OF UNIVERSITI PUTRA MALAYSIA (UPM) SERDANG CAMPUS MAIN ACCESS

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Abstract

The inbound and outbound traffic flow characteristic of a campus is an important physical component of overall university setting. The traffic circulation generated may create indirect effects on the environment such as, disturbance to lecture-time when traffic congestion occurs during peak-hours, loss of natural environment and greenery, degradation of the visual environment by improper or illegal parking, air pollution from motorized vehicles either moving or in idle mode due to traffic congestion, noise pollution, energy consumption, land use arrangement and health effects on the community of Universiti Putra Malaysia (UPM) Serdang. A traffic volume and Level of Service (LOS) study is required to facilitate better accessibility and improves the road capacity within the campus area. The purpose of this paper is to highlight the traffic volume and Level of Service of the main access the UPM Serdang campus. A traffic survey was conducted over three (3) weekdays during an active semester to understand the traffic flow pattern. The findings on traffic flow during peak hours are highlighted. The conclusions of on-campus traffic flow patterns are also drawn.

***Keywords*:** campus traffic, inbound-outbound traffic flow, motorized vehicle

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INTRODUCTION

The high concentration of people and traffic movement in university campus is typically due to the growth of the campus population and the university's physical development (Singh & Goyal, 2015). UPM Serdang, as one of the leading higher learning institution in Malaysia has unique transportation needs and a comprehensive transportation plan to achieve greater sustainable campus mobility. The number of vehicles that have travelled across the campus, and consequently, their impact on the environment can be related to several determining factors (Norzalwi & Ismail, 2011). These factors include (1) existing road infrastructure capacity; (2) quality of transportation services and facilities provisions on-campus (3) geographical setting of campus living and motor vehicle use; and, (4) low participation of sustainable transportation programs such as bus services (Abdul Azeez, 2011). Hence, a study on road capacity is necessary as the improvement of road services is important to fulfil the travel needs and reducing the impact of vehicle use to the environment setting of campuses (Abd-Razak, Mustafa, Che-Ani, Abdullah, & Mohd-Nor, 2011; Azzali & Abdel Sabour, 2018).

In addition, the existing transportation service system of a university may also create indirect effects on the environment such as, disturbance to lecture-time when traffic congestion occurs during peak-hours, loss of natural environment and greenery, degradation of the visual environment by improper or illegal parking, air pollution from motorized vehicles either moving or in idle mode due to traffic congestion, noise pollution, energy consumption, land use arrangement and health effects on the campus community (Lundberg & Weber, 2014; Soria-Lara, Marquet, & Miralles-Guasch, 2017).

Improper traffic control and management lead to the traffic congestion at the main access of the campus, as well as illegal parking at busy locations, which in turn are contributing factors to accidents and loss of road capacity as well as increase of air pollutions within the university campus (Dontu, Maftei, Barsanescu, Sachelarie, & Budeanu, 2016). Furthermore, the phenomenon of increased vehicle travel induced by new parking spaces (added vehicle-storing capacity) is similar to the phenomenon of increased vehicle travel induced by new roads (added vehicle-carrying) capacity (Aoun, Abou-Zeid, Kaysi, & Myntti, 2013).

A proper study on transportation planning is required to provide better accessibility and improves mobility within the campus area (Curtis & Scheurer, 2010). Besides this, critical planning towards a sustainable and green transportation orientation campus should be on the forefront of each university administrator's blueprint (Gopikrishna & Shanmugapriyan, 2015). This paper addresses the existing conditions of traffic flow in the Universiti Putra Malaysia Serdang campus. A traffic survey was conducted to understand the pattern of inbound and outbound of on-campus traffic flow. Findings on the existing

conditions of traffic flow and level of service of the main access capacity derived from the survey are highlighted in this paper. The conclusions of on-campus traffic flow pattern are also drawn.

MATERIALS AND METHODS

General Characteristics of the UPM Serdang campus

Universiti Putra Malaysia (UPM) Serdang is located in Serdang, Selangor. The total number of current students in the year 2018 was 29,319 including postgraduate and undergraduate students. The main campus of Serdang covers an area of 1,200 hectares consisting of tropical greenery that situated approximately 45 kilometres (km) from Kuala Lumpur International Airport (KLIA). It serves disciplines related to agriculture, medicine and health, architecture and design, environment and engineering and others, all housed within 16 faculties, 10 institutes, 1 school and 1 academic building. The study area includes the four (4) major entry points and the main collector road at Persiaran Universiti 1 leading to the core administration and academic area (Figure 1).

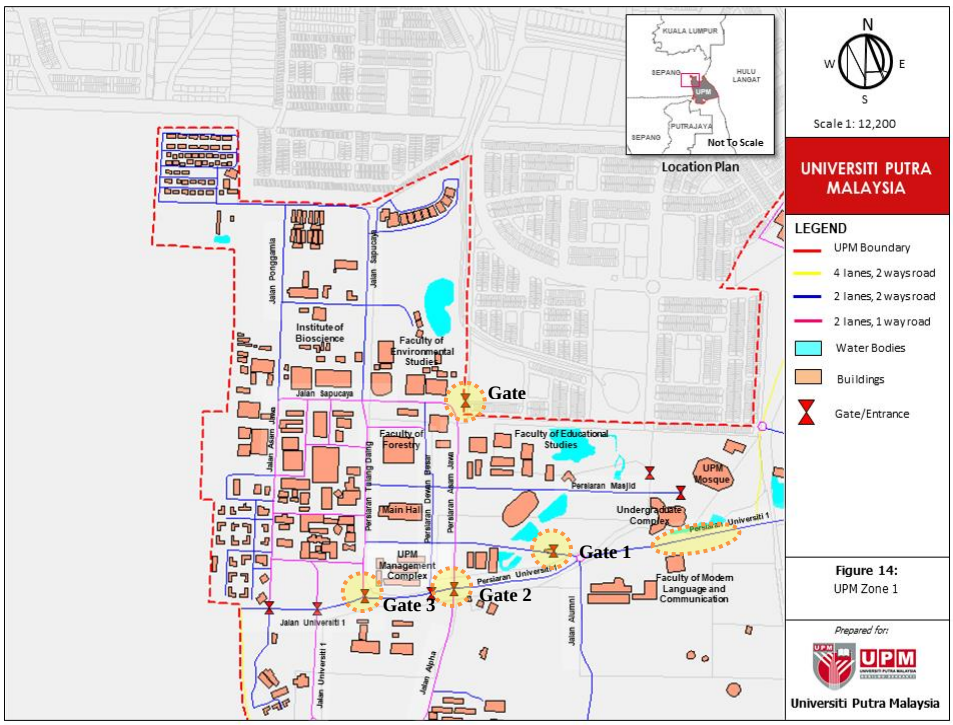

Figure 1 Universiti Putra Malaysia Serdang campus

Traffic Counting and Survey

Enumerators were located at the strategic locations identified including entrances, junctions, non-signalised intersections and significant points of potential traffic conflicts to conduct three (3) days of traffic counting during the peak hours of morning, noon and afternoon of during an active semester.

Passenger Car Unit

The urban standard of Passenger Car Unit metric was used to assess the traffic flow of the UPM Serdang campus. The value of PCU Equivalent for Urban roads is taken as: 1.0 for car/axi (4-wheelers), 0.75 for motorcycle (2-wheelers), 3.0 for bus/lorry and 0.2 for bicycle.

Level of Service

A standard Level of Service (LOS) from the Public Works Department of Malaysia is referred to assess the LOS of road service in UPM main campus, as shown in the Table 1.

Table 1 Level of service by volume/capacity ratio

Volume/Capacity Ratio	Traffic Flow	Level of Service
0.0 – 0.2	Free flow	A
0.2 – 0.4	Free flow but close to stable flow	B
0.4 – 0.6	Stable flow	C
0.6 – 0.8	Stable flow but close to congested	D
0.8 – 1.0	Congested	E
More than 1.0	Very congested	F

Source: Public Works Department Malaysia (1986)

RESULTS AND DISCUSSION

Traffic Volume

Table 1, 2, 3, 4, and 5 shows the results from observed traffic volume by hours at five (5) main accesses of the UPM Serdang campus during weekdays of an active semester. Four types of transportation modes (car, motorcycle, bus and bicycle) are identified passing through the main road and entry points to the campus.

The hourly variation of traffic volume (Table 1) at Gate 1 Pintu Anjung Putra indicate that the maximum number of vehicles entering the UPM Serdang campus via this entrance was 944, between the hours of 7.00am-9.00am (Thursday), and the maximum number of vehicles leaving the campus via Gate 1 was 1,045, between the hours 4.00pm-6.00pm (Wednesday).

Table 1 Hourly Traffic Volume at Gate 1 Pintu Anjung Putra

Count Hour	Wednesday		Thursday		Friday	
Direction	In	Out	In	Out	In	Out
7.00am -9.00am	903	478	944	433	501	340
12.00 pm – 2.00 pm	637	819	597	635	220	389
4.00 pm – 6.00 pm	528	1045	339	723	312	523
TOTAL	2068	2342	1880	1791	1033	1252

Source: Field survey

At Gate 2 (Table 2), the maximum number of vehicles observed leaving the campus via this entrance is 1,397 at 4.00pm-6.00pm (Wednesday).

Table 2 Hourly traffic volume at Gate 2 Pintu Asam Jawa

Count Hour	Wednesday	Thursday	Friday
Direction	Out	Out	Out
7.00am - 9.00am	880	1169	1058
12.00 pm – 2.00 pm	1065	1113	1213
4.00 pm – 6.00 pm	1397	1005	1395
TOTAL	3342	3287	3666

Source: Field survey

Gate 3, another inbound entrance of the campus, shows the maximum number of vehicles entering the campus via this entrance is 1,136 at 7.00am – 9.00am on Thursday (Table 3).

Table 3 Hourly traffic volume at Gate 3 Pintu CIMB

Count Hour	Wednesday	Thursday	Friday
Direction	In	In	In
7.00am -9.00am	1079	1136	1132
12.00 pm – 2.00 pm	892	292	817
4.00 pm – 6.00 pm	770	562	901
TOTAL	2741	1990	2850

Source: Field survey

Meanwhile, the volume observed at Gate 9 (Table 4) shows the maximum number of vehicles entering the campus via this entrance was 1,320 at 7.00am-9.00am on Wednesday, whereas a maximum of 1298 vehicles leftthe campus at 4.00pm-6.00pm on Friday.

Table 4 Hourly traffic volume at Gate 9 Pintu Tasik Serdang

Count Hour	Wednesday		Thursday		Friday	
Direction	In	Out	In	Out	In	Out
7.00am -9.00am	1320	674	1062	493	1005	752
12.00 pm – 2.00 pm	827	810	664	1216	822	772
4.00 pm – 6.00 pm	556	595	269	555	697	1298
TOTAL	2703	2079	1995	2264	2524	2822

Source: Field survey

Table 5 illustrates that a maximum of 1,028 vehicles were observed entering the campus through Persiaran Universiti 1. It also shows that 1,052 vehicles left the campus via this gate, and 1,043 vehicles passed by using the same entrance.

Table 5 Hourly traffic volume at main road Persiaran Universiti 1

Count Hour	Wednesday			Thursday			Friday		
Direction	In	Out	Pass-by	In	Out	Pass-by	In	Out	Pass-by
7.00am - 9.00am	596	453	817	1028	391	1020	610	340	1043
12.00 pm – 2.00 pm	459	1052	715	666	635	452	589	389	683
4.00 pm – 6.00 pm	280	312	472	482	572	567	360	523	549
TOTAL	**1335**	**1817**	**2004**	**2176**	**1598**	**2039**	**1559**	**1252**	**2275**

Source: Field survey

18 Hours Count of Traffic Flow

The 18 hours traffic count observation indicates that the highest number of vehicles entered UPM through Gate 3 and the lowest through Gate 1. More vehicles left the campus through Gate 2 compared to Gates 1 and Gate 9. Table 6 presents the cumulative 18 hours count of traffic flow over three weekdays during an active semester. High number of vehicle passing through Persiaran Universiti 1 as the road is servicing other nearby institutions, such as government institutes, secondary schools and residential zones. On average, from a total of 24,854 vehicles recorded over three days, approximately 8,285 vehicles entered the campus daily at an average 1,380 vehicles per hour.

Table 6 Cumulative 18 hours count of traffic flow over three weekdays during an active semester

	Gate 1		Gate 2	Gate 3	Gate 9		Persiaran Universiti 1		
	In	Out	Out	In	In	Out	In	Out	Pass-by
Car	3645	3721	5849	5313	5257	5146	3268	3122	4470
Motorcycle	1040	1533	4062	2203	1903	1920	1493	1373	1646
Bus	281	108	243	49	46	52	293	147	189
Bicycle	15	23	141	16	16	47	16	25	13
TOTAL	**4981**	**6382**	**10295**	**7581**	**7222**	**7165**	**5070**	**4667**	**6318**

Source: Field survey

Peak Hour PCU

The maximum PCU for inbound traffic was 7115.45 at Gate 3 and the maximum PCU for outbound traffic was 9652.7 at Gate 2 (Table7). Meanwhile, 6274.1 PCU passed through Persiaran Universiti 1 during the 18 hours traffic counting. Overall, the highest mode of transport passing through the campus road and entry points was car, followed by motorcycle and bus. This is due to the lack number of public transportation services entering the campus, as well as the location of the campus, which is far from the nearest rail services. The residential area and institutional zones that located nearby also contributes to the daily traffic flow around the campus access road.

Table 7 Cumulative 18 hours count of PCU over three weekdays during an active semester

	Gate 1		Gate 2	Gate 3	Gate 9		Persiaran Universiti 1		
	In	Out	Out	In	In	Out	In	Out	Pass-by
Car	3645	3721	5849	5313	5257	5146	3268	3122	4470
Motorcycle	780	1149.75	3046.5	1652.25	1427.25	1440	1119.75	1029.75	1234.5
Bus	843	324	729	147	138	156	879	441	567
Bicycle	3	4.6	28.2	3.2	3.2	9.4	3.2	5	2.6
TOTAL	**5271**	**5199.35**	**9652.7**	**7115.45**	**6825.45**	**6751.4**	**5269.95**	**4597.75**	**6274.1**

Source: Field survey

Table 8 summarises the peak hour PCU's at the main access of the UPM Serdang campus during a specific identified time. The maximum vehicles counted for inbound traffic was 1,320 vehicles at Gate 9 from 7.00am-9.00am (Wednesday), whereas the maximum vehicles counted for outbound traffic was 1,397 vehicles at Gate 2 from 4.00pm-6.00pm (Wednesday).

Table 8 Peak hour PCU's at main access

Location	Period	Vehicles/2hours	PCU/2hours
Gate 1 Pintu Anjung Putra	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	944	963.6
	Peak Hour for Outbound Traffic Wednesday 4.00pm-6.00pm	1045	998.65
Gate 2 Pintu Asam Jawa	Peak Hour for Outbound Traffic Wednesday 4.00pm-6.00pm	1397	1326.35
Gate 3 Pintu CIMB	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	1136	1064.75
Gate 9 Pintu Tasik Serdang	Peak Hour for Inbound Traffic Wednesday 7.00am-9.00 am	1320	1261.15
	Peak Hour for Outbound Traffic Friday 4.00pm-6.00pm	1298	1223.5
Main Road Persiaran Universiti 1	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	1028	969.5
	Peak Hour for Outbound Traffic Wednesday 12.00pm-2.00pm	1052	1046

Location	Period	Vehicles/2hours	PCU/2hours
	Peak Hour for Pass-by Traffic Friday 7.00am -9.00am	1043	949.95

Level of Service

The volume/capacity ratio was determined to calculate and the LOS based on peak hour service. Table 9 presents the findings on LOS of the main access to the UPM Serdang campus, which show this to be between C and D, indicating a stable flow, or stable flow but close to congested road capacity during the peak hours.

Table 9 Level of service of the main access to the UPM Serdang Campus

Location	Time	Peak Hour Traffic in PCU/2hours	Total Width of road (m)	No. of Lane	Design Service Volume	V-C ratio	Level of Service (LOS)
Gate 1 Pintu Anjung Putra	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	963.6	15.56	1	2000	0.48	C
	Peak Hour for Outbound Traffic Wednesday 4.00pm-6.00pm	998.65		1	2000	0.50	C
Gate 2 Pintu Asam Jawa	Peak Hour for Outbound Traffic Wednesday 4.00pm-6.00pm	1326.35	7.3	1	2000	0.66	D
Gate 3 Pintu CIMB	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	1064.75	18.2	1	2000	0.53	C
Gate 9 Pintu Tasik Serdang	Peak Hour for Inbound Traffic Wednesday 7.00am-9.00am	1261.15	15.1	1	2000	0.63	D
	Peak Hour for Outbound Traffic Friday	1223.5		1	2000	0.61	D

Location	Time	Peak Hour Traffic in PCU/2hours	Total Width of road (m)	No. of Lane	Design Service Volume	V-C ratio	Level of Service (LOS)
	4.00pm-6.00pm						
Main Road Persiaran Universiti 1	Peak Hour for Inbound Traffic Thursday 7.00am-9.00am	969.5	25	1	2000	0.48	C
	Peak Hour for Outbound Traffic Wednesday 12.00pm-2.00pm	1046		1	2000	0.52	C
	Peak Hour for Pass-by Traffic Friday 7.00am-9.00am	949.95		1	2000	0.47	C

Table 10 summarises the maximum total of inbound and outbound traffic, as well as pass-by traffic volumes at the main access of UPM Serdang campus over 18 hours of traffic count. The maximum total inbound of traffic volume at the main access of the UPM Serdang campus was 7,581 vehicles at Gate 3 with B LOS of hourly road service. On the other hand, the maximum total outbound of traffic volume over 18 hours of traffic count at the main access of UPM Serdang campus was 10,295 vehicles at Gate 2 with B LOS of hourly road capacity. Meanwhile, the total pass-by traffic volume at Persiaran Universiti 1 was 6,318 vehicles with A LOS of hourly road capacity.

Table 10 Maximum of inbound, outbound and pass-by traffic volume at the main access of UPM Serdang Campus

Name of the Access	**18 - hour count**	**Maximum Traffic Volume**	**Road Capacity (PCU/hr)**	**V-C ratio**	**Level of Service (LOS)**
Total inbound at Gate 3 Pintu CIMB	**7581**	**1136** (Thursday 7.00 am – 9.00 am)	7115.45/2000 = 3.56	0.20	B
Total outbound traffic at Gate 2 Pintu Assam Jawa	**10295**	**1397** (Wednesday 4.00 pm – 6.00 pm)	9652.7/2000 = 4.83	0.27	B

Name of the Access	18 - hour count	Maximum Traffic Volume	Road Capacity (PCU/hr)	V-C ratio	Level of Service (LOS)
Pass-by traffic at Persiaran Universiti 1	**6318**	**1043** (Friday 7.00 am – 9.00 am)	6274.1/2000 = 3.14	0.17	A

These traffic flow findings of the UPM Serdang campus may differ from other university campuses, particularly in Malaysia, according to the geographical setting of the campus, road and traffic system design, total campus population, and other factors, such as the location of nearby public transportation services and in-campus residential policies. The size of the campus, building layout and master plan also significantly contribute to the traffic flow and levels of service of the road. For instance, the traffic condition in International Islamic University Malaysia (Abdul Azeez, 2011) showed similar findings with UPM Serdang's traffic flow. This similarity may be caused by a similar population range and the location of the public transportation system, e.g, rail services that are far from the campus. Hence, other factors, such as the different traffic movement systems in both universities, are not significantly contributors. Meanwhile, other universities such as the University of Malaya, Universiti Kebangsaan Malaysia, etc. may have different traffic movements, depending on these contributing factors.

CONCLUSION

This study was conducted to analyse the traffic characteristics of the UPM Serdang campus. The following main conclusions are drawn from the work:

1. As per the data collected from the traffic volume study fover 18 hours of counting, it was found that the maximum number of vehicles arriving at the campus was 7,581 entering the campus through Gate 3 Pintu CIMB and 10,295 vehicles leaving the campus through Gate 2, Pintu Assam Jawa.

2. The minimum traffic (over 18 hours) observed was 4,981 inbound campus traffic through Gate 1 Pintu Anjung Putra, and 4,667 vehicles leaving the campus using the main road, Persiaran Universiti 1.

3. The traffic composition of the vehicles arriving and leaving the campus comprised cars at 50-70 percent, motorcycles at 20-40 percent, buses at 5-10 percent and bicycles at 1-2 percent, from all main accesses.

4. The peak hour of the traffic entering the campus was found to be between 7:00am-9:00am on Thursday at Gate 1 (944 vehicles), Gate 3 (1,397 vehicles)

and Persiaran Universiti 1 (1,028 vehicles), and on Wednesday at Gate 9 (1,320 vehicles).

5. The peak hour of traffic leaving the campus was found to be between 4:00pm-6:00pm on Wednesday at Gate 1 (1,045 vehicles), Gate 3 (1,397 vehicles) and Persiaran Universiti 1 (1,052 vehicles), and on Friday at Gate 9 (1,298 vehicles).

6. The level of service as calculated for all main access of the UPM Serdang campus was found to be between C- D level of service against all the peak hour traffic.

7. More vehicles entered the campus through Gate 3 (7,851 vehicles) and more vehicles leave the campus through Gate 2 with 10,295 vehicles observed over 18 hours.

8. The comparative study between different university campuses is suggested for future research to identify common on-campus transportation system issues and develop sustainable transportation campus indices.

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APPRAISAL OF URBANISATION, TOWNSHIP AND HOUSING TRENDS FOR A DESIRED FUTURE IN MALAYSIA

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Abstract

This paper reviews the trend of township planning in Malaysia by featuring measures for the preparation of urban housing, and utilising the contemporary shifts in town 'landscaping'. Learning from the Habitat III, a competitive township is essential for better and vibrant society. In Malaysia, the competitiveness, capital at present can be measured in policy implementation financially and transformative technologies support with any cutting-edge human capital strategy. The objectives of this paper are to investigate the strategic angle of sustainable urban development and to suggest better future urbanisation, township and housing in Malaysia. Detailed review was done through content analysis aiming at well-being and economic stability of its residents. The content in focus comprised housing integration, housing assistance, economic participation, and technology and design. It was found that Malaysia must be aware and compatible with such challenges to align with the national aspiration for harmonious living standards for future planning and housing development.

Keywords: urbanisation, city planning, urban housing, urban policy, township

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INTRODUCTION

Until 2010, the total number of Malaysian households was 6,396,174 with the number of living quarters at 7,380,865 (JPM, 2011). Based on statistics, there are enough houses for every family, with an additional 984,691 more houses available in the market. Rightfully, the aim of government towards providing 'One Family One House' should have been fulfilled. However, the issue of insufficient housing still surfaces in Malaysia and has led to other problems such as the high prices of houses and limited affordability; abandoned housing projects, and unsold housing units (UNDP-EPU, 2015). These problems in turn would create other social problems such as homelessness and involvement in crime due to the stress and pressures faced in daily life (Kingsley, 2017). In order to solve these problems, meticulous 'physical' planning needs to be done, which indirectly would promote a harmonious social growth and resulting in a commendable social achievement (UNDP-EPU, 2015).

Therefore, an understanding of the needs and demands of the public is important, and should be seen from the viewpoints of the segmented status of individuals, households, and regional society (Jenkins, Smith, & Ya Ping, 2007). For example, a social disadvantage would have an impact on an individual's education, which would lead to a job placement with a low salary. This could have been caused by the location of a school which was not strategic and hampered the schooling activities of students as mentioned in the New Urban UN-Habitat Agenda (Amann & Jurasszovich, 2017). In order to understand the potential and direction in setting contemporary township with planned housing, there must also be an understanding on the smart township approach, housing concepts and the legal framework, especially at the local level, to serve as guidelines in planning decision-making process.

METHODS AND MATERIALS

The work in this paper concentrated mostly on academic reports of original investigations rather than reviews apart from the following in Table 1. These databases are in both electronic form and printed form, and are continuously being updated. Reviews and reports on the township and housing trend include the following (Table 1):

Table 1 Reviews and reports

Author	Theme
Construction Industry Development Board (CIDB) Malaysia	Country Report
Economic Planning Unit	Malaysia Plan
Green Building Index (GBI)	Sustainable Assessment Criteria
Department of Statistics (JPM).	National Census
United Nations	World Urbanisation Prospects
United Nations	Social Housing
United Nations	Future Cities

United Nations Development Programme & Economic Planning Unit	Urbanisation in Malaysia
UN-HABITAT	Urban Policy
UN-HABITAT	Housing Policy
World Bank	Township

Detailed review of the above research was conducted through content analysis of township and housing trends in the future aiming at well-being and economic stability of its residents. The content in focus comprised housing integration, housing assistance and economic participation as in Table 2.

Table 2 Contents focus

Main Author/s	**Theme**
Phillimore (2017) & Weiss (2015)	Housing Integration
Kingsley (2017) & UN-HABITAT (2015)	Housing Assistance
Ong et al. (2017), UN (2014), EPU (2015), Song (2015)	Economic Participation
Petit et al. (2018), Oberndorfer et al., 2007, Satiennam, Jaensirisak, Satiennam, & Detdamrong (2016) & Gunawan (2015)	Technology & Design

The conclusions in this paper are generalisations founded on the authors' interpretation of those original reports based on the contents. The review revealed some literature databases and overviews, notably from Asian context, focusing on Malaysia in particular. The objectives are to investigate the strategic angle of sustainable urban development and to suggest better future urbanisation, township and housing in Malaysia.

THEORETICAL FRAMEWORK

Reports with reviews on township, housing policy and trends have been published in several countries. In the Malaysia, in particular, there are government sponsored promotional publications about these particular topics such as the Malaysia Plan Documents and the National Census. Meanwhile, in the International arena, mostly these particular topics being covered by the World Bank and UN-HABITAT are included for consideration. Planning for the provision of housing through mixed development or otherwise would be determined by the various policies set by the relevant authorities. In Malaysia, there are four main guiding pillars for the nation to progress towards becoming a high-income, developed nation by 2020 (EPU, 2015). These pillars are:

- 1 Malaysia Concept;
- Government Transformation Programme (GTP/PTK);
- New Economic Model; and
- Malaysia 5-Year Plans

These policies would determine the form and direction of the Nation's plans. The government has outlined three main components encompassing human capital, private capital and social capital (EPU, 2015). The three components play essential roles and without these components, any major plan made by the government for the development of the people and the country would be impossible to be realized. For example, these components serve as the stimuli in the legislation of the National Social Policy. Other policies which have resulted from the implementation of the main policies concerning the provision of housing are as follows:

- National Housing Policy (Dasar Perumahan Negara)
- National Urbanisation Policy (Dasar Perbandaran Negara/DPN)
- National Physical Plan (Rancangan Fizikal Negara/RFN) which include the National Physical Plan (RFN), State Structure Plan (RSN), District Local Plan (RTD) and Special Area Plan (RKK) at the state and district levels.

Township Trends Globally, in Asia and Malaysia

In a nutshell, a township is a built-up or developed area having a population exceeding 10,000 people. There are five categories of townships as shown in Table 3. In 2014, more than half of the world's urban population live in areas with fewer than 500,000 people, especially in Asia (Figure 1). All over the world, there are more people living in urban areas compared to those living in rural areas. Rapidly developing cities need to cope with the unprecedented growth before 2025 where an additional 2 billion new urban residents by the mid-2020s with most of the growth occurring in South and East Asia (Cohen, 2004). The urban population around the world is expected to increase to more than two-thirds by 2050. Even though its urbanisation process is at a lower rate, Asia is the choice for 53 percent of the world urban dwellers up until 2014. It is anticipated that, the urbanisation process in Asia, including Africa would occur rapidly compared to the rest of the world in the future, as the economy grows more rapidly (UN, 2014).

Table 3: Classification of cities

Types of city	**No. of people**
Megacity	> 10,000,000
Major city	5,000,000 - 9,999,999
Medium city	1,000,000 - 4,999,999
Town	500,000 - 900,000
Small Town	500,000

Source: World Bank (2015)

In 2007, for the first time in history, the global urban population exceeded those living in the rural areas, and the world population has remained mostly in urban locations since then. This planet has undergone a rapid urbanisation process for the last six decades. In 1950, more than two-thirds (70%) of the population

around the world lived in rural settlements and less than one-third (30%) lived in urban locations. In 2014, 54% of the world population was living in towns. In United Kingdom, 90% of the population lives in urban areas, in the United States more than 80%, in Germany more than 70%, in Japan more than 65% and in France, above 60%. Urban dwellers are expected to increase in number until the year 2050, when the world population would become one-third in rural areas (34%) and two-thirds in townships and cities (66%), a reversal of what was the scenario in the 1950s (UN, 2014).

Since the time Malaysia has gained independence, the urbanisation process has been occurring rapidly and the establishment of townships is unavoidable. Malaysia is one of the countries in East Asia, which is advancing in many aspects, and the urban population continues to multiply with each passing moment (CIDB, 2014). Figure 1 shows the change in the Malaysian landscape, from being dominantly covered forests in areas undergoing exploration.

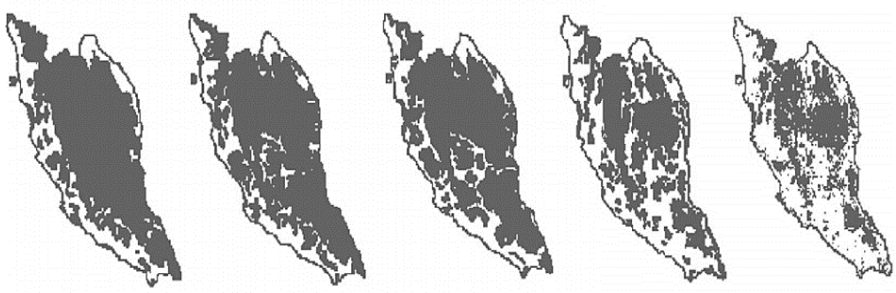

Figure 1 Reduction in forest areas, replaced with other categories
Source: World Bank (2015)

The Malaysian urban population has increased between 2000 to 2010 from 10.2 million (43% of the total population) to 15 million (53%), making it as among the countries with a high urbanisation rate in the region in terms of demography, next to Japan, Republic of Korea, and Singapore (and also Taiwan, China) (UN, 2014). According to the World Urbanisation Prospects (UN, 2014), Malaysia has 72.8% of its population living in urban areas in 2011. This is expected to increase to 77.9% (higher than the official target of 73.5%) by 2020, with an average urban growth rate of 2.08% between 2015 and 2020. Nevertheless, the urban areas in Malaysia on average are among those with the lowest density in East Asia (including Japan & South Korea), with the overall density of the urban population at 3,300 people per kilometre square in 2010, which had increased from 2,600 people per kilometre square in 2000, and is much lower compared to the regional density rate (East Asia), which on average is about 5,800 per kilometre square (World Bank, 2015).

Until 2010, Malaysia has 19 urban areas with more than 100,000 people, which comprised Kuala Lumpur (urban area with more than 5 million people); George Town (between 1 million and 5 million people); Johor Bahru (5 urban areas having between 500,000 to 1 million people); and 12 other urban areas between 100,000 and 500,000 people. During the same period, the Kuala Lumpur urban area was the largest in Malaysia and the eighth biggest in the East Asian region, bigger than some of the urban megacity areas such as Jakarta, Manila, and Seoul, although with fewer number of people. It increased from about 1,500 per kilometre square to 1,700 between 2000 and 2010, with an average annual growth rate of 1.2%, considered to be among the lowest growth rate for an urban area of similar size in the region (JPM, 2011).

ANALYSIS & DISCUSSIONS

The Adaptation Process of Planning in Malaysia

In Malaysia, practically the international conventions as proposed by international bodies would be adapted to suit the local conditions (UNDP-EPU, 2015). The concept of liveable towns or cities was also adapted from such international standards. The concept of liveable townships firstly requires it to be viewed from the perspective of the current practical planning framework. The term liveability is usually used to portray the various shared aspects of society, the surroundings, and the experiences that would shape the society. Liveability brings into focus the human experiences in a particular place at a particular time. There is an interconnectedness in this situation, among the economic, social and spatial components which could be linked during the planning and development stages. Thus, in the planning for the provision of housing, consideration needs to be given to the combined components of the economic stimulus, spatial and social aspects. In principle, from the viewpoint of planning and the provision of housing, the combination of '*housing assistance'* and '*economic participation*' for the public housing needs to be understood clearly (UN-HABITAT, 2015). At the same time, the role of the private sector in providing housing in other categories would also depend on market demands, as offering houses which are unsuitable would lead to them being unsold.

For example, condominiums and apartment units built on the outskirts of towns throughout the country faced difficulties of being sold within the first six months after they were launched. It is a fact that, any housing development that does not take into account the economic participation of the designated population, the provision of such housing would be deemed a failure. This is due to the lack of financial input from the local populace, which would impede the dynamics of economic growth, and tend to have negative effects on social growth (UN, 2014). For example, a housing development project needs to consider mixed planning or economic stimulus activities in the surrounding areas. Mixed

development would consist of components for housing, utilities and facilities, commercial, industries, and institutions among others. Indirectly, there would be a fair representation of activities for the population that would encourage pursuits such as job opportunities, recreation, services and others of similar nature. Mixed development in Malaysia has long been in practice. Previous research has also shown that when amenities and commercial outlets are within walking distance or under shelter from the main door of the housing unit to the outlets, the percentage of foreclosures dropped drastically (Song, 2015). This means the emphasis is on walkability within the housing area is important for the development to be vibrant (Roosli & Collins, 2016).

The Future Challenges of Future Housing in Malaysia

Housing in the future for Malaysia will revolve around the theme of integration. Integration of housing can be seen in two aspects, which is an integration of housing as a township through the creation of smart cities (digital planning) and the integration of housing at the personal level by designing smart homes (Phillimore, 2017). Integration of housing as a satellite township shall be supported by infrastructure for connectivity, facilities for conveniences (high-end and high–touch), and comprehensive planning for township identity (Phillimore, 2017). On the other hand, integration of housing at the personal level is about having houses that provide good quality of life with customised designs and multi-purpose space. The result of this can be translated into three distinct ways (Weiss, 2015). Firstly is the general evolution in the characteristics of housing units. This will be seen as newer building methods and designs strive to overcome increases in density and cost of land. Secondly, can be seen in the environment around housing where cities will continue to mature and increase in density allowing for viability of more public services and spending. Thirdly, the combination of both ways in order to create a rapid increase in demand for certain combination of housing units such as mixed developments to be discussed later.

As land becomes scarcer in urban areas, it is expected that future housing units will be smaller in size. With that in mind, future housing estates that are dense should be designed with more communal spaces, especially in high-rise living to allow areas for people to engage in social activities. Vertical village living with the ambience of on the ground setting is envisioned by urban planners and architects as a solution for urban housing in Malaysia. Hence, more houses will be designed to cater for lives where eating, resting, working and living are brought together.

Increasing features for liveability will also be the mainstream in the future. The connectivity of future housing should be seen within the same area through building connectors that are either underground or linked through sky bridges. This linkage will increase the walkability within an area and reduce the need for cars. Currently, this trend is common among commercial and public

areas. Some good examples are in Singapore, Mandarin Oriental Hotel and Pan Pacific Serviced Suites are both linked to mandarin Gallery Mall via shaded walkways, while Bugis Junction and Bugis+ are two commercial outlets linked via a sky bridge. The famous shopping center One Utama in Damansara, Kuala Lumpur comes also with a bridge between two commercial buildings. Nonetheless, this concept can be extended to residential buildings that are not mixed development. For example Marina Bay Residences in Singapore has an underground pass that leads straight into the Downtown MRT and link mall. This concept may attract some reservation as security issues may be a concern. However, more safer and shaded walkways between buildings can be built as a start. The shaded walkways that are constructed shall be wide enough to cater for pedestrians, scooters, sedgeways, hover boards and the likes. Subsequently, with more people walking and less cars required, car parks can be turned into green areas by creating pocket parks.

In order to increase availability of public transportation in urban expansion, the existing and future housing estates have to be supported by good public transportation and infrastructure to ensure the connectivity between different areas (Petit et al., 2018). Some of the systems that can be emulated to improve connectivity are the Bus Rapid Transit system (BRT) in Jakarta, Indonesia, which is the world's largest BRT system, and the Bike Sharing program in Hangzhou China, Taipei Taiwan and Brisbane Australia.

Launched in 2004 by the city administration of Jakarta, TransJakarta was the first BRT system in Southern and Southeast Asia with dedicated bus-only lanes, at level boarding platforms and pre-ticketing. It has successfully converted private motorised vehicle users into BRT riders, which makes up 20% of BRT passengers (Satiennam et al., 2016). Currently TransJakarta has the world's longest BRT system with 13 primary routes and 11 cross-corridor routes with more corridors due to commence construction. In addition, there are 17 'city feeder' routes that continue past the end of the exclusive bus ways into the municipalities surrounding Jakarta and use special buses that allow for boarding at either ground level or the TransJakarta station platforms (Gunawan, 2015).

In Hangzhou, the city provides the largest public bicycle fleet in the world. Launched in 2008, the service allows members to access a shared fleet of bicycles. As of March 2011, Hangzhou Public Bicycle operated 60,600 bicycles with 2,416 fixed stations in eight core districts. Bike sharing in Hangzhou captured modal share from bus transit, walking, automobiles and taxis (Shaheen, Zhang, Martin, & Guzman, 2011). Approximately 30% of members had incorporated bike-sharing into their most common commute. Members indicated that they most frequently used a bike sharing station closest to either home (40%) or work (40%). These modal shifts suggested that bike sharing acted as both a competitor and a complement to existing public transit.

Malaysia is gradually moving towards the direction of having better public transportation to improve connectivity between districts. It is most evident in Kuala Lumpur (KL) and Greater KL with the existing bus, monorail, commuter and Light Rail transit (LRT) systems, BRT system implemented in Sunway in 2015 with extensions planned, and the Mass Rapid Transit (MRT) system that will serve areas along Sungai Buloh to Kajang, which is expected to be ready by 2017. Upon completion of the high-speed rail in 2026, connectivity in Greater KL will eventually span through six other cities, namely Putrajaya, Seremban, Ayer Keroh, Muar, Batu Pahat and Iskandar Puteri before terminating in Singapore's Jurong East. In Penang, the State commissioned a Transport Master Plan Strategy report with the aim to improve the State's present transport system from now until 2030 by constructing three new highways in Penang Island and a third undersea tunnel project. Plans for BRT, LRT and monorail systems are also in place. The suitability of each system has to be carefully studied before being implemented in each area.

One of the key aspects of successful mixed development is the economy of scale (Ong et al., 2017). As mixed development is usually expected to have a mix of residential units with varied facilities, commercial outlets, offices and institutions within the area, it is crucial that the development is supported by a large enough population in order for synergy to take place. There is a win-win effect for residential and commercial outlets to be located on the same estate. The residents of the estate will benefit from the convenience available, while the commercial outlets will have a thriving business. Mixed development allows residents to have a live-work-play lifestyle as the distances between housing, workplaces, commercial businesses and other destinations are reduced, thus transpiring walkable neighbourhoods. The compact development also allows for a stronger neighbourhood character to form and becomes a self-sustaining township.

Housing plays a big part in the national environmental initiatives. Future housing will be designed with more electric cars charging point. As of 2016, the Green Building Index (GBI) does not require GBI certified residential buildings to provide car parks for green vehicles. Currently, this agreement is only applicable to the non-residential development to have 5% of its car park to be allocated to green vehicles for a score of 1 point (Green Building Index, 2009). In the next 20 years, it is plausible that GBI will implement 30% green car parks requirement in order to achieve the green initiatives (Petit et al., 2018).

Rainwater harvesting systems will also become common in future housing, especially in Malaysia which has a tropical climate. The rainwater collected can be used for irrigation and washing. Water bills will be reduced in the housing estates. Green roofs would also be the future demand as this is an emerging trend, reducing storm-water runoffs, improve regulation of building interior indoor temperature, reduce urban heat island and increase urban wildlife

habitat (Oberndorfer et al., 2007). Similarly, vertical landscaping is also an emerging design trend. An example of residential building with plenty of vertical landscaping is Le Nouvel in Kuala Lumpur. Sustainable choice of plants is needed for green roofs and vertical landscaping. For instance, native and drought tolerant plants such as grasses, herbs and sedums, can be chosen for this purpose.

Based on the lessons learnt from past developments on townships, development should not be focused only on specific towns or cities such as in Kuala Lumpur (Weiss, 2015). The development of satellite townships too need to be considered. In planning for development, it needs to take into account achieving equilibrium between the urban and rural areas (Kingsley, 2017). For example, the concept of a 21st-century village, if introduced, would be truly relevant to the current situation in Malaysia. Besides providing the balance between the migration of the urban and rural population, this concept has proven to be effective in Japan and the Netherlands. Rural areas too need to be designed based on the liveable town component, as they could function as the stimuli and counter the effects of widespread urbanisation. However, in countries such as Japan and the Netherlands, there is strong support for the development of public transport services that is efficient and exemplary.

CONCLUSION

Housing industry cannot be seen independently and has to be integrated with other aspects for quality and comfortable homes to be visible. Housing in the future needs to be supported by many aspects such as infrastructure, transportation, technology, improved architecture and engineering, and development of sustainable products to achieve a high performing building standard. It will be a remarkable achievement if this envision of housing becomes a reality sooner (within the next 20 years) than later. In the further future, the housing benchmark can be further elevated by creating housing that can produce its own energy and is self-sustainable. Although the developed countries have allocated substantial amounts from their budget on social expenditure, there are still many unaddressed housing issues such as vandalism, homelessness, and community segregation. Learning from all of these challenges, 'physical' planning needs to be aligned with the needs and demands of the public which indirectly would promote a harmonious social growth and resulting in a commendable social achievement for future housing trends in Malaysia.

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SERVICE CATCHMENT OF MASS RAPID TRANSIT (MRT) FEEDER BUS: A PRELIMINARY STUDY OF T461 ROUTE TAMAN KAJANG UTAMA

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Abstract

The planning and development of rail services require various considerations. Land availability, land use, catchment, route matching, infrastructure fitting, barrier free and micro-climate friendly designs are some of the factors heeded prior to such installations. A deviation between designated and highly demanded service area in urban sprawl zones of the city has been occurring in many Malaysian cities. These gaps have led to the mismatch between origin/destination of passengers and planned locations of train stations and its feeder bus stops. As such, rail services become less accessible to populations with the highest demands. This paper discusses the preliminary findings from a pilot study which seeks to calibrate the research instrument and validate preliminary findings before actual data collection for the purpose of determining the service catchment of the T461 feeder bus in Kajang MRT Station. The Garmin GPS device acts as the research instrument to obtain coordinates of locations where passengers board and alight feeder buses. On-board surveys and comparison analyses are methods that have been used to obtain the optimum GPS coordinates of the bus stop locations. The preliminary findings indicate that the research instrument is ready to be used for actual data collection and geospatial analysis to determine the service catchment of the T461 feeder bus service.

Keywords: Feeder bus, service catchment, urban rail transit

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INTRODUCTION

The planning and development of rail services require various considerations. Land availability, land use, catchment, route matching, infrastructure fitting, barrier free and micro-climate-friendly designs are some of the factors heeded prior to such installations. A deviation between designated and highly demanded service areas in urban sprawl zones of the city has been occurring in many Malaysian cities. These gaps have led to the mismatch between origin/destination of passengers and planned locations of train stations and its feeder bus stops. As such, rail services become less accessible to populations with the highest demands. Whilst many types of bus services are provided to varying degrees in Malaysia, less has been prioritised on ensuring the feeder bus system's integration, coordination and monitoring to reach an efficient level of sustainability (Hayashi, Doi, Yagishita, & Kuwata, 2004).

Rail lines provide maximum efficiency when it comes to transporting a huge number of passengers in the most convenient way, whereas feeder bus routes provide a platform for passengers to travel from bus stops to rail line stations. It is important that the designated feeder bus routes and stops provided along the route is planned and located in a way that uses the least cost, while serving a sufficient number of passengers to a satisfactory level. Nevertheless, several issues in feeder bus services such as the lack of facilities, low passenger trips and long waiting times still occur. Therefore, the feeder bus route design is the first and most important step in the planning procedure. A good bus route network with high coverage and high accessibility will increase the quality of service for a travelling passenger (Almasi, Sadollah, Oh, Kim, & Kang, 2018; Almasi, Mounes, Koting, & Karim, 2014).

Service Catchment

To access the transit network, passengers have to travel to stations either by walking, cycling and public or private transportation. These stations are meant to be located at strategic locations that have catchment areas of high potential travellers. Vuchic (2005) suggests that maximising area coverage is a crucial goal in the design of rail network, as the frequency of usage depends on how easily accessible the stations are to potential travellers. Catchment areas are generally defined as the maximum walking distance or acceptable walking distance, of which the passengers are willing to walk rather than drive (Pongprasert & Kubota, 2017).

In 1929, American architect Clarence Perry (as cited in Asfour & Zourob, 2017) articulated the neighbourhood unit concept as a part of the published Regional Plan of New York. The concept stemmed from Perry's interest to create functional, safe and attractive neighbourhoods for middle and upper-income nuclear families with children, and also to remedy the ill-effects of heavy vehicular traffic (LeGates & Stout, 2011; Meenakshi, 2011). The neighbourhood

concept depicts the relationship between residential components of a neighbourhood based on a five-minute walking radius, which is within 400 meters (Khalid, n.d.). Perry's concept has contributed tremendously in the field of urban planning in cities as a basic guideline for acceptable walking distances in a neighbourhood. However, the neighbourhood unit concept has also raised questions and criticisms globally as to what extent is this method is responsive to local housing needs. Based on several studies (as cited in Asfour & Zourob, 2017), recent social changes and diverse lifestyles, self-sufficiency, and cross-neighbourhood walkability are determinants of walking behaviours and distances that are acceptable by the residents.

In the public transit industry, service catchment guidelines are commonly based on buffers at 400 meters around bus stops and 800 meters around rail stations (El-Geneidy, Grimsrud, Wasfi, Tétreault, & Surprenant-Legault, 2014). In the Malaysian context, the Green Neighbourhood Guidelines developed by PLANMalaysia stated that for human movement in a neighbourhood, common facilities such as bus stops are to be placed in walkable locations that are within 400 meters or a five minute walk, and transit stations to be located within 800 meters or a ten minute walk. However, acceptable walking distances depend on many factors and differ between communities. Azmi and Karim (2011) found that residents in Shah Alam tend to walk a maximum distance of 200 meters to reach community facilities before deciding to drive. Moreover, Sukor and Fisal (2018) discovered that respondents in Penang Island are willing to walk an average distance of 600 meters to access bus services, with the average time travelled to be around 20 minutes. In Singapore, it is found that about 60% of MRT passengers walked to the stations with an average walking distance of 608 meters (Olszewski & Wibowo, 2005).

The willingness to walk varies for different countries and cities due to the many factors that influence acceptable walking distance, such as gender, age, income and weather (Johar, Jain, Garg, & Gundaliya, 2015). El-Geneidy et al. (2014) concluded that service areas around transit stations should vary based on the service offered and attributes of the people and places served.

'Ped shed' (pedestrian shed) is a terminology used to explain the percentage or ratio of pedestrian accessible areas. Quoting the definition of Ped shed in the New Lynn Urban Plan, "Ped sheds are often defined as the area covered by a 5-minute walk (about 400 to 500 meters or a ten minute walk – 800 to 1000 meters)" (New Zealand, Auckland Council, 2010, p. 181). Ped sheds can also be defined as walkable catchments in maps showing the actual area within a five minute walking distance from any centre, or ten minutes from major transit stops such as a railway station. The Ped shed analysis technique has been used widely to assess the walkability of a neighbourhood and is a comparative evaluation of movement in an urban area from residential areas to common facilities (Active Healthy Communities, 2014).

Good Design of Feeder Bus System

A well-designed route network can improve the efficiency of the feeder bus system and reduce total costs of supplying the transit service (Salvo & Sabatini, 2014; Lovett, Haynes, Sünnenberg, & Gale, 2002). The route network should be designed in a way that utilises and fully maximises the catchment areas of the station (Shi, Blainer, & Hounsell, 2017). Besides route networks, bus operations should follow designated feeder bus routes and stops for passengers' access and egress points, to avoid inefficient transit services and inconvenience to the passengers. The bus stop facilities should also meet the passengers' needs, such as the provision of a shade and bench for passengers to sit while waiting for the bus to arrive. The lack of facilities will decrease the level of satisfaction of bus transit for the passengers, which may lead to them choosing other means of transportation.

The feeder bus is a public transit service for the connection of local areas, where the demand for bus services has to be gathered and transferred to the main stop, which is usually a transit hub or terminal, such as a rapid rail transit station or an express bus terminal (Ciaffi, Cipriani, & Petrelli, 2012). Feeder buses also provide services to transport passengers between the outskirts of a city to the urban centre. Inefficient feeder bus services can impede access to better housing, employment and income opportunities (O'Connor & Caulfield, 2017) and lessen the level of service of the rail system. The current feeder bus system adopted in many urban routes is not appropriate for the urban settlement forms, as well as the socio-demographic and trip characteristics of the communities (Almasi et al., 2014). Many advantageous measures of bus priority as applied in developed countries have not been adopted in assessing feeder bus service levels in Malaysia (Advani & Tiwari, 2006). Several contemporary studies have propagated the use of the following variables to assess a bus service's sustainability levels: the number of bus fleets, the route coverage of bus operations, the percentage of main land use activity points covered by designated routes, the bus speed and schedules/route adherence, the passenger load factors, as well as service durations and time periods of service provision (Almanis et al., 2014; Ciaffi et al., 2012; Huang, Liu, Huang, & Shen, 2010); yet, such studies are lacking in the contemporary research of feeder bus services quality in Malaysia, especially in evaluating the effectiveness and quality of feeder bus performance. Focusing on the service catchment of feeder bus services and whether the placement of bus stops maximise coverage while avoiding gap redundancies, a case study in Malaysia's urban area can be considered useful to illustrate an assessment of feeder bus services and the land use transport strategy.

This study concerns the location and design of feeder bus stops as the two parameters that influence rail service system performance, as well as the safety and security of passengers. The environment and placement of bus stops are also essential in enhancing passengers' comfort, convenience and favourable

waiting experiences, as well as buses' reliability and accessibility. This study assesses the current system of feeder bus services in supplementing rail services in urban areas of Malaysia. In this context, therefore, the overall aim of this research is to obtain the service catchment gap of planned feeder bus routes.

This paper discusses the preliminary findings on the existing operations of the feeder bus service in Kajang MRT station based on a pilot study that took place on a Wednesday during morning off-peak hours. The purpose of the pilot study is to test and calibrate the research instrument. A preliminary discussion on issues related to existing feeder bus operation, services and recommendations is drawn in this paper, focusing on data based upon the on-board survey and interviews.

MATERIALS AND METHODS

To determine the service catchment of the T461 feeder bus service, the research instrument plays an important role in the collection and analysis of data. For this study, the main research instrument required is a global positioning system (GPS) device. To calibrate the GPS device, a pilot study was conducted through an on-board survey method, whereby the GPS coordinates of the locations when passengers board and alight the feeder bus are recorded. The pilot study consists of three repetitive trips along the T461 feeder bus route, covering the Taman Kajang Utama area. The GPS coordinates were recorded during each trip to calibrate the research instrument. The pilot study took place on a Wednesday morning off-peak hour, to avoid peak hours as the purpose of the pilot study is to calibrate the research instrument. To validate the accuracy of the GPS coordinates recorded, the coordinates recorded for each trip are compared with actual coordinates of the bus stops found on the Google Maps service.

For this paper, results and discussions are focussed on the pilot study, which is based on data collected through an on-board survey to obtain GPS coordinates of the passengers' boarding and alighting locations.

On-board survey

To determine the service catchment of the T461 feeder bus service, data collection involves identifying the locations of the designated bus stops along the bus route by utilizing the GPS device. This is done to analyse the service catchment areas of each bus stop through spatial analysis, which requires exact locations of the bus stops.

Besides that, data collection will also include the manual counting of passengers boarding and alighting the feeder bus during different times throughout the day to determine and compare the frequency of use of the feeder bus service. The evaluation is conducted by collecting data over several bus trip sessions, consisting of the first trip of the day, during the morning peak hour (from 7.00am until 9.00am), afternoon peak hour (from 12.30pm until 2.30pm),

shoulder hour (from 9.00am until 12.30pm or 2.30pm until 4.30pm) and evening peak hour (from 4.30 pm until 6.30 pm). The data collected includes 1 day over the weekend and 3 days over the weekdays, as working hours and traffic flow are usually heavier on weekdays. The comparison between peak and non-peak hours, as well as weekdays and weekends, will be done in the full paper.

GPS Points Recording

The GPS location of passengers' access and egress points were recorded during rides for the on-board survey. The use of GPS for the coordinates recorded and GIS for the spatial analysis offers advantages on graphical and attribute data input. For this study, the coordinates/GPS points of passenger's access and egress points are recorded through the on-board survey, where the points are plotted on a projected map using geographical information system (GIS). The variables (Table 1) for this method applied are:

Table 1 Research variables for GPS/GIS application

Independent Variables		**Dependent Variables**	
Item	**Category**	**Item**	**Category**
Bus No	String	Travel Time	Ordinal
Origin	String	Departure Time	Ordinal
Destination	String	Arrival Time	Ordinal
Number of Seats	String	Distance	Ordinal
		GPS location of bus egress and alighting points	Ordinal
		Number of passengers egress and alighting	Ordinal

Interview with Bus Operator

Brief interviews with bus operators were conducted during the on-board survey upon alighting the feeder bus, where information on the feeder bus service was obtained. The nature of the interviews with the bus operators was informal and included 4 bus drivers operating the feeder buses at the Kajang MRT Station.

Ped Shed Analysis

Ped shed analysis is a technique for comparative evaluation of the walkability in a neighbourhood or urban area. This technique is used to assess whether the T461 feeder bus service provides bus stops that are located within walkable catchment areas based on the ped shed concept (400 meter radius around a neighbourhood, and 800 meter radius around a railway station). The process for calculating walkable catchments can be done through GIS spatial analysis.

GIS Spatial Analysis

Spatial analysis is be done by using programs that utilise GIS, such as MapInfo Professional, Google Earth and Basecamp. These programs aid in determining the service catchment area, types of land use surrounding the feeder bus stops and applying the ped shed analysis.

RESULTS AND DISCUSSION

This paper discusses the preliminary findings based on the pilot survey conducted for the purpose of calibrating the research instrument and validating the GPS coordinates of the passengers' access and egress points. The validation of the accuracy of locations is fundamental and important to achieve the main research aim, which is to determine the service catchment of the T461 feeder bus service provided at the Kajang MRT Station.

T461 Feeder Bus Route

The T461 feeder bus route consists of 19 bus stops, including the origin and final destination of the feeder bus, which is Kajang MRT Station. Figure 1 shows the locations obtained through the on-board survey for the pilot study. The distance and area covered in the T461 route is 9.4 km and 0.3 square km respectively.

Figure 1 Map of T461 bus route with location of bus stops
Source: Google Earth, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Findings from Pilot Study

The GPS coordinates of locations where passengers board and alight the feeder bus were recorded three times to calibrate the research instrument. The findings for each trip are recorded in Tables 2, 3 and 4 below.

Table 2 Trip 1

Bus Route	T461 Route: Taman Kajang Utama						Departure Time at Origin (O)		10.13 am	
Trip Duration	21 minutes 34 seconds						Arrival Time at Destination (D)		10.34 am	
Distance of Route / Area	9.4 km / 0.3 sq km						Date		30 May 2018, Wednesday	
Drop Off Point	GPS Reading						Arrival Time	Departure Time	No. of New Passengers	No. of Passengers Off
	North			East						
	Deg	Min	Sec	Deg	Min	Sec				
(O) Kajang MRT	2	58	55.80	101	47	24.10	-	10.13 am	0	0
1- Taman Reko Jaya	2	58		101	47				0	0
2- Taman Kajang Sentral	2	58		101	47				0	0
3- Kuarters Guru Kajang Utama	2	58		101	47				0	0
4- SMK Kajang Utama	2	58	25.20	101	47	44.60	10.19 am	10.19 am	0	0
5- Flat Kajang Utama	2	58	15.40	101	47	35.70	10.20 am	10.21 am	2	0
6- Flat Citra	2	58	8.00	101	47	32.50	10.22 am	10.22 am	0	0
7- Apartment Suria	2	58	11.70	101	47	29.80	10.23 am	10.23 am	0	0
8- Perumahan Seksyen 2	2	58	11.80	101	47	41.30	10.23 am	10.23 am	0	0
9- Perumahan Seksyen 3	2	58	15.80	101	47	54.50	10.25 am	10.25 am	1	0
10- Apartment Cemara	2	58	19.40	101	47	57.30	10.25 am	10.25 am	0	0
11- Apartment Sutera	2	58	23.70	101	48	3.00	10.25 am	10.25 am	3	1
12- Taman Bukit Mewah Fasa 8a	2	58	28.90	101	48	4.40	10.26 am	10.26 am	0	0
13- Komersial Taman Bukit Mewah	2	58	29.20	101	47	59.40	10.27 am	10.27 am	0	0
14- Taman Kajang Utama	2	58	29.70	101	47	52.80	10.27 am	10.27 am	0	0
15-Seksyen 1 Taman Kajang Utama	2	58	36.70	101	47	41.40	10.28 am	10.28 am	0	0
16- Taman Bangi	2	58	32.10	101	47	11.70	10.30 am	10.30 am	0	0
17- Taman Sri Reko	2	58	44.40	101	47	23.20	10.31 am	10.31 am	0	0
18- Taman Hijau	2	58	51.20	101	47	23.20	10.31 am	10.32 am	0	4
(O) 19- Kajang MRT	2	58	58.10	101	47	24.00	10.34 am	-	0	1

Source: Research Studyor Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Table 3 Trip 2

Bus Route	T461 Route: Taman Kajang Utama						Departure Time at Origin (O)		10.43 am	
Trip Duration	20 minutes 11 seconds						Arrival Time at Destination (D)		11.03 am	
Distance of Route / Area	9.4 km / 0.3 sq km						Date		30 May 2018, Wednesday	
Drop Off Point	GPS Reading						Arrival Time	Departure Time	No. of New Passengers	No. of Passengers Off
	North			East						
	Deg	Min	Sec	Deg	Min	Sec				
(O) Kajang MRT	2	58	58.14	101	47	24.00	-	10.43 am	3	0
1- Taman Reko Jaya	2	58	55.80	101	47	24.06	10.44 am	10.44 am	0	0
2- Taman Kajang Sentral	2	58	45.24	101	47	23.46	10.46 am	10.46 am	0	0
3- Kuarters Guru Kajang Utama	2	58	37.20	101	47	40.02	10.47 am	10.47 am	0	0
4- SMK Kajang Utama	2	58	25.80	101	47	42.84	10.48 am	10.48 am	0	0
5- Flat Kajang Utama	2	58	15.48	101	47	35.82	10.49 am	10.49 am	0	0
6- Flat Citra	2	58	8.10	101	47	32.70	10.50 am	10.51 am	3	1
7- Apartment Suria	2	58	11.82	101	47	30.00	10.51 am	10.51 am	0	0
8- Perumahan Seksyen 2	2	58	12.00	101	47	41.40	10.52 am	10.53 am	0	1
9- Perumahan Seksyen 3	2	58	15.90	101	47	54.84	10.54 am	10.54 am	2	0
10- Apartment Cemara	2	58	19.92	101	47	57.18	10.55 am	10.55 am	0	0
11- Apartment Sutera	2	58	23.70	101	48	2.46	10.55 am	10.55 am	0	0
12- Taman Bukit Mewah Fasa 8a	2	58	28.92	101	48	4.32	10.56 am	10.56 am	0	1
13- Komersial Taman Bukit Mewah	2	58	29.16	101	47	58.86	10.56 am	10.56 am	0	0
14- Taman Kajang Utama	2	58	29.70	101	47	52.86	10.57 am	10.57 am	0	0
15-Seksyen 1 Taman Kajang Utama	2	58	36.54	101	47	41.10	10.57 am	10.57 am	0	0
16- Taman Bangi	2	58	32.10	101	47	12.00	10.59 am	10.59 am	0	0
17- Taman Sri Reko	2	58	44.28	101	47	22.98	11.01 am	11.01 am	0	0
18- Taman Hijau	2	58	50.94	101	47	23.22	11.01 am	11.01 am	0	0
(O) 19- Kajang MRT	2	58	57.84	101	47	24.36	11.03 am	-	0	5

Source: Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Table 4 Trip 3

Bus Route	T461 Route: Taman Kajang Utama						Departure Time at Origin (O)		11.14 am	
Trip Duration	25 minutes 34 seconds						Arrival Time at Destination (D)		11.39 am	
Distance of Route / Area	9.4 km / 0.3 sq km						Date		30 May 2018, Wednesday	
Drop Off Point	GPS Reading						Arrival Time	Departure Time	No. of New Passengers	No. of Passengers Off
	North			East						
	Deg	Min	Sec	Deg	Min	Sec				
(O) Kajang MRT	2	58	56.28	101	47	23.88	-	11.14 am	5	0
1- Taman Reko Jaya	2	58	45.06	101	47	23.40	11.15 am	11.15 am	0	0
2- Taman Kajang Sentral	2	58	37.26	101	47	40.08	11.19 am	11.19 am	2	0
3- Kuarters Guru Kajang Utama	2	58	25.08	101	47	48.54	11.22 am	11.22 am	0	2
4- SMK Kajang Utama	2	58	26.22	101	47	41.94	11.23 am	11.23 am	0	0
5- Flat Kajang Utama	2	58	15.54	101	47	35.88	11.24 am	11.24 am	0	2
6- Flat Citra	2	58	8.28	101	47	32.76	11.25 am	11.26 am	1	0
7- Apartment Suria	2	58	11.88	101	47	30.00	11.27 am	11.27 am	0	1
8- Perumahan Seksyen 2	2	58	11.94	101	47	41.10	11.28 am	11.28 am	0	0
9- Perumahan Seksyen 3	2	58	15.78	101	47	54.36	11.29 am	11.29 am	0	0
10- Apartment Cemara	2	58	19.62	101	47	57.00	11.30 am	11.30 am	2	0
11- Apartment Sutera	2	58	23.82	101	48	2.52	11.30 am	11.30 am	0	2
12- Taman Bukit Mewah Fasa 8a	2	58	28.86	101	48	4.32	11.31 am	11.32 am	7	1
13- Komersial Taman Bukit Mewah	2	58	28.92	101	47	58.74	11.32 am	11.32 am	0	0
14- Taman Kajang Utama	2	58	29.58	101	47	52.86	11.33 am	11.33 am	0	0
15-Seksyen 1 Taman Kajang Utama	2	58	36.54	101	47	41.46	11.34 am	11.34 am	0	0
16- Taman Bangi	2	58	32.10	101	47	11.76	11.35 am	11.35 am	0	0
17- Taman Sri Reko	2	58	43.86	101	47	22.80	11.37 am	11.37 am	0	0
18- Taman Hijau	2	58	51.00	101	47	22.92	11.37 am	11.37 am	0	3
(O) 19- Kajang MRT	2	58	57.84	101	47	24.24	11.39 am	-	0	6

Source: Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Comparison Analysis

To validate the accuracy of the GPS coordinates recorded during the pilot study, a comparison analysis between the findings from the pilot study and actual coordinates of the bus stop locations was done. Through comparison analysis, we were able to identify any difference between data obtained from the on-board survey and data obtained from a geospatial resource. The actual bus stop coordinates were obtained through Google Maps, which is a good resource for geospatial data. Tables 5, 6 and 7 below show the comparison of GPS coordinates, while Table 8 shows the difference in coordinates for all three trips during the pilot study.

Table 5 Comparison of GPS Coordinates between pilot study (Trip 1) and geospatial resource

Drop Off Point	Pilot Study						Geospatial resource					
	GPS Reading						GPS Reading					
	North			East			North			East		
	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec
(O) Kajang MRT	2	58	55.8	101	47	24.1	2	58	56.6	101	47	24.3
1- Taman Reko Jaya	2	58		101	47		2	58	44.8	101	47	23.5
2- Taman Kajang Sentral	2	58		101	47		2	58	36.3	101	47	40.8
3- Kuarters Guru Kajang Utama	2	58		101	47		2	58	25.2	101	47	48.1
4- SMK Kajang Utama	2	58	25.2	101	47	44.6	2	58	26.4	101	47	41.6
5- Flat Kajang Utama	2	58	15.4	101	47	35.7	2	58	15.8	101	47	35.8
6- Flat Citra	2	58	8.0	101	47	32.5	2	58	8.2	101	47	32.8
7- Apartment Suria	2	58	11.7	101	47	29.8	2	58	12.1	101	47	30.1
8- Perumahan Seksyen 2	2	58	11.8	101	47	41.3	2	58	12.2	101	47	41.4
9- Perumahan Seksyen 3	2	58	15.8	101	47	54.5	2	58	16.2	101	47	54.6
10- Apartment Cemara	2	58	19.4	101	47	57.3	2	58	19.8	101	47	57.1
11- Apartment Sutera	2	58	23.7	101	48	3.0	2	58	24.0	101	48	2.5
12- Taman Bukit Mewah Fasa 8a	2	58	28.9	101	48	4.4	2	58	29.0	101	48	4.3
13- Komersial Taman Bukit Mewah	2	58	29.2	101	47	59.4	2	58	29.0	101	47	58.5
14- Taman Kajang Utama	2	58	29.7	101	47	52.8	2	58	31.0	101	47	52.7
15-Seksyen 1 Taman Kajang Utama	2	58	36.7	101	47	41.4	2	58	36.4	101	47	41.0
16- Taman Bangi	2	58	32.1	101	47	11.7	2	58	32.5	101	47	12.5

17- Taman Sri Reko	2	58	44.4	101	47	23.2	2	58	44.9	101	47	22.9
18- Taman Hijau	2	58	51.2	101	47	23.2	2	58	51.0	101	47	23.0
(O) 19- Kajang MRT	2	58	58.1	101	47	24.0	2	58	58.2	101	47	24.3

Source: Google Maps, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Table 6 Comparison of GPS Coordinates between pilot study (Trip 2) and geospatial resource

Drop Off Point	Pilot Study						Geospatial resource					
	GPS Reading						GPS Reading					
	North			East			North			East		
	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec
(O) Kajang MRT	2	58	58.1	101	47	24.0	2	58	56.6	101	47	24.3
1- Taman Reko Jaya	2	58	55.8	101	47	24.1	2	58	44.8	101	47	23.5
2- Taman Kajang Sentral	2	58	45.2	101	47	23.5	2	58	36.3	101	47	40.8
3- Kuarters Guru Kajang Utama	2	58	37.2	101	47	40.0	2	58	25.2	101	47	48.1
4- SMK Kajang Utama	2	58	25.8	101	47	42.8	2	58	26.4	101	47	41.6
5- Flat Kajang Utama	2	58	15.5	101	47	35.8	2	58	15.8	101	47	35.8
6- Flat Citra	2	58	8.1	101	47	32.7	2	58	8.2	101	47	32.8
7- Apartment Suria	2	58	11.8	101	47	30.0	2	58	12.1	101	47	30.1
8- Perumahan Seksyen 2	2	58	12.0	101	47	41.4	2	58	12.2	101	47	41.4
9- Perumahan Seksyen 3	2	58	15.9	101	47	54.8	2	58	16.2	101	47	54.6
10- Apartment Cemara	2	58	19.9	101	47	57.2	2	58	19.8	101	47	57.1
11- Apartment Sutera	2	58	23.7	101	48	2.5	2	58	24.0	101	48	2.5
12- Taman Bukit Mewah Fasa 8a	2	58	28.9	101	48	4.3	2	58	29.0	101	48	4.3
13- Komersial Taman Bukit Mewah	2	58	29.2	101	47	58.9	2	58	29.0	101	47	58.5
14- Taman Kajang Utama	2	58	29.7	101	47	52.9	2	58	31.0	101	47	52.7
15-Seksyen 1 Taman Kajang Utama	2	58	36.5	101	47	41.1	2	58	36.4	101	47	41.0
16- Taman Bangi	2	58	32.1	101	47	12.0	2	58	32.5	101	47	12.5
17- Taman Sri Reko	2	58	44.3	101	47	23.0	2	58	44.9	101	47	22.9
18- Taman Hijau	2	58	50.9	101	47	23.2	2	58	51.0	101	47	23.0
(O) 19- Kajang MRT	2	58	57.8	101	47	24.4	2	58	58.2	101	47	24.3

Source: Google Maps, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Table 7 Comparison of GPS Coordinates between pilot study (Trip 3) and geospatial resource

Drop Off Point	Pilot Study						Geospatial resource					
	GPS Reading						GPS Reading					
	North			East			North			East		
	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec
(O) Kajang MRT	2	58	56.3	101	47	23.9	2	58	56.6	101	47	24.3
1- Taman Reko Jaya	2	58	45.1	101	47	23.4	2	58	44.8	101	47	23.5
2- Taman Kajang Sentral	2	58	37.3	101	47	40.1	2	58	36.3	101	47	40.8
3- Kuarters Guru Kajang Utama	2	58	25.1	101	47	48.5	2	58	25.2	101	47	48.1
4- SMK Kajang Utama	2	58	26.2	101	47	41.9	2	58	26.4	101	47	41.6
5- Flat Kajang Utama	2	58	15.5	101	47	35.9	2	58	15.8	101	47	35.8
6- Flat Citra	2	58	8.3	101	47	32.8	2	58	8.2	101	47	32.8
7- Apartment Suria	2	58	11.9	101	47	30.0	2	58	12.1	101	47	30.1
8- Perumahan Seksyen 2	2	58	11.9	101	47	41.1	2	58	12.2	101	47	41.4
9- Perumahan Seksyen 3	2	58	15.8	101	47	54.4	2	58	16.2	101	47	54.6
10- Apartment Cemara	2	58	19.6	101	47	57.0	2	58	19.8	101	47	57.1
11- Apartment Sutera	2	58	23.8	101	48	2.5	2	58	24.0	101	48	2.5
12- Taman Bukit Mewah Fasa 8a	2	58	28.9	101	48	4.3	2	58	29.0	101	48	4.3
13- Komersial Taman Bukit Mewah	2	58	28.9	101	47	58.7	2	58	29.0	101	47	58.5
14- Taman Kajang Utama	2	58	29.6	101	47	52.9	2	58	31.0	101	47	52.7
15-Seksyen 1 Taman Kajang Utama	2	58	36.5	101	47	41.5	2	58	36.4	101	47	41.0
16- Taman Bangi	2	58	32.1	101	47	11.8	2	58	32.5	101	47	12.5
17- Taman Sri Reko	2	58	43.9	101	47	22.8	2	58	44.9	101	47	22.9
18- Taman Hijau	2	58	51.0	101	47	22.9	2	58	51.0	101	47	23.0
(O) 19- Kajang MRT	2	58	57.8	101	47	24.2	2	58	58.2	101	47	24.3

Source: Google Maps, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Table 8 Difference in GPS Coordinates between pilot study and geospatial resource

Drop Off Point (*)	Trip 1						Trip 2						Trip 3					
	Difference in GPS Reading						Difference in GPS Reading						Difference in GPS Reading					
	North			East			North			East			North			East		
	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec	Deg	Min	Sec
(O)	0	0	0.8	0	0	0.2	0	0	1.5	0	0	0.3	0	0	0.3	0	0	0.4
1	0	0	N/A	0	0	N/A	0	0	11.0	0	0	0.6	0	0	0.3	0	0	0.1
2	0	0	N/A	0	0	N/A	0	0	8.9	0	0	17.3	0	0	1.0	0	0	0.7
3	0	0	N/A	0	0	N/A	0	0	12.0	0	0	8.1	0	0	0.1	0	0	0.4
4	0	0	1.2	0	0	3.0	0	0	0.6	0	0	1.2	0	0	0.2	0	0	0.3
5	0	0	0.4	0	0	0.1	0	0	0.3	0	0	0	0	0	0.3	0	0	0.1
6	0	0	0.2	0	0	0.3	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0
7	0	0	0.4	0	0	0.3	0	0	0.3	0	0	0.1	0	0	0.2	0	0	0.1
8	0	0	0.4	0	0	0.1	0	0	0.2	0	0	0	0	0	0.3	0	0	0.3
9	0	0	0.4	0	0	0.1	0	0	0.3	0	0	0.2	0	0	0.4	0	0	0.2
10	0	0	0.4	0	0	0.2	0	0	0.1	0	0	0.1	0	0	0.2	0	0	0.1
11	0	0	0.3	0	0	0.5	0	0	0.3	0	0	0	0	0	0.2	0	0	0
12	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1	0	0	0
13	0	0	0.2	0	0	0.9	0	0	0.2	0	0	0.4	0	0	0.1	0	0	0.2
14	0	0	1.3	0	0	0.1	0	0	1.3	0	0	0.2	0	0	1.4	0	0	0.2
15	0	0	0.3	0	0	0.4	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0.5
16	0	0	0.4	0	0	0.8	0	0	0.4	0	0	0.5	0	0	0.4	0	0	0.7
17	0	0	0.5	0	0	0.3	0	0	0.6	0	0	0.1	0	0	1.0	0	0	0.1
18	0	0	0.2	0	0	0.2	0	0	0.1	0	0	0.2	0	0	0	0	0	0.1
(O)	0	0	0.1	0	0	0.3	0	0	0.4	0	0	0.1	0	0	0.4	0	0	0.1

Source: Google Maps, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

(*)Drop Off Point

(O) Kajang MRT	6- Flat Citra	12- Taman Bukit Mewah Fasa 8a	18- Taman Hijau
1- Taman Reko Jaya	7- Apartment Suria	13- Komersial Taman Bukit Mewah	
2- Taman Kajang Sentral	8- Perumahan Seksyen 2	14- Taman Kajang Utama	
3- Kuarters Guru Kajang Utama	9- Perumahan Seksyen 3	15-Seksyen 1 Taman Kajang Utama	
4- SMK Kajang Utama	10- Apartment Cemara	16- Taman Bangi	
5- Flat Kajang Utama	11- Apartment Sutera	17- Taman Sri Reko	

Based on Table 8, comparison analysis between the three trips can be seen in terms of differences in GPS coordinates between data collected from the on-board survey and data from a geospatial resource. The highlighted coordinates are the optimum GPS coordinates among the three trips, having the least difference in coordinates, which represents an approximately accurate result for the bus stop locations. For the origin and final destination of the T461 feeder bus,

no optimum coordinates are chosen as the feeder buses may depart or arrive at different locations. For Trip 1, the coordinates for drop off points 1, 2 and 3 were unattainable due to the unfamiliarity of the route and locations of the bus stops during the pilot survey.

One second of latitude and one second of longitude represents 30.72m and 30.92m respectively. The findings show that for the optimum coordinates, the range of the difference in latitude are within 0 seconds to 1.3 seconds, which represents a gap distance of less than 40m, whereas the range of difference in longitude are within 0 seconds to 0.7 seconds, which represents a gap distance of less than 30m. Generally, the difference in coordinates is minimal, which is acceptable for this study due to the situational nature of the movement of feeder buses. Hence, the pilot study was able to calibrate the research instrument and validate the accuracy of the GPS coordinates. The revised GPS coordinates based on the optimum locations can be seen in Table 9 below.

Table 9 Optimum GPS coordinates of bus stop locations

Drop Off Point	Pilot Study					
	GPS Reading					
	North			East		
	Deg	Min	Sec	Deg	Min	Sec
(O) Kajang MRT	2	58	56.3	101	47	23.9
1- Taman Reko Jaya	2	58	45.1	101	47	23.4
2- Taman Kajang Sentral	2	58	37.3	101	47	40.1
3- Kuarters Guru Kajang Utama	2	58	25.1	101	47	48.5
4- SMK Kajang Utama	2	58	26.2	101	47	41.9
5- Flat Kajang Utama	2	58	15.5	101	47	35.8
6- Flat Citra	2	58	8.3	101	47	32.8
7- Apartment Suria	2	58	11.9	101	47	30.0
8- Perumahan Seksyen 2	2	58	12.0	101	47	41.4
9- Perumahan Seksyen 3	2	58	15.8	101	47	54.5
10- Apartment Cemara	2	58	19.9	101	47	57.2
11- Apartment Sutera	2	58	23.8	101	48	2.5
12- Taman Bukit Mewah Fasa 8a	2	58	28.9	101	48	4.3
13- Komersial Taman Bukit Mewah	2	58	28.9	101	47	58.7
14- Taman Kajang Utama	2	58	29.7	101	47	52.8
15-Seksyen 1 Taman Kajang Utama	2	58	36.5	101	47	41.5
16- Taman Bangi	2	58	32.1	101	47	12.0
17- Taman Sri Reko	2	58	44.3	101	47	23.0
18- Taman Hijau	2	58	51.0	101	47	22.9
(O) 19- Kajang MRT	2	58	57.8	101	47	24.2

Source: Google Maps, Research Study for Service Catchment of Mass Rapid Transit (MRT) Feeder Bus: A Preliminary Study of T461 Route Taman Kajang Utama

Recommendations

From the larger context of the tudy, further discussion should be done on several aspects in the feeder bus system regarding the service catchment of the feeder bus service. The following are recommendations for further discussion in the actual study:

- Bus stop spacing
- Bus stop environment and facilities
- Process of Ped shed analysis
- Redundancies in service gap
- Land use pattern
- Geospatial analysis

CONCLUSION

Literature review shows that walkable catchment areas differ all around the world and depend on various factors. Commonly, the 400m and 800m buffers are applied in urban planning to determine walkable catchment areas in a neighbourhood. By determining the service catchment of feeder buses, we are able to identify gaps or mismatches in the feeder bus system that might potentially affect the performance and effectiveness of urban rail transit. Ped shed terminology has been used as a tool in urban planning to assess the walkability catchments of common facilities. It is also useful in suggesting improvements for the connectivity and walkability of bus stops.

The findings from this preliminary study indicate that the research instrument is ready to be used for actual data collection and geospatial analysis to determine the service catchment of the T461 feeder bus service. Optimum GPS coordinates derived from the pilot study will be used for geospatial analysis to achieve the research objectives.

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VEHICLE – PEDESTRIAN CONFLICT: A CASE STUDY IN UNIVERSITI PUTRA MALAYSIA

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Abstract

Vehicle-pedestrian conflict is a commonly unsafe event that occurs in both urban and rural areas, especially in developing countries. It is still an open research topic, mostly in traffic safety and urban planning, which is utilised for evaluating the behaviours of vehicles and pedestrians at a non-signalised marked walkway. Three stations were selected based on higher daily activities to calculate the regularity of pedestrian movement. A manual calculation method was applied, and the calculation was done only during the daytime. Three different teams were formed to obtain the measurements at the three different sampling points simultaneously. A present study on preliminary vehicle-pedestrian conflict reveals the frequency of pedestrians in a concentrated area and its Level of Service (LOS) in Universiti Putra Malaysia (UPM) Serdang. The findings show that rush hour occurs during the mid-day in weekday, when students have finished their classes and adults have gone out for other businesses.

Keywords: campus, pedestrian, non-motorised vehicle, shared pathway

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INTRODUCTION

Urban areas, especially in developing countries, commonly have mixed traffic flows (Ni, Wang, Sun, & Li, 2016). In this approach of mixed traffic, motor vehicles, non-motorised vehicles (bicycles) and pedestrians share the same space (roads and intersections), which in turn triggers conflicts (Almodfer, Xiong, Fang, Kong, & Zheng, 2016). These vehicle-vehicle conflicts, bicycle-vehicle conflicts, and pedestrian-vehicle conflicts occur frequently, with vehicle-pedestrian conflicts being the most concerning issue.

The behaviour of pedestrians and drivers can become a great influence, which depends on many uncertain factors (Suzuki & Ito, 2017). For example, pedestrians and cyclists may step out onto the road without warning and sometimes are unaware or being less alert around traffic, which present risk of collision with vehicles. Besides that, the millennial generation tends to obsess over their smart phones, texting or talking and being seemingly ignorant of their surroundings (Cloutier et. al., 2017). On the other hand, drivers of motorised vehicles could also be using their smart phones while driving, compromising their attention to the road. Policy and decision makers around the world have typically prioritised the safety of pedestrians (Iryo-Asano & Alhajyaseen, 2017). However, these intentions get less attention due to increasing vehicle congestion in urban areas. Additionally, pedestrian areas have been minimised to allow for better road openings.

Pedestrians are vulnerable road users because of their unprotected safety on the road (Zheng, Chase, Elefteriadou, Schroeder, & Sisiopiku, 2015). In Malaysia, more than 6,000 cases involving pedestrian injuries and fatalities on the road are reported annually. Meanwhile, pedestrian fatalities are averages at 500 deaths each year (Mohd Syazwan, Baba, Nur Zarifah, Aqbal Hafeez, & Noor Faradila, 2017). Most injuries involve the elderly (60 years above), and >60% of these accidents occurred on straight roads. The fatality statistics of pedestrians has been showing a continued increase from 24.4% in 2006 to 44.2% in 2013, and thus needs to be attended to. Table 1 shows the fatalities involving pedestrians in Southeast Asian countries.

Universiti Putra Malaysia (UPM) has set a new record when it was listed as the world's top 17th university in the UI-Greenmetric World University Ranking based on its rigorous efforts to promote campus sustainability and effective environmental management. In year 2013, UPM established a cycling space for the students to cycle in the campus as part of its green campus initiative. This benefits the students by improving air quality, minimising pollution and road damage, and promotes healthy living. This could also reduce the frequencies of bus service within the campus. These bicycle lanes have been built on the existing roads, which are also being used by other vehicles. The bicycle lanes themselves are shared with pedestrian.

Table 1 Pedestrian causalities in Southeast Asian countries in 2015

Southeast Asian Country	Reported Road traffic Fatalities (Count)	Death by Pedestrian Category (Percentage)
Laos DPR	910	10%
Malaysia	6,915	7%
Myanmar	3,612	26%
Philippines	1,513	19%
Singapore	159	27%
Thailand	14,059	8%
Vietnam	9,156	-
Cambodia	1,950	13%
Brunei	54	9.20%
Indonesia	26,460	21%
Timor-Leste	74	-

Source: Modified from Mohd Syazwan et al. (2017)

UPM has made significant improvements, particularly in the sectors of transport and infrastructure, such as the size of available green space, the use of efficient energy-saving facilities and bicycles within the campus area. However, in terms of pedestrian and cyclist space there are still some issues regarding both groups, especially with regards to the shared pathway with motorised vehicles. Vehicle-pedestrian/cyclist interactions are commonly inter-related with traffic safety. In addition, the shared pathways between both parties could increase interaction conflict. Pedestrian and cyclist safety is also an important matter, especially at night. Low light conditions add difficulties for the visibility of both vehicles and pedestrians/cyclists (King, Wood, Lacherez, & Marszalek, 2012). Neglecting the necessary dimensions could cause injuries to the pedestrian/cyclist. Hence, important measures should be in place to ensure pedestrian/cyclist safety on walkways and cycling lanes.

This paper intends to contribute to the existing body of knowledge in terms of, firstly, quantifying pedestrian frequency in the study are, and secondly, evaluating the Level of Service (LOS) as well as exploring the factor of pedestrian-vehicle conflicts.

RESEARCH BACKGROUND

This study is based on the observational method (counted measurement) and data was collected using the manual count method. The study sites chosen are situated at three (3) intersections in the north campus of Universiti Putra Malaysia; namely V1 - Junction at Persiaran Tulang Daing (CIMB Bank), V2 - Junction at Persiaran Tulang Daing (Faculty of Forestry) and V3 - Junction at Persiaran Asam Jawa (Faculty of Educational Studies) (Figure 1). These sites were selected as they are considered high density areas with a high capacity of pedestrian activities.

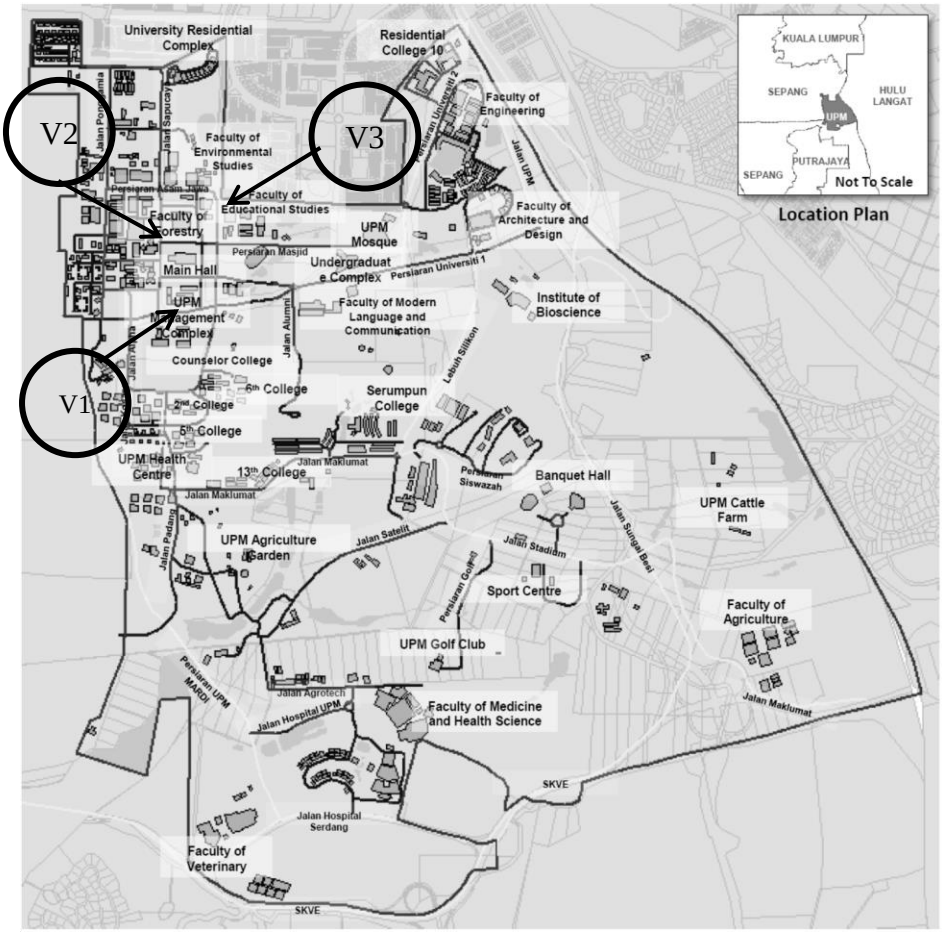

Figure 1 The study area is located at the north campus in Universiti Putra Malaysia.

The pedestrian volume counter was used to determine the volume of pedestrians using a walkway or crossing a street either at a signalised or non-signalised intersection. Normally, pedestrian volume counts at each walkway should be made during the same period as the vehicle volume count. Tallies should also be made during the same periods as the vehicle volume count.

The pedestrian data collection processes started with pre-site survey preparation, where all the equipment, such as manual counter, safety jacket and tally sheet, was prepared. Then, sampling points were selected by selecting locations with a clear view of the pedestrian walk, and was safe and away from danger. Next, by using the tally sheet, each data collected was filled in and merged with other data at the end of the sampling day. Data collection in every area was carried out by an assigned team member at a pre-determined site. The observations were conducted during the day of three (3) days, day 1 (Thursday),

day 2 (Friday) and day 3 (Saturday) – from 0800 to 1900 – at intervals of 15 minutes. Once a complete set of data was obtained, analyses were carried out using the Statistical Package for Social Science and the results were evaluated to identify the Level of Service (LOS).

RESULTS AND DISCUSSION

Pedestrian volume

Each sampling point consists of three (3) different junctions, namely D1, D2 and D3 (Figure 2). The pedestrian frequency analysis explains the total number of pedestrians at a designated time. The results of three (3) days sampling are summarized in Figure 2. Station V1 has the higher volume of pedestrians in day 1 which occurred at mid-day with a total of 758 pedestrians while total pedestrians for a day are 2904. This number is expected to be high as people were going out for lunch and other businesses as this area is where the bank, food court and the road to students' residences are located. Meanwhile, station V2 has a different pattern as this area consists of faculty buildings and the main library across the road. Usually, students would complete their classes and walk to the library or the bus stop at mid-day and during the evening. The average total volume of pedestrians over the course of one day was 664 and the highest volumes of pedestrians were recorded on day 2 with 1071. At station V3, pedestrians usually walk by to reach the Faculty of Education and Lecture Hall beside the parking lot. Only certain students involved in classes in the Lecture Hall would walk to this area. Lecture times are usually packed from morning to afternoon and reduced in the evening, with a total average of pedestrians of 659, 246 and 54 during 3 days sampling periods respectively. The summary of pedestrian volume is as shown in Figure 2.

The Highway Capacity Manual (HCM) uses LOS as a qualitative measure to describe operational conditions of pedestrian circulation. The HCM's method for analysing pedestrian LOS is based on the measurement of pedestrian flow rate and sidewalk space. For this survey, pedestrian queuing LOS was used as a standard to measure pedestrian LOS because the flow pattern for pedestrian is quite similar to that of queuing. Table 2 below shows the LOS criteria for pedestrian.

The LOS output shows that the LOS value varies in spatial and temporal scale. Station V1 indicate of 88% of LOS output is F (day 1), which is described as "standing, where virtually all persons are standing in direct physical contact with others and no movement is possible in the queue". This is because at this moment, most pedestrians use this route during the given time and the space along the pedestrian route is only 3.1m wide. In day 2, station V1 experienced moderate LOS with 29% of A and D criteria and 100% of A criterion in day 3. Meanwhile, station V2 was observed with steady LOS in day 1 where the LOS having 38%

of D and F criteria. Comparatively, day 2 and day 3 having highest LOS of F and A criteria with 54% and 83% respectively.

For station V3, the highest LOS for day 1 and 3 are A criterion with 42% and 100% respectively showing the description of "Standing and free circulation through the queuing area is possible without disturbing others within the queue". Day 2 for station V3 showing an average condition of LOS with 29% of criteria A and D for the reason of different time period. Furthermore, Day 2 of the survey was conducted on a Friday, where most of the male students are performing the Friday prayers.

Day 3 of sampling campaign shows low pattern of movement in each station. This is because most of undergraduate student stayed in the residential area but only certain students that enrolled in credited co-curricular activities or postgraduate students having their classes in the main campus are using the pedestrian walkway.

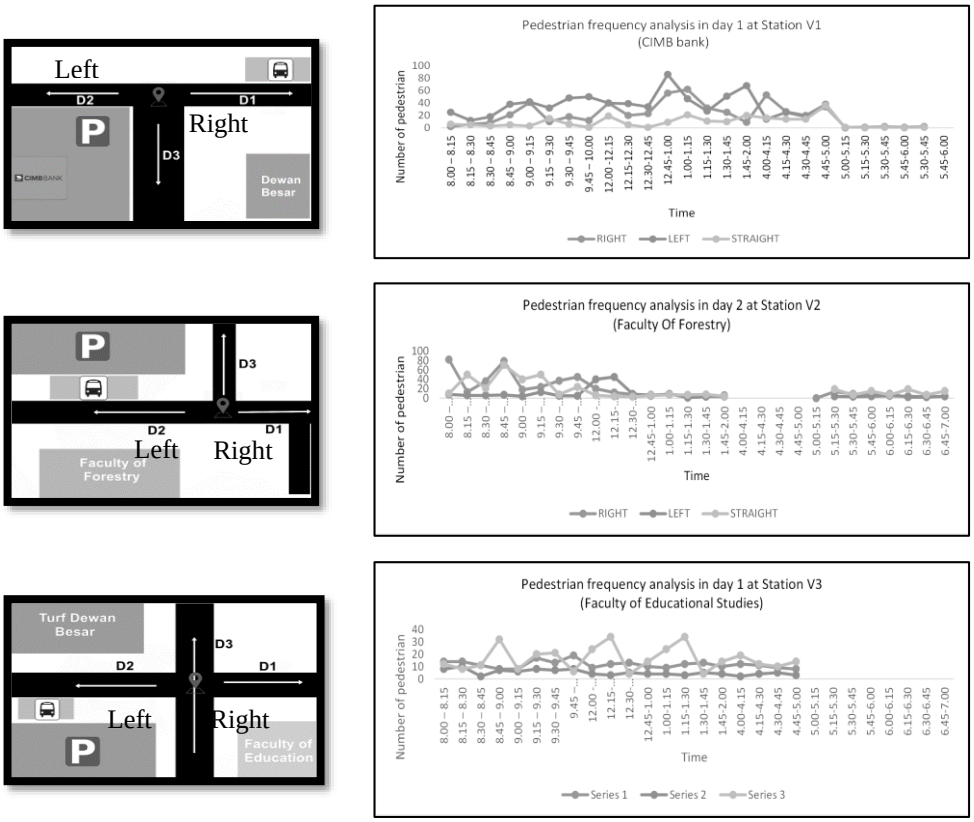

Figure 2 Summary of highest pedestrian volume (left) & summary of pedestrian volume (right)

Table 2 Level of service criteria for pedestrian

Station	Day 1 (Thurs)				Day 2 (Fri)				Day 3 (Sat)			
	Time											
	0800 - 1000	**1200 - 1400**	**1600 - 1800**	**Total pedestrian /hr**	**0800 - 1000**	**1200 - 1400**	**1600 - 1800**	**Total pedestrian /hr**	**0800 - 1000**	**1200 - 1400**	**1600 - 1800**	**Total pedestrian /hr**
V1	427	755	305	**1487**	356	128	105	589	39	47	35	121
V2	235	282	241	758	662	231	178	**1071**	69	53	41	163
V3	278	272	109	**659**	29	82	135	246	18	18	18	54
Total				2904				1906				338

LOS	Average Space (m^2/p)	Description
A	>1.2	Standing and free circulation through the queuing area is possible without disturbing others within the queue.
B	>0.9-1.2	Standing and partially restricted circulation to avoid disturbing others in the queue is possible.
C	>0.6-0.9	Standing and restricted circulation through the queuing area by disturbing others in the queue is possible.
D	>0.3- 0.6	Standing without touching is possible; circulation is severely restricted within the queue and forward movement is only possible as a group.
E	>0.2- 0.3	Standing in physical contact with others is unavoidable; circulation in the queue is not possible; queuing can only be sustained for a short period without serious discomfort.
F	≤ 0.2	Standing virtually all persons within the standing in direct physical contact with others and no movement is possible in the queue.

Table 3 Summary of Level of Service (LOS) in 3 days for each station

Station	Day 1 (Thurs)		Day 2 (Firi)		Day 3 (Sat)
V1	D = 4%		A = 29%	D = 29%	A = 100%
	E = 8%		B = 4%	E = 10%	
	F = 88%		C = 14%	F = 14%	
V2	A = 4%	E = 16%	C = 18%	F = 54%	A = 83%
	C = 4%	F = 38%	D = 18%		B = 13%
	D = 38%		E = 10%		D = 4%
V3	A = 42%	D = 13%	A = 29%	D = 29%	A = 100%
	B = 4%	E = 25%	B = 4%	E = 10%	
	C = 8%	F = 8%	C = 14%	F = 14%	

CONCLUSION

In this study, by using the data collected from three stations, the pedestrian volume pattern was generated. The distribution of pedestrian varies between spatial and temporal measurement. The highest contribution of pedestrian volume is during weekday where most of the students will be around the main campus for lecture time. It also indicates that most of the students will be concentrated in an area of lecture hall and library. From the findings, the Level of Services (LOS) were measured. The LOS criteria also strongly depend on the spatial and temporal distribution as for present study, most of the station experience criterion F during weekday which explains issues on crowd and congestion while criterion A during weekend.

Based on the output, the preliminary data can be used to explore diverse and complex pedestrian-vehicle interactions and pair these with sufficient considerations when evaluating pedestrian safety. In the future, the development of walkway designs and the addition of safety and visibility features can reduce the probability of interactions between crossing pedestrians and vehicles. Awareness of both drivers and pedestrians to respect each other's space requires an understanding of where, between whom, and under what circumstances interactions can occur. Such an approach can also help identify which engineering, urban design and enforcement programs are needed to ensure safe pedestrian crossings for all ages.

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EVALUATING CAPACITY BUILDING OF THE LOCAL COMMUNITY TOWARDS ENVIRONMENTAL CONSERVATION IN AN ESTUARINE COMMUNITY, KONG KONG LAUT, JOHOR

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Abstract

Key community-based environmental conservation programmes in Kong Kong Laut, Johor include the river and mangrove ecosystem conservation and management programme. The overall aim of conserving the ecosystem and encouraging local community participation in the programme is to promote the existing eco-tourism potential of the area. This paper entails the outcomes of community-based activities aimed at building the capacities of local communities through community mobilisation, awareness creation and capacity building (i.e. transferred knowledge and skills). Findings indicate that there have been improvements in the river water quality status within the ecosystems over the course of a one-year project, despite relatively small participation among the local communities in the conservation programme. However, it was evident that active participation from a minority group of the local community has contributed to significant human and social capital, suggesting that community empowerment might be crucial for future development. Despite this, a school outreach programme on waste minimisation within the community demonstrated an encouraging level of participation among school children and teachers. The major challenge to maintaining continuous efforts to conserve their environment is the simultaneous developments taking place close to the river and mangrove ecosystems. While it remains a challenge to all the stakeholders, collaborative efforts among the local communities and the university, school, government agencies and private sector have made it possible to strategise for more future approaches that will benefit the whole community.

Keywords: Knowledge transfer, environmental conservation, capacity building, local community, awareness, water quality

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INTRODUCTION

The role of university engagements in capacity building programmes has been undeniably important in helping to develop and strengthen the skills and abilities that communities need in order to adapt and thrive in a changing environment. Capacity building not only focuses on internal activities among students and university staff towards building their capacities, but rather, the focus has now extended to externally-oriented activities aimed at building capacity within a local community to promote engagement in a wider group of stakeholders. Universities may either lead such activities, or be the key partner in endeavours to empower communities in order to address challenges (Shiel, Filho, do-Paco, & Brandli, 2016). This will enable communities to develop sustainable ways of living through facilitation, community learning and continuous efforts to build their capacities.

This paper presents the processes and outcomes of community development and conservation programmes aimed at improving participation and building capacity in a local community. It assesses the extent to which the approaches have contributed to more sustainably-managed environments and increased awareness among the local communities through the transferred knowledge and skills.

The greatest challenge in the conservation and management of river and mangrove ecosystems in Kong Kong Laut, Johor comes from the simultaneous developments taking place close to the river ecosystem and the various anthropogenic activities along the coast. The mangrove ecosystem is very diverse in its composition and has become one of the main attractions of the local community in terms of eco-tourism potential. Therefore, such a conservation effort would essentially help in maintaining and sustaining the river and mangrove ecosystems' functions in the particular environment. This paper describes the experiences gained in the community-based programme in which the overall objective is the conservation and management of the river and mangrove ecosystems. In addition, involvement and active participation of local communities have been identified as key to integrating the diverse perspectives of the local communities (Raburu, Wa'Munga, & Okeyo-Owuor, 2012).

METHODS

Programme Planning

The activities conducted throughout the conservation project were planned on a quarterly basis over a period of one year starting with community mobilisation, awareness creation and capacity building in an attempt to encourage full participation from the local communities.

Approaches Used in the Conservation Programme

Community Mobilisation

At the beginning of the project, community leaders and representatives were mobilised and brought for a tour within the river ecosystems to enable them to recognise environmental problems and the potential to improve existing eco-tourism within the area. A focused-group discussion was then conducted where they discussed the causes of environmental problems, possible ways of mitigating the issues and strategies for future eco-tourism development in their local community. Members of the community were also mobilised and given the opportunity to visit other local communities having the same ecosystem characteristics as theirs. Apart from the community members, teachers from a primary school located in the project area were also involved in order to indirectly encourage participation among school children.

Awareness Creation

Awareness brings issues to the attention of individuals or key groups who have the power to influence outcomes (Stephen, Jai, Syma, & Laly, 2000). According to Bahir (2010), a typical awareness-raising cycle includes, namely: capturing the attention of stakeholders and stimulating their interest; improving the public's knowledge and understanding; enhancing social skills and competencies for change; increasing capacity to implement change; and finally, implementing the change and evaluating progress made.

In order to attract maximum participation from stakeholders in the conservation programme, several approaches towards crafting awareness programmes and activities were carried out, as different approaches were targeted for different stakeholders (Figure 1). For instance, a two-day conservation and community service programme in the local community provided opportunities to create awareness to a wider group of stakeholders, including government officials, the private sector, school children, and the general public. In this programme, local communities were informed of the importance of environmental conservation so as to facilitate their understanding on the importance of maintaining sustainable environments.

Apart from this programme, the role played by the school in awareness creation through a school outreach programme was outstanding. Activities involving the school children were designed to create life-long awareness among the pupils and the general public. All activities conducted such as the waste minimisation and recycling programme were organised in the form of competitions among the primary school children and the general public (local communities of Kampung Sg Latoh and Kong Kong Laut). The theme for the competitions was set in accordance with the waste management programme, (i.e. From Waste to Solution). The best products from the waste minimization

programme were awarded prizes so as to stimulate future participation and raise awareness among pupils.

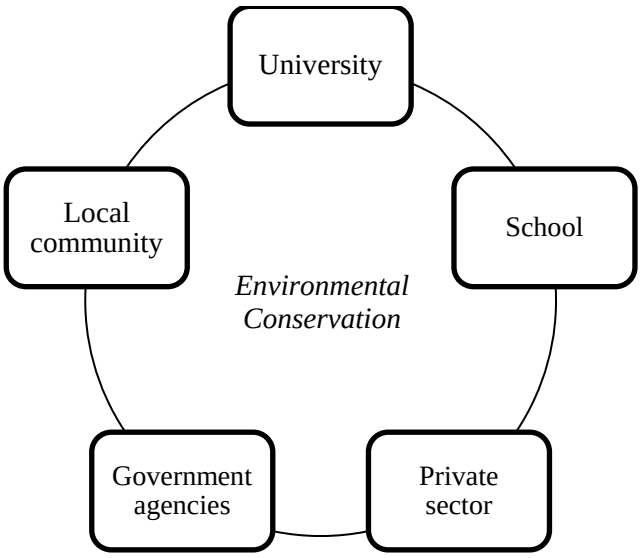

Figure 1 Involvement of stakeholders in the environmental conservation programme in Kong Kong Laut, Johor

Capacity Building Programme

Capacity building is designed to equip community members with skills that would enable them to mobilise resources even after they are left on their own. In addition to the transfer of knowledge and technical capabilities, capacity building should also foster social cohesion within communities and build both human and social capital (Raburu et al., 2012). Capacity building relates to a range of activities whereby individuals or groups improve their capacity in achieving sustainable natural resource management (FAO, 1999). The approach to community capacity building aims to ensure that it is an empowering experience for communities engaged in the development programme so that their capacity is sustained after the programme ends (Tania & Daniel, 2003).

During the course of the project, training courses were conducted on, the following topics: techniques of river water quality monitoring; conservation of the river ecosystem and water resources; and minimisation of waste generation. These knowledge transfers were aimed at improving the local communities' skills in resource management and mobilisation. The activity crafted for achieving community engagement was specifically aimed at enhancing the ability to act through the provision of the transferred knowledge and skills, and fostering motivation to act through awareness creation programmes and support that lead to effective community engagement (Raburu et al., 2012). The local communities

were also motivated to develop their leadership skills. Apart from the community members, the university staff also benefited from the various aspects of the capacity building activities.

Community Participation

Participation of all stakeholders including the local community, university community, school community, government agency and private sector was measured by evaluating the number of actual participation from the targeted number of participants from each target groups. The degree of participation was denoted as having satisfactory or unsatisfactory involvement based on the number of actual participation ranked from low to high percentage of participation. Local community participation was further evaluated through a cross-sectional survey involving the local communities within the ecosystem to exemplify their awareness and satisfaction on the conservation programme as well as their willingness to participate in the capacity building programmes. The local communities were informed of the activities so that they were aware of the conservation programme.

Monitoring Programme

In order to ensure the effectiveness of this programme, continuous monitoring was carried out each month for one year. A field monitoring programme for observing the improvement of water quality was performed during the period April to December 2015. This was intended to assess whether any improvement had been made after the commissioning of the conservation programme starting November 2014. Monitoring of the water quality was undertaken at several locations (S1-S5) as shown in Figure 2. Description of the monitored locations is given in Table 1. Multiple activities that are taking place in the vicinity of the study area could directly or indirectly cause an impact on the quality of the river water (Kusin et al., 2017). As such, the conservation programme was centralised in the areas that are potentially affected by various activities within and nearby the river ecosystem.

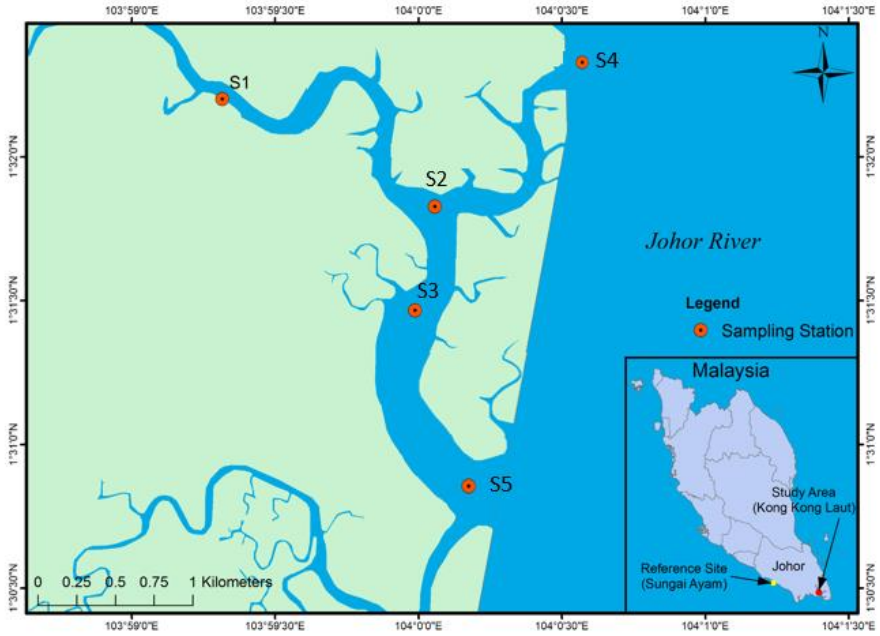

Figure 2 Locations of river water quality monitoring in Kong Kong Laut, Johor

Table 1 Description of monitored locations

Monitored Station	Site Description
Sg. Serai (S1)	A tributary to Mendana Strait; near to oil palm plantation areas
Sg. Serai (S2)	A tributary to Mendana Strait; fishing area and waterway transportation
Selat Mendana (S3)	Within raft house and jetty areas
Selat Mendana (S4)	An estuary to Sg. Johor
Selat Mendana (S5)	Within restaurant area

RESULTS AND DISCUSSION

Capacity Building of Local Community

The involvement of local communities in the conservation programme greatly contributed to maintaining and restoring ecological integrity and improving community well-being. In addition, it also helped to promote the area's eco-tourism potential, as in the case of Kampung Kong Kong Laut. Although physical development of the community are clearly visible in terms of infrastructure development, there was still a lack of community participation in most of the capacity building programmes. This suggests that the physical development in the area are still not in line with the objectives of the conservation programme.

However, active participation from a minority segment of the local communities has been a great contribution. Despite the relatively small number of active participation, this group has contributed to significant growth of human and social capital within their community. Thus, this choice had indirectly created 2 groups of social capital within the local communities, namely, the uncooperative group and the cooperative group. Social capital can be defined as the social relationship of individuals or groups (Agnitsch, Flora, & Ryan, 2006; Matarasso, 2007). It may facilitate transactions among groups of a particular interest, while excluding other groups from access to resources (Warren, Acciaioli, Steenbergen, & McCarthy, 2015). The existence of the uncooperative group arises basically because they feel uncomfortable with outside interference as they are aware of the implications (Sudarmono, Sulehan, & Bakar, 2012). One of the implications that usually eventuate is the lowering of their social status compared to the outsiders, who are viewed as having high status. Thus, they have to work hard to obtain more resources in order to achieve higher benefits. On the other hand, the cooperative group was willingly involved in the activities as their own motivation drove them to use the resources available for the benefit of the whole community.

As monitoring and data collection processes were continuous throughout the period of the project, it became evident that the uncooperative group not only had a fragile relationship with the cooperative group (even though they come from within the same community (bonding social capital)), but also with outsiders (linking social capital). In this case, the implication was other organisations. According to Woolcock & Narayan (2000), linking social capital has a major influence on helping individuals or communities to gain power to control their lives in many aspects, including environmental circumstances within a community's living area. Furthermore, the new interventions made the uncooperative group feel threatened, especially when they were trying to maintain their existing lifestyles. The conflict occurred when there were interventions through specific regulations and mechanisms that attempt to interfere with the local community's daily practices. This is also one of the factors that may lead to the fragility of linking social capacity, which is influential to help a community gain access to other resources and thus, improve their quality of life (Woolcock & Narayan, 2000).

Local Community Participation

The overall participation from stakeholders over the course of the programme is summarised in Table 2. Participants' involvement was ranked according to the percentage of participation from each groups; poor (0-25%), low (16-50%), moderate (51-75%) and high (76-100%). Satisfactory involvement denotes moderate to high participation from the targeted number of participants from each group. It was evident that participation from the local communities of Kg. Sg. Latoh and Kong Kong Laut was still at unsatisfactory level. Therefore, the local

communities were evaluated of their awareness on the conservation programme, satisfaction towards existing condition of the ecosystem, so as their willingness to participate in the capacity building programme.

Table 2 Summary of participation of stakeholders/target groups

Stakeholder/target group	Role	Remarks
University (researchers and students of Faculty of Environmental Studies, UPM)	Project team / Programme leader/ Facilitator/ Demonstrator	Satisfactory involvement by all members
Local community (Communities of Kg. Sg Latoh and Kong Kong Laut)	Permanent residents/villagers	Unsatisfactory involvement
Local community (members of Koperasi Kg Sg Latoh Berhad)	Initiator to community infrastructure development, managing the eco-tourism sector	Satisfactory involvement by a minority of active members
School community (primary school-SK Kong Kong Laut)	Teacher/educator Pupils	Satisfactory involvement by all members
Government agency (IRDA)	Development funder	Satisfactory involvement
Private sector (individual companies)	Service provider	Satisfactory involvement

The local communities included communities of Kg. Sg. Latoh and Kong Kong Laut, as well as members of Koperasi Kg. Sg. Latoh Berhad. This includes a range of communities aging between 20-70 years and having education background of between secondary school certificate and bachelor's degree holders. In terms of awareness creation, it was found that majority of the local communities were aware of the conservation programmes taking place within their ecosystem. However, more than half of them were having lower satisfaction towards existing riverine ecosystem conditions. This was mainly due to current physical development across their community that may hinder synchronised integration between natural resources management and rural development.

Despite having high intention to participate in the conservation programmes, the level of participation in the community was closely related with their social and economic needs. The older generation and members of Koperasi Kg. Sg. Latoh Berhad were the active participating communities because they were the initiator to the community infrastructure development and responsible for the eco-tourism sector within the community. They also believed that environmental conservation is equally important to physical and eco-tourism development that has long served as their main source of income. The younger

generation showed lesser extent of participation partly because they are less sure of their ability to contribute to such programmes and due to time availability.

Factors Influencing Capacity Building on Environmental Conservation in a Local Community

Factors that influenced the outcomes of the conservation programme in Kong Kong Laut based on local experiences with capacity building approaches are given in Table 3. These are summarised according to several basic principles, which must be put in practice for community-based natural resource management approaches (Addun & Muzones, 1997).

Table 3 Factors that influence capacity building on environmental conservation in Kong Kong Laut

Influencing factor	Requirements for improvement
*Empowerment – the actual transfer of economic and political power from the operationalisation of community management	Wider cooperation between leaders and organisation members is needed
*Sustainability – ensure development through resource extraction practices, intra-generational equity and equity between present and future generations	A systematic incorporation of the conservation approach is needed to bridge the gap between young and senior members
*Equity – where communities as a whole rather than only a few individuals benefit	Attention is required to encourage participation of marginalised groups
Timeframe	Interventions require longer time frames to enable adaptive learning

**As defined by Addun & Muzones (1997)*

Partnerships in the Community Conservation Programme

Partnerships in community-based programme are important in order to achieve sustained and continuous capacity building among all the stakeholders. Over the course of the project, several collaborative activities were carried out with collaboration among local communities, government agencies, the university and the private sector respectively. The activities included a series of workshops and awareness programmes such as: Awareness Campaign on Waste Management; Workshop on Pytoremediation Technique; Waste-to-Solution Competition; and an educational visit by the stakeholders. The major government agencies that worked closely with the project were the Iskandar Regional Development Authority (IRDA) and the Department of Fisheries, Johor. IRDA is a Malaysian Federal Government statutory body responsible for regulating and fostering stakeholders' involvement towards sustainable development within Iskandar Malaysia. The project also benefitted from contributions by private companies that have helped in enhancing and promoting the eco-tourism potential of the village.

CONCLUSION

A sustained and successful conservation programme requires a good relationship between both the bonding social capital and influential linking social capital. This reflects the potential for an effective transfer of knowledge and skills. It is crucial that such a relationship would improve in various aspects, thus enabling them to attain better capacities of life in facing challenges. Experiences gained from the community-based programme have exemplified significant roles from all stakeholders involved, although continuous efforts will still have to be made to stimulate full participation among local communities. Community sustainability was seen as an important tool to facilitate wider cooperation among the local public, as it was evident that they do have the capacity to further develop their areas by integrating natural resources. This is clearly in line with the overall objective of the conservation programme, despite having to face changing environments as a result of current physical developments across their community.

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QUANTIFYING THE ORGANIC WASTE GENERATED FROM THE FRESH MARKET IN KUNDASANG TOWN, SABAH

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Abstract

It is necessary to assess solid waste generation to identify the rate by which we generate waste. A rapid increase in solid waste generation constitutes a significant challenge for developing countries such as Malaysia. Municipal Solid Waste (MSW) is the primary source of solid waste generated in Malaysia and covers 64% of the total waste composition. 45% of the average composition of Malaysian MSW is dominated by organic waste (e.g. food, vegetable and fruits). This is followed by recyclable waste (e.g. plastic, paper and metal) at 30% with the remaining made up of non-recyclable waste (e.g. polystyrene). The Fresh Market in Kundasang town, Sabah is a major contributor to the increase of organic waste generated in the Ranau district. As such, it has the potential to implement effective composting practices. This study was conducted to determine the total amount of organic waste generated as well as the organic waste generation rate in the Fresh Market. The sampling was conducted among 148 sellers in the Fresh Market over a period of two weeks (5th August - 18th August 2017). Total organic waste generation was 13,147.50kg, while the organic waste generation rate was 6.35kg/premise/day. The value for municipal solid waste generation recorded by Majlis Daerah Ranau (MDR) in three varied routes of Kundasang during August 2017 (Jalan Pekan Kundasang, Jalan Mesilou and Jalan Kota Kinabalu) were 17 tonnes, 15 tonnes and 13 tonnes respectively. This shows that the solid waste generated in Jalan Pekan Kundasang was the highest compare to Jalan Mesilou and Jalan Kota Kinabalu. This study presents the current status of organic waste generation which can serve as preliminary baseline information.

***Keywords*:** compost; municipal solid waste; organic waste; waste generation; waste composition

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INTRODUCTION

Increased generation of solid waste and its management represents a significant challenge for Malaysia. Currently, the mean per person of solid waste generation in Malaysia is 0.85 kg/person/day and an estimated 33,130 tonnes of solid waste per day is generated, thereby exceeding the projected production of 33,000 tonnes per day by 2020 (Mohammed, Mustafa, Bashir, & Mokhtar, 2013). The composition of solid waste in Malaysia is dominated by recyclable waste, but these wastes are not fully recovered and recycled. The percentage of organic waste is the highest consisting of up to 63.7% of the total solid waste composition found in landfill sites. These organic wastes contain high moisture content, and the bulk density is above 200kg/m^2 (Sumiani, Onn, Mohd, & Wan, 2009).

Malaysia has undergone substantial change in agricultural exports for all five regions; the Northern, Central, Southern, East Coast and Eastern with an estimated population of 8,250 involved in vegetable production (Tey et al., 2014). A highland altitude is a suitable place for the growth of temperate crops throughout the year. In Peninsular Malaysia, farmers grow their temperate vegetables, fruits, flowers and also tea in Cameron Highland due to its conducive climate (Saadati, Abdullah, Zakaria, Rezayi, & Hosseinizare, 2012). Meanwhile, in Sabah, temperate vegetables and fruits are grown in Kundasang. Most of these vegetables and fruits are produced by smallholder farmers to fulfil the demand of local community members and/or tourists. Wholesale traders then buy these agricultural products from the Fresh Market in Kundasang town. This Fresh Market contains small stalls selling a variety of fresh food such as vegetables and fruit.

In Sabah, an estimated 1.4 million tonnes of solid waste was generated, and the volume is increasing rapidly (Ministry of Housing and Local Government, 2013). Kundasang is the most-visited destination in Sabah by both local and international tourists due to its proximity to Mount Kinabalu (the highest mountain in Southeast Asia). Increased tourist numbers and rapid economic development have led to significant increases in the volume of solid waste being generated in this area. Additionally, most wholesale vegetables from Sandakan (east coast) and Kota Kinabalu (west coast) are sent directly to Kundasang. As such, Kundasang is regarded as a regional hub for fresh produce distribution due to its strategic geographic location and accessibility. The roads linking Kota Kinabalu, Kundasang and Sandakan, are among the first paved roads to be built in Sabah and were completed in 1972 (Dambul & Buang, 2017).

The recent rapid expansion of agriculture production in this area has also led to increased generation of organic waste. These organic waste materials need to be managed sustainably to avoid the depletion of natural resources, minimise risk to human health, reduce environmental burdens and maintain an overall balance in the ecosystem. One method of archiving this is by composting as it is low-cost and environmentally-friendly. According to Agamuthu, Khidzir and

Hamid (2009), in order to structure a proper solid waste (SW) management practice for a given region, it is essential to know the quantity of waste generated and its composition before any implementation process can take place.

Thus, this study aims to determine the total amount of organic waste production together with organic waste generation rates (waste generation per premise) in the Fresh Market in Kundasang town, Sabah. The data were obtained to identify the majority of the organic waste generation rates by the sellers in the Fresh Market. The study provides preliminary baseline information for the decision-making stage for planning and management plans.

RESEARCH BACKGROUND

This study was conducted at Kundasang, located in the Sabah highlands. It is among the most popular tourist destinations in Sabah because of its proximity to Mount Kinabalu. Historically, Kundasang is a rural area, which has grown from a small town into a popular leisure destination for visitors from all over the world. As a result, the area has experienced increased development of resorts and homestay accommodation making tourism the main activity in Kundasang with most of the villagers working as farmers and/or sellers of fresh vegetables at the small stalls in Kundasang town. However, the tourism activities have affected the environment as rising consumption has increased municipal solid waste generation, especially organic waste.

The total agricultural area in Kundasang is 18,085.2 hectares. It is experiencing continuous growth in agricultural activities (Roslee, Tahir, Musta & Omang, 2010). The Fresh Market in Kundasang is located between Mount Kinabalu and Ranau town (six kilometres from the southeast side of Mount Kinabalu and 12 kilometres from Ranau town). The Fresh Market houses 235 sellers who operated from small stalls selling vegetables and fruits. These stalls contribute to the production of large amounts of organic waste. The typical seller is a mature adult woman aged between 40 to 59 years. Business operations extend from 7am to 6pm (Monday to Saturday). Figure 1 shows the location of the Fresh Market.

METHODOLOGY

This study focuses on the issue of organic waste generated by the vegetable and fruit sellers in the Fresh Market. According to the Malaysian Standards MS2505:2012, solid waste generation includes waste retained for other purposes and wastes discarded for collection. This refers to direct waste collection either at the source (e.g. individual premises) and/or from vehicle loads (Edjabou et al., 2015). This is a quantitative research using the direct measurement of organic waste, as summarised in Figure 2.

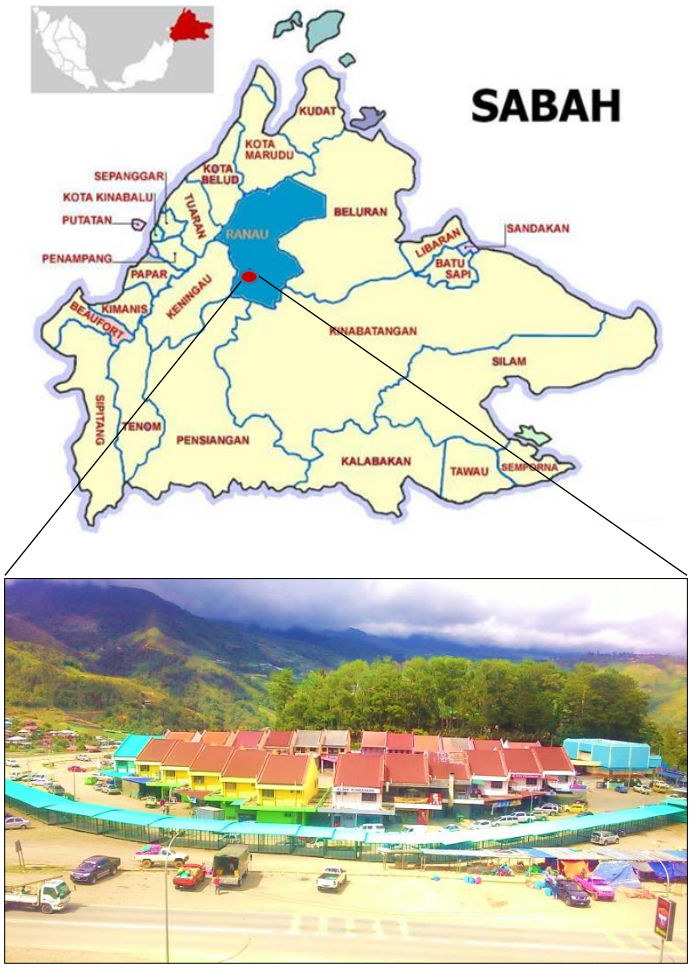

Figure 1 Fresh Market, Kundasang town

Organic Waste

According to the Malaysian Standards (2012), there are 15 components of solid waste. Only six components out of the 15 are usually sufficient for a general solid waste study, specifically: organic waste; paper; plastic; glass; metal/aluminium and others. This study measures organic waste as the highest percentage of solid waste generated in the Fresh Market. Tchobanoglous, Theisen and Vigil (1993) state that organic waste comprises vegetable peelings and trimmings, as well as fruits and can also include cooked vegetables. This includes kitchen waste that contains or is potentially contaminated with meat or meat products.

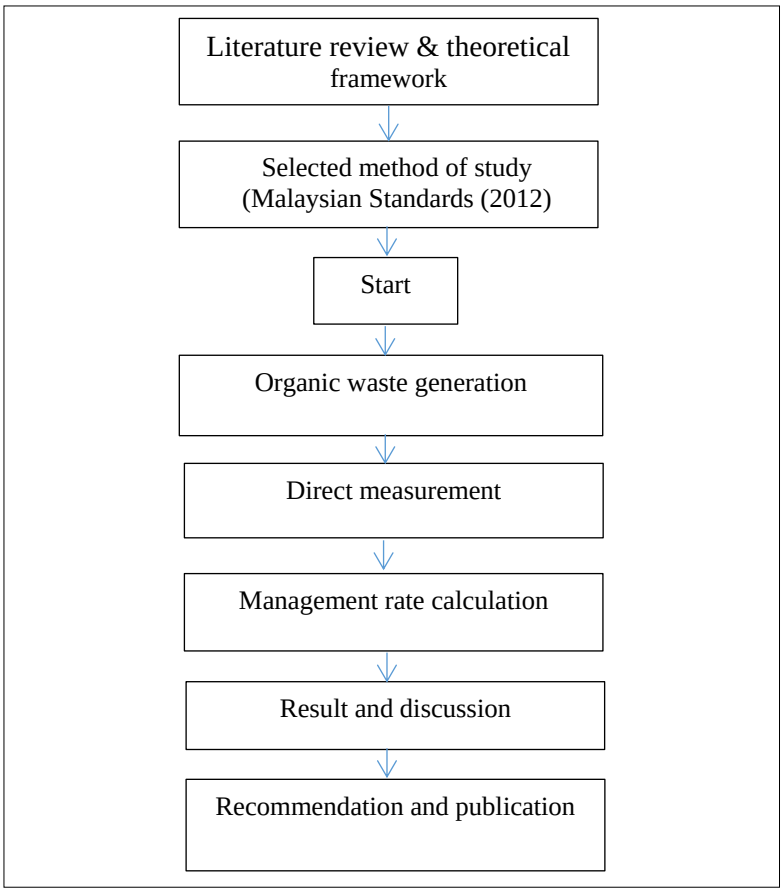

Figure 2 Methodological Framework

Equipment

The two items of equipment used when measuring organic waste generation are weighting scale (kg) and plastic bags. Table 1 briefly explains the function of this equipment.

Waste Sampling

Sampling of organic waste was conducted in Fresh Market, Kundasang town for a period of 14 days (two weeks). There were 148 respondents from a total of 235 sellers who were randomly selected based on the formula of sample size by Yamane (1967). An appropriate sample size for this study at 90% confidence level is shown in Equation (1).

Table 1 List of equipment

Equipment	Description
	-Weighting scale digital. -Use to measure the weight of organic waste generated (kg) for 14 days (2 weeks).
	-Containers for collection and storage of the waste. -Provide 1 large plastic bag for each respondent.

n=N/ (1+Ne^2)……..Equation (1)

Where;

n = sample size
N = population size (no of premises)
E = level of precision (constants = 0.05)

The selected vegetable and fruit sellers were given plastic garbage bags to collect the organic waste which was weighed and recorded daily. Figure 3 shows the flowchart of the organic waste sampling activities.

Data Calculation

The organic waste generation rate was calculated using Equation (2) to identify the amount of organic waste produced daily. Meanwhile, the percentage of organic waste is calculated using Equation (3) to determine the percentage of organic waste from the total solid waste generated by the sampled sellers. The secondary data for municipal solid waste generated was recorded by MDR in three varied routes during August 2017 as shown in Table 2.

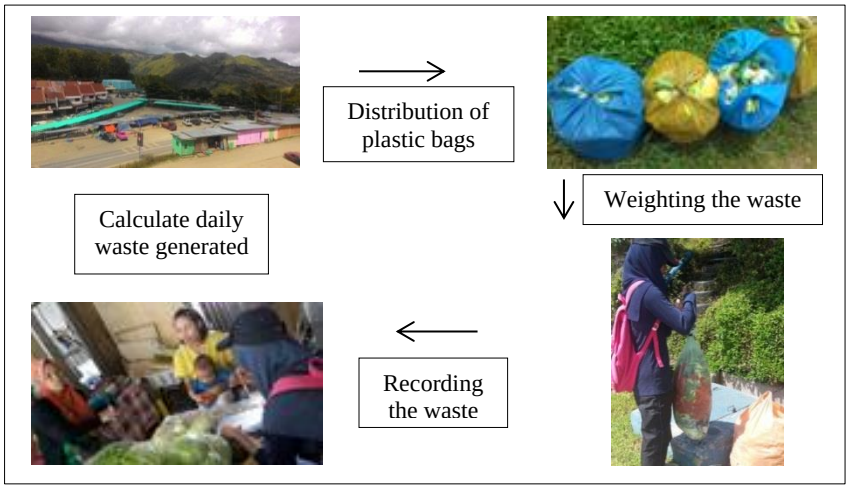

Figure 3 Flowchart for measuring organic waste

Table 2 Municipal solid waste generated in August 2017

Location	Municipal solid waste (tonnes)
Jalan Pekan Kundasang	17
Jalan Mesilou	15
Jalan Kota Kinabalu	13

$$Rate\ of\ waste\ genaration\ = \frac{\text{organic waste weight (kg)}}{\text{no.of stall x 14 day}} \quad \text{....Equation (2)}$$

$$Organic\ waste\ \% = \frac{Organic\ waste\ weight\ (kg)}{\text{total municipal solid waste weight (kg)}} \text{ x 10 ....Equation (3)}$$

RESULTS AND DISCUSSION

The organic waste generated by small stalls from Fresh Market in Kundasang town is shown in Table 3. The total organic waste generation over a period of two weeks was 13,147.50 kg. The waste generation rate was expressed in kg per stall per day and was estimated at 6.35kg. The Fresh Market in Kundasang plays an important role in providing fresh agro-products for surrounding communities. The organic waste generation rate was high compared to the solid waste generation rate in the range of 0.5–0.8 kg/capital/day for Malaysia. Another factor that contributes to the high amount of organic waste is because these wastes are disposed directly into landfills and are not composted or converted into animal feed which is more environmentally sustainable. Agamuthu and Fauziah (2007) suggest that the establishment of new technology in the manufacturing of animal feed with desired nutrient levels has rendered organic market waste no longer viable as the source of food for animals. Most studies found that organic waste

was the predominant factor in MSW fraction, although the percentage of organic waste varied considerably (Wagland, Veltre, & Longhurst, 2012).

Table 3 Organic waste generation in Fresh Market, Kundasang town

Organic waste (vegetable and fruits)	Waste generation (kg)	Generation rate (kg/person/day)
	13,147.50	6.35

The frequency of organic waste generation rate for sellers at Fresh Market is shown in Figure 4 over a period of 14 days. In this study, the majority of respondents (113) generated less than 5.00 kg/person/day, followed by six respondents who generated in the range of 6.00 to 10.0 kg/person/day. However, 13 respondents generated less than 20.00 kg/stall/day. Besides that, 12 respondents generated below 30.00 kg/stall/day, while only four respondents generated above 30.00 kg/stall/day in this study. Thus, sellers mostly generated less than 5.00 kg/stall/day (when taking into account the representative size of the stall).

The trend of organic waste generation for sellers in the Fresh Market is shown in Figure 5 over a period of 14 days. The generation of organic waste was highest on 15 August (4,157.10 kg), followed by 14 August and 16 August with rates of 2,682.30 kg and 2,608.20 kg respectively. This occurred because, during that time, most of the vegetables (especially Napa Cabbage and cauliflower) are widely produced. At this time, the sellers receive triple the number of agricultural products compared to a normal day. These vegetables and fruits are processed and packaged by the sellers before being sold to customers. However, unwanted parts from these vegetables (such as leaves and roots) are discarded as waste. Most of this waste will then be collected and transported to the landfill site by MDR (the local authority). This event is commonly known as the flood season, or '*musim banjir'*, and refers to peak production of agricultural product in Kundasang.

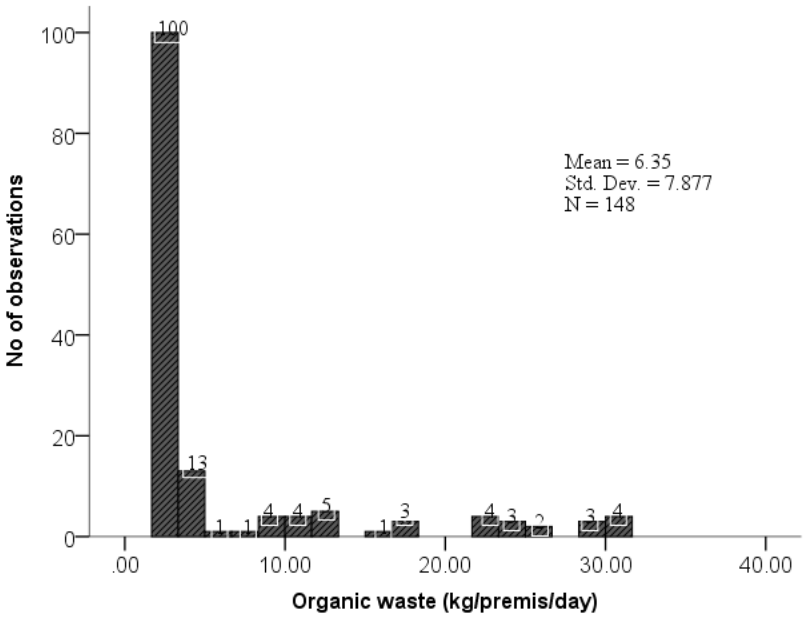

Figure 4 Frequency of organic waste generation of sellers per day

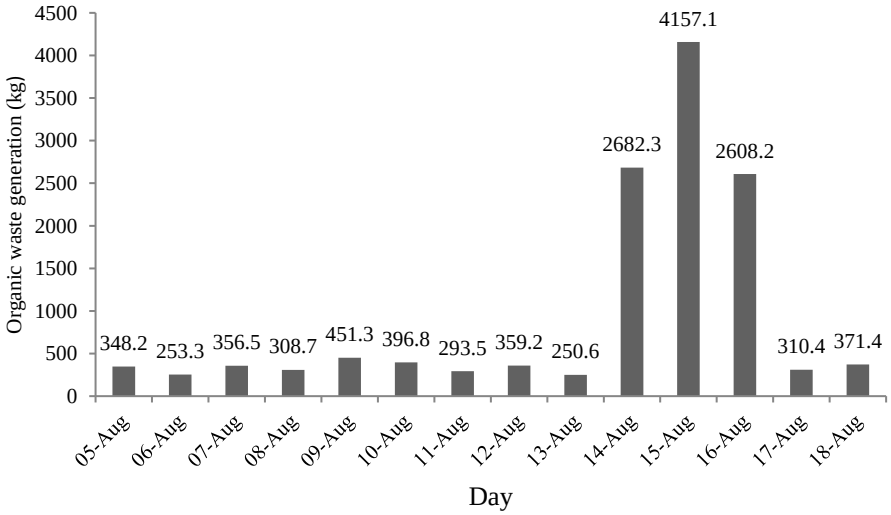

Figure 5 Trend of organic waste generation

The total percentage of organic waste and MSW is shown in Figure 6. The secondary data for municipal solid waste was obtained through the number of vehicles that transport these waste materials to the landfill site in Tanah Merah,

Ranau. The highest solid waste recorded (17 tonnes) was collected from Pekan Kundasang, followed by Jalan Mesilou (15 tonnes). The lowest amount of solid waste (13 tonnes) was collected from Jalan Kota Kinabalu. 77% from the total municipal solid waste was organic waste, while 23% was in the category of "other" including recyclable and non-recyclable waste. These findings determine that solid waste generation is dominated by organic waste as a result of high demand for vegetables and fruit from the local community and/or tourists. This study also shows that the Fresh Market generated a large amount of municipal solid waste compared to Jalan Mesilou and Jalan Kota Kinabalu. Thus, it is essential to promote composting activities among the sellers to reduce the amount of organic waste.

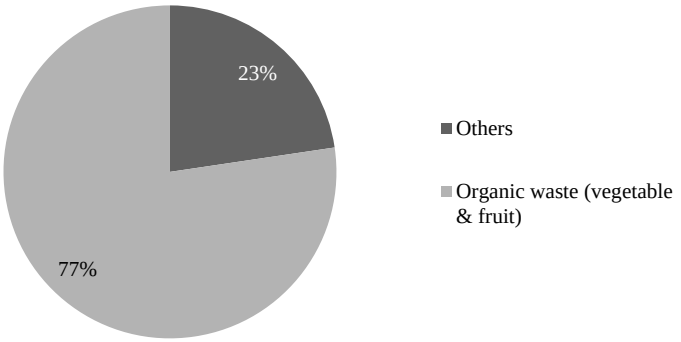

Figure 6 Percentage of organic waste from MSW in Kundasang town

CONCLUSION

Based on the data analysis, the amount of solid waste generated in the Fresh Market Kundasang is higher compared to that of Jalan Kota Kinabalu and Jalan Mesilou. This can be attributed to huge amounts of organic waste produced. This indicates that waste generated in Kundasang is largely dominated by organic waste compared to others. Hence, the composting of organic waste is the best type of solid waste management practice for this area. As such, we propose that the local authority (MDR) should conduct suitable composting workshops for the benefit of sellers in the Fresh Market as a preliminary step towards reducing the production of organic waste.

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WATER FOOTPRINT OF CROP PRODUCTION IN TEHRAN PROVINCE

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Abstract

Evaluation of supply chain of water consumption contributes toward reducing water scarcity, as it allows for increased water productivity in the agricultural sector. Water Footprint (WF) is a powerful tool for water management; it accounts for the volume of water consumption at high spatial and temporal resolution. The objective of this research is to investigate the water footprint trend of crop production in Tehran from 2008 to 2015 and to assess blue water scarcity in the agricultural sector. Water consumption of crop production was evaluated based on the WF method. Evapotranspiration was evaluated by applying the CROPWAT model. Blue water scarcity was evaluated using the blue water footprint-to-blue water availability formula. The results demonstrate that pistachio, cotton, walnut, almond, and wheat have a large WF, amounting to 11.111 m^3/kg, 4,703 m^3/kg, 3,932 m^3/kg, 3,217 m^3/kg, and 1.817 m^3/kg, respectively. Agricultural blue water scarcity amounted to 0.6 (severe water stress class) (2015–2016). Agricultural water consumption in Tehran is unsustainable since it contributes to severe blue water scarcity. Tehran should reduce agricultural water scarcity by reducing the water footprint of the agricultural sector.

Keywords: blue water footprint, CROPWAT model, green water footprint, water consumption; water management

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INTRODUCTION

Water is life. This statement refers to the worth of water for individuals and life on the planet. Water is essential for human beings, and thus access to clean water is considered a human right. Water crisis is a crucial issue because approximately 1.2 billion people face severe water scarcity (Rijsberman, 2004).

A variety of methods to evaluate water use in the supply chain have been developed. Allen, Pereira, Raes and Smith (1998) introduced virtual water, which accounts for water consumption in other countries. Hoekstra and Hung (2002) introduced a tool to measure water consumption in the supply chain of products with regard to time and location, which is known as the water footprint concept. The International Standard Organisation (ISO) provides guidelines for water footprint assessment, known as ISO14046.

To date, limited WF studies have been done in Iran but all are based on a national scale. This study addresses this gap by examining the water footprint of crop production in Tehran province and comparing the trend in water footprint during the period 2008–2015. Then, blue water stress was evaluated.

Iran is facing severe water scarcity. Water use in Iran was approximately 4.5 billion m^3 in 1963. Consumption has increased dramatically to more than 93 billion m^3 in 2006 but per capita water use was declined sharply (Zehtabian, Khosravi, & Ghodsi, 2009). A country will be identified as a water scarcity area when water availability for one person is lower than 1,700 m^3 (Rockstrom & Falkenmark, 2006). Iran with a population of more than 70 million people is among the countries facing the most severe water shortage in the world (Madani, 2014). It is claimed that approximately 90% of limited water resources in Iran is allocated to the inefficient agricultural sector (Madani, 2014). Therefore, it is essential to account for the water consumption in Tehran to reduce its negative effect on water resources. This study can help decision makers to prioritise water consumption in order to achieve optimal water consumption in the agricultural sector (Tillotson, Liu, Guan, & Pahlow, 2014).

The purpose of this study is to assess the water footprint of different crop products and compare the water footprint trend from 2008 to 2015. Besides that, blue water scarcity was evaluated to identify the status of blue water resource in terms of sustainability.

METHODOLOGY

In this study, the water footprint method created by Hoekstra and Hung (2002) is used because this approach is more comprehensive assessment for evaluating water consumption at high spatial and temporal resolution. In this study, the blue and green water footprints for the production of crops in Tehran province were evaluated based on the Hoekstra et al. approach (Hoekstra, Chapagain, Aldaya, & Mekonne, 2011). The annual blue and green water footprint of apple, apricot, cherry, sour cherry, pear, plum, almond, walnut, pistachio, pomegranate, peach,

wheat, alfalfa, barley, bean, cotton, maize, tomato, potato, grapes, melon, watermelon, and onion were evaluated from 2007 to 2015. The blue water footprint of growing crops is the fraction of water use by crop CWU blue (m^3/ha) to the yield (ton/ha.), as per Equation (1) (Hoekstra et al., 2011). The green water footprint is evaluated using a similar method - Equation (2) (Hoekstra et al., 2011).

$$WF\ blue = \frac{CWU\ blue}{Y} \quad \text{Equation (1)}$$

$$WF\ green = \frac{CWU\ green}{Y} \quad \text{Equation (2)}$$

Crop water use (CWU) is assessed based on evapotranspiration (ET). CWU per crop is evaluated. CWU is defined as the sum of water consumption for each crop during the growing time in cubic meters to hectare (m^3/ha) (Hoekstra et al., 2011). Crop water use (CWU_{blue} and CWU_{green}) is accounted for by multiplying ET blue and ET green with 10, respectively (Hoekstra et al., 2011) (Equations (3) and (4)). The evaluation of ET was done during crop growth from planting day to harvesting day. Lgp refers to length of the growing period. The value of 10 is used to convert the unit mm to m^3/ha.

$$CWU_{blue} = 10\sum_{d=1}^{lgp} ET\ blue \quad \text{Equation (3)}$$

$$CWU_{green} = 10\sum_{d=1}^{lgp} ET\ green \quad \text{Equation (4)}$$

Evaluation of ET was laborious and time consuming. In this study, ET_{blue} and ET_{green} were simulated using the CROPWAT model (Allen et al., 1998). The requirements for this software are climate data and crop parameters. The output from the CROPWAT software includes evapotranspiration, effective rainfall, and irrigation requirements. ET_{blue} was determined by subtracting effective rainfall from evapotranspiration. However, the green water footprint is the minimum effective rainfall and evapotranspiration (Hoekstra et al., 2011).

Water Footprint of Crop Production

The water footprint of crop production was assessed by multiplying crop water footprint (m^3/ton) with volume of production (ton/year) in a year. In this study, the green and blue water footprints were calculated by multiplying water footprint with annual production ((Equations (5) and (6)) (Boer, 2014).

$$WF_{blue} = WF_{p,\,blue} \times \text{production} \quad \text{Equation (5)}$$

$$WF_{green} = WF_{p,\,green} \times \text{production} \quad \text{Equation (6)}$$

The agricultural water scarcity indices are the ratio of water withdrawal to water availability (Xinchun et al., 2017). In this study, agricultural blue water scarcity (AWS_{blue}) was evaluated as the fraction of agricultural blue water footprint to the agricultural blue water availability (AWA_{blue}), as per Equation (7).

Water scarcity was ranked as follows: WSI < 0.1 = low water stress; 0.1<WSI< 0.5 = moderate; 0.5 <WSI < 0.9 = high water stress, and WSI> 0.9 = very high water stress.

$$AWS_{blue} = \frac{AWF_{blue}}{AWA_{blue}} \quad \text{Equation (7)}$$

AWA_{blue} is accounted for using Equation (8) (Xinchun et al., 2017).

$$AWA_{blue} = \frac{AWU_{blue} \times WR_{blue}}{WU_{blue}} \quad \text{Equation (8)}$$

Where, AWU_{blue}, WR_{blue} and WU_{blue} are the agricultural water use, blue water resource, and blue water used by all sectors, respectively.

RESULTS

The results illustrate the average virtual water of different crops cultivated in Tehran in 2007–2014. The virtual water of different crops depends on productivity and water requirement. In Tehran, pistachio consumed high virtual water. The blue and green virtual water for production of pistachio was 756 m^3/ton and 10,355 m^3/ton, respectively. Additionally, the green and blue virtual water for the production of cotton was 410 m^3/ton and 4293 m^3/ton, respectively. Besides that, cotton, walnut, almond, and wheat had large total green and blue WF, amounting to 11.111m^3/kg, 4,703 m^3/kg, 3,932 m^3/kg, 3,217 m^3/kg, and 1.817 m^3/kg, respectively (Figure 1).

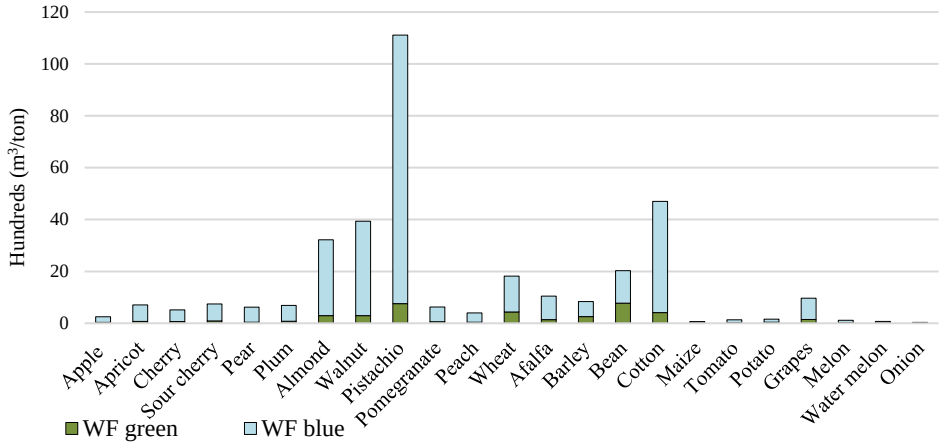

Figure 1 The average virtual water (m^3/ton) of different crop productions in Tehran province, 2007–2015

The average blue and green water footprints (2008–2015) of barley was 844,204,277.33 m^3/year, consuming 33% of water resources in the agriculture sector. Production of peach and wheat consumed 369,008,329.2 2 m^3/year and 345,494,549.78 m^3/year of green and blue water in Tehran, respectively. Besides that, apricot, apple, maize, sour cherry, grapes, cotton, cherry, tomato, pear, and plum consumed 298 MCM (million cubic meter), 119 MCM, 81 MCM, 68 MCM, 62 MCM, 45 MCM, 41 MCM, 19 MCM, 13 MCM, and 10 MCM of blue and green water resources, respectively. Other crops including potato, melon, watermelon, and onion consumed 9 MCM, 7 MCM, 1 MCM, and 1 MCM of blue and green water resources, respectively (Figure 2).

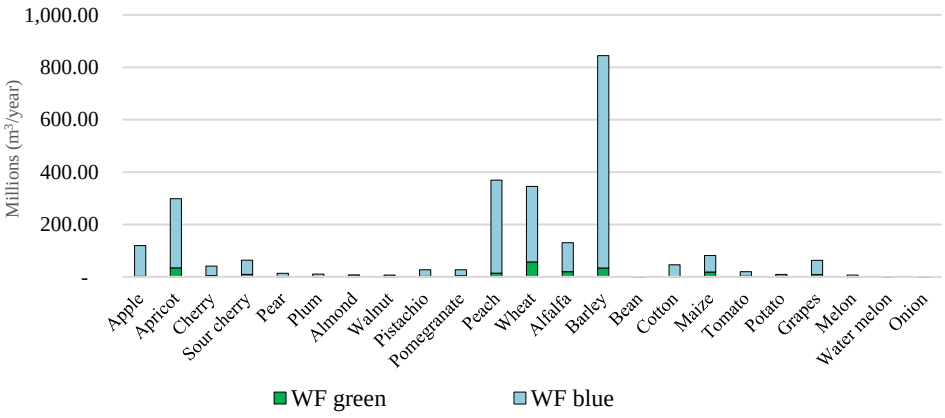

Figure 2 The average blue and green water footprint of crop production in Tehran (m^3/year)

The proportion of crop water footprint in relation to crop production in Tehran province is illustrated in Figure 3. The average total blue and green water footprint during 2007–2015 was 2,422,200,987.18 m^3/year. Barley and peach consumed the largest total water footprint; altogether accounting for 48% of the total agricultural water footprint in this province. Moreover, wheat and apricot consumed 14% and 12% of blue and green water resources in Tehran, respectively (Figure 5). Other crops including apple, cherry, sour cherry, cherry, pear, plum, almond, walnut, pistachio, pomegranate, alfalfa, bean, cotton, maize, tomato, potato, grapes, melon, watermelon, and onion altogether consumed 26% of the total water footprint.

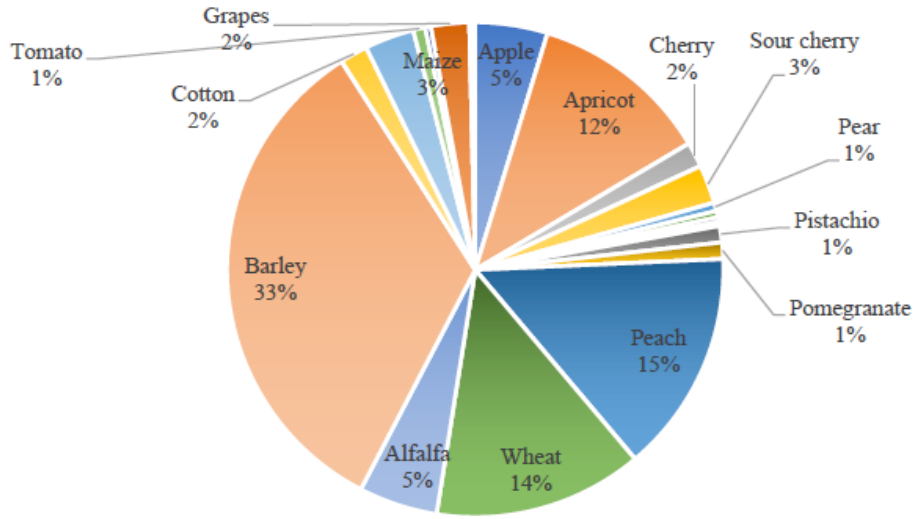

Figure 3 The contribution of water footprint of different crops to the total water footprint of Tehran province

Average total blue water footprint from 2007 to 20015 was 100,392,161.52 m^3/year. Barley and peach had the largest blue water footprint accounting for 35% and 15% of the total blue water footprint for Tehran province, respectively. Wheat and apricot consumed 14% and 12% of total blue water footprint in agricultural sector. Other crops consumed 25% of the total blue water footprint (Figure 4).

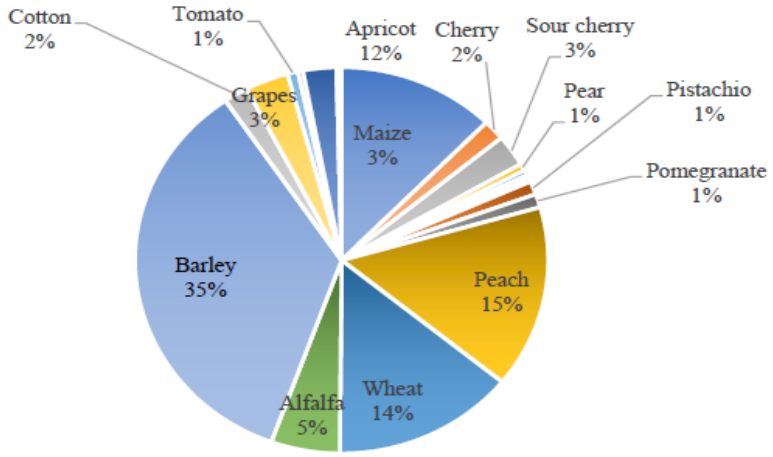

Figure 4 The contribution of blue water footprint of different crops to the total water footprint of Tehran province

The average total green water footprint was 10,132,557.15 m3/year (2007–2015). Wheat and barley have the largest green water footprint. Both account for 40% of the total green water footprint in Tehran province. Apricot consumed 15% green water resource, which amounted to 34 MCM/year. Maize and alfalfa contributed the same ratio of green water footprint, which accounted for 18,736,933 m3/year and 19,971,664 m3/year, respectively, or 8% of the total green water footprint. Other crops altogether consumed 29% of total green water footprint in Tehran. Besides that, all of the fruits contributed to 41% of the total water footprint in Tehran (Figure 5).

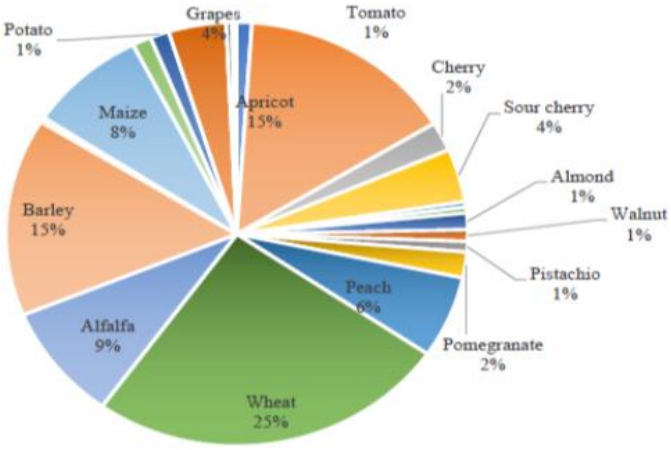

Figure 5 The contribution of green water footprint of different crops to the total water footprint of Tehran province

Water footprint trend in Tehran

The total water footprint of crop production in Tehran has increased from 986.857 MCM (2008) to 1,097,738,205.2 m^3/year (2015) (Figure 6). The water footprint of wheat decreased from 366.868 MCM (2008) to 297.899 MCM because productivity increased in 2015 (4.83ton/ha) in comparison to 2008 (3.2 ton/ha). The water footprint of all fruits increased because the volume of production was also increased. However, the water footprint decreased from 2009-2011 because productivity increased during these years. The water footprint of alfalfa was increased from 116 MCM to 193 MCM in 2008–2015 (Figure 8). The water footprint of barley increased from 34 MCM/year to 131 MCM in 2008–2015 because the volume of production has increased. The water footprint for the production of maize increased from 66 MCM to 113 MCM.

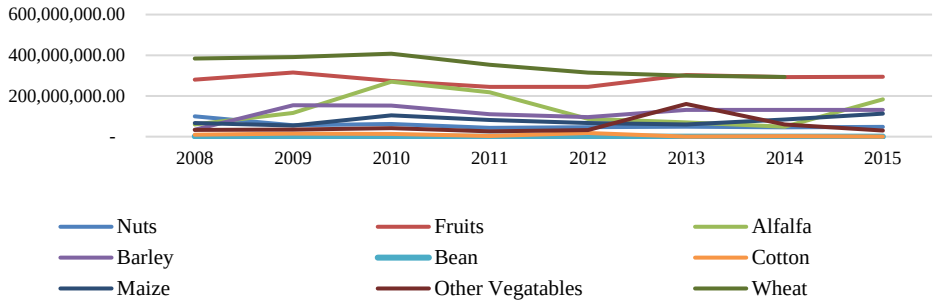

Figure 6 The trend of water footprint (m3/ton) of different crops from 2008 to 2015

Blue water stress in Tehran

Blue water stress in the agricultural sector in Tehran was evaluated. The blue water stress was 0.64 (high class) in 2015–2016, which indicates high blue water stress in the agricultural sector. This means that the production of agricultural crops in Tehran is unsustainable.

DISCUSSION

During the period 2008–2015, barley and wheat consumed 1198698827 m^3/year, and approximately 1/2 of agricultural water withdrawal was allocated to the production of these crops in Tehran province. The contribution of green water in the production of cereal was just 8%. The findings from this study suggest that the production of wheat and barley should be reduced since these crops are more dependent on limited blue water resources. Besides that, the production of wheat and barley have the largest water footprint in Tehran in comparison to the global average water footprint (Mekonnen & Hoekstra, 2010). Additionally, the production of some fruits such as peach and apricot in Tehran should be reduced since these fruits altogether consumed 27% of the blue water resources in

Tehran. The water footprint of some crops such as watermelon, melon, and onion is the lowest in Tehran. This study, therefore, suggested increase in the cultivation of these crops, as they have shown the highest productivity.

It is concluded that the water footprint (m^3/ton) of crops relies on productivity. Besides that, the water footprint also showed an increasing trend whenever productivity decreased. The green water footprint was the largest footprint contributing to the total water footprint in 2007, but in 2015, this footprint was the lowest because the precipitation in 2015 was lower than 2007 and 2015 was a dry year.

In a previous water footprint assessment of Iran (Ababaei & Etedali, 2014), the water footprint of cereal production was evaluated on a national scale. This research, however, investigates the water footprint of all crops in the province of Tehran as well as the water footprint trend spanning 9 years. The water footprint of crops (2008–2005) in this this research is slightly larger than the water footprint assessment by Hoekstra (1996–2005) (Mekonnen & Hoekstra, 2010) because climate and productivity were different.

CONCLUSION

The total average water footprint (excluding the grey water footprint) for production of crops in Tehran province from 2008 and 2015 was 1,069,096,320.93 m^3/year. Blue water footprint contributed the largest footprint (91%) in the total water footprint for Tehran province because of the climate condition in this province. Total water footprint was slightly increased from 986,857,963m^3/year (2008) to 1,097,738,205.2 m^3/year (2015). The water footprint in Tehran relies on productivity, which differs from year to year. Reduced productivity contributes to increased total water footprint. The total water footprint in 2015 was higher than that of 2008. Green water footprint is dependent on rainfall. The green water footprint in Tehran increased in the year observing high precipitation. The production of cereal consumed half of the water withdrawal in the agricultural sector. It is suggested that the production of wheat and barley be reduced since the production of these crops relatively depends on limited blue water resources. Besides that, decision makers in the agricultural sector should reduce the production of crops with high water footprint, so as to reduce pressure on water resources in Tehran. Moreover, agricultural blue water scarcity accounted for 0.6 (in the severe class of water stress) in 2015–2016. The WF of crop production depends on productivity and climate condition. The green WF is reliant on rainfall. It is, therefore, suggested that the production of cereal in Tehran be reduced since the production of these crops is highly dependent on limited blue water resources. In the future, the water footprint assessment particularly blue water footprint will be evaluated separately to obtain separate ground and surface water footprints and, in turn, ground and surface water stress, respectively.

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THE BEHAVIOURS AND JOB POSITIONS OF CITIZENS IN SMART CITIES' DEVELOPMENT

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Abstract

Of the three major actors in smart cities, citizens have the most ambiguous roles, unlike the government which is the clear decision-maker, and the private technological players which are obviously supposed to provide state-of-the-art technologies to smart cities. Evidently, the possession of ambiguous characteristics or vague roles can result in the manipulation and subjugation of the general public by the power-holders. Thus, the objective of this paper is to identify the desirable characteristics – including the behaviours and job positions – of the citizens who participate in the development of smart cities. Following the conduction of semi-structured interviews on the stakeholders of smart cities, it was found that citizens can actually be (1) active and independent volunteers in public life, (2) local champions or co-producers of public values, as well as (3) aware and educated-intention human sensors who drive changes, instead of being passive users of data or beneficiaries of services. It has been argued that the creation of smart cities is reliant on a deeper understanding of the citizens' characteristics, apart from the implementation of policies which generate aware and civic-minded citizens.

Keywords: role of citizen; public participation; smart city; public engagement

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INTRODUCTION

At the moment, although the concept of smart cities is ill-defined and suffering from a wide variety of definitions from various paradigms (Albino, Berardi, & Dangelico, 2015; Lara, Moreira Da Costa, Furlani, & Yigitcanlar, 2016; Mora, Bolici, & Deakin, 2017), there is a general consensus that three-way interactions which involve the governments (institutional factor), corporates (technological factor), and citizens (human factor) constitute the fundamental components of a smart city (Nam & Pardo, 2011). However, recent studies on Smart London (Willems, Bergh, & Viaene, 2017) and Dublin (Cardullo & Kitchin, 2017) have revealed that the characteristics of the citizens of such cities are still unclear, and that the individuals are mostly playing the role of passive beneficiaries.

Thus, the objective of this paper is to identify the characteristics of the citizens who participated in the development of smart cities. As such, the research question that has been looked into is the existence of newer characteristics in citizens who were involved in the same.

CITIZEN'S CHARACTERISTICS

In the 1990's, citizens were not central to the development of smart cities, even though the latter have been built to improve the quality of life (Koolhaas, 2014). Evidently, the earlier concepts of smart cities have intrinsically considered citizens to be 'passive' recipients of services and beneficiaries of activities (Castelnovo, 2016). It is true that citizens have very few choices, if at all, to decide whether or not to participate in the initiatives of smart cities or the programmes organised by the local authorities. However, the citizens still have to constantly update their knowledge of the rapidly-changing technological applications, or risk being left behind.

The above situation has prompted some scholars in the early 2010s to redefine smart cities such that citizens are given due precedence (Chourabi et al., 2012; Nam & Pardo, 2011). Accordingly, several orientations have been proposed with respect to the smart cities' initiatives. For example, Chourabi et al. (2012) has advocated that such initiatives allow the members of the cities to participate in the governance. In time, these ideas have been accepted in policies like Smart Barcelona and Smart London. As a result, the citizens are gradually taking on the 'active user' role (Castelnovo, 2016). In other words, they are increasingly being allowed to become co-producers (Bovaird, 2007; UCLG, 2016), providers of information, and human sensors (Linders, 2012; Berntzen & Johannessen, 2016b; Vanolo, 2016) to help the cities become smarter.

According to the literature on public administration, the 'active' characteristic of the citizens has long been studied as part of the dynamic relationship between public administrators and citizens (Callahan, 2007; Thomas, 2013; Vigoda, 2002). In fact, the said attribute is still subjected to on-going debates. Logically, the citizens of smart cities should be active in the sense that

they need to continuously participate in public life and help drive the ever-changing technologies. Other than being active, they are supposed to be more 'independent', or less reliant on governmental resources (Giffinger et al., 2007; Castelnovo, 2016b). This is crucial as the smart cities are getting increasingly democratic in nature (Araya, 2015). When cities are built in a similar manner to those of democratic ecologies or nations, the citizens will need to continuously create public values as well, by means of voting and participating in voluntary work (Giffinger et al., 2007; Nam & Pardo, 2011).

In this study, we have come up with five possible characters (or behaviours) and eight roles (or job positions) for the citizens of smart cities. The former comprises 'active', 'independent', 'aware', 'creating public values', and 'educated-intention', while the latter includes leaders, local champions, co-producers, entrepreneurs, proposers, human sensors, volunteers, and experts. The definition of each term is provided in Tables 1 and 2. As per Callahan (2007), the aforementioned characteristics are not mutually exclusive; rather, any of them can dominate at a given point in time. Furthermore, the (identified) roles and the subject of interaction are possibly influencing the other citizens' behaviours (Vigoda, 2002). For example, a local champion and a less-responsive local authority are possibly stimulating the other communities' behaviours to become more aware, and independent.

Table 1 Construct definitions for citizens' characters (behaviours)

Term	Construct Definition	Reference
Active	Active citizens participate in public life, where they take part, respond, care for each other, collaborate in exercising power, and make efforts to help, but not to interfere or leave something to happen by itself (i.e. in decision-making).	Vigoda (2002); Giffinger et al. (2007); Callahan (2007); Chourabi et al. (2012); Thomas (2013); Alonso & Castro (2016); Castelnovo (2016); Berntzen & Johannessen (2016a)
Aware	'Aware' citizens are well-informed with up-to-date information and civic-minded. They know and care on what is happening in the system of the city and government from inside and also the surrounding competitions.	Alonso & Castro (2016); Castelnovo (2016); Willems et al. (2017); Boyte (2018)
Independent on government resources	Independent citizens are democratic; they are self-decisive and free. They could have the right to choose and could have control over the data they generate. They are able to self-create resources and decide on the subjects that matter to their cities.	Giffinger et al. (2007); Morison (2007); Castelnovo (2016)
Educated-intention	'Educated-intention' citizens are those who are well-equipped with knowledge and are college graduates. They intent to learn new skills and communicate through various channels.	Winters (2011); Castelnovo (2016); Willems et al. (2017)
Public values creation	This character is important in the sense that citizens take part in politics, voting, and voluntary work. These values are of the interest of the people, and can benefit the public or even future generations.	Giffinger et al. (2007); Nam & Pardo (2011); Castelnovo (2016)

Table 2 Construct definitions for citizens' roles (job positions)

Term	Construct Definition	Reference
Leader (Synonym: decision-maker)	Citizens may act as leaders of local community organizations, in which they make decisions, distribute resources such as funding and human capital, as well as mediate between public organizations and individuals. They should have the qualities such as accountability, approachability, and decisiveness. Quality: to lead, decide, and mediate	Bovaird (2007); UCLG (2016); Harrington (2017)
Local Champion	Champions are citizens or community organizations who take part in meetings to stimulate common interest and bring about changes. They sometimes donate money to tackle local issues. Quality: to stimulate interest	Baldersheim (2013); MCMC (2016); Harrington (2017)
Co-producer (Synonym: co-creator, co-manager)	Citizens may act as co-producers in the chain of public services. They plan, cooperate, negotiate, manage, or deliver along with power-holders or service-providers. Quality: to negotiate or produce	Bovaird (2007); Castelnovo (2016); UCLG (2016)
Entrepreneur	Entrepreneurs are the ones who cause commercial, social, and mature organization innovation in smart cities and communities. They bring in disruptive or incremental changes. The motivation for changes vary from wealth seeking, to creative accomplishments, and to the greater public good. Quality: to innovate and compete (economically)	Harrington (2017)
Proposer (Synonym: advisor, citizen sourcing-design)	Citizens may act as proposers, where they are able to suggest alternatives, make additions to proposals, facilitate feedback, and provide advice to plans. Quality: to suggest or advise	Linders (2012); Willems et al. (2017); Cardullo & Kitchin (2017)
Human sensor (Synonym: information provider, data point, citizen-sourcing - monitor)	Citizen may act as human sensors to make information contributions to smart cities through their daily activities, in which data is created and shared in real time. The challenging part is to convert the unconscious human sensors to conscious data-providers so as to protect their privacy. Quality: to create or share data	Linders (2012); Berntzen & Johannessen (2016b); Vanolo (2016); Castelnovo (2016); Cardullo & Kitchin (2017)
Volunteer	Sharing and helping are considered as acts of volunteerism. Therefore, in smart cities' technological applications, citizens play a vital role as volunteers by contributing all kinds of efforts and support. Most importantly, they contribute without demanding for returns. Quality: to contribute time or effort	Berntzen & Johannessen (2016b); Harrington (2017)
Expert (Synonym: citizen professional)	Citizens may be experts in sharing their competence, experience, knowledge, special skill & insights, or draw out others talents and capacities Quality: to share competence or experience	Berntzen & Johannessen (2016b); Boyte (2018); Bason (2013)

METHOD

This study – which was carried out during the Smart Selangor Conference 2017 (MBI, 2017) – was part of a larger research on the citizen-centricity of smart cities. Being the most developed state in Malaysia, Selangor has adopted the Smart State vision since 2015 (Fong, 2017; SSDU, 2016). Accordingly, the above conference has invited various stakeholders of smart cities to get together and share new technologies as well as networks.

Convenience sampling was performed, following which the informants were interviewed with reference to semi-structured questionnaires that consisted of (1) questions on demographic details of the respondents, as well as (2) questions on the citizens' characteristics and roles mentioned in the previous section. The informants provided data from the views of power-holders and have-not citizens. Data collection was stopped when the informant count was 18 because the answers began to repeat, and the contents attained a saturation point (Laher & Botha, 2012). According to Laher & Botha (2012), there is no exact sample size for qualitative study, however it should not be too small (i.e. 1 or 2 samples) or too big (i.e. more than 100 samples). For example, a qualitative citizenship study by Williams (2014) has interviewed 20 informants.

Thematic analysis was executed to identify the codes, categories, and themes from the verbatim data (Merriam & Tisdell, 2016). Atlas.ti v.7.5.7 and Mendeley v.1.19.1 software have been used to facilitate the analysis.

FINDINGS

Demographics Details of Informants

The informants have been selected in such a way that there is maximum diversity among them (in terms of gender, age, local and global views, education level, experience in the field of smart cities, serving sector, as well as role in smart cities), as described in Table 3. In terms of nationality, the majority (11 of 18) informants were from Asia (eight from Malaysia, and one each from Indonesia and Taiwan; the remaining informant declined to reveal his identity owing to protocol restrictions). Meanwhile, four were from Europe (two from Spain, and one each from Netherlands and Sweden), and three were from the United States, Dominican Republic, and Turkey respectively.

As for experience in the field of smart cities, six of the respondents had 11 – 20 years of experience, six more 1 – 5 years, three more than 20 years, and the remaining three 6 – 10 years. With respect to the sector in which the respondents were serving, nine of them were in the private sector, seven public sector, and two public-private partnership companies. To ensure the privacy of the informants, symbols have been used to represent the stakeholders' roles or positions in the development of smart cities. For example, 'PC' denoted

politicians, 'O' federal or state officers; 'LA' local authority officers, 'R' residents/ community representatives, and 'P' for private sector workers.

Table 3 Demographics of informants (N = 18)

	Frequency		Frequency
Gender		**Experience in smart city & engagement field**	
Male	15	More than 20 years	3
Female	3	11-20 years	6
Age		6-10 years	3
22 to 40	8	1-5 years	6
41 to 60	9	**Sector serving**	
61 and above	1	Public	7
Nationality		Private	9
European	4	Join Venture of Public and Private	2
American	1	**Stakeholders' Position**	
Latin American	1	Politicians (PC)	1
Middle East	1	Federal/ State Officers (O)	2
Asian (8 Malaysian)	11	Local Authority Officers (LA)	5
Highest level of education		Residents/ Community Representatives (R)	5
PhD	4	Private Technologies & Developers (P)	5
Master's degree	5		
Degree	7		
Diploma	2		

Analysis of Citizen Behaviours/ Characters

The majority of the informants (PC1, O1, O2, LA2, LA4, LA5, R1, R2, R3, P3, P4 and P5) agreed that activeness was the most important characteristic in citizens who participated in the development of smart cities. According to PC1, active citizens are very valuable partners in the abovementioned exercise; authorities who simply make decisions on behalf of the citizens will fail to activate the latter.

> "*Active citizens can be a big asset in the value proposition of smart city initiatives. Active citizens are valuable to partner with, as I mentioned before, in the end, the end user is important. So if you don't encourage your citizens to be active by making decision for them, eventually they are not gonna accept it well*." (PC1:174)

However, P3 argued that active citizens hardly existed in reality, even though they were highly important. While the government desired to have more active citizens, the latter are usually too busy making their ends meet. Likewise, LA2 opined that there is a limit to citizens' activeness in the sense that these individuals can actively provide constructive feedback, but not modify every decision undertaken by the policy-makers.

Apart from being active, the citizens should be aware in order to facilitate the responsive development of smart cities. As such, awareness is more important than the level of education (PC1, P3 R2, R3, R4, R5, P1, LA1, LA2, and LA3). It was mentioned by PC1 that not all 'educated-intention' citizens are sufficiently

civic-minded and interested to contribute to a smart city's initiatives and programmes organised by the local authorities. Rather, citizens with high levels of awareness were more likely to do so. Nevertheless, P2, R1, and LA1 argued that most of citizens were not aware since they lacked interest in public life. As such, local governments need to constantly cultivate aware citizens.

The majority of the informants did not relate independence on governmental resources with the development of smart cities. Conversely, the said respondents opined that citizens have to depend on resources provided by the government, especially during the early phases of the implementation of initiatives in such cities. However, according to LA4 and PC1, the citizens should learn more skills and be independent over the longer term, in view of the fact that more independent citizens enhance the development of smart cities. Meanwhile, P3 claimed that there is a possibility for community schools to be managed by the public without completely relying on the government. For example, a kindergarten facility can be provided by the authorities; from there, the premise is self-managed by the community via online platforms.

Most respondents were unfamiliar with the creation of public values. Be that as it may, they felt that the abovementioned exercise is a huge challenge because the citizens of smart cities are generally self-centered (P5) and might not all be interested to participate in public life (PC1). Additionally, the creation of such values is an uphill task as these are naturally and culturally inherent (LA4). According to LA4, selflessness generally manifests in times of hardship like crises or disasters. For example, following the hurricane in Texas (Gonzalez, 2017), the communities came together to help each other despite the immense societal diversity. Nevertheless, these rarely happen in normal life.

Other characteristics like 'driving change' (by O2, PC1, P3, LA4, and LA5) and 'empathy' (by P5 and LA4) have surfaced during interviews. Citizens can drive changes instead of merely waiting for help from the government. LA4 gave an example that in response to emergencies, citizens can actually initiate disaster relief efforts. Furthermore, with compliance to the existing laws, such relief works can involve the creation of websites that identify the locations of emergency supplies, or donated supplies and medicines. On another matter, P3, P4, and LA4 stated that citizens can make changes by voting for their desired leaders during elections as well.

Empathy denotes an attempt to include all feedback and accept all differences in order to come up with better solutions to problems. P5 added that a competent and empathetic person will recognise not only his/ her interests, but also those of others, thereby leading to co-production.

Analysis of Citizen's Job Positions/ Roles

Next, the possible job positions or roles of the citizens of smart cities were analysed. The general view of the informants was that citizens are not in an ideal position to become the leaders of all the initiatives of smart cities. Rather, they are only suitable to act as local champions who connect communities and expand common interests with the government. P4 opined that the leaders should comprise elected politicians. However, it is interesting to note that in Barcelona, neighbourhood leaders can eventually become councillors.

On another matter, there were differing views in terms of the co-producer role of the citizens. Evidently, the majority of the interviewees have never encountered this term before. Following explanations from the researchers that the concept is similar to partnerships and workload-sharing, the informants started to put forth ideas. P5 mentioned that it is possible to co-produce, but this is influenced by self-interest. For example, in Malaysia, a certain race or religion may be given priorities over others during the selection of co-producers. Nevertheless, P3 supported the idea of co-production. Additionally, according to R4, Barcelona is now focusing on co-management, whereby the government provides infrastructures like neighbourhood kindergartens, apart from allowing the communities to form committees and manage these facilities as per their needs.

The prevailing opinion of the respondents was that entrepreneurs are important for delivering economic innovations and financial assistance to the residents of smart cities. However, most of the citizens are not suited to become entrepreneurs because, according to R4, P1, and P4 not all citizens like to be involved in businesses. Rather, this role is only desired by business owners. Still, it is the duty of the government to assist in economic matters.

With reference to the role of a proposer, LA5 described a scenario in Indonesia in which village communities can come up with programmes and applications to improve their neighbourhoods. Through these, they can access governmental websites and, for instance, request the authorities to fix neighbourhood amenities like parks. Likewise, P4 – a private consultant – mentioned that citizens can come up with ideas during meetings; this practice is very much emphasised in Barcelona.

Human sensors are involved in the conscious or unconscious sharing of information or provision of data. Some of the informants (R1, R2, R3, R4, LA1, and LA2) mentioned that they have not heard of the term 'human sensor' before. Still, LA5 felt that idea-sharing by the community through online platforms can give rise to the generation of more solutions. An example of the effectiveness of human sensors by O1 revolved around the abandoned shopping trolley problem in common areas in Singapore. On the other hand, P3 pointed out that citizens are not in favour of sharing data with the government, even though they readily do so to like-minded people or through Facebook.

Citizens can act as volunteers – is the most desired role as per the informants' feedback. A smart city needs volunteers with altruistic mentalities. According to LA4, the desire to participate and help without receiving obvious benefits makes it the most important role of a citizen. Conversely, R4 opined that smart cities are supposed to have fewer volunteers, and a larger number of the same shows that the infrastructure of the city needs human assistance and hence, are not smart enough.

Last but not least, all informants except for PC1 and LA2 agreed that citizens can become experts who contribute their skills and knowledge to make cities smarter. As per LA2, public professionals have vast experiences and expertise in their respective fields, while general citizens should listen and provide opinion instead of assuming the role as experts. Otherwise, no additional roles have been raised by the informants.

DISCUSSION ON CITIZENS' CHARACTERISTICS

This study has attempted to elicit the desirable characteristics of citizens who participated in development of smart cities direction. All characteristics and roles which have been mentioned in the previous section came mainly from the current literature on smart cities, and these have been cross-checked with those on public administration. Comparisons between both types of literatures, apart from the attempts to redefine the possible roles of the citizens (Cardullo & Kitchin, 2017), have revealed that some of the said characteristics are not totally new; rather they are less-commonly heard of in the development of smart cities amid the prevalent roles of social media (Linders, 2012) and other technologies.

The relatively newer characters (i.e. independence and creation of public values) and roles (i.e. co-producers and human sensors) were somewhat alien to the informants. Evidently, this finding is in line with those of the smart city literatures, as summarized in Tables 1 and 2. Another noteworthy outcome was that according to one of the informants, all the above mentioned characteristics are not mutually exclusive. Simply put, in real practice, the roles and characteristics of the citizens can be interchangeable, depending on the levels of interaction and cooperation between the citizens and governments.

As per the interviews, two new characters have also surfaced, namely 'driving change' and 'empathy'. Apparently, citizens have the ability to drive changes in smart cities, provided that they are aware of the happenings in and around the area (Giffinger et al., 2007). This type of change is related to citizen-sourcing, whereby citizens help the government to be more responsive and effective (Linders, 2012). Also, the former can act as entrepreneurs (Harrington, 2017) to influence the direction and outcomes of the policies, apart from improving the government's awareness of the current situations. While empathy has been mentioned in the literature on smart cities (Lee, Hong, & Jeong, 2016; Thomas, Wang, Mullagh, & Dunn, 2016), it has not been explained. Evidently, it

refers to a human quality which accepts differences (in terms of opinions, interests, or problems), in addition to observing, and sympathising. Empathy may even be related to awareness and civic-mindedness, both of which are attained through self-tracking (En & Pöll, 2016). Anyhow, this characteristic is highly important and can also be a part of public values. Hence, further explorations into the same are needed in the future.

As per the analysis of the eight job roles, these were adequate to cover the possible roles within the scope of knowledge of the informants. In fact, all the proposed roles – except for several controversial ones like entrepreneurs and leaders – were accepted by informants. Although Harrington (2017) have proposed the 'entrepreneur' role for the citizens, we concur with respondents that such a role is only appropriate for business owners and their ilk. On another matter, leaders are largely confined to politicians. Rather, 'local champion' appears to be a more suitable term to address the gap between the community and the government.

In fact, with respect to the classification mentioned in this paper, a behaviour (action) which could be turned into a 'job' or 'post' would have been categorised as a role rather than a character. Two cases will be presented to explain this. First, sharing of information or provision of data is an action that is becoming more important in smart cities. In fact, this can be further developed into a salaried job (i.e. 'human sensors') in the future. Second, actions like co-production and co-management are highly likely to be transformed into an occupation (i.e. 'co-producers') as well (Tables 1 and 2).

CONTRIBUTIONS AND LIMITATIONS

This study has filled the knowledge gap pertaining to the characteristics of the citizens who participate in the development of smart cities. It has also answered the research question on the newer characteristics of the said citizens, apart from conceptualising the same with respect to the development of smart cities. For example, instead of being passive users of data or beneficiaries of services, citizens can actually be (1) active and independent volunteers in public life, (2) local champions or co-producers who create public values together, as well as (3) aware and educated-intention human sensors who drive changes.

One of the limitations of this study was the mutually-exclusive nature of the aforementioned characteristics (Callahan, 2007). In reality, both citizens and public professionals will find it difficult to adopt these characteristics to achieve the objectives of the smart cities. While the semi-structured interviews with the stakeholders have elicited valuable opinions, the convenient selection of the informants might have reduced the validity of the results since the respondents' opinions were subjective.

CONCLUSION AND SUGGESTION

The development of 'smarter' cities is not always in accordance with the descriptions by mainstream corporates (e.g. IBM and Cisco) that solely focus on technology-led strategy (Mora, Deakin, Reid, & Angelidou, 2019). Rather, it is a holistic process which requires deeper understanding of the citizens' characteristics. Thus, in the drafting of policies for smart cities, it is strongly recommended that the authorities prioritise on the cultivation of aware and civic-minded citizens in readiness for driving cutting age technologies. Doing so is definitely better than merely giving precedence to the provision of basic ICT infrastructures.

In a nutshell, it can be concluded that the aforementioned desirable characteristics of the citizens of smart cities are at an early stage of manifestation. This is because technology changes and develops, subsequently giving rise to new possibilities that assist in the creation of smarter cities. Data triangulation and verification by means of quantitative questionnaire-based surveys are recommended to confirm and fine-tune the results of this study.

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THE NEED FOR THE IMPROVEMENT OF STREET VENDORS MANAGEMENT IN PUBLIC SPACES AT SURAKARTA CITY

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Abstract

The presence of an activity in a public space should not obstruct the right of other users. In order to create an ideal public space as a shared space, the existence of various activities such as street vendors (SVs) must be properly managed. SVs, as well as other activities, should strengthen the function of public spaces and not the other way round. Stabilisation is implemented by regulating several characteristics of SVs location and activity as a form of SVs management in public spaces. This idea became the entry point for SVs improvement, although so far SVs conditions have not been optimally improved. Some new components/ indicators of arrangement will enrich the efforts for stabilisation. In this study, the analysis technique of partial least square (PLS), which negates a variety of assumptions was applied to test the effect of stabilisation on the change or improvement of SVs' welfare, behaviour, and location. The results show that the enrichment of components in stabilisation arrangement has a positive and significant effect on the three elements of SV improvement. The effect of stabilisation on SVs' behavioural changes had the highest value if compared to that of welfare and location changes.

Keywords: Stabilisation, public space, welfare, behaviour

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INTRODUCTION

Surakarta city has long conducted SVs stabilisation at the governmental public spaces such as those located around pedestrians (without disturbing the right of pedestrians), city park, and open space. This step was taken by the government as a way of accommodating the needs and fulfilling the characteristics of SVs as well as keeping the beauty of the city. This further indicates that Surakarta city has made serious efforts in developing a good planning system that enhances city management and that equally conform to social justice and the beautification of the city which is sustainable (Hudalah, Winarso, & Woltjer, 2010; Buchori, 2011). If the regulated stabilisation is not conducted, SVs will be regarded as a city element that is detrimental to the visual aesthetics of the environment, unexpected, and vulnerable to raise the conflict of space exploitation (Shirvani, 1985; Yatmo 2008). In addition, Yatmo (2008) calls that element *out of place*. In order to make SVs an element that contributes to the environment, its presence needs to be recognised and facilitated in the city development plan (McGee & Yeung, 1977; Lefebvre, 1991; Yatmo, 2008). Accordingly, the state of ignored elements, out of place, or city pathology can ultimately change into an energetic city as the expected condition of SVs resulted from stabilisation in Surakarta City nowadays.

In Surakarta, stabilisation is undertaken by stipulating a location whose basis is a public space to be a legal retailing area for SVs through building some shelters, although the related retailing activities are still regarded informal (McGee & Yeung, 1977; Kettles, 2007; Puspitasari, 2010; Tualeka, 2013; Schindler, 2014; Linares, 2018). According to Rahayu (2016), the success of arranging SVs in a public space will become one of the keys to successfully reduce poverty. While arrangements have been made, the increase in SV conditions has not occurred optimally. Therefore, some new arrangement components/ indicators are needed to enrich stabilisation efforts, in order to obtain optimum results.

The arrangement of SVs is one of the forms of interaction between humans and its surrounding environment (Rahayu, 2016). This interaction will lead to changes (Bintarto, 1989). These changes include welfare, location, and behavioural changes. Sunaryo (2004) also states that the physical condition of environment will really influence humans, either knowingly or unknowingly, so that it causes a change.

In the meantime, the objective of development *per se* is to achieve welfare (Bintarto, 1989). The constituent of welfare in the context of development can be defined as a change to a better or more qualified condition so that the change which is studied is the existing change of the welfare that aligns with the objectives of SVs arrangement.

Anchored in Koelle (1974), the indicator of welfare is seen from the quality of life which covers several aspects that entail income or material,

physicality and health, mentality such as education, and spirituality pertinent to the sense that SVs arrangement is secured from both crimes and eviction.

A change of location refers to location displacement, which frequently leads to a condition whereby the SVs, in fact, will move their location again over the stated given position even after being officially arranged. In addition, with respect to the change of behaviour on the basis of Bloom's theory (Sunaryo, 2004), it can be split into three domains that comprise knowledge, attitude, and action. In accordance with Muhibbin Syah (2008), knowledge represents any information known by SVs so that they acquire adequate understanding through their five senses. Attitude refers to someone's efficacy playing a role in committing himself/herself to do something. Furthermore, action portrays the skills of psychomotor which manifest the acquired insights or knowledge and the mental attitude. The values consistently embedded in one's self will effectively control him/her. The behaviour in this context is in accordance with a change of behaviour towards the welfare experienced by SVs. This condition entails the improvement of insights or knowledge about welfare, the improvement of attitude towards welfare, and the improvement of action for the sake of welfare.

The existence of SVs can be identified through the characteristics of activities and locations (Mc Gee & Yeung, 1977). Location characteristic, besides being related to the typical features of location, is also connected with the retailing regulation adjusted based on the condition of location (Rahayu, Werdiningtyas, & Musyawaroh, 2016). The characteristic of activity is associated with a variety of activities which become the bases and are influenced by the location *per se* such as the types of goods, the types of trading facilities, the scale of consumer or customer service, capital, and income. There are two factors or characteristics which should be considered while conducting SVs stabilisation namely the characteristics of SVs location and SVs activity which can be intervened by the government (Werdiningtyas, Rahayu, & Musyawaroh, 2012; Rahayu & Musyawaroh, 2013; Rahayu et al., 2016). The aforementioned characteristics of stabilisation entail 21 components of arrangement, including the size of retail units (P1), retail facilities (P2), retailing activity time (P3), SVs grouping (P4), the strategic value of location (P5), accessibility (P6), retail supporting facilities (P7), parking area (P8), lighting (P9), clean water (P10), waste disposal facilities (P11), the aesthetics of location (P12), the distance to activities center (P13), the level of security (P14), the level of cleanliness/ hygiene (P15), the level of convenience (P16), education/ training from government (P17), legality (P18), agglomeration (P19), retribution (P20), and loan assistance from the government (P21) (Mc Gee &Yeung, 1977; Regional Regulation 3/2008 Surakarta City; Donovan, 2008; Werdiningtyas et al., 2012; Novelia & Sardjito, 2015; Rahayu et al., 2016; Widjajanti, 2016). Among the 21 components of stabilisation arrangement, there are 3 new components, namely retribution, the strategic value of location and the aesthetics of location

(Werdiningtyas et al., 2012; Rahayu et al., 2016; Hanifah & Musadun, 2014). The new components will be tested for validity in influencing SVs changes, in addition to the 18 other arrangement components. Therefore, the enrichment of SVs stabilisation components that influence the changes in SVs can be obtained.

METHOD

The area of this study involved 25 locations of SVs stabilisation which were spread across Surakarta City, Central Java, Indonesia (Figure 1). This study used a quantitative method using the data collection technique SEM on the basis of Partial Least Square (PLS) that negates various assumptions as commonly made in the study on the basis of Ordinary Least Square (OLS) (Ghozali & Latan, 2015).

The population of SVs engaged in this study was those retail units in Surakarta city that had been managed through stabilisation, both (a) those existing within the stated location of stabilisation and (b) those having moved over the given location of stabilisation. The tested hypothesis was the effect of stabilisation on welfare development, the change of location, and the improvement of the SVs' behaviours through evaluating (1) outer model with valuing convergent validity, discriminant validity, Cronbach's alpha, composite reliability and AVE, and (2) inner model with valuing F^2 dan R^2. This study uses the loading factor limit of 0.5, cronbach's alpha of 0.7, and the reliability composite value of 0.7. Good results are indicated by numbers above the threshold.

The proportional random sampling technique was applied to get the number of respondents from the SVs that were still present at the location of stabilisation. The number of population was 551 SVs, with the degree of error 5% gained from 213 respondents. The number of population from the SVs that had moved over the location of stabilisation was difficult to be detected, so such SVs incorporated in this study were those who could be encountered by applying incidental/convenience sampling technique. They were 30 SVs that represented them. The exogenous latent variable indicators of stabilisation arrangement include 21 components/indicators, consisting of 18 confirmatory components and 3 exploratory components (new components). In addition, the endogenous latent variables of change or improvement included the variables of welfare improvement (PI), behavioural change (BC) and location change (LC). The indicators of welfare improvement were comprised of income (PI1), health access (PI2), educational access (PI3), and security (PI4). Behavioural change entailed the insights appertaining to income (BC1), those associated with health access (BC2), those related to educational access (BC3), those corresponding to security (BC4), positive attitude towards the standard of income (BC5), positive attitude towards health access (BC6), positive attitude towards educational access, (BC7), positive attitude towards the importance of security (BC8), the efforts to achieve

the standard of income (BC9), the efforts to get health access (BC10), the efforts to access education (BC11), and the efforts to be secured (BC12). The last endogenous latent variable was the location change (LC) at which some SVs had moved over the location of stabilisation, and some others still remained in the location. The stabilisation indicators were assessed using a rating scale 1-7, ranging from bad, moderate, to very good (Sugiyono, 2011). Likewise, the change or development indicators used a scale of 1-7 ranging from very decreasing, steady, to very high.

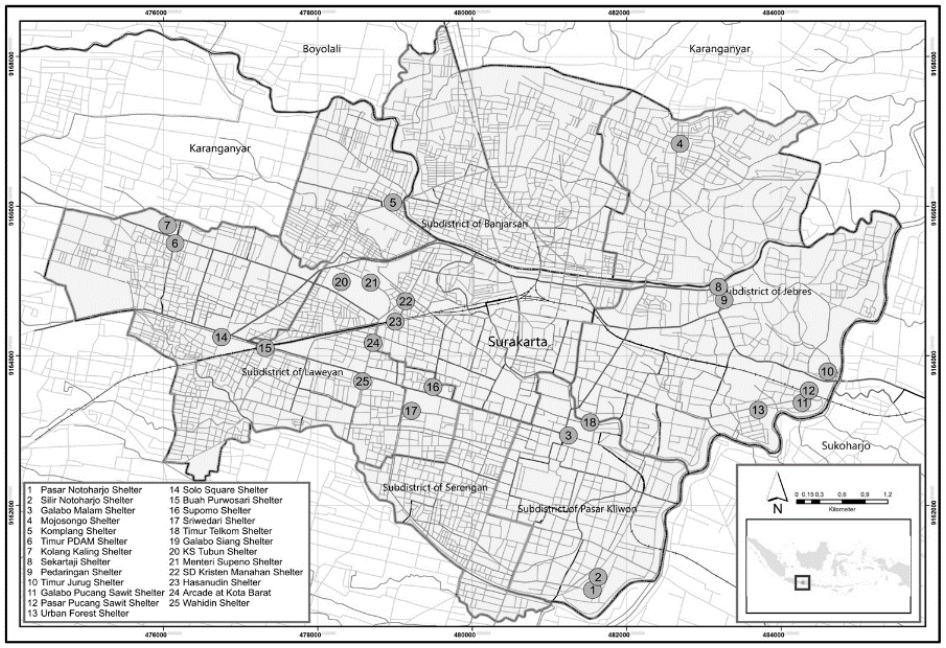

Figure 1 The map of the distribution of street vendor stabilisation locations in Surakarta
Source: Observation results, 2017

RESULTS AND DISCUSSION

Anchored in the data of exogenous variable garnered from questionnaire, it could be discerned that the indicator or component of retribution determination was considered good by most of SVs as represented by 97% of SVs. The components of agglomeration, the level of cleanliness/ hygiene, accessibility, legality, the distance to activities center, the level of security, the strategic value of location, and the level of convenience were valued good by more than 60% of SVs. This condition indicates that these components of arrangement have been adequate in most of the locations, so that the locations are attractive, proximate, and reachable due to existing in a public space (Widyaningrum, 2009; Solomon-Ayeh, King, & Decardi-Nelson, 2011; Onyango, Olima, & Onyango, 2012; Bell & Loukaitou,

2014, Widjajanti, 2016). Appertaining to legality component, the SVs had possessed a placement license as adequate proof in order that they could stay for retailing in an area of a public space whereby their activity status was informal. This condition is viewed by Bromley (2000) as the government ambiguous attitude since though their activities are categorized as informal; such condition is more profitable for the SVs.

For a couple of characteristics/variabels such as retailing activity time, SVs grouping, clean water, and retail facilities were valued good by less than 50% of SVs. It was due to these factors, that some other SVs assumed that those components were not yet optimal in their stabilisation area. Furthermore, a number of components such as the size of retail units, retail supporting facilities, education/training from government, aesthetics of location, lighting, parking area, and waste disposal facilities were only considered good by less than 50% of SVs. These components only sufficed in some locations. The last component was loan assistance from the government. Associated with this component, there were no any SVs who gave the value more than 4. Majority of SVs agreed that the government never allotted an amount of loan to them. In fact, in accordance with Tualeka (2013), loan is the most important thing for the SVs' business nowadays.

With regard to endogenous variable, the welfare improvement in this sense referred to an improvement that occurred after SVs were placed in the stabilisation area. The improvement of security became the first order in the welfare variable which was considered good by most of the SVs. The SVs security from eviction and crimes will lead to a state where the SVs are willing to follow the governmental management (Santos, 2017; Kettles, 2007; Rahayu & Musyawaroh, 2013). SVs do not need to be afraid of either being chased by security forces while they are retailing, or being terrorised by crimes by virtue of staying in a crowded area.

The improvement of access to education took the second highest order to be valued good by the SVs; the improvement of access to health was placed in the third order by the SVs; and the last order was the improvement of income. This is in line with the point conveyed by Onyango et al. (2012) and Rahayu et al. (2016) in which after management, the income improvement is merely experienced by some SVs. According to behavioural change data, it was observed that an improvement mostly undergone by the SVs was at the indicator of action in accessing education and health as shown by more than 70% of SVs. Secondly, it was the action to gain income and to have security. The next most vital improvement was found at the SVs' attitude and insights or knowledge pertinent to the standard of education and health.

The fourth order of improvement happened to the indicators of attitude and insights or knowledge corresponding to the level of security which were experienced by 58% of SVs. The last order for the experienced improvement by SVs was at the indicators of insights or knowledge and attitude towards the

standard of income. Such attitude towards the standard of income meant to express the agreement towards the standard of income gained in every month. The assigned minimum income standard was the UMK of regency or city. These SVs knew and had agreed with the presence of UMK certified by the government in order that the societies could live prosperously. However, for them, the important thing was a real action and effort, not merely insights and attitude towards a governmental policy. More importantly, for them, they expected to have adequate profits from retailing everyday. Of what benefit is the use of knowing and agreeing if there was no real action to achieve it. In fact, the results obtained would only depend on how hard they tried, not on how much they knew and agreed. This is different from Muhibbin Syah (2008) in that between knowledge, attitudes and actions are interrelated. As for the location change, some stabilised SVs moved over to the stated location for various reasons. Some of them considered that the location they occupied was less strategic. This shows that the SVs retailing location is indeed very sensitive to changes or shifts even though they are only a few (Zees & Sugiantoro, 2013). Some SVs assess the location of arrangement is not developed aesthetically, so it is less attractive for visitors to come (Rahayu, 2016).

The next step was data processing using the SmartPLS 3.0 program. Based on the result of the convergent validity test on outer models, it was found that there were 5 components that had a loading factor below 0.5, namely: (P3) the retailing activity time, (P10) clean water, (P17) education/ training from government, (P20) retribution, and (P21) loan assistance from the government, so that those indicators must be removed from the model. As for the obtained AVE value, there were still found some variables that had a value of <0.5 so that the indicators that had the lowest loading factor values must be eliminated as well. They encompassed (P1) the size of retail units, (P8) parking area, and (P11) waste disposal facilities so that a good convergent validity was obtained with AVE> 0.5. Furthermore, it can be seen that valid components/indicators that form the stabilisation arrangement and influence the changes in SVs are (P2) retail facilities, (P5) the strategic value of location, (P6) accessibility, (P7) retail supporting facilities, (P8) parking area, (P9) lighting, (P12) the aesthetics of location, (P13) the distance to activities center, (P14) the level of security, (P15) the level of cleanliness, (P16) the level of convenience, (P18) education/training from government and (P19) agglomeration. The 13 valid arrangement components consist of 11 old components and 2 new components.

Continuously, the reliability test was undertaken. Concerning the result of the reliability test, the Cronbach's alpha value of all constructs > 0.7, and the composite reliability value > 0.7, which meant that all constructs had fulfilled good construct reliability. The estimation result of PLS model can be seen in the following figure.

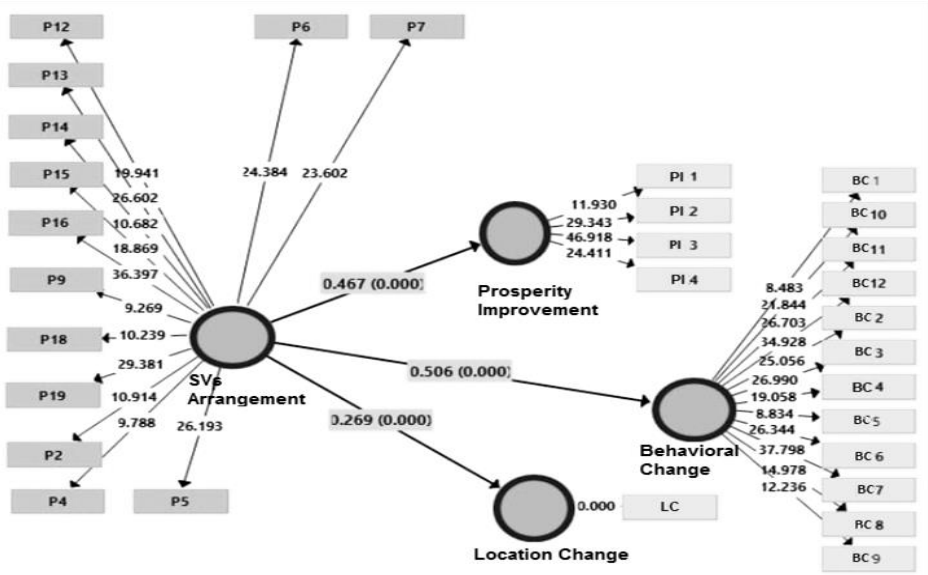

Figure 2 The estimation result of PLS model
Source: Data processing, 2018

Based on the estimation result of the PLS (bootstrapping) model above, it can be explained that p value of the effect of SVs arrangement variable on changes in the SVs welfare is 0,000, with a positive original sample of 0.467. It can be concluded that SVs arrangement has a significant and positive effect on the improvement of SVs welfare as represented by 0.218. This shows that the management objectives are achieved (Regional Regulation No. 3/2008, Surakarta City; Tualeka, 2013). The better implementation of stabilisation arrangements, the better effect on the welfare of SVs.

The p value of the effect of SVs arrangement variable on SVs behavioural changes is 0,000, with a positive original sample of 0.506. It can be concluded that SVs arrangement has a positive and significant effect on the change or improvement of SVs' behaviours as indicated by 0.256. The relationship between activities and the environment will directly be able to change humans' behaviour (Bintarto, 1989).

The p value of the effect of SVs arrangement variable on SVs location changes is 0,000, with the original sample positive 0.269. Hence, it can be concluded that SVs arrangement has a significant effect on SVs location changes as manifested by 0.072. The conducted management will regulate where SVs should be. This is so that SVs can be a positive energy for the city and its people (McGee & Yeung, 1977; Lefebvre, 1991; Yatmo, 2008). The results show that the better implementation of stabilisation arrangements, the better the behaviour of SVs and they feel more convenience in the arrangement location.

The locations of SVs stabilisation which have been set by the government will make those locations legal for SVs even though their activities are still categorized as informal activities (Mc Gee & Yeung, 1977; Kettles, 2007; Puspitasari, 2010; Tualeka, 2013; Schindler, 2014; Linares, 2018). This Surakarta governmental policy, other than to carry out the mandate of Law No. 26/2007 about spatial planning that has to accommodate the informal sectors within its spatial structure, is also in line with the basic problems of Surakarta city. Generally, the basic problems occurring in Surakarta city encompass three cases which entail spatial planning, poverty, and marginal people (Rahayu & Musyawaroh, 2013). One of the problems faced by marginalised people is the presence of SVs.

Surakarta City, likewise in Singapore, arranges SVs in a number of public space locations which are determined by the government. This way, besides preventing slums and congestion, is also capable of attracting tourists (Rahayu & Musyawaroh, 2013; Henderson, 2012). The SVs prefer such management in the form of stabilisation (Lince, 2011; Rahayu, 2016). One of the objectives of the SVs management or arrangement is to create welfare for SVs besides other goals for the sake of the orderliness and the aesthetics of the city. In addition, this finding also aligns with the results of studies conducted by Henderson (2012), and Rahayu and Musyawaroh (2013), whereby the management or arrangement of SVs will influence their income although not all of the SVs gain an improvement.

Besides affecting the increased SVs' income, the SVs management also encourages SVs to have an increased ability to access health and education. SVs themselves realize that becoming SVs is caused by low education and skills. Hence, for SVs, improving their education or their children's education is important in order that they can live more prosperously (Manning & Pratomo, 2013). SVs also want better quality health for themselves and their families in order to continuously work hard and try better. SVs in this sense experience vertical mobility in the aspects of income, education, and health. This is the evolutionary condition as stated by Santos (2017).

After SVs are managed through stabilisation, they can carry out their business calmly and securely because the places where they trade do justice to the proper characteristics and are legal as well. This point becomes an entry for the stabilised SVs to improve their knowledge, attitude, and efforts for the sake of welfare. The increase of behaviours experienced by most of the SVs happen to the improvement of their actions in reaching welfare, the improvement of their knowledge, and lastly, the improvement of their attitude.

This condition indicates that after being managed or arranged, most of the SVs try harder to prosper. Their efforts to become more prosperous are manifested by the improvement of their behaviours in achieving welfare. The

quality of a good stabilisation management is articulated by the SVs through trying harder in doing business so that their welfare increases.

Given the fact that some stabilised SVs, later on, move over to the given stabilisation locations, it indicates that there is a sort of vulnerability from the locations of stabilisation that they occupy. SVs' habit of looking for a location merely based on their intuition but not in accordance with a particular rule (Onyango et al., 2012) eventually leads them to feel that the locations of stabilisation which they occupy are less appropriate based on their perceptions as regards the proper locations they expect. According to the SVs who have moved over to the given stabilised locations, even though their income is mostly increased after getting managed, the welfare has not completely increased in overall. The increment of their income has not yet been in line with the increasing number of their needs. The SVs move over to the designated locations of stabilisation because they expect to gain a significant increase of welfare.

CONCLUSION

Of the 21 stabilisation components/indicators, there are 13 components that are valid in determining the good or bad effect of the SVs arrangement. Within the 13 components, 2 of them are new components/exploratory, namely the strategic value of location and the aesthetics of location. This research has shown the enrichment of components in stabilisation arrangements that affect changes in SVs. Overall, those components encompass retail facilities, SVs grouping, the strategic value of location, accessibility, retail supporting facilities, lighting, the aesthetics of location, the distance to activities center, the level of security, cleanliness/ hygiene, the level of convenience, legality, and agglomeration. The 8 indicators which are not valid in determining the good or bad effect of SVs arrangement are the size of retail units, the retailing activity time, parking area, clean water, waste disposal facilities, education/ training from government, retribution, and loan assistance from the government.

Stabilisation variables have a significant and positive effect on the change or improvement variables, although in the weak category. The better the condition of the components in stabilisation arrangements will lead to better changes in SVs. The order of the effect of the magnitude of stabilisation, which is the most occurrence in behavioural changes, then the changes in welfare, and finally the changes in location.

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ENHANCING THE POTENTIAL OF RECYCLABLES WASTE COLLECTION THROUGH WASTE BANK PROGRAMME: EXPERIENCE FROM HEI IN MALAYSIA

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Abstract

A voluntary approach for recycling programme can be enhanced by the establishment of waste bank in institutions of higher education. Hence, a waste bank programme was implemented in a "close loop" system at the Faculty of Environmental Studies, Universiti Putra Malaysia (FPAS, UPM). This aims to promote collection of recyclable materials and raise awareness among UPM students on the importance of recycling. Throughout the five (5) phases of operation, about 500 students were registered as waste bank members with the amount of total collected recyclables reaching 14,817.46 kg. The direct measurement method was applied in the waste bank operation procedure to weigh the recyclable materials received twice a week. The most frequent type of recyclable material collected was paper, including black/white paper, newspaper, and mix paper. The waste bank programme has enhanced the potential of solid waste minimisation by shifting the amount of waste disposed at the landfill site. Moreover, it enables recyclable materials to be seen as valuable resources as monetary rewards were given to encourage recycling practices among students based on the total weight for each collection of recyclable materials. Therefore, the implementation of the waste bank programme in Higher Education Institutions (HEI) in Malaysia creates an opportunity to be a medium of a sustainable solid waste minimisation system in promoting sustainable green campuses at the university.

***Keywords*:** awareness, green campus, higher education institution, recyclables, recycling, waste bank

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INTRODUCTION

The rapid rate of development in Malaysia has accelerated the daily generation and volume of solid waste. The amount of waste produced has increased from 33,000 tonnes in 2012 to 38,000 tonnes of waste in year 2015. This figure is expected to increase to 16.76 million tonnes by year 2020 with 45,900 tonnes of waste are predicted to be generated every day (Agamuthu & Dennis, 2011; SWCorp. 2012; SWCorp, 2014). Approximately 28% of the total daily waste generated originate from the commercial and institutional sectors, which contributed 9,224 million tonnes of waste generated daily (NSWMD, 2015).

At the same time, the rapid expansion of the Higher Education Institutions (HEI) sector in Malaysia has also led to the increasing of solid waste generation as the population within HEIs in Malaysia increases (Jibril, Sipan, & Lawal, 2012). Population in HEIs comprises administrative personnel, students, academic staff and non-academic staff. These groups produced waste of which only 40% of recyclable items were collected at educational institutions with an average per person of 0.33 kg/person/day. Additionally, the recycling rate for the institutional and commercial sectors is about 7.4% and almost 89% of waste were disposed of in landfill sites (NSWMD, 2015).

A recycling programme is an activity which often attracts attention in HEIs as an on-going sustainability initiative for solid waste management. HEIs are among the major contributors to the increase in solid waste generation and most of the waste generated were recyclable materials (Kehmeyer et al., 2011). HEIs in Malaysia have taken the initiative to implement recycling as a campus sustainability programme by involving the campus community, such as in Universiti Sains Malaysia (USM). However, the recycling programme failed to achieve sustainability due to the seasonal nature of the programme and the ineffective recycling system adopted (Abas & Md Nor, 2014). Meanwhile, Universiti Teknologi Malaysia (UTM) has produced the UTM Sustainable Campus Policy as a general guideline for campus sustainability including areas such as energy management. Monday is UTM Recycling Day, where the Green Office and Sustainable Arcade make an effort to provide a conducive campus environment for a sustainable learning and teaching environment in the university (Zen, Ahamad, & Omar, 2014). UPM was also the leading university in terms of sustainable campus by implementing the Environmental Management System (EMS) MS ISO 14001 through activities relating to the teaching and learning process in the campus towards sustainable development goals.

In fact, solid waste minimisation strategies (particularly in recycling) have been noted as practical solutions in overcoming the solid waste disposal issues due to the increasing waste generation rates (Sakawi, 2011). Moreover, Purcell and Magette (2010) also revealed that recycling can reduce the waste disposal problem by extending the landfill space and prolonging the lifespan of landfill sites.

Initially, recycling collections were dominated by the informal sector such as door-to door itinerant recycling buyers, waste collection workers separating recyclable materials and scavenging activities in landfills (Siwar, 2008). Zen and Siwar (2015) revealed that about 31% of households have a high preference towards door-to-door itinerant buyers because of monetary incentives received. Besides that, accessibility of kerbside recycling and drop-off recycling has a significant impact on solid waste reduction and can also have a positive effect on the percentage of recyclables collected. However, both methods largely dependent on household participation on voluntary basis. Nevertheless, the individuals' recycling participation is also influenced by investment of time, space, money and effort, in addition to their knowledge and attitude towards recycling (Sidique, Joshi, & Lupi, 2010).

According to Beringer, Wright and Malone (2008), and Zen, Bandi, Zakaria and Saleh (2013), campus waste characterisation studies are relatively inexpensive and can generate administrative support and cooperation among students and academia by inspiring involvement in the sustainable campus community. This can be achieved through activities involving the aspects of teaching, learning and research as part of the education to the campus community. Thus, this paper highlights the activities of UPM through its Faculty of Environmental Studies' initiative of implementing a waste bank programme for the campus community as part of its ongoing efforts to promote green campus.

RESEARCH BACKGROUND

Universiti Putra Malaysia (UPM) formerly known as *Universiti Pertanian Malaysia* is located in Serdang, Selangor next to Malaysia's administrative capital city, Putrajaya. It is one of Malaysia's leading research universities (RU) with a total enrolment of 24,874 students and 2,595 academic staff for the 2016 academic year. Its campus sits on an estimated 1,108.103 hectares of land, housing 16 faculties, 17 student hostels, nine (9) institutes, four (4) centres and several administrative and academic buildings respectively. The major activities on campus focused on teaching, research and extracurricular activities such as sports, recreation, associations, clubs, arts and culture.

Waste Bank Initiative

The waste bank was initiated by a lecturer in FPAS and a group of volunteers from the solid waste management course (EMG 3104). They were inspired by UPM's green campus aspiration and sought to achieve this by reducing solid waste generation and promoting recycling practices among the campus community. The project began in the year 2015 and has continuously being operated on the campus. The waste bank (Figure 1) is located at the Solid Waste Lab at FPAS, UPM.

Figure 1 Waste bank at Faculty of Environmental Studies, UPM

Waste Bank Operation Procedure

The waste bank operates twice a week during 14 weeks of teaching and learning in campus for every semester. It began its operation on October 2015 and has been continually operated every semester since then. Figure 2 shows the operational procedure, which has been implemented in the waste bank programme. There are four main steps, namely, registration, sorting, weighing, and recording. Firstly, students have to register as waste bank member where each member will receive a waste bank book. Recyclable waste brought by students to the waste bank will then be sorted and stored at the waste bank. Next, the recyclable waste will be weighed by direct measurement method based on the recyclable waste category and recorded in the waste bank book. The sampling guideline was based on the Malaysian Standard guideline for solid waste generation and composition (Department of Standard Malaysia, 2012). The type of recyclable waste and total weight will be recorded to ensure that the amount of recyclable waste per kilogram is calculated correctly. At the end of semester, as a way of encouraging recycling practices at UPM, the waste bank members received monetary incentives, university merits and rewards based on their participation in the waste bank programme.

Figure 2 Waste Bank Operation Procedure

Type of Recyclable Waste

The waste bank receives five (5) main types of recyclable waste namely:

i. Paper: Newspaper, Mix paper, Black/white paper;
ii. Plastic: PETE, HDPE;
iii. Aluminium cans: Can drinks;
iv. Box/cardboard: All types of boxes; and
v. Metal: Food cans and all types of metal.

RESULTS AND DISCUSSION

Waste bank has been operating in a five (5) phase operation where about 500 students had registered as waste bank members since October 2015 until December 2017, with the total recyclables collection reached 14,817.46 kg (Table 1). The participation in the waste bank has been on a voluntary basis among UPM students and a mandatory basis for environmental students who took the Solid Waste Management Course (EMG 3104) as part of their teaching and learning process.

Table 1 Waste bank recyclables collection

Phases	Time	Member (nos.)	Recyclables collection (kg)
1	October-December 2015	53	1,663.22
2	March-June 2016	113	1,986.11
3	October-December 2016	137	3,604.74
4	March-June 2017	144	5,555.74
5	October-December 2017	53	2,007.65
	TOTAL	500	14,817.46

Phase 1 was the pilot phase where 53 students who took the Solid Waste Management Course (EMG 3104) were required to be involved in collecting recyclable waste as part of their teaching and learning process in the faculty. Saphores, Ogunseitanc and Shapiro (2012) stated that there is a positive correlation between knowledge and action in environmental behaviour. Thus, the students managed to collect 1,663.22kg of recyclable materials in 14 weeks. The overwhelming results encouraged the waste bank programme to be continually operated for the next phase.

In Phase 2, waste bank operation was opened to UPM students and staff on a voluntary basis in which increasing amount of recyclables were collected. About 1,986.11kg of recyclable waste was collected showing the increased awareness towards recycling. Subsequently, to also support the university effort towards green campus, several activities and recycling programmes were organised during Phases 3 and 4. The amount of recyclables collected, again, increased due to overwhelming participation from the students in the campus. National Recycling Day, Waste Bank Open Day and Recycling Training were organised in FPAS to raise awareness on the importance of recycling. Besides that, as part of the teaching and learning process in EMG 3104, the environmental students were required to spread recycling awareness in every faculty in the UPM campus and promote the waste bank programme. The increasing participation has increased the amount of recyclables collection from 3,604.74kg to 5,555.74kg.

In addition, to encourage recycling practices among UPM students, monetary incentives were provided to each member as well as university merit as a reward for their participation. However, in phase 5, which extended from October until December 2017, the amount of recyclables collected decreased to 2,007.65kg. The reduced amount could possibly be due to other recycling collections being operated in other faculties, due to growing awareness towards the idea of a green campus for a sustainable community. Furthermore, recycling awareness has increased among campus community as UPM has conceived a Green Policy. The Green Policy also has recognised the waste bank programme as part of the green activities in the campus. The existence of waste bank as a positive asset of the university in encouraging students to participate actively in recycling practices on campus supports Dahle and Neumayer's (2001) research where they proposed that HEIs can serve as a role model in environmental behaviour by implementing an appropriate recycling system on campus.

Figure 3 shows the total weight and total sales for each type of recyclable waste collected at the waste bank. The highest type of recyclable waste collected was paper; 8,453.26kg. This is followed with plastic waste collection figures reaching 2,124.72kg, together with other types of recyclable waste such as box/cardboard (1,977.45 kg), aluminium cans (1,153.68kg), and metal (1,108.35kg). Based on the price of recyclables in waste bank, aluminium cans represent the highest total sales (RM2,307.36). This is followed by plastic. For

paper, black paper and white paper have higher sales compared to mix paper and newspaper despite lower amount collected. The high sales show that recyclable materials have high potential in market values as well as economic benefits.

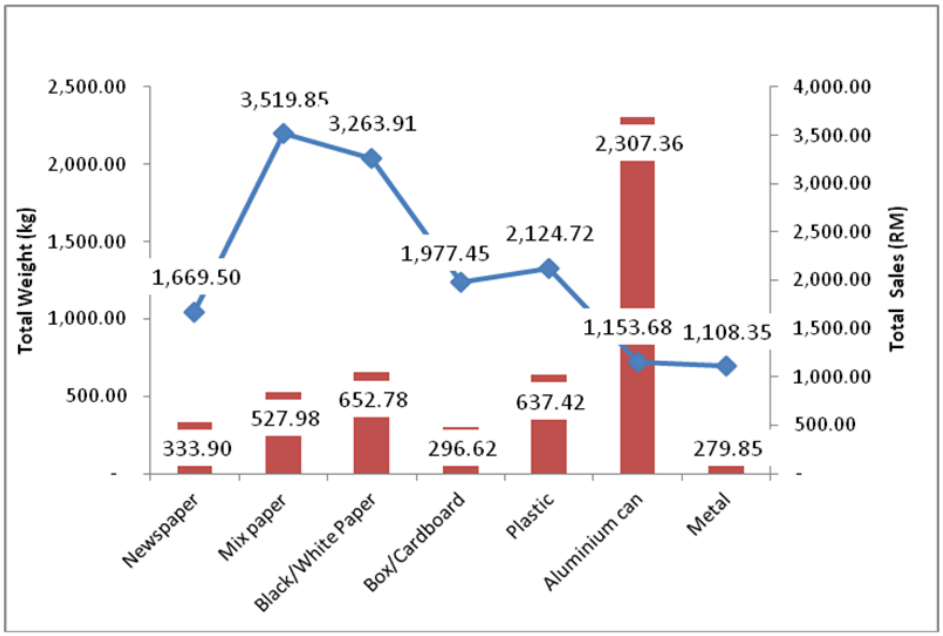

Figure 3 Total weight and total sales of recyclable waste by category

Table 2 shows that the potential waste bank revenues from the recyclables collection reached RM7,182.96 based on the market price set by Alam Flora Sdn Bhd. The amount indicates that collection of recyclables has a high potential value in market sales as the potential margin profit reached RM2,147.05 with an average of RM 429.41 collected each phase. Normally, due to the fluctuating price of recyclables in the market, demand has prompted the waste bank operator to update the price of recyclable materials in the waste bank during the waste bank operation. Although some of the prices of recyclables were low, it did not become a barrier to students from participating in the waste bank programme, as awareness generated from the recycling process is more important.

Table 2 Waste Bank Potential Revenues

Items	Recyclable Collection (kg)	Recyclables Market Price (RM)*	Total Sales in Waste Bank (RM)	Potential Revenues (RM)
Newspaper	1,669.50	0.24	333.90	400.68
Mix paper	3,519.85	0.18	527.98	633.57
Black/White paper	3,263.91	0.34	652.78	1109.79
Plastic	2,124.72	0.40	637.42	849.88
Aluminium	1,153.68	3.00	2307.36	3461.04
Box/Cardboard	1,977.45	0.20	296.62	395.49
Metal	1,108.35	0.30	279.85	332.51
Total	14,817.46		5,035.90	7,182.96

**Note: Market price set by from Alam Flora Sdn Bhd. (2016)*

Figure 4 shows that 57% of the recyclable waste collection consisted of paper (newspaper/ mix paper and black/white paper). This represented the highest quantity of recyclable waste collected. This is due to the location of waste bank at Universiti Putra Malaysia (UPM), one of the HEIs in Malaysia which influenced the type of recyclable waste in the collection. Moreover, the campus activities of teaching and learning produce a significant amount of recyclable waste paper such as lecture notes, books, study notes, exam papers, letters, memos and research papers. Plastic waste also provided good revenue for the recycling programme as there was 14% of plastic material collected in the waste bank. The plastic waste consisted of plastic code 1 which is PETE and mineral bottles, and plastic code 2: HDPE such as shampoo, liquid soap bottles, and cosmetic containers. The collection also comprised aluminium cans including those from carbonated drinks, and metal consisting of food cans and all types of metal.

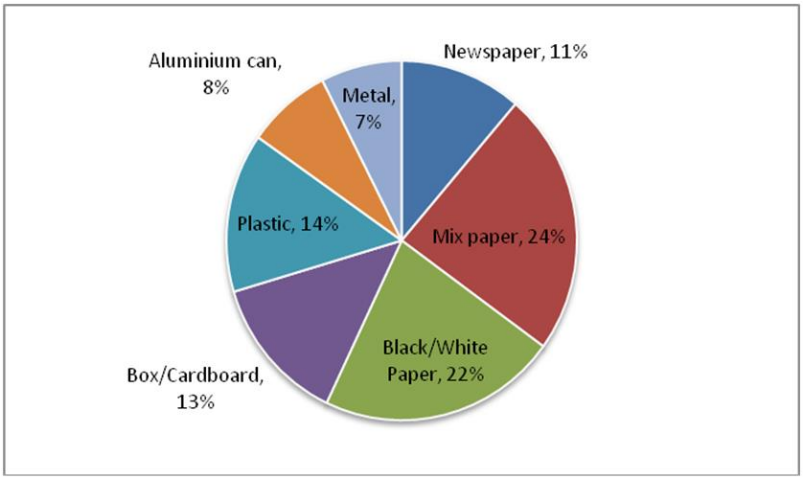

Figure 4 Percentage of recyclable waste by category

Throughout the waste bank operation, monetary rewards and university merit were an encouragement for students to participation. These have also become a key contributing factor to the success of the waste bank operation in UPM. Basri, Zawawi, Zain, Mohamad and Kasa (2016) also mentioned that encouragement and incentive measures should be provided to students as this will motivate them to be more keen to participate in the on-campus recycling activities. Students play a vital role in the sustainable campus society as their attitudes and behaviour have been of great importance in the success of the recycling programme.

CONCLUSION

Based on the results obtained, it can be concluded that it is important to develop sustainability policies in campus which cover the issue of solid waste minimisation to support the waste bank programme. The waste bank programme reveals the potential of solid waste minimisation, as can be seen from the recyclables collection in the campus and also raised awareness towards the importance of recycling. Besides that, the waste bank programme also shows the potential value of recyclables in the market. Moreover, it could be suggested that the waste bank programme can be seen as an environmental protection in HEIs as part of the learning and teaching programme aiming towards sustainability of campuses and green universities. A waste bank programme would be a beneficial model for a sustainable solid waste minimization system for HEIs in Malaysia in order to increase awareness levels towards sustainability development goals.

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SOURCE WATER PROTECTION FROM PHARMACEUTICAL CONTAMINANTS: ASSESSMENT OF ENVIRONMENTAL QUALITY ACT 1974 AND ITS REGULATIONS

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Abstract

Pharmaceutical contaminants have become a global "emerging pollutant". Many countries developed various policies and technologies to deal with the problem. In Malaysia, there is no serious attention given to this problem in the Environmental Quality Act 1974 (EQA) and other regulations (Malaysian legislation). Therefore, pharmaceutical contaminants still enter the environment and affect human health through water consumption and water usage. In response to this problem, this study aims to analyse Malaysian legislation and to identify potential protection provided to protect source water from pharmaceutical contaminants. This study employed a qualitative approach. A systematic search was carried out on existing pharmaceutical-related Malaysian legislation. Later, content analysis was conducted to discover patterns and ideas within the existing legislation. This would determine the provisions that could assist the protection of source water from pharmaceutical contaminants. The findings of this study demonstrate only few provisions addressed the problem of pharmaceutical contaminants and thus, this type of contaminant continues to harm the environment. It is hoped that the result of this study could enhance Malaysian legislation pertaining to the problem and minimise the risk of pharmaceutical contaminant in drinking water.

Keywords: drug disposal; emerging contaminant; Environmental Quality Act; Malaysia; pharmaceutical residues; source water; waste management; water pollution

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INTRODUCTION

Pharmaceutical contaminants caused by the production residue, improper disposal of expired and unused medication, accidental spills during manufacturing and distributing, as well as from the raw and treated effluent discharged from housing areas and hospitals, which are later brought into the rivers (Al-Odaini, Zakaria, Yaziz, Surif, & Abdulghani, 2011; Boleda, Galceran, & Ventura, 2011; Kookana et al., 2014). Pharmaceuticals which are neither volatile nor biodegradable escaping sedimentation and biological treatment in sewerage treatment plan (STP) and their metabolites enter the water bodies (Al-Odaini et al., 2011; Boleda et al., 2011; Jelic et al., 2011). There were reports showing pharmaceutical contaminants having toxic impact onto environment and human especially through water consumption and water usage (Alshakka, Ibrahim, Hassali, Palaian, & Aljadhey, 2016).

Pharmaceutical contaminants also found in Malaysian source water. Source water refers to "any river, river basin, ground water, and water body" as defined by Selangor Water Management Authority Enactment 1999. However, there is no explicit regulation that governs the issue of pharmaceutical-safe source water as pharmaceutical waste is considered as a non-priority pollutant (Al-Odaini et al., 2011; Al-Odaini, Zakaria, Yaziz, & Surif, 2016). Malaysian legislation only deal with the problem of pollution in general and the legislation themselves are scattered and piecemeal. Furthermore, the extent of their enforcement is disputable since source water management in Malaysia is also regulated under the state legislation.

This study focuses on source water protection from pharmaceutical contaminants in Malaysia by evaluating Malaysian legislative framework to mitigate the risk of pharmaceutical contaminants from entering source water. This include management, monitoring, and surveillance to ensure continuous protection of source water as they could provide information for identifying threats and hazards, also targeting source water protection and management strategies towards issue concern (Canadian Council of Ministers of the Environment, 2004; Plummer, Velaniskis, de Grosbois, Kreutzwiser, & Rob, 2010; The Council of the European Union, 1998; World Health Organization, 2004, 2011).

MATERIALS AND METHODS

This study is qualitative in nature. Secondary data were systematically selected, consisting of legal documents in Malaysia such as EQA and its regulations related to the problem of pharmaceutical contaminants. These sets of document have been searched through various databases such as Google Scholar, Mendeley, and from the official website of relevant government agencies including Department of Environment, Ministry of Health, and Ministry of Ministry of Energy, Green Technology, and Water. Specific keywords were used such as "pharmaceutical

waste", "pharmaceutical pollutant", "clinical waste", "medical waste", "waste management law in Malaysia", "pharmaceutical law in Malaysia", "pharmaceutical waste policy", and "pharmaceutical legislation". Only relevant legal documents related to source water protection from contaminants were scrutinised and finalised. Selected legal documents have been sent to experts for validation purposes to ensure their comprehensiveness and could cater the problem of pharmaceutical contaminants in source water. Data collected were analysed using content analysis approach. The raw data was coded and categorised according to themes. Nvivo10 software was utilised to carry out the content analysis and to ensure the collected data was systematically managed. This was also vital for the development of 'cognitive mapping' and framework matrices for the data.

RESULTS

Coding was done by examining selected Malaysian legislation. After indicators were identified, categories and sub-categories were inductively generated and given specific description to ensure the analysed legislation came within the ambit of the definition. The indicators, categories, and sub-categories and discussed below.

Provision Related to Source Water Management and Protection from Hazardous Substance

Control of Effluent Discharge

Section 25 and 27 of EQA made the restriction on pollution of inland waters by discharging any environmental hazardous substance (EHS), pollutant or waste unless licensed by the authority. Further, in Section 34B prohibits scheduled wastes from entering Malaysian waters. Section 2 of the same Act defines 'scheduled wastes' as any waste prescribed by the minister in the regulations as scheduled wastes. The 'regulations' referred in Section 2 of EQA is Environmental Quality (Scheduled Wastes) Regulations 2005 (EQSWR). EQSWR further defines 'scheduled wastes' as any waste falling within the categories of waste listed in the First Schedule. SW 4 of the First Schedule lists wastes from discarded drugs, clinical, pharmaceutical preparation, production products, and residues from treatment or recovery of scheduled wastes to be part of 'scheduled wastes' category.

Furthermore, Regulations 4, 5, 9, and 10 of EQSWR details out that scheduled waste should be disposed and treated as according to regulations' requirement, such as labelling for identification and warning purposes as well as procedure for storage of schedule waste to prevent spillage or leakage into the environment. The activities should be conducted at 'prescribed premises' whereby 'prescribed premises' refers to premises prescribed in Order 3 of

Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989 (EQPSO), which includes off-site storage facilities, off-site treatment facilities, off-site recovery facilities, scheduled waste incinerators, land treatment facilities, and secure landfills.

Regulations 11, 12, and 13 of Environmental Quality (Industrial Effluent) Regulation 2009 (EQIER) specified certain parameter under Fifth Schedule for the discharge of industrial effluent or mixed effluent. There are two standards applicable for each parameter, namely Standard A for the discharge into catchment listed under Sixth Schedule, and Standard B for the discharge into any other inland water or Malaysian water or other than what has been listed under Sixth Schedule.

Risk Mitigation from Accidental Discharge

There are regulations that deal with the risk prevention of the source water threat and pollution including on the risk of spillage or accidental discharge of the contaminant into soil or inland waters. For instance, Regulation 20 of EQIER and Regulation 14 of EQSWR mentioned that the person who caused any spillage or accidental discharge of scheduled waste (Reg. 14), industrial, and mixed effluent (Reg. 20) which either directly or indirectly gains or may gain access into soil or inland waters, shall immediately notify the Director-General of Environmental Quality about the occurrence. On top of that, the person shall perform any necessary action to cleanse the spill or discharge and must also determine the impact of such spillage or accidental discharge towards the environment.

Administrative Platform

Administrative platform is classified into two, which are general administration practices and monetary administration that is strictly covers the environmental fund.

General administration practice includes ‘environmental audit’ as in Section 33A of EQA, which plays an important role as it could be considered as the main Section to ensure the requirements set out under legislation were complied. Several Environmental Quality Regulations such as EQIER, EQSWR, and Environmental Quality (Sewage) Regulations 2009 (‘EQSR’) have laid down the acceptable condition of the contaminant to be discharged into source water and the ‘receiving place’ which the contaminant or waste should go. Without an environmental audit, the authority will bear more burdens in ensuring compliance of the regulations.

In term of monetary administration, Section 36B, 36D, and 36E of EQA have specified on the establishment of ‘environmental fund’ for the purpose of preserving the environment and mitigating the pollution including preventing the occurrence of discharge and dumping of EHS and waste and encouraging

conservation measures against damage that may cause by the discharge and dumping of EHS and waste.

Responsibilities of Stakeholders

First responsibility of stakeholder is to identify the existing and emerging threat to source water. Section 37 of EQA, Regulations 4 of EQSR, Regulation 3, 11 and 12 of EQSWR require the information and notification to be provided to the authority in regard to any effluent discharged including up-to-date inventory of scheduled waste.

Further, Regulations 5, 6, 8, 9, 10, and 13 of EQSWR spell out the responsibility of waste generator to provide detail procedures of treatment, recovery of products and the residuals from the recovery, storage, labelling, and transported outside waste generator of scheduled waste.

Next responsibility is to develop and implement methods for source water protection and preservation. The methods to be developed might include policies, guidelines, practices, processes, programmes, standards, and measures for protection and preservation of source water from EHS and any pollutant that might be detrimental to public health. For instance, Regulation 15 of the EQSWR states that every waste generator shall conduct training for his employees in terms of management of scheduled waste including identification, handling, labelling, storage, transportation, spillage, and discharge of scheduled waste.

Best Management Practice

Best Management Practice (BMP) addressed under Malaysian legislation is relating to the issue of hazardous substances wastes. BMP is defined under Regulation 1 of EQIER as "*practical, structural or non-structural methods for the purpose of preventing or reducing the discharge of industrial effluent or mixed effluent containing contaminants".* However, the definition was left for various interpretations since there is no specific practice could be considered as BMP. In Malaysia, the provision only applies to the discharge of industrial and mixed effluent, and excluded all other effluent such as domestic and household effluent.

For example, Regulation 14 of EQIER mentioned that BMP should be adopted for industrial effluent or mixed effluent if discharging certain types of contaminant is listed under Ninth Schedule of the regulations. The parameter list in the Ninth Schedule mentions the BMP for discharging endocrine disruptors (EDCs), which could include the synthetic EDCs comprising pharmaceuticals and personal care products (Aris, Shamsuddin, & Praveena, 2014; Wee & Aris, 2017).

Basically, BMP is considered as 'something extra' from the regulatory requirement. For example, the protection of water environment from hazardous substances could be the vital part of BMP. This is based on its role in preventing

and protecting hazardous contaminants from entering water environment, and not solely focusing on specific contaminant as discussed in the first part sub-category of BMP.

As one practice of BMP, Malaysian Department of Environment (DOE) has introduced a scheme on Environmentally Hazardous Substances Notification and Registration (EHSNR) whereby manufacturers and importers of EHS are required to submit EHS notification to DOE when the substances are manufactured or imported above certain amount. With this scheme, DOE will have the necessary information on EHS, which enable them to work with other agencies to identify the EHS and prevent this EHS from polluting the environment.

DOE, in 1999, has also published the Guidelines on Handling of Clinical Waste in Malaysia by DOE in 2009. Under the guidelines, consideration is given to generation and minimisation, source separation and segregation, identification and labelling, handling and storage, safe transportation, treatment, and disposal of residues. Since the definition of clinical waste has included pharmaceutical products, therefore, this guideline could be complementary to EQSWR since it detailed out the procedure and the steps to be taken for managing the clinical waste in order to avoid risk to human health and the environment.

Provision Related to Monitoring of Source Water

Notification and Information from Stakeholder

Section 37 of EQA makes it necessary for the stakeholder to furnish information with regard to the EHS and the use of EHS and any environmental risk that may result from the use of those materials.

Regulation 4 of EQSR, and Regulations 12 and 13 of EQSWR require the notification and information to be given to the authority regarding the discharge or release of effluent into any inland waters or Malaysia waters. The notification shall be in accordance with First Schedule of EQSR and Sixth Schedule of EQSWR, whereby it shall contain, among others, premises' information, information on sewage treatment, type of waste, waste packaging, quantity, and type of operation. Furthermore, EQSR also touches on the type of contaminants and acceptable parameter of discharge of such contaminants in its Second Schedule.

Environmental Audit

Environmental audit is a post evaluation approach undertaken after the development of a project to ensure regulations compliance (Yusoff, 2013). Unlike surveillance, specific requirements need to be fulfilled under environmental audit. Section 33A of EQA requires owner or occupier of vehicle, ship, and

premise to carry out environmental audit in the manner prescribed by regulations made under the EQA and to submit the report to the authority.

Several environmental quality regulations, such as EQIER, EQSR and EQSWR, have also laid down the acceptable condition of the contaminant to be discharged into source water. Without an environmental audit, the authority could not monitor the compliance to the regulations.

Provision Related to Surveillance of Source Water

Surveillance Agencies

Surveillance agencies refer to independent agencies that will conduct surveillance on source water quality. The agencies shall include government ministries and state authorities.

Section 33A (1) of EQA requires the owner or occupier of vehicle, ship, or premises to submit environmental audit report to the authority. Section 33A (2) and (3) further state that the owner or occupier shall appoint qualified personnel who are registered with the authority to carry out the environmental audit.

DISCUSSION

Based on the analysis, this study found that there are protections in the existing Malaysian legislation for pharmaceutical contaminant in source water. However, there are still gaps especially with regard to pharmaceutical contaminations. Pharmaceutical contaminants have been regulated under various categories such as scheduled waste, EHS, and industrial effluent. From all EQA and its regulations, only four (4) addressed the issue of pharmaceutical residue in their provisions, namely EQA, EQSWR, EQSR, and EQIER.

Only a few has specifically mentioned the types of contaminant that enter the water environment such as EQIER and EQSWR. Other legislation adopted a more general term such as EHS, ‘poisonous’, and ‘noxious’ contaminant, which the study has to interpret whether the pharmaceutical contaminants come within the ambit of what the legislation intended to protect. As mentioned in the finding that EHS is among the substance which Malaysian legislation looked into, this could be a good protection to source water since previous literature has recognised pharmaceutical contaminant as one type of EHS component (Milutinoviv & Trumbulovic, 2014; Motiekaityte & Venckus, 2016).

While many literatures have reported various pathway of pharmaceutical residue (Al-Odaini et al., 2011; Al-Odaini et al., 2016; Boleda et al., 2011; Kookana et al., 2014) and its released into the environment without any treatment (Lundborg & Tamhankar, 2017), Malaysian legislation still do not classify pharmaceutical residue as one of the parameters that should be treated in wastewater treatment plant. The worst scenario is, there are currently more than

200 industries involving pharmaceutical products such as manufacturing, distributing, and consuming (Drug Control Authority, 2016). Lundborg and Tamhankar (2017) further suggested that wastewater treatment plant should be upgraded in order to treat pharmaceutical residue before the residual water being discharged into river or source water.

Effluent discharge is considered as the major source of emission which might contain pharmaceutical contaminants either in its natural form or its metabolites (Rajbongshi, Shah, & Sajib, 2016). Although the EQIER have specified a certain parameter for the discharge of industrial effluent or mixed effluent, nothing in this legislation refers to pharmaceutical contaminant or as one of the parameters to be considered before discharge. But EQIER lists the catchment areas of water supply intake for the purpose of human consumption (including drinking water) under its Sixth Schedule where the effluent parameter discharge are specified. Thus, EQIER could help in preventing pharmaceutical contaminants in drinking water if pharmaceutical residue is included under the list of the parameter. Further, the category of 'other industries' in Schedule Seventh of Regulation 12 of EQIER is vague since the definition of the 'other industries' is unclear whether it includes pharmaceutical industries.

Apart from the categorisation of pharmaceutical waste as scheduled waste under EQSWR, none of the legislation mentioned the approach to handle pharmaceutical waste from other sources such as household waste and non-point source (Alshakka et al., 2016; Gaw, Thomas, & Hutchinson, 2014; Gorman, 2010; Lundborg & Tamhankar, 2017; Rajbongshi et al., 2016). This could lead to the unlawful disposal of such contaminants into the environment such as via trash and flushing down the toilet (Vatovec, Van Wagoner, & Evans, 2017). The scope of scheduled waste under existing legislation should be expanded in order to cover various types of pharmaceutical contaminants and its sources.

The result showed that the legislation listed has fulfilled both legal capacity and monetary capability. It gives full power to the authority to protect the environment from pollution. Addiionally, previous literature also mentioned that among the key components to protect source water is the capability to make and access of funding, and when the fund is able to meet the expenses of water management (Al Ibrahim & Patrick, 2017).

In Malaysian legislation, there are several provisions referring to monitoring such as information sharing, notification of discharge of contaminant, and environmental audit. Except Regulation 12 of EQSWR, which states that scheduled waste should include pharmaceutical, other legislation do not mention specifically about pharmaceutical contaminant.

It has been reported that a lot of pharmaceutical contaminants are polluting the environment, yet there is lack of documentation, making this type of pollution difficult to manage (Lundborg & Tamhankar, 2017; Milutinoviv & Trumbulovic, 2014). Monitoring could be considered as one of the important

methods since the information acquired could be used to administer the type of waste from risking the environment and new innovation of technologies could be proposed in order to protect source water from pharmaceutical contaminant (Lundborg & Tamhankar, 2017). It would alert the authority to develop inventory management, later allow the control to the amount of hazardous pharmaceutical waste generated (Priya, 2017).

In addition, routine surveillance can guide the development and implementation of appropriate contextual interventions (Lundborg & Tamhankar, 2017). EQA does mention the independent bodies to carry out the surveillance and audit, yet their responsibilities are not detailed out.

CONCLUSION

The loopholes in Malaysian legislation basically relating to source water management, including the inclusion of pharmaceutical contaminant as the part of "waste" and "parameter" that legislation should be looked into. WHO (2011) has urged for the existing policies to be improved on the management of pharmaceutical waste.

The finding of this study could give better information on the relevant methods, in which Malaysian legislation should improve in order to protect source water from pharmaceutical contaminants since public health is likely to be negatively affected if this problem remained unattended. Advancement of technical innovations is very crucial. Nevertheless, the improvement of technology is useless if pharmaceutical contaminants were not included in the legislation parameter. Apart from that, many countries such as US, Europe, and Canada have proven that among the best and economical way to cope with this issue of pharmaceutical waste is via 'take-back" programme.

In conclusion, source water protection from pharmaceutical contaminants could not be done by single action. The protection involves multiple and various actions to realise the aim of having pharmaceutical-safe water supplies.

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QUANTIFYING THE ABOVEGROUND BIOMASS AND CARBON STORAGE OF URBAN TREE SPECIES IN SOKOTO METROPOLIS, NORTH-WESTERN NIGERIA

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Abstract

Increases in human activities, land use/cover changes and urbanisation have led to continuous accumulation of carbon dioxide and other greenhouse gases in the atmosphere, thus threatening the efficiency of natural carbon sinks such as urban trees. This paper assessed the aboveground biomass and carbon stock of trees in Sokoto metropolis, North-Western Nigeria, using an allometric equation. The metropolis was stratified into five broad land use/cover types from which 200 sample plots of 30m × 30m were generated. Data on tree species and diameter at breast height were collected from all trees ≥ 5cm in diameter within the plots. A total of 722 trees belonging to 30 species in 17 genera and 14 families were identified. The trees stored 854.73 tonnes of biomass equivalent to 427.37 tonnes of carbon with the highest proportion being stored by *Azadirachta indica*, *Mangifera indica*, *Adansonia digitata*, and *Ficus polita*. There was a significant difference in tree biomass and carbon stock across the land use/cover types ($F = 4.730$, $p < 0.001$). The Green Area recorded the highest carbon density of 96.5t ha^{-1} while Farmland recorded the least carbon density (7.4t ha^{-1}). Urban areas have diverse tree species that could contribute significantly to reducing global atmospheric carbon. This potential, which varies with the species, number, and size of trees, as well as land cover, can be successfully estimated using allometric equations.

Keywords: aboveground biomass; carbon stock; diversity; native species; exotic species

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INTRODUCTION

Carbon dioxide (CO_2) contributes approximately 84% of global radiative forcing (World Meteorological Organization, 2014) and 60% of observed global warming (Grace, 2004) making it the most important anthropogenic greenhouse gas in the atmosphere. The atmospheric concentration of CO_2 rose from about 300 ppm in the pre-industrial 1880s to about 405.58 ppm in 2017 (World Meteorological Organization, 2014). This threatens the efficiency of global natural carbon sinks and accelerates the process of global warming (Canadell et al., 2010). Most of these increases are attributable to human activities such as burning fossil fuels, land use/cover changes (Wang et al., 2014), and urbanisation (Churkina, 2016).

Urban areas are centres of economic and commercial activities, as they accommodate more than half of the global population. These areas require higher amount of fossil fuel for transportation, cooking, heating, cooling, and electricity generation; thus, emitting higher atmospheric carbon (Pataki et al., 2006). According to the United Nations (2018), the rates of urbanisation are higher in Asia and Africa where levels of carbon dioxide emissions are also higher (Clerici, Rubiano, Abd-Elrahman, Posada, & Escobedo, 2016). It was envisaged that Africa would contribute about 21% of the global urban population, with Nigeria expected to contribute an estimated 186 million people by 2050 (United Nations, 2018).

Urban trees and forests are increasingly being recognised as important components of biodiversity, hence gaining more relevance for academic, planning, and urban sustainability purposes (Dahlhausen, Biber, Rötzer, Uhl, & Pretzsch, 2016). Trees enhance the resilience of ecosystems in the face of changes and losses due to pests or diseases (Conway & Vander Vecht, 2015). In urban areas, trees provide free ecosystem services such as the provision of food, shade and fuel, removal of air pollutants, provision of recreational activities and other physical and mental health (Justin et al., 2016), as well as psychological and spiritual benefits (Peter & Shackleton, 2017). Urban trees also sequester and store large amounts of carbon as they grow over time (Liu & Li, 2012). The potential for carbon sequestration and storage of trees depend on their density, composition, growing condition and environmental gradients (Chave et al., 2009; Nowak, Greenfield, Hoehn, & Lapoint, 2013). Despite its global importance however, carbon sequestration and storage potential of urban trees in Africa and many developing regions have not been adequately assessed and documented (McPherson, Xiao, & Aguaron, 2013). Most urban carbon studies were conducted in developed countries such as the United States (Liu & Li, 2012). The results obtained from such studies might therefore not extrapolate successfully to areas with different urbanisation patterns (Davies, Edmondson, Heinemeyer, Leake, & Gaston, 2011). This justifies the need for region-specific estimates so that relevant information for climate change mitigation and urban sustainability

purposes could be generated. The aim of this paper is, therefore, to estimate the biomass and carbon stock of trees in Sokoto metropolis, North-Western Nigeria and highlight the contribution of individual tree species in the region to urban carbon balance (Tang, Chen, & Zhao, 2016), reduction of CO_2 emissions in the global carbon cycle, and climate change mitigation.

MATERIALS AND METHOD

The Study Area

Sokoto is located on latitudes 13°3'5"N and longitudes 5°13'53"E, and covers an area of about 94 km^2 (Figure 1). The city has an estimated population of 554,775 people (National Bureau of Statistics, 2016), and lies in a semi-arid region with typical Koppen's tropical wet and dry (Aw) climate (Belda, Holtanová, Halenka, & Kalvová, 2014). The mean annual temperature in this zone ranges between 21℃ and 33℃ while mean annual rainfall ranges between 508mm in the driest part to 1,016mm in the wettest part (Sanni, Odekunle, & Adesina, 2012). Vegetation comprises the Sudano-Sahelian type of short, feathery grasses, and some spiny woody species (Nsangu, 2009). The soils are generally leached and ferruginous consisting of silt and sand with hydromorphic soils found in riverine areas (Swindell, 1986).

Sampling and Data Collection

This study adopted a stratified sampling approach (Zhang et al., 2016), which ensures better representation by taking into account variation in the size of clusters (Levy & Lemeshow, 2011), thereby increasing sampling precision (Yang, McBride, Zhou, & Sun, 2005). A Landsat 8 OLI TIRS image of the metropolis for 2015 was pre-processed and classified (see Liu & Yang, 2015) with TerrSet geospatial monitoring and modelling system into five broad land use/cover classes. These include the Built-up Area, Farmland, Green Area, Open Space, and Wetland/Water. A stratified sample of 200 points was then generated across the land cover classes using the TerrSet sampling facility (Figure 1). This is considered reasonable (Nowak, Crane, Stevens, & Hoehn, 2003; Nowak, Walton, Stevens, Crane, & Hoehn, 2008).

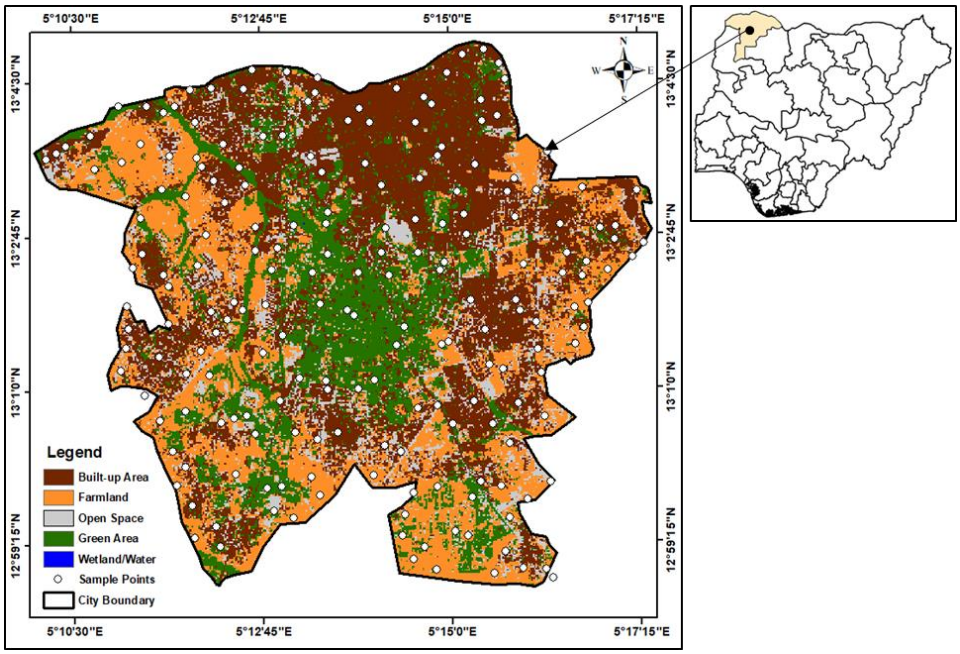

Figure 1 Classified land cover map of Sokoto metropolis and sample points distribution

Tree data were collected from 189 plots, as the remaining 11 plots were not accessible due to privacy issues. We demarcated 30m × 30m (0.09ha) quadrats at each sample point to coincide with the resolution of the Landsat image used in the classification (Ren et al., 2017). All trees with a diameter ≥ 5cm within the quadrats were identified to species level with the aid of a trained botanist. Species provenance (native or exotic) was established with reference to Lely (1925) and Keay, Onochie and Stanfield (1964), while nomenclature followed Hutchinson and Dalziel (1972). Tree diameter at breast height (DBH) was measured 1.3 m from the ground with a diameter tape, while basal area was derived from Equation (1):

$$BA = (d\frac{1}{2})^2\pi \quad \text{Equation (1)}$$

where,
BA = Basal Area
d = Diameter
π = 3.142

Data Analysis

Tree species composition, structural characteristics and density were calculated, while aboveground biomass (AGB) and carbon stock (C) were estimated using an allometric equation. Using allometric equations to estimate AGB is a more popular option (Vashum & Jayakumar, 2012) than the expensive and time-consuming, destructive approach (Chave et al., 2014). Many such equations exist in the literature (e.g. Chave et al., 2014; Feldpausch et al., 2011). However, this study adopted the equation provided by Brown, Gillespie and Lugo (1989), which was developed specifically to estimate AGB of trees in dry climates with less than 900mm annual rainfall and successfully used in other studies (e.g. O'Donoghue & Shackleton, 2013; Woldegerima, Yeshitela, & Lindley, 2017). This is given in Equation (2):

$$Y = \exp\{-1.996+2.32*\ln(D)\} \quad \text{Equation (2)}$$

where,
Y = biomass per tree (kg)
exp = e – (the base of natural logarithms), raised to the power of (…)
D = DBH (cm)

The equation uses tree DBH as the predictor variable as this produces the most stable regional AGB estimates (Montagu, Düttmer, Barton, & Cowie, 2005), while also reducing uncertainties (Liu & Li, 2012). The results were multiplied by a conversion factor of 0.8 (Nowak et al., 2013) to account for the variability in biomass and carbon content between open-grown and high-biomass forest trees, which were used to develop most of the AGB estimation equations. This was then multiplied by 0.5 to obtain carbon stock (Liu & Li, 2012).

RESULTS AND DISCUSSION

Tree Species Composition, Biomass and Carbon Stock

The total number of species recorded, their status, nomenclature and corresponding biomass and carbon stock is given in Table 1. A total of 722 stems belonging to 30 species in 17 genera and 14 families were recorded. The native species accounted for 26.8% of the stems while exotic species accounted for 73.2%. Species with a higher number of stems include *Azadirachta indica* (424), *Mangifera indica* (68), *Adansonia digitata* (37), *Ficus polita* (37) and *Terminalia catappa* (24).

The total tree biomass was estimated at 854.73 tonnes, which is equivalent to 427.37 tonnes of carbon. Species with the highest biomass and carbon stock include *Azadirachta indica, Mangifera indica, Adansonia digitata*

and *Ficus polita*. These species accounted for 86% of the total biomass and carbon stock recorded (Table 1).

Table 1 Trees Species composition, provenance, biomass and carbon stock in Sokoto metropolis

S/N	Species	Family	Stems	Status	Y(t)	C(t)	Mean C (t)
1	*Acacia machrostachya* (Reichenb. ex Benth.)	Fabaceae	9	Nt	11.70	5.85	1.30
2	*Acacia nilotica* (Linn., Willd. ex Del.)	Fabaceae	7	Nt	2.13	1.06	0.30
3	*Adansonia digitata* (Linn.)	Malvaceae	37	Nt	63.98	31.99	1.88
4	*Albizia lebbeck* (Linn.) Benth.	Fabaceae	5	Ex	5.07	2.54	0.85
5	*Anacardium occidentale* (Linn)	Anacardiaceae	1	Nt	0.03	0.02	0.03
6	*Anogeissus leiocarpus* (DC., Guill. & Perr)	Combretaceae	3	Nt	1.58	0.79	0.39
7	*Azadirachta indica* (A. Juss)	Meliaceae	424	Ex	521.4	260.7	1.24
8	*Balanites aegyptiaca (*Linn., DeI.)	Balanitaceae	16	Nt	16.19	8.10	1.01
9	*Borassus aethiopium (*Mart.)	Palmae	3	Nt	1.64	0.82	0.55
10	*Citrus aurantifolia (*Christm., Swingle)	Fruitaceae	1	Ex	0.30	0.15	0.30
11	*Cocos nucifera* (Linn)	Palmae	2	Ex	1.45	0.72	0.72
12	*Crescentia cujete* (Linn.)	Bignoniaceae	1	Ex	0.05	0.02	0.05
13	*Delonix regia* (Roxb.)	Fabaceae	11	Nt	10.41	5.20	1.16
14	*Eucalyptus smithi* (F. Muell. ex R.T. Baker)	Myrtaceae	14	Ex	5.17	2.58	0.37
15	*Ficus polita* (Vahl)	Moraceae	37	Nt	39.05	19.53	1.03
16	*Ficus thonongii* (Blume)	Moraceae	17	Nt	14.95	7.47	0.88
17	*Gmelina arborea* (Roxb.)	Lamiaceae	6	Ex	6.26	3.13	1.04
18	*Khaya senegalensis* (Desr.) A. Juss.	Meliaceae	1	Nt	1.49	0.74	0.50
19	*Lannea microcarpa* (Engl. & K. Krause)	Anacardiaceae	2	Nt	0.51	0.26	0.17
20	*Mangifera Indica* (Linn.)	Anacardiaceae	68	Ex	109.92	54.96	1.59
21	*Moringa oleifera* (Lam.)	Moringaceae	1	Nt	0.10	0.05	0.10
22	*Parkia biglobosa* (Jacq., Benth)	Fabaceae	7	Nt	10.85	5.43	1.55
23	*Phoenix dactylifera* (Linn.)	Palmae	1	Nt	1.90	0.95	1.90
24	*Piliostigma reticulatum (*DC., Hochst.)	Fabaceae	6	Nt	0.95	0.48	0.19
25	*Psidium guajava* (Linn.)	Myrtaceae	3	Ex	0.04	0.02	0.01
26	*Sclerocarya birrea* (A. Rich., Hochst.)	Pedaliaceae	3	Nt	3.63	1.82	1.21
27	*Tamarindus indica* (Linn).	Fabaceae	2	Nt	4.58	2.29	2.29
28	*Terminalia catappa* (Linn.)	Combretaceae	24	Ex	12.37	6.18	0.49
29	*Terminalia ivorensis* (A. Chev.)	Combretaceae	9	Nt	4.44	2.22	0.44
30	*Vitex doniana* (Sweet)	Verbenaceae	1	Nt	2.2	1.11	1.11
			722		**854.4**	**426.1**	

Nt = Native species; Ex = Exotic species; Y = Biomass; C = Carbon Stock; t = tonne

Tree Species, Biomass and Carbon Stock Distribution

Tree species and their individual stems were not evenly distributed across the metropolis. The highest number of stems (447) was recorded in the Built-up Area, followed by the Green Area (134), and Wetland/Water area (52), while the least

number of stems (43) was recorded in the Open Space. Similarly, the highest stem density was obtained in the Green Area (184ha^{-1}) while the lowest stem density (12.9ha^{-1}) was recorded in the Open Space. The density and distribution of biomass and carbon stock also vary significantly between the different land use/cover types. The total biomass and carbon stock were higher in the Built-up and Green areas, while the lowest values were recorded in the Farmland. However, carbon density per hectare was higher in the Green Area (96.5 tonnes ha^{-1}) and Wetland/Water area (55.8 tonnes ha^{-1}) even though the Built-up Area had higher total biomass and carbon stock (Table 2).

Table 2 Trees species, biomass and carbon stock distribution

S/N	Land cover	Total Stems			Y (t)	C (t)	C (t/ha)
		Native	Exotic	Total			
1	Built-up Area	128	319	447	533.1	266.54	28.8
2	Farmland	33	13	46	42.5	21.23	7.4
3	Green Area	5	129	134	139.0	69.51	96.5
4	Open Space	16	27	43	49.8	24.92	7.5
5	Wetland/Water	11	41	52	90.3	45.16	55.8
	Total	**193**	**529**	**722**	**854.73**	**427.37**	

Y = Biomass; C = Carbon stock

DISCUSSION

The composition and distribution of trees species in this study (Table 1) shows that Sokoto metropolis is composed of few native and exotic tree species distributed disproportionately across the different land use/cover types. The exotic species however, have higher stem population, thus dominating the landscape. This has been reported in many studies (e.g. Kuruneri-Chitepo & Shackleton, 2011; Seburanga, Kaplin, Zhang, & Gatesire, 2014), thereby raising the fear that the exotic species may in the long run, outcompete the native species in many cities due to biotic homogenisation (McKinney, 2006). Hence, much need to be done to improve tree abundance and diversity in the metropolis through afforestation programmes and tree planting campaigns. Such programmes should take account of the many stresses urban tress are exposed to as a result of increasing urban temperatures, restricted rooting space, water deficiencies (Davies et al., 2011) and the ecosystem service potentials of the different tree species.

The total biomass and carbon stock recorded in this study are considerably high when compared to findings from other studies such as Liu and Li (2012), where mean carbon stock of 33.22t ha^{-1}, 30.25t ha^{-1} and 43.70t ha^{-1} were observed in Shenyang, Hangzhou, and Beijing cities, respectively. However, this is comparatively less than the 552,415 tonnes total carbon reported by Woldegerima et al. (2017) in Addis Ababa. The relatively high tree biomass and carbon stock recorded in this study may be attributable to the number of trees

with medium to high trunk diameters, which are a characteristic of the Savannah ecosystem where the city is located (Glèlè Kakaï & Sinsin, 2009). Most of the stems (73.1%) have a trunk diameter between 30cm and 75cm. About 2.5% had a diameter of more than 75cm and only 24.4% of the stems have a trunk diameter of less than 30cm (Figure 2).

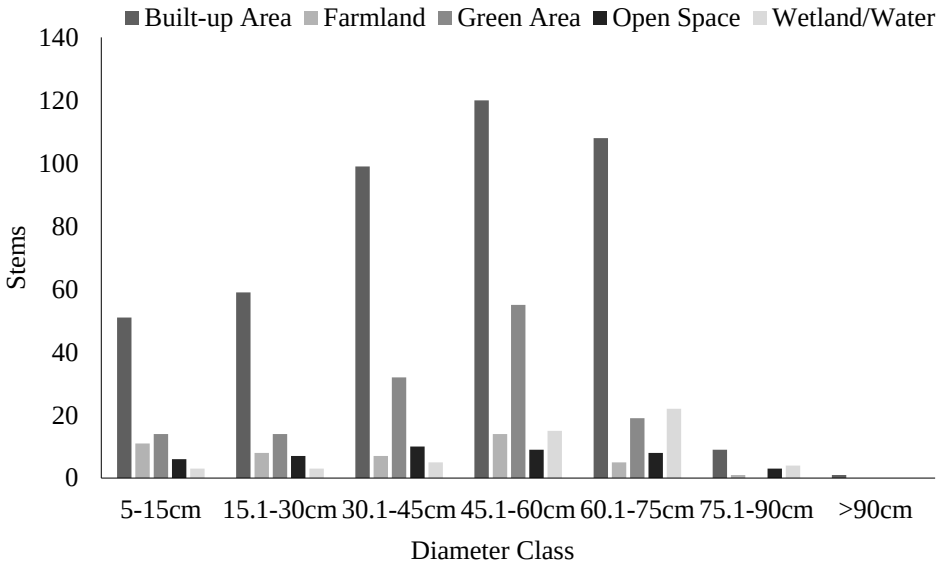

Figure 2 Stem diameter distribution

Although the carbon storage and sequestration potential of urban trees in this part of the world have somehow been neglected, this study shows that urban trees in the region are good carbon sinks. This however, varied with the type of species, diameter and land use/cover type. Species with the highest mean biomass and carbon stock include *Tamarindus indica, Phoenix dactylifera, Adansonia digitata, Mangifera Indica* and *Parkia biglobosa* (Table 1). Between the land cover types, the Built-up and Green areas accounted for 80% of the stems recorded and also accommodate most of the large-diameter trees. Higher total biomass and carbon stock were therefore recorded in these areas (Table 2).

The structural characteristics of tree species recorded in this study varied across the land use/cover types. These to a large extent, determined the biomass and carbon stock of trees in the metropolis. A one-way Analysis of Variance (ANOVA) revealed significant difference in mean stem diameter ($f = 5.79$, $p < 0.001$), mean stem basal area ($f = 5.21$, $p < 0.001$) and consequently, mean stem biomass and carbon stock ($f = 4.73$, $p < 0.001$) across the different land use/cover types. The highest mean stem biomass (1.73t/stem) was recorded in the

Wetland/Water where mean stem diameter was highest and the lowest mean stem biomass (0.92t/stem) was recorded in the Farmland where mean stem diameter was correspondingly lower (Table 3).

Table 3 Comparison of structural parameters and tree biomass

S/N	Parameter	BUA	Farmland	GA	OS	WW	*f*	*p*
1	Total Stems	477	46	134	43	52		
2	Stem Density (ha^{-1})	48.22	15.97	186.1	12.91	64.2		
3	Mean DBH (cm) ±SD	44.6± 20.8	36.8± 23.4	43.4± 16.95	43.3± 22.0	55.8± 18.8	5.79	.001
4	Mean BA (cm^2) ±SD	1903.7 ± 1645.43	1487.1± 1448.29	1701.7± 1016.16	1846.7± 1558.16	2714.4± 1395.61	5.21	.001
5	Mean Biomass (t) ±SD	1.19± 1.18	0.92± 0.96	1.03± 0.66	1.15± 1.05	1.73± 0.95	4.73	.001

BUA = Built-up Area; GA = Green Area; OS = Open Space; WW = Wetland/ Water

CONCLUSION

Sokoto metropolis is composed of a few tree species which are distributed disproportionately across the land cover classes. Depending on the tree species, tree density and diameter as well as land cover type, these trees store a considerable amount of aboveground biomass and carbon stock and thus, contribute significantly to the regional and global carbon budget. In view of climate change mitigation, *Tamarindus indica, Phoenix dactylifera, Adansonia digitata, Mangifera Indica* and *Parkia biglobosa* which have higher mean biomass and carbon stock storage should be adopted as species of choice in the metropolis and widely propagated.

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INCOME PERSPECTIVE ON THE FACTORS INFLUENCING HOUSEHOLDS' RECYCLING INTENTION: IMPLICATIONS FROM THE EXTENDED THEORY OF PLANNED BEHAVIOUR

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Abstract

Although few studies have attempted to explain residents' waste handling behaviour from social and psychological perspective, yet, there is little understanding regarding the influence of households' moral obligation, consequences awareness, and perceived lack of facilitating conditions on forming recycling intention. This study aims at investigating the key determinants of household recycling intention using the extended theory of planned behaviour (TPB). Data collected from 422 households in Kano metropolis were analysed using structural equation modelling to determine the influence of each predictor on the recycling intention. The results indicate that attitude, subjective norms, personal norm, consequences awareness and perceived lack of facilitating conditions significantly predict recycling intention, with attitude being the most significant predictor of households' intention. Additional analysis on the effect of households' income level on their recycling intention shows that income level moderates the relationships between attitude and recycling intention, personal norms—recycling intention, and perceived lack of facilitating conditions—recycling intention. The findings provide valuable suggestions for recycling policies that can focus on households' intention formation by providing recycling facilities, encouraging participation through market-driven recycling programs, and promoting recycling awareness and education.

Keywords: Solid waste, recycling, households, behavioural intention, Kano metropolis

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INTRODUCTION

Household solid waste (HSW) is the main source of municipal solid waste (MSW) in many countries to which most cost of the waste management is allocated (Parkpour, Zeidi, Emamjomeh, Asefzadeh, & Pearson, 2014). In spite of the huge allocation, improper handling and disposal of the wastes has been a major challenge and a growing concern in many countries, particularly in developing nations.

Landfilling has been a major way of solid waste disposal in many countries across the world. The rate of landfilling is higher than the sustainable waste reduction and recycling in many African and east European nations (Pérez-López et al., 2016). However, landfilling is detrimental to the environment and public health, and results to high rates of morbidity and mortality (Pérez-López, Prior, Zafra-Gómez, & Plata-Díaz, 2016). Waste recycling seemed to be a fundamental scheme that can be used to achieve a sustainable management of municipal solid waste as it has significant environmental and economic benefits (Khalil, Abdullah, Abd Manaf, Sharaai, & Nabegu, 2017). In spite of its importance, low participation of residents in recycling has been reported in most developing countries. For example, previous studies reported that more than half of all the solid waste generated is recyclable, however, only about 2% of the wastes produced are recycled due to lack of residents' participation in recycling (Khalil et al., 2017).

Past literature on household solid waste recycling has focused mainly on four aspects of recycling, namely; determinants of waste recycling behaviour, efficiency of waste recycling schemes, and the partnerships between formal and informal recycling sectors (Wan, Shen, & Yu, 2014; Xu, Ling, Lu, & Shen 2017). However, only few studies discussed about the effectiveness of waste separation and recycling policies (Wan et al., 2014; Xu et al., 2017). This study seeks to investigate the moderating effect of a demographic variable on factors influencing residents' recycling intention in Kano metropolis Nigeria by extending the theory of planned behaviour.

THEORETICAL FRAMEWORK

Theory of Planned Behaviour (TPB)

Theory of Planned Behaviour (TPB) proposed that people's intention to perform a behaviour depends on their "behavioural beliefs" about the outcome of the behaviour, "normative beliefs" about the expectations of important people around them, as well as their "control belief" about performing the behaviour and the likely obstacles (Ajzen, 1991). These three beliefs give rise to the formation of attitudes, subjective norms, and perceived behavioural control respectively, which subsequently influence people's intention to perform an action (Ajzen,

1991). Additionally, when the perceived behavioural control is high, it can directly influence behaviour (Chen & Tung, 2010).

The present study extends the TPB framework to increase its predictive capacity. Personal norms, consequences awareness, perceived lack of facilitating conditions (residents' perception about availability of recycling facilities and its effect on their recycling intention) and a demographic variable (income level) were included in the TPB framework (Figure 1).

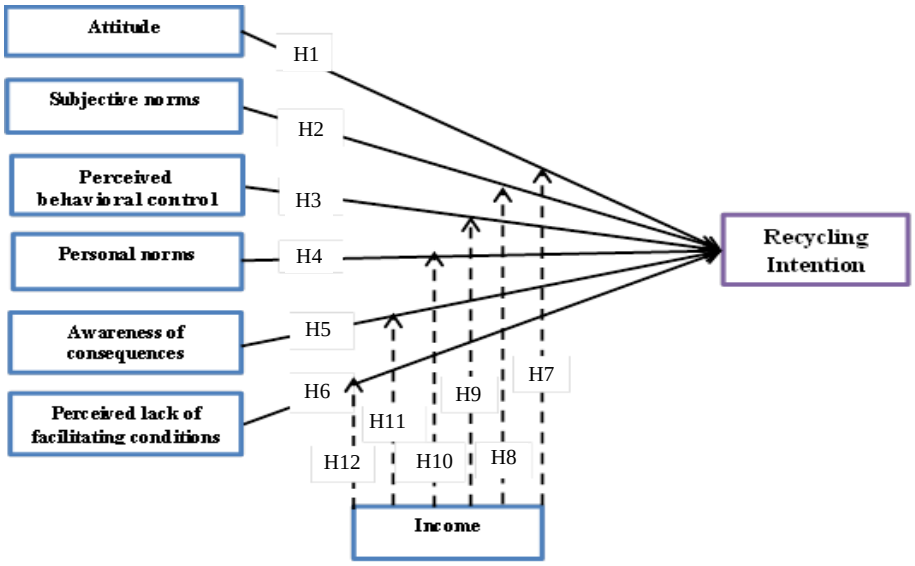

Figure 1 The extended theory of planned behaviour (TPB)

MATERIALS AND METHODS

Sampling Design and Participants of the Study

In this study, the respondents constitute households residing within Kano metropolis. With an estimated population of 477,805 households, Kano metropolis is composed of two income groups: the high income households residing mainly in the GRA, and the low income households that dominated the suburban areas (Suleyman & Khalil, 2014). The sample size for this study was determined as 384 using Krejcie and Morgan (1970) estimation. However, to avoid the problems of unreturned and unattended questionnaires, 10% over-sampling was added to arrive at 422 households as suggested by Singh and Masuku (2014). A multistage sampling technique was adopted to select the participants for this study. Participants were selected proportionately from the two income groups based on their total population number. The distribution of the respondents in the study area from where the sample was drawn is as follows:

low income areas have 251,660 households, and its proportionate sample was 236.94 (52.64%), Nassarawa (high income) has 226,145 households, and its proportionate sample was 213.058 (47.33%).

Questionnaires were administered with the help of research assistants between September and November, 2017. From the 422 returned questionnaires, about 29 were found to have a significant missing data; hence they were removed using a list wise deletion method. This method reduced the sample to 393, making the response rate of the completed questionnaire to be 93.77%, which is considered adequate enough for the analysis of this study.

Measures

This study adopted and modified the instrument from previous study by Chen and Tung (2010), a five-point Likert scale was used to assess the respondents' level of agreement to each statement measuring the constructs from 1=strongly disagree to 5=strongly agree. In the first section of the instrument, participants were asked to respond to demographic questions and in the second section participants were asked to respond to questions on latent constructs.

Data analysis

The analyses performed in this study include the descriptive statistics in which the participants' demographic characteristics were analysed. Subsequently, confirmatory factor analysis (CFA) was conducted to test the validity and reliability of the variables in the model. Additionally, structural equation modelling analysis was carried out to determine the individual and collective contribution of the predictor variables on the recycling intention. Finally, the study utilises Multi-Group Analysis technique in order to test the moderating effect of income on the relationships between the predictor variable and recycling intention. All these analyses were made possible using SPSS version 20 and AMOS version 22 statistical tools.

RESULTS AND DISCUSSION

Result of the Descriptive Analysis

Of the 393 respondents, majority of them (50.9%) were male and the rest were female. Most of the households were within the age bracket 35-49 years old while only few (1.3%) were above 65 years of age. Additionally, majority of the respondents (62.8%) attained a tertiary education level, and 52.64% of them reside in low income area. 43.3% of the households have their monthly income between N150001-N300000 ($416-$833). The household size of majority of the respondents (36.1%) ranges between 5-8 people.

The Measurement Model

Confirmatory factor analysis was conducted to test for the fitness of the data; composite reliability, discriminant and convergent validity of the model. Indices were used to assess the fitness of the model as suggested by Hayes and Scharkow, (2013), these are: (CMIN/df ≤ 5), (NFI ≥ 0.90), (CFI ≥ 0.90), (AGFI ≥ 0.90), (GFI ≥ 0.90), (RAMSEA ≤ 0.08). A measurement model is considered fit if it achieved at least three or four of the recommended goodness-of-fit indices. Based on the criteria suggested by Hair, Black, Babin and Anderson (2010), the model met the recommended goodness-of-fit indices value as shown in Table 1:

Table 1 Summary of the goodness-of-fit indices of the measurement model of this study

CMIN	***dF***	**CMIN/*df***	***P***	**GFI**	**AGFI**	**CFI**	**IFI**	**NFI**
1174.106	441	2.662	000	0.839	0.807	0.910	0.911	0.864
TLI	**RMSEA**							
0.899	0.065							

This study further tested the validity of the constructs. Two types of validity tests were conducted: convergent validity which indicates the agreement among the measures of the same construct on what they are designed to measure. A construct is said to have a good convergent validity when all its indicators share high common proportion of variance. According to Hayes and Scharkow (2013), a convergent validity of a construct can be determined based on the following measures: average variance extracted (AVE), factor loading and construct reliability. AVE is the average amount of variance in the criterion variable that is explained by a predictor variable to which it is theoretically related. AVE of 0.5 and above indicates an adequate convergent validity. Therefore, the constructs of this study have achieved a good convergent validity based on their AVE value as shown in Table 2.

Table 2 Reliability and convergent validity of the measurement mode

Construct	Item	Standardized Factor Loading	Composite Reliability	Average Variance Extracted
Attitude	ATT1	0.70	0.72	0.596
	ATT2	0.93		
	ATT3	0.70		
	ATT4	0.69		
	ATT5	0.58		
Subjective norms	SN1	0.83	0.78	0.525
	SN2	0.81		
	SN3	0.70		
	SN4	0.78		
	SN5	0.81		

Perceived behavioural control	PBC1	0.73	0.76	0.568
	PBC2	0.83		
	PBC3	0.74		
	PBC4	0.91		
	PBC5	0.62		
Personal norms	PN1	0.76	0.79	0.603
	PN2	0.82		
	PN3	0.73		
	PN4	0.90		
	PN5	0.94		
	PN6	0.61		
Consequences awareness	AC1	0.93	0.79	0.590
	AC2	0.74		
	AC3	0.69		
	AC4	0.92		
	AC5	0.71		
Intention to recycle	INTR1	0.83	0.80	0.535
	INTR2	0.79		
	INTR3	0.70		
	INTR4	0.91		
Perceived lack of facilitating conditions	PLFC1	0.92	0.81	0.510
	PLFC2	0.71		

Factor loading is another important method for testing convergent validity. A minimum acceptable value of a standardised factor loading is between 0.5 and 0.7 or even higher as asserted by Hayes and Scharkow (2013). Based on this recommendation, the indicators of all the constructs of this study have a good factor loading as indicated in Table 2. Another measure for testing convergent validity is construct reliability (CR), which refers to a level at which indicators of a construct consistently measure what they are expected to measure (Ary, Jacobs, Irvine, & Walker, 2013). A CR value of 0.6 to 0.7 or higher is acceptable. A higher CR indicates a high internal consistency between the indicators representing a latent variable (Hayes & Scharkow, 2013). Based on the above criterion, this study has achieved a reliability test indicating that there is internal consistency among the indicators of the constructs.

Furthermore, a test for discriminant validity (DV) was conducted in this study. The results of discriminant validity (Table 3) for the constructs of this study show that the AVE value of all the constructs is greater than the squared multiple correlations between them. This suggests that the individual constructs are distinct, hence discriminant validity was achieved.

Table 3 Discriminant validity index summary for the construct

Construct	**PBC**	**PN**	**ATT**	**SN**	**INTR**	**AC**	**PLFC**
PBC	**0.753**						
PN	0.162	**0.776**					

ATT	0.300	0.318	**0.772**				
SN	0.295	0.015	0.169	**0.724**			
INTR	0.173	0.506	0.287	0.034	**0.731**		
AC	0.46	0.52	0.43	0.49	0.40	**0.768**	
PLFC	0.44	0.40	0.17	0.14	0.38	0.14	**0.714**

Results of the Structural Equation Modeling (SEM)

The current study employed the use of SEM to investigate the causal relationships among the variables. Overall, the results show that the independent variables collectively explain 58% variance in the recycling intention. The result shows that the structural model has a good fit as it achieved the recommended fit indices as follows: $\chi 2$ (CMIN) = 1208.706 (df = 441), relative $\chi 2$ (CMIN/df) = 2.741, GFI = 0.835, AGFI = 0.803, CFI = 0.905, IFI = 0.906, NFI = 0.856, TLI = 0.893, and RMSEA = 0.067.

The result of the SEM analysis reveals that the paths from attitude to recycling intention and from subjective norms to recycling intention were significant with standardised regression weight ($\beta = 0.599$, $p < 0.001$) and ($\beta = 0.081$, $p < 0.05$) respectively. The paths from personal norm to recycling intention and from consequences awareness to recycling intention were also significant ($\beta = 0.136$, $p < 0.05$) and ($\beta = 0.114$, $p < 0.05$) respectively. The path from perceived lack of facilitating condition to recycling intention was also significant but negative ($\beta = -0.148$, $p < 0.05$) indicating that the more people perceived there is lack of recycling facilities and local collection, the lower will be their intention to recycle. However, the path from perceived behavioural control to recycling intention was not significant ($\beta = 0.019$, $p = 0.592$) as shown in Table 4. Thus, this result shows that H1, H2, H4, H5 and H6 were supported, but H3 was not supported. Attitude has the highest regression weight ($\beta = 0.599$) which made it the strongest predictor of recycling intention, meaning that for every 1 point increase in ATT, RI increases by 0.599 points.

Table 4 Standardised regression weight in the structural equation model

Hypothesised Relationship	S.E	Standardised Regression Weight Estimate (B)	CR	p
INT <--- ATT	0.073	0.599	8.434	0.000
INT <--- SN	0.034	0.081	2.062	0.003
INT <--- PBC	0.053	0.019	0.521	0.592
INT <--- PN	0.085	0.136	2.211	0.033
INT <--- AC	0.075	0.114	1.129	0.026
INT <--- PLFC	0.064	-0.148	-2.540	0.001

The Moderation Analysis of Households Income Level

The analysis of the moderating effect was carried out using Multi-Group Analysis. This method as posited by Samah (2016) can be executed by

determining the moderating impact on the overall model as well as on each path in the structural model.

To test the moderating effect on the overall structural model, Unconstrained and Measurement Residual Models were created and compared based on their goodness-of-fit indices. If the unconstrained model has a smaller chi-square and degree of freedom as compared to the measurement residual model, then the unconstrained model is said to be better than the measurement residual model, implying that there is moderating effect on the overall model as suggested by Samah (2016). Based on this method, the results show that there is moderating effect of income on the overall structural model.

To test the moderating effects of households income level on the individual Path, this study used procedure suggested by Hair et al. (2010), which suggests that a relationship path is said to be moderated if: Beta (β) for Group 1 is significant, however that of Group 2 is not significant, or Beta (β) for both groups (low and high incomes groups) is significant, nonetheless, one is positive and the other is negative.

Therefore, the result of the moderating test reveals that three of the six paths were moderated by income. These include: attitude—recycling intention [low income (β = 1.058, p = 0.003) and high income (β = -0.155, p = 0.501)], personal norms—recycling intention [low income (β = 1.007, p = 0.008) and high income (β = 0.501, p = 0.213)], and perceived lack of facilitating conditions—recycling intention [low income (β = 0.096, p = 0.009) and high income (β = -0.529, p = 0.000)], whereas the other three paths; subjective norms—recycling intention [low income (β = 0.022, p = 0.710) and high income (β = 0.127, p = 0.405)], perceived behavioural control—recycling intention [low income (β = 0.032, p = 0.313) and high income (β = 0.168, p = 0.231)], and awareness of consequences—recycling intention [low income (β = 0.250, p = 0.000) and high income (β = 0.577, p = 0.041)] were not moderated by households' income as shown in Table 5. This result shows that H7, H10, and H12 were supported (but not H8, H9, and H11).

Table 5 Result of moderation effect of income on the relationships between the independent variables and recycling intention

Constructs	Observations in Each Group	Standardised Regression Weight Estimate (β)	p-value
Attitude towards recycling			
Low income	201	1.058	0.003
High income	192	-0.155	0.501
Subjective norms toward recycling			
Low income	201	0.022	0.710
High income	192	0.127	0.405

Perceived behavioral control to recycling			
Low income	201	0.032	0.313
High income	192	0.168	0.231
Personal norms toward recycling			
Low income	201	1.007	0.008
High income	192	0.501	0.213
Awareness of consequences of recycling			
Low income	201	0.250	0.000
High income	192	0.577	0.041
Perceived lack of facilitating conditions			
Low income	201	0.096	0.009
High income	192	-0.529	0.000

Discussion and Policy Implication

The SEM result shows that attitude and subjective norms have a significant and positive influence on recycling intention, which is consistent with the theoretical expectation by Ajzen (1991) and the findings from the past literature such as Khalil et al. (2017), Karim Ghani, Rusli, Biak and Idris (2013), Tonglet, Phillips and Read (2004). However, perceived behavioural control did not significantly predict recycling intention. This finding is congruent with the previous researches by Chen and Tung, (2010), and Wan et al., (2014). Ajzen (1991) also posited that when perceived behavioural control is low, the behavioural intention to perform environmentally friendly behaviour may likely be low. The insignificant effect of PBC on recycling intention may be because the study area lacks formal recycling system, with lack of recycling facilities and local collection, which can affect households' perceived control on recycling. This is especially in high income areas where households are more concerned about the availability of recycling facilities, which is directly linked to their perceived control over recycling.

The incorporated variables; personal norm, consequences awareness, and perceived lack of facilitating conditions have also significantly influenced recycling intention. Past researches have reported that personal norm has a significant influence on recycling behavioural intention (Wan et al., 2014; Xu et al., 2017). The result of the present study shows that households' personal norm towards recycling can be activated more easily when appropriate intervention strategy is in place. Furthermore, the negative causal relationship between perceived lack of facilitating condition and recycling intention suggests that if households perceived that recycling facilities are not available, they may likely have low recycling intention.

The moderating result suggests that when the income level of a household increases, the causal relationship between attitude-intention and personal norms-intention tends to diminish. That is to say, high income households may likely

have low attitude towards recycling especially when recycling facilities and local collections are lacking. On the other hand, the attitude of low income households may likely influence their intention to recycle regardless of the availability of recycling facilities. Similarly, the moderating result shows that the causal relationship between perceived lack of facilitating conditions and recycling intention is positive and significant for low income householders; however, the same relationship shows significant but negative for high income households. This suggests that households in high income group are motivated by the availability of recycling facilities, which is directly linked to their perceived control. On the other hand, households in low income group are more concerned about the financial benefit of recycling rather than the recycling facilities as such their low income status may likely influence their recycling intention. This is consistent with the findings of Fisher, Bashyal and Bachman (2012), and Pakpour et al. (2014), but contrary to that of Meyer and Liebe (2010) who reported that higher income consumers are more likely to perform environmentally friendly behaviour.

Policy Implications of the Study

The results of this study show that perceived behavioural control did not influence households' recycling intention. To improve households' perceived control, authorities should provide appropriate recycling facilities such as curb side collection, drop-off points that are convenient to the households.

Additionally, the significant influence of awareness of consequences on recycling intention in this study underlines the significance of enlightening people about the positive consequences of recycling and the individual and collective responsibility of performing recycling for the benefit of oneself and the community at large.

The findings also suggest that the policy approach should be area specific. For example, the low income households can be encouraged to participate further in recycling by giving them incentives as they tend to be more motivated toward the financial benefits of recycling, whereas, the high income households can be encouraged by providing recycling facilities and local collections in a more convenient and accessible location that would ease their participation.

CONCLUSION

This study attempted to investigate the moderating effect of income on households' recycling intention. The results indicated that income moderated the positive relationships between attitude - recycling intention, personal norms - recycling intention, as well as those between perceived lack of facilitating conditions - recycling intention. While previous researchers have found that recycling intention increases with the increase in income level, the results from

this study revealed a unique finding that recycling intention decreases with increase in household income. This finding is considered unique as no previous study investigated the moderating effect of income on households' recycling intention. The extended TPB model used in this research will help policy makers to better understand the factors affecting recycling intention.

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CHILDREN'S DIRECT AND INDIRECT EXPERIENCES WITH NATURE AND THEIR CONNECTEDNESS TO NATURE

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Abstract

Direct experiences with nature during childhood plays an important role to influence children's connectedness to nature (CTN) as a child now and later as an adult. However, today's children obtain nature experiences mostly through indirect ways (e.g. observing nature and vicarious learning), which may not have the same quality as direct ways (e.g. activities with plants and earth elements). Hence, this study aims to first identify the current trends of children experience nature and further examine the effects of both direct and indirect experiences with nature on their CTN. Questionnaires were distributed to 760 children from 20 schools include both urban and rural schools in Kedah and Penang, Malaysia. The data were analysed using mean score, standard deviation, and multiple regression. The results confirmed that the current trends of children having experiences with nature are more through indirect ways. Results also showed that indirect experiences with nature make more contribution to children's CTN than direct experiences. Overall, this study highlights that indirect experiences with nature can be an alternative and effective way to develop children's CTN without neglecting the importance of direct experiences with nature.

Keywords: children, connectedness to nature, direct experiences with nature, indirect experiences with nature

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INTRODUCTION

An individual attachment to nature, known as connectedness to nature (CTN), plays an important role in developing a positive attitude and behaviour towards the environment. Studies have found that CTN has positively influenced people's environmental concerns and behaviours (Cheng & Monroe, 2010; Collado, Staats, & Corraliza, 2013; Duerden & Witt, 2010), as well as specific attitudes towards nature (Lin et al., 2017) and the environment including wildlife (Zhang, Goodale, & Chen, 2014). In addition, CTN also has a positive impact on individual's psychological well-being (Capaldi, Dopko, & Zelenski, 2014; Howell, Dopko, Passmore, & Buro, 2011). Given the many benefits of CTN regarding individual attitudes towards nature and the environment, as well as psychological well-being, the question is how an individual develops their CTN. Many studies have demonstrated that frequent experiences with and in nature are the most significant factor that contributes to an individual's CTN, which subsequently influences their environmental concerns and behaviours (Cheng & Monroe, 2010; Duerden & Witt, 2010; Zhang et al., 2014). Most importantly, retrospective studies have found that childhood frequent experiences with and in nature in creating long-lasting effects that endure until adulthood (Chawla, 2007; Wells & Lekies, 2006).

However, it has become a concern as the frequency of children having direct experiences with nature is declining (Gundersen, Skår, O'Brien, Wold, & Follo, 2016; Skår & Krogh, 2009). Rapid urbanisation and population growth, which mostly occur in developing countries including Malaysia, have reduced children's experiences with nature especially direct experiences (Chawla & Derr, 2012; Louv, 2008). Modernisation has also caused children's leisure activities to change from them being actively involved in outdoor activities to being passively confined to indoor activities, aided by gadgets (Louv, 2008; Veitch, Bagley, Ball, & Salmon, 2006). Also, parental restrictions due to safety have limited children's opportunities to play in the outdoor environment (Castonguay, 2010; Holt, Lee, Millar, & Spence, 2015) where they can experience nature directly. For that reason, children have obtained experiences with nature mostly from indirect experiences through the media (Cohen & Horm-Wingerd, 1993; Kellert, 2005) and books, as well as in classes and visits to organised natural places, such as zoos (Louv, 2008).

Even though many studies have demonstrated that both direct and indirect experiences with nature make contribution to children's CTN (Duerden & Witt, 2010), concerns have been raised, as several studies have found that children have less knowledge about, affection to and interest in nature when they only have indirect experiences with nature without direct experiences (Aaron & Witt, 2011). Direct experiences with nature through gardening and planting trees were found to make greater contribution to children's CTN when they become adult as compared to indirect experiences with nature (Lohr & Pearson-mims,

2005). As the frequency of children having direct experiences with nature is declining (Skår & Krogh, 2009; Gundersen et al., 2016) and children obtain nature experiences mostly through indirect ways; hence, it is important to examine whether indirect experiences with nature have a similar effect to direct experiences with nature on children's CTN. Moreover, most studies have been conducted in Western countries, and few have been conducted in Asian countries. It is important to fill this gap because studies have found that people with different cultures have a different engagement with nature (Milfont, 2012; Robertson, Walford, & Fox, 2003). Therefore, this study aims to first identify the current trends of Malaysian children experience with nature that include both direct and indirect experiences, and further examine the effects of these experiences on their CTN.

METHODOLOGY

Participants

This study used quantitative approach involving distribution of questionnaires to 760 children aged 10-11 years old from 20 schools, both urban and rural schools, located in Northern Region of Malaysia, particularly in Kedah and Penang. The sample was chosen using stratified random sampling. Children aged 10 to 11 years old were first divided into urban and rural strata. Then, five schools were selected randomly from each stratum; all the selected schools were national schools (*Sekolah Kebangsaan* (SK)). Subsequently, a class was randomly chosen from each batch (year) in every school. Complete collection (criterion sampling) was used to select the children. Every student in the chosen classes completed the questionnaire; however, only 760 were randomly selected according to the number that had been calculated using proportionate simple random sampling calculation. Overall the number of selected children was 382 from Kedah and 378 from Penang. Data collection was conducted from February 2016 until April 2016. Copies of questionnaire were distributed personally to the children in classes. The questionnaires were distributed in the Malay language as English is not the first language of the children. The children took 20 minutes to answer the questionnaire.

Questionnaire Development

Experiences with Nature

Children's experiences with nature were measured through two types of experiences, which were 'direct experiences' and 'indirect experiences'. The items for both experiences were adapted from Cheng and Monroe (2010), and Zhang et al. (2014). Some of the items were also derived from pre-test. The children were asked to tick on the frequency of them doing the listed items.

Following Cheng and Monroe (2010), this study employed five-point Likert scale (1=never, 2=seldom, 3=sometimes, 4= often and 5=very often). 'Seldom' refers to 1 to 2 times per year, 'sometimes' refers to almost every month, 'often' refers to almost every week and 'very often' refers to almost every day.

'Direct experiences' was measured by 22 items that have been categorised into activities with plants, activities with earth elements, water activities, and activities with animals. Activities with plants category consists of eight items, for example, climbing trees, picking flowers, and gardening. Activities with earth elements category includes three items which are playing with soil, playing with mud, and collecting sea shell. Water activities category consists two items: bathing at the beach and bathing in the river. Meanwhile, activities with animals category consists of nine items, for example, fishing and catching butterfly.

'Indirect experiences' was measured by 12 items that have been categorised into three categories: observation of natural elements, visit organised natural places, and vicarious activities. Observation of natural elements category consists of six items, such as observing plants, observing birds, and observing insects. Visits to organised natural places category consists of three items: visiting zoo, visiting aquaria centre, and visiting botanical garden. Vicarious activities category consists of three items: watching nature programme on television, reading books about nature, and collecting nature pictures.

The reliability test indicated that Cronbach's alpha coefficient values for direct and indirect experiences with nature were acceptable with values ranging from 0.7 to 0.8.

Connectedness to Nature

Children's CTN was measured through six constructs, which were nature dependence, sense of responsibility, enjoyment in nature, empathy towards nature, interest in nature activities, and interest in natural spaces. Overall, there were 26 items and the items for each construct were adapted from previous instruments of CTN. The items were a combination of items from studies by Nisbet, Zelenski and Murphy (2008), Clayton (2003), Larson, Green and Castleberry (2009), Cheng and Monroe (2010), Aaron and Witt (2011), McAllister, Lewi and Murphy (2012), and Ballantyne and Packer (2002). The level of agreement for children's CTN was designed to be child friendly by using a smiley icon to indicate their level of agreement. This present study measured CTN using a four-point Likert scale with 1 (strongly disagree), 2 (disagree), 3 (agree), and 4 (strongly agree).

Nature dependence was measured through five items. The examples of the items for nature dependence were, "Nature is important for my life" and "I need nature to survive". Meanwhile, sense of responsibility was constructed by six items and the examples of items were "I will take care of nature". Empathy

towards nature was measured by three items. The items for empathy towards nature were "I feel sad seeing forests being cleared" and "I feel sad seeing nature being destroyed". Enjoyment in nature was measured through eight items. The examples of items for enjoyment in nature was "I feel happy being in natural places such as waterfalls, rivers, and the beach". For interest in natural spaces, six items were used to measure children's intention to be in spaces that have natural elements. Examples of items for this construct were "I want to own a house that has green areas" and "I would prefer to live in a house surrounded by green areas compared to surrounded by buildings". As for interest in nature activities, four items were used to measure children's interest in being involved in nature activities. Examples of items for interest in nature activities was "I want to join in camping near natural places".

A pilot study was first conducted before the actual study to ensure the children understand the questionnaire. Face, content, and construct validity were also conducted to validate the instrument. As for reliability test, this study used 0.6 as the cut-off for Cronbach's alpha value, as the instrument in this study was a newly developed instrument. The results for reliability test indicated that the CTN scale was reliable with values of Cronbach's alpha for each construct ranging from 0.6 to 0.9. Even though five of the constructs have an acceptable value with a low value for Cronbach's alpha (0.6), for all items, the inter-correlation values were above 0.3 which were acceptable (Pallant, 2013).

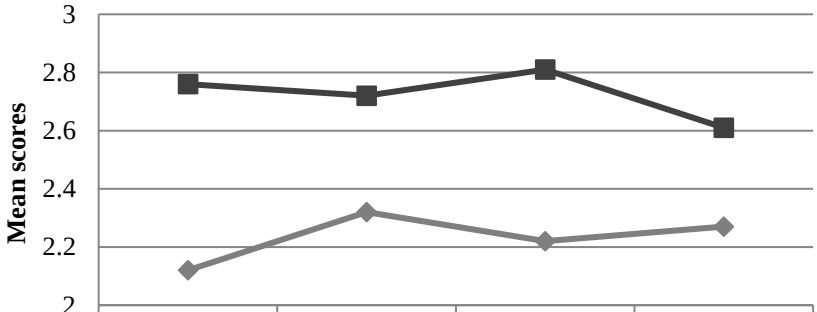
Analyses

The data were analysed using IBM SPSS Statistics Version 22. Descriptive analysis using mean score and standard deviation were used to identify the frequency of both direct and indirect experiences with nature. Meanwhile, inferential analysis using standard multiple regression was used to examine the relationship between children's direct and indirect experiences with nature and their CTN.

RESULTS

Frequency of Children's Direct and Indirect Experiences with Nature

Based on Figure 1, it is apparent that indirect experiences in nature have the highest mean score for all for locations, followed by direct experiences in nature. These findings indicate that the children involved more with indirect experiences with nature as compared to direct experiences.



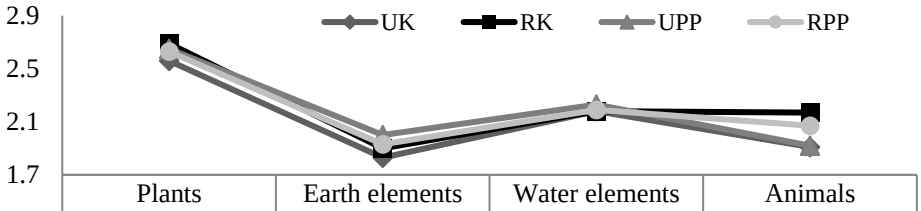
	UK	RK	UPP	RPP
Direct	2.12	2.32	2.22	2.27
Indirect	2.76	2.72	2.81	2.61

Legend: UK=Urban Kedah, RK=Rural Kedah, UPP=Urban Penang, RPP=Rural Penang

Figure 1 Mean scores for direct and indirect experiences with nature

Direct Experiences with Nature

As shown in Figure 2, it is clear that the children frequently engaged in activities with plants for all locations with mean score of 2.56 (SD= 0.77), 2.69 (SD= 0.73), 2.65 (SD=0.76) and 2.63 (SD=0.73), respectively for Urban Kedah, Rural Kedah, Urban Penang and Rural Penang. This is followed by activities with water elements, activities with animals, and activities with earth elements. These results indicate that children from all locations have about the same frequency of direct experiences for all activities with just slight differences.



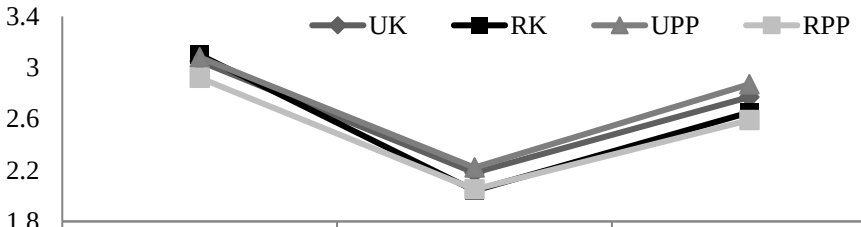
	Plants	Earth elements	Water elements	Animals
UK	2.56	1.83	2.18	1.91
RK	2.69	1.9	2.18	2.17
UPP	2.65	2.00	2.23	1.92
RPP	2.63	1.93	2.19	2.07

Legend: UK=Urban Kedah, RK=Rural Kedah, UPP=Urban Penang, RPP=Rural Penang

Figure 2 Mean scores for each category of direct experiences with nature

Indirect Experiences with Nature

From Figure 3, it is clear that the activities that have higher mean scores for indirect experiences are observation of natural elements and vicarious activities. Meanwhile, the least frequent indirect experiences with nature that children did was visit organized natural places. These results indicate that the activities that the children did most are observation of natural elements and vicarious activities. However, the category of visits to organised natural places has a lower frequency, as children need to travel to those places.



	Observation	Visitation	Vicarious
UK	3.05	2.18	2.77
RK	3.1	2.04	2.65
UPP	3.08	2.22	2.87
RPP	2.92	2.05	2.59

Legend: UK=Urban Kedah, RK=Rural Kedah, UPP=Urban Penang, RPP=Rural Penang

Figure 3 Mean scores for indirect experiences with nature categories

The Relationship between Children's Experiences with Nature and their Connectedness to Nature

Prior to conducting multiple regression analysis, all the preliminary analyses for multicollinearity, outliers, normality, linearity, and homoscedasticity meet the assumptions; hence, the regression model is appropriate. The coefficient determination for the developed model is 0.120 (R2 = 0.120). Thus, 0.120 (12.0%) of CTN can be explained by the independent variables. The model has a significance level of 0.000 ($p < 0.005$). Therefore, this model is appropriate to predict CTN. Based on Table 2, only one independent variable predicts CTN. The results illustrate that indirect experiences with nature are statistically significant in making a contribution to CTN with $p < 0.05$ (b= 0.32, t=7.74, Sig. 0.00). Meanwhile, direct experiences with nature is not statistically significant in making a contribution to CTN with (b= 0.044, t=1.06, Sig. 0.29). Surprisingly, the results have demonstrated that direct experiences with nature have no significant effect on CTN, whereas indirect experiences with nature significantly affect CTN.

Table 2 Regression coefficients (direct and indirect experiences)

Model	Standardized Coefficients		
	Beta	**t**	**Sig.**
(Constant)		51.50	.000
Direct	.044	1.06	.291
Indirect	.322	7.74	.000

Direct Experiences with Nature and Connectedness to Nature

The results indicate that the model is appropriate, with a significant level of 0.00 ($p < 0.005$). As shown in Table 3, activities with plants and activities with earth elements are statistically significant in predicting CTN, whereas activities with water elements and activities with animals are statistically insignificant in predicting CTN. The highest predictor in making a contribution to CTN that has the highest beta coefficient is activities with plants with $p < 0.05$ (b=0.23, t= 5.50, Sig. 0.000). The second highest predictor is activities with earth elements with $p < 0.05$ (b= 0.06, t= 3.12, Sig. 0.002).

Table 3 Regression coefficients (direct experiences activities)

Model	Standardized Coefficients		
	Beta	**t**	**Sig.**
(Constant)		53.59	.000
Plants	.227	5.50	.000
Earth elements	.121	3.12	.002
Water elements	.037	.97	.332
Animals	-.057	-1.36	.176

Indirect Experiences with Nature and Connectedness to Nature

The model has a significance level of 0.000 ($p < 0.005$). Hence, the model of indirect experiences with nature is appropriate to predict CTN. As shown in Table 4, observation of natural elements and vicarious learning activities are statistically significant in predicting CTN. Vicarious activities have the highest beta coefficient (see Table 4.43); thus, vicarious activities make the strongest contribution to CTN with $p < 0.05$ (b= 0.28, t= 7.58, Sig. 0.000), followed by observation activities with $p < 0.05$ (b=0.15, t= 4.16, Sig. 0.000).

Table 4 Regression coefficients (indirect experiences activities)

Model	Standardized Coefficients		
	Beta	**t**	**Sig.**
(Constant)		59.68	.000
Observation	.152	4.16	.000
Visits	.039	1.10	.270
Vicarious	.281	7.58	.000

DISCUSSION

In general, as expected, the mean scores for direct experiences is lower than indirect experiences with nature, indicating that the current trend is children having more indirect experiences with nature compared to direct experiences. As for direct experiences with nature, the most frequent activities that the children involved is activities with plants. Meanwhile, for indirect experiences with nature, the most frequent activities that the children involved are observation of natural elements and vicarious activities. Unexpectedly, this study found that direct experiences is insignificant predictor of children's CTN, while indirect experiences is significant. This finding is in contrast to substantial studies that have suggested that direct experiences have positive effects on children's CTN (Cheng & Monroe, 2010; Duerden & Witt, 2010; Zhang et al., 2014). This finding is also in contrast to Lohr and Pearson-mims's (2005) study that found direct experiences make greater contribution to CTN than indirect experiences with nature. On the other hand, although indirect experiences with nature do not provide the adventure, surprise, and discovery element, they do significantly affect children's CTN. These findings can be explained by the fact that the quality of direct experiences that the children are having are insufficient to develop their knowledge on, affection to, and interest in nature. Another possible explanation might be related to cultural differences, as people in different cultures engage differently with nature, as has been found in several studies (Milfont & Sibley, 2012; Robertson et al., 2003).

For indirect experiences with nature, further analysis has shown that experiences through observation and vicarious activities significantly predict CTN, with vicarious activities make a slightly greater contribution compared to observation. This finding is in contrast to findings of previous studies where children who had indirect experiences with nature through vicarious activities, such as books and media, were unaware about and not connected to nature (Aaron & Witt 2011). A possible explanation of why vicarious activities contribute to children's CTN may relate to the knowledge that they obtain through vicarious learning activities, which helps to increase their understanding on the importance of nature and develop their sense of responsibility and empathy towards nature; these further affect their overall CTN. Furthermore, this finding suggests that only being surrounded by nature, which allows children to have daily view and

observation towards nature, also can help to increase the level of children's CTN. Therefore, indirect experiences can be an alternative and effective way to develop children's CTN.

As for direct experiences with nature, even though direct experiences do not significantly affect children's CTN, further analysis revealed that activities with plants and earth elements are statistically significant in making a slight contribution to children's CTN. This indicates that as children frequently do activities with plants and earth elements such as gardening and playing with soil, the children will gain more knowledge about the plants and soil, develop affection towards those elements and further develop their interest to further participate in activities that involve those elements. Both activities make only a small contribution, something which is likely to be related to the quality of the experience itself. Hence, the importance of direct experiences also cannot be neglected.

CONCLUSION

Overall, the findings of this research suggest that such low frequency of children's direct experiences with nature is insufficient to develop their CTN; and the trends of children having most nature experiences indirectly does not give negative effect as indirect experiences with nature is significantly influence their CTN. Hence, indirect experiences through vicarious activities and observation towards nature can become an effective alternative way to connect the children with nature in the future as children have constraints of being explorative in the outdoor environment where they can have direct experiences with nature. However, the importance of direct experiences with nature cannot be neglected. It is suggested that practitioners in built environment, environmental education, as well as parents should help to reconnect the children with nature through both direct and indirect ways as both can complement each other.

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SOCIAL IMPACT EVALUATION OF TEA PRODUCTION USING SOCIAL LIFE CYCLE ASSESSMENT (S-LCA) METHOD IN CAMERON HIGHLANDS, PAHANG, MALAYSIA

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Abstract

Commercial convention of tea production and plantation at the largest scale in this country has shown an escalation year by year, together with the high demand for tea products in the Malaysian market. This may have a direct social impact throughout the life cycle of tea production. Thus, this research sought to identify the social impacts from the overall process of tea production. This study used the Social Life Cycle Assessment (S-LCA) involving descriptive analysis by assessing the social impacts associated with the stakeholders of tea production using three sets of questionnaires. The studies were conducted at one of the highest tea production companies in Cameron Highlands, Malaysia. The findings of the stakeholders showed a good level of satisfaction because there was no significant negative effect. Overall, the social aspects of the tea production met the required criteria in terms of social significance. However, there were some social aspects that can be improved by the factory in the future such as health and safety, discrimination, job opportunity and local community involvement.

Keywords: Social Life Cycle Assessment (S-LCA), job satisfaction; job discrimination; social security; safe and healthy living condition

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INTRODUCTION

The tea bush is botanically known as *Camellia Sinensis*. It is an evergreen plant with smooth, shiny, oval-shaped leaves and small white flowers. Today, tea is grown in more than 25 countries around the world. In Malaysia, the best place for tea is in Cameron Highlands, which has been planted with the world's most flavoured beverage made from the dried leaves and buds of the tea bush. Tea is also one of the precursors to Cameron Highlands development as a hill station before its transformation into a major tourist destination. Recently, tea industry in Cameron Highlands is facing difficulties to sustain and survives. The tea industry is facing many challenges in its expanding its operations and in handling the social impact of tea companies such as the discrimination toward workers, cultural & heritage conservation, water shortages, and demands of fair wages from workers. Not only that, some local communities had to depend on polluted source of drinking water and had been inflicted with diseases as the result of extensive use of fertilizers and herbicides in the plantations, and untreated effluent discharge from tea mill into majority of the streams.

Tea production is one of the major economic income generators that provides high rate of employment in Cameron Highlands, Pahang. The high demand for tea in the manufacturing industry for tea-based products contributes to the opening of large-scale tea cultivation and creates more employment opportunities to the local community. The demands come not only from the domestic market, but also from international markets. According to the Food and Agriculture Organization (FAO) of the United Nations (2016), the production of tea in Malaysia has been continuously increasing year by year. In 2015, the total production of tea was 9,760 tonnes and it has increased to 11,600 tonnes in 2016. In order to meet the overwhelming demand, tea plantations require expansion and the use of more lands. In some producing countries, the expansion of tea plantations led to new areas being developed for plantation and leading to conflicts between the plantations and the local communities especially regarding their lands that have been misappropriated by the plantations.

The main objective in this study is to assess the social implications of tea production toward workers, local communities and consumers. S-LCA is a technique of social impact assessment, which is aimed at assessing the social and socio-economic aspects of a product as well as the positive and negative impacts on the whole life cycle (Amir Hamzah, 2016). The assessment begins from the comprehensive production and processing of raw materials, production, distribution, use, reuse, maintenance, recycling and final disposal of a particular product (Muhammad, Sharaai, Ismail, Harun, & Wong, 2019).

Basically, the concept of the S-LCA adopted in this study is similar to the Life Cycle Assessment (LCA) framework which focusses on environment while the S-LCA focusses on social aspect. To understand and analyse the social issues in tea production, an S-LCA study could be a feasible option for assessing

the social impacts generated throughout the life cycle of tea production. Moreover, there is no study yet for S-LCA on tea production especially in Malaysia.

MATERIALS AND METHODS

The S-LCA study adapted the framework of the Life Cycle Assessment (LCA), of which it has four important steps; 1) goal and scope definition, 2) Life Cycle Inventory (LCI) analysis, 3) Life Cycle Impact Assessment (LCIA), and 4) interpretation. In other words, it was conducted based on the guidelines of the ISO 14040 and ISO 14044 (International Organization Standardization, 2006). This study was carried out at a selected tea production company in Cameron Highlands, Pahang. The area of study was based on its high production and plantation of tea in Malaysia.

Goal and Scope Definition

The first step in the S-LCA process is to define a clear goal that determines how a study is to be conducted. The goal of this study was to identify the social hotspots in the tea production process for product development in supply chain establishments of purchasing procedures or development of public and worker policies. The system boundary of this study is cradle-to-gate involving tea plantation up to the factory process (tea manufacturing) (Figure 1).

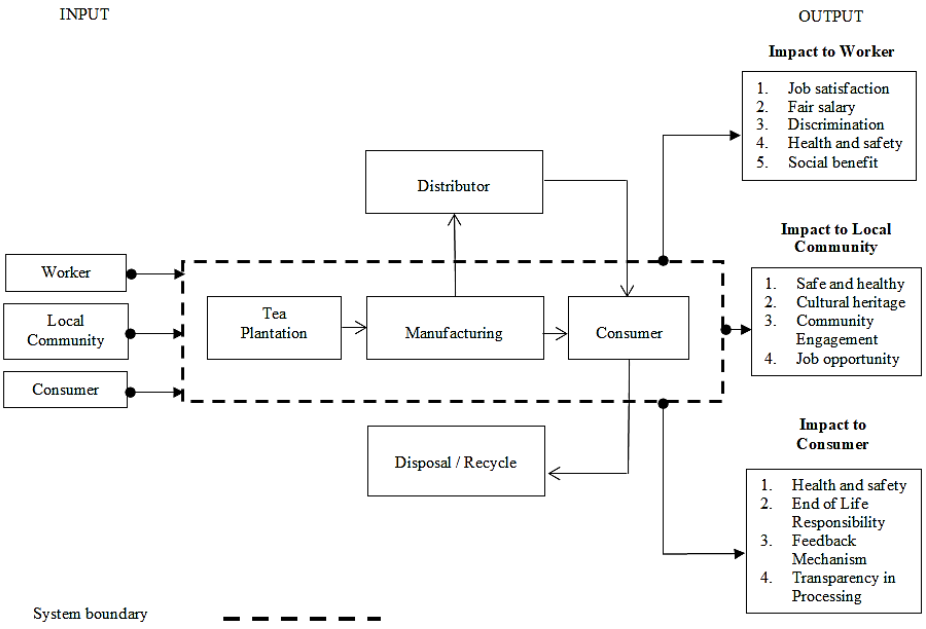

Figure 1 System boundary for the S-LCA study of tea production at Cameron Highlands

Social Life Cycle Inventory Analysis (S-LCI)

The social life cycle inventory analysis concerns the process in which data are collected. In order to obtain the potential social impacts in a system boundary, a survey was used to obtain the related information from three stakeholders: the workers, the local communities and the consumers. Three sets of questionnaires were employed as the instrument to obtain the related information from the three stakeholders. The questionnaires were constructed based on a subcategory proposed by UNEP (2009), which included five subcategories for workers, four subcategories for the local communities and four subcategories for the consumers.

Research instrument

The three sets of questionnaires contained 35 items for workers, 29 items for the local communities and 24 items for the consumers. All data collected from the questionnaire survey was analysed descriptively after which the analysed data was used to support the expected outcomes. The questionnaires were assessed based on validity and reliability tests before they were distributed in the actual study. Two languages, Malay and English, were used in the questionnaires so that the respondents could better understand and answer them. A 5-point Likert scale was used, ranging from 'strongly disagree' (1 point), 'disagree' (2 point), 'neutral' (3 point), 'agree' (4 point) and 'strongly disagree' (5 point).

Validity of the questionnaire

In order to validate the content of the survey, content validity analysis was performed to ensure that the number of items in each category is sufficient to represent each category. Besides, consultation with experts in social studies was carried out as well. They examined the suitability and adequacy of the questions posed in the questionnaires. These experts were selected due to their vast experiences (15 years' of experience and knowledge in this particular field) and they had personally seen, witnessed, and participated in the social impacts and tea industry activities. The item content validity index (I-CVI) (Muhammad, Muhamad Pauzi, & Sharaai, 2015) was evaluated by the experts to evaluate the relevancy of each item in the questionnaire where the experts were given the choice to tick the 4-point Likert scale (1 = not relevant, value 2 = somewhat relevant, value 3 = relevant, and value 4 = very relevant). For each question, the experts were required to give either the values of 3 or 4 for 'relevant' rating and marked as (X), or the values of 1 or 2 for 'irrelevant' and marked with the dash symbol (-). Then, the proportion of the values was calculated. Table 1 shows the sub category and the item content validity index (I-CVI).

Table 1 Validity and reliability of items in the questionnaires

Stakeholder category	Sub-category	No. of items	Item CVI	Cronbach's Alpha
Workers	1. Job satisfaction	10	0.9	0.92
	2. Fair Salary	5	0.9	0.82
	3. Equal opportunities/ discrimination	7	0.9	0.83
	4. Health and safety	7	0.9	0.97
	5. Social benefit/ social security	6	0.9	0.87
Local communities	1. Safe and healthy living condition	12	1.0	0.83
	2. Cultural heritage	7	0.9	0.67
	3. Community engagement	4	0.9	0.72
	4. Job opportunity	6	0.9	0.83
Consumers	1. Health and safety	8	0.9	0.72
	2. End of Life Responsibility	5	1.0	0.75
	3. Feedback Mechanism	6	0.9	0.67
	4. Transparency in Processing	5	0.9	0.67

Pilot study

A total of 30 respondents for the local community, 20 respondents for workers and 30 respondents for consumer were selected as subjects for the pilot study. The reliability of the items was executed using the internal consistency reliability test. Based on Table 1, the average value of the internal consistency reliability (Cronbach's alpha values) for workers, local communities and consumers were 0.886, 0.764 and 0.69 respectively. The questionnaires were confirmed to have a high reliability because its Cronbach's alpha values were greater than 0.65 and the data was normally distributed. The questionnaires for this pilot study were valid to be used in the real study.

Number of Sampling

The total population in Cameron Highlands in year 2010 was 37,147 (District Council of Cameron Highlands, 2010). In line with Krejcie and Morgan formulation, as cited in Saleh and Bista (2017), 380 respondents from Brinchang, Cameron Highlands were chosen in this study to represent the population.

Sampling Technique

Stratified and systematic sampling techniques were used to distribute the questionnaires to the local communities. A total of 397 sets of questionnaires

were distributed evenly to the local communities, mostly distributed around the housing area surrounding primary schools and night markets. The respondents were selected randomly in each area. For workers, there were only 20 workers allowed by the company to be selected as respondents due to private and confidential issues in the management system at the tea production company. Lastly, a total of 380 questionnaires were distributed randomly to consumers of the tea products.

RESULTS AND DISCUSSION

Social Impact of the Workers

The social impact result for this study constitutes the third step (LCIA) in the S-LCA. The impact category for workers aimed to cover social problems on tea plantation and production such as job satisfaction, salary, discrimination, and health and safety. Table 2 shows the total points from the Likert scale for each section. The percentage of each subcategory was obtained by dividing each subcategory with the total of the impact.

Table 2 The social impact of worker at tea production

Social Impact subcategory	Total point of respondent responds
1. Job Satisfaction	1,312 (50%)
2. Salary/ wages	413 (16%)
3. Discrimination	306 (12%)
4. Health and Safety	562 (22%)
GRAND TOTAL	**2593 (100%)**

From Table 2 above, all social impacts had almost different values. There was one social impact that had the highest value of satisfaction compared to others, which was 50% for job satisfaction. Job satisfaction reflects the workers' satisfaction on the job given and the relationship between supervisor and staff. This was followed by 22% on health and safety. After that, 16% was on the salary based on whether the workers were paid well or paid according to their effort in work. The least was 12% for discrimination issues in the company. From this, it can be said that the workers had different values of satisfaction toward working in tea companies for all of the social impacts. The satisfaction was low for social impact of discrimination and salary; they did not see any issue or problem in these impacts and emphasised more on job satisfaction and health and safety. This finding was supported by Schierbeck (2006), in which S-LCA holds the potential of promoting economic and social welfare in developing countries and improving working conditions around the world by providing responsible companies with a tool to assess the social impacts in the product chain of their business activities. It is necessary for S-LCA to give an image of the social impacts and use business decision making to help reflect the impacts that raise living standards. This

indicates that companies obeyed the minimum wage policy set by the Malaysian government that was RM1,000 for local workers (Minimum Wage Order, 2016). In addition, a study by Chen (2009) on tea growers in China, where each tea growing household runs a 1,500-2,000 square metres of tea farm, found their average income is only half of the average income of farmers, which has caused tea growing to become unattractive.

The lowest level of satisfaction was discrimination, which was 12%. All employees and applicants for employment should receive fair treatment and are not subjected to discrimination based on race, nationality, religion, disability, gender, age, sexual orientation, union membership, political bodies and other related issues. It is believed that this was not a serious issue in the mills and tea companies because both employees and employers were bound by the provisions of protection under the Labour Act (Wild Asia, 2016).

Social Impact of the Local Communities

The impact category for the local communities aimed to cover social problems on tea plantation and tea production such as safe living conditions, cultural heritage, community engagement and local employment. Table 3 shows the four sections in the questionnaire for the local community, which covered health and safety living conditions, cultural heritage, local community involvement and job opportunity. There were 275 respondents and the percentage of each section was obtained by dividing each section with the total points of every subcategory in the questionnaire.

Table 3 The social impact of local communities at tea production

Social Impact subcategory	Total point of respondent responds
1. Health and safety living condition	11,072 (36%)
2. Cultural heritage	9,009 (30%)
3. Local community involved	5,250 (17%)
4. Job opportunities	5,233 (17%)
GRAND TOTAL	**30,564 (100%)**

From Table 3 above, it can be seen that the highest percentage was on health and safety living conditions (36%), followed by cultural heritage (30%), job opportunities (17%) and local community involvement (17%) respectively. This shows that the locals have a high value of satisfaction for health and safety and the cultural heritage preserved in Brinchang more than the job opportunities and local community involvement by the company. The local communities did not have any complaint for the company because they feel safe to stay in the area even though it is near a factory. Besides, there was no social problem caused by the workers hired by the plantation company. As a matter of fact, the company had used some of its fund for the welfare of the people but they did not make it

public. They had even allocated scholarships for primary school students who scored excellently in the primary school evaluation test (known as UPSR). The majority of the local communities have a good impression of the brand of the company and they believed that the company helped to reduce the negative impact to the earth with its production of tea products.

Social Impact of the Consumers

The impact category for the consumers aimed to cover social problems in the final damage on the Area of Protection such as health and safety, end of life responsibility, feedback mechanism and transparency in the processing process. Table 4 shows the total points from the Likert scale for each section covering the 380 respondents. The percentage of each section was obtained by dividing each section with the total point of 30,891**.**

Table 4 The social impact of consumers at tea production

Social Impact subcategory	Total of respondent respond
1. Health and safety	8,733 (28.3%)
2. End of life responsibility	6,745 (21.8%)
3. Feedback mechanism	8,293 (26.9%)
4. Transparency in processing process	7,120 (23.0%)
GRAND TOTAL	**30,891 (100%)**

According to Table 4, all social impacts had almost the same value. This shows that there was no impact category that had a high value of satisfaction compared to the other. In short, consumers had the same value of satisfaction for all social midpoint impacts. Therefore, it can be assumed that the company of tea products has been a great hit and mostly received the support from the consumers. The meaning of its "Ummph!" slogan represented feelings of enjoyment. According to Jorgensen, Le Bocq, Nazarkina and Hauschild (2012), S-LCA has a more holistic perspective on the impact of products than comparable social assessment tools, including several stages in the life cycle. Activities that the respondents claimed the company had been doing was cleaning the village and organising running events. Based on the company's website, with a production capacity approaching 3,000kg per hectare, the plantation company produced four million kilogrammes of tea annually, which translates to about 5.5 million cups per day. This represents about 70% of all tea produced in Malaysia. The respondents felt safe to consume the company's tea products and they believed it has high quality as no food poisoning reports had ever occurred.

Life Cycle Interpretation

The life cycle interpretation is the process to assess the result of the study. In line with the objective and scope of the study, this phase consists of objectives for the result analysis to identify significant issues, evaluate the study, make a

conclusion, explain the limitations of the study, and give suggestions and recommendations (UNEP, 2009). This is a positive strength for the company as the products are not required to be replaced or reinvented to replace the obsolete products. The company can save cost from creating new products and spend additional revenue to maintain the premium grade of their black tea. The market is saturated by tea products from multiple manufacturers. Other competitors are pushing products into the market, increasing competition and eating the company's market share. Since tea products have been around for a long time, there is not much diversification that can be improvised to the product for improvement and might lead to product stagnation.

CONCLUSION

Contrary to what most people believe, this study proved that the existence of tea plantation and mills had led to positive impacts to the stakeholders i.e. workers local communities and consumers. The overall social aspects derived from the S-LCA for tea production met the required criteria in terms of social significance for those who had direct contact with this operation. However, there are marginal aspects such as discrimination to workers and poor local community involvement and feedback mechanism that needs to be reviewed and improved.

In overall, this study presents an important product conducted using S-LCA in this country. The results of this study can be interpreted and applied to reduce social impacts and improve efficiency across every stage of the production line. This can contribute to the long-term success of the company's owner by enhancing the product with the customers, retailers and staff to promote social sustainability. By understanding the relative impacts of the various operations over which farmers as a producer ultimately have control, it enables the company to take targeted initiatives and investment into procurement, energy and process efficiency measures, and production design.

The results of this study will be forwarded to relevant factories coupled with recommendations for best manufacturing practices, which are specifically aimed at reducing the negative social impacts of tea production. Nevertheless, this study only focused on two life cycle phases (tea plantation and manufacturing processing), which do not represent the whole life cycle of tea production. Research still needs to be carried out for the rest of the phases to determine the overall potential social impacts especially regarding the other two important phases in tea production i.e. the distributors and consumers.

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PLANNING OF PRIVATE GATED DEVELOPMENT: AN ANALYSIS OF GATED VS NON-GATED NEIGHBOURHOODS, CITY OF GURUGRAM, INDIA

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Abstract

The cities are expanding rapidly all over the world. India has also experienced this phenomenon and has continued the pace of growth. The recent trends in spatial growth of the cities are a new phenomenon in Indian urban landscape. The cities in India are witnessing development with the help of private developers for the last couple of decades. Being private properties these are by nature of exercising control have gates and boundaries. In scholarly literature these are called as Gated Community/Gated Development. Authors have argued them from various perspectives of anthropology, law, management and sociology etc. but very little has been discussed about their planning and morphology. Although, the rise of Gated Development is majorly attributed to the sense of fear and need for security, yet architects and urban designers, and even sociologist stress upon other methods to make the neighbourhoods secured. Hence the security aspects are not made part of the research here. The aspects of how these gated development impacts the perception of neighbourhood by residents is not touched upon. The paper discusses the distinction between the gated and non-gated neighbourhoods and also how residents perceive their neighbourhoods at large. For explaining this phenomenon, three neighbourhoods in the city of Gurugram in Haryana state in India have been identified as case study. These are identified on the basis of different morphological images that are identified. Space syntax and space cognition through sketch mapping is used for the analysis of the three neighbourhoods. The paper suggest that the continuity and connectivity of any spatial configuration is of utmost importance to make neighbourhood environment worthy of living life more socially connected.

Keywords: gated development, space syntax, morphology, planning, cognition

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INTRODUCTION

The liberalisation of economy during 1990s, IT sector steered the economy of the country. The distances were no constraint for ideas to germinate and mitigate. The world came closer, global became local and local became global giving rise to definition of a new term called "Glocal". Consequently, a new form of residential development emerged i.e. the private developer oriented development that changed the urban landscape of Indian cities. This is the "Gated Development" where development is confined within gates and boundaries and such developments are on private land parcels with no relevance and respect to overall spatial and social imagery. The private developers shaped the spatial growth pattern in Indian cities. In this era of marketing a product with a packaging fascinates many groups of people.

Most scholars have been critical of territorialisation of spaces through gated development. Such gated developments on divided land parcel have been a subject of scholarship globally. Scholars at international level have opined that such developments segregate the social fabric of the society. Some of the problems in the physical morphology of such developments are formation of fragmented & fractured urban communities, non–coherent design at neighbourhood level, shared and unshared privileges, privatization of public space and discontinuity in urban fabric, and introvert closed development. The objective of the paper is to differentiate the gated and non-gated neighbourhood in terms of morphological characteristics and also bring out differences of residents perception living in these areas. For this purpose:

- Three different neighbourhoods have been identified in Gurugram city (refer figure 3).
- There morphological characteristics have been understood. The distinction between the three has been brought out.
- The perception of residents has been identified through cognition survey.

RESEARCH BACKGROUND

The definition of gated communities/development in the literature is not absolute. Various terms like walled city, edge cities, enclosed neighbourhoods, enclaves etc. have been used to justify the physical nature of the development. Gwyther (2005), with reference to planned estates on Sydney fringe, says that the "MPC are latest manifestation of utopian place making deriving from the Garden City movement of the late 19th century". Mathieu (2007) hypothesizes those GCs as a postmodern kind of Utopia. He also relates the social and spatial reversal, spatial one as a consequence of the social one. Where the elite who choose to live behind gates away from the world they cannot control. Closed condominiums are also included within the large ambit of GCs. These are multi-family residential developments that may have well-crafted master plan comprising high-rise condominiums with one, two, three or more bedrooms units (Abe-Kudo, 2007).

This paper is on discontinuity in urban fabric and its impact on human perception. Usually the private developers develop a piece of land with boundaries and well-designed gate at the entrance to attract the prospective customers. On the other hand, gating of a neighbourhood is also a phenomenon in which and any neighbourhood is compounded with gated and boundaries. These gates/boundaries are not part of initial planning of the neighbourhood. These gates/boundaries are erected by the residents' welfare organisation of the neighbourhood to maintain security of the area.

CONTEXT

The private developers now have a major role in shaping the spatial growth of Indian cities. In fact this is now a major trend across all countries of the world. India adopted new housing policy known as 'National Urban Housing and Habitat Policy, 2007' that emphasized on the role of private sector for meeting the deficit in housing. In Haryana (one of the state of India), during the last decade there has been a spurt in private residential development across the state, especially in Gurugram (a district). The kind of residential developments that are taking place in India and in the state of Haryana is similar in other countries. The master plan document enumerates the physical planning norms for a city, but it does not foresee the implication of the resultant spatial development after its implementation. Such developments are very intensive in city of Gurugram.

Gurugram, Haryana

Haryana was part of the composite Punjab state till 1966. This region has witnessed tremendous economic progress over the last 30 years due to the Green Revolution. Haryana has been spearheading the growth trends in the country and is one of the states with high growth rate. According to census 2011 the total population of Haryana was 2,53,53,081 (Government of India, 2011). Physically it is one of the smallest states in India with an area of 44,212 square kilometres. But the state's GDP growth rate and per-capita income is amongst the highest in the country. State of Haryana encircles the National Capital Delhi on three sides and Uttar Pradesh on one side. Gurugram falls under National Capital Region. On its north, it is bounded by the Jhajjar District of the state & the union territory of Delhi; Faridabad District lies to its east. On south it shares boundaries with Mewat whereas Rewari lies in its west. It is also known as Gurgaon/Gurugram (Biswas, 2002). It is renamed by the present political dispensation as Gurugram in September 2016.

Private Developers & the Process of Urban Development in Gurugram

The key element in Gurugram's explosive growth was the state of Haryana's lifting of restrictions on the land-acquisition process. The lifting of restrictions and Gurugram's natural advantage in being close to Delhi allowed private

developers to build residences, office parks, and manufacturing facilities that met the demand of India's booming high-tech sectors during the high-growth period that followed liberalisation of key sectors in the early 1990s.

Today the city of Gurugram is classified as region of hyper potential. The recent master plan of Gurugram has a projected population of 42.50 lacs and with an area of 16021 acres for residential development out of total of 32988 acres of developed land (Government of Haryana, 2012). Gurugram is significant from the gated development point of view because 69% of gated group housings in the state are located in Gurugram region.

With reference to Gurugram, the new sectors that are being developed show a quite different character in terms of private vs public space. As a matter of policy the land is acquired by developers from the land owners and after getting the license to develop a colony or a group housing, developers are able to sell the residential unit in terms of plots of flats. The basic nature of private development gives them the inherent character of gated and guarded residential complex.

Case Study Areas

Gating is a morphological outcome of city neighbourhood. The city of Gurugram, which has been gradually developed with the help of master plan over a period of time, and has different planning and development strategies that have manifested in its urban development in the form of gating. The sectors are, as mentioned earlier, the neighbourhood units planned by Haryana Urban Development Authority, HUDA. The morphological resemblance of earlier sectors can be traced from the planning of sectors of Chandigarh. The city of Chandigarh has been planned with sector as the basis planning unit. It is the primary module of city's design, a neighbourhood unit of size 800 meters x 1200 meters. It is a self-sufficient unit having shops, school, health centres and places of recreations and worship. The population of a sector varies between 3000 and 20000 depending upon the sizes of plots and the topography of the area. Henceforth, for neighbourhood unit the term 'sector' shall be used.

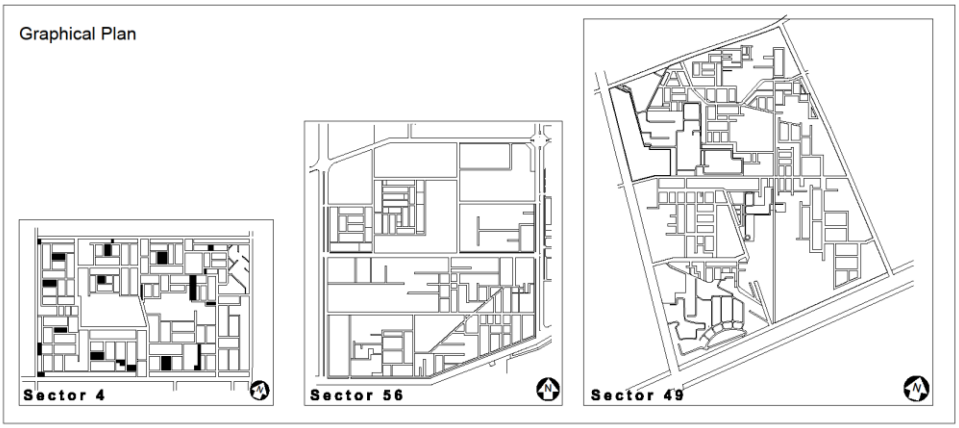

Figure 1 Graphical plan of Sectors 4, 56, 49 respectively on comparative scale
Source: Author

Sector 4
This is one of the earliest developed sectors of the city. The same was developed during 1975-1978 (Mehtani, 2012). This residential sector comprises plotted development with plot sizes that range from 150 square meters to 500 square meters. Sector development is a typical prototype of orthogonal street network system as can be seen in figure 6. A typical housing is as seen in Figure 1.

Sector 56
This sector was developed during the year 2000 (Mehtani, 2012) The residential sector comprises plotted development by HUDA and 83 group housings on plots ranging from half acre to over 15 acres. The gated group housing is spread all over and majority of them located on northern part of the sector.

Sector 49
This sector comprises mixed development and was developed between the year 1995-2000. The sector is a development initiative of private developers. Since it is developed by private developers all the respective development is gated and guarded.

METHODOLOGY
To analyse the morphology of the three distinct sectors developed at different point of time with different policy background following methodology is adopted.

Application of Space Syntax in Spatial Cognition
Space syntax is based on the fact that an urban environment is an interconnected space where everywhere links to everywhere else. The space syntax approach

provides an urban morphological representation by looking at only public spaces (open space). These public spaces look like a beady ring system, in which space widens to form irregular beads, and narrows to form strings, while at the same time joining back to itself so that there are always choices of routes from any one space to any other space (Hillier & Hanson, 1984). Space syntax developed by Hillier and his colleagues at University College of London in 1984 is a set of measures for space configuration that have shown a considerable correlation with how people move through and use building and urban spaces. It represents and "measuring the pattern properties of open space in the built environment" (Kim & Penn, 2004).

Spatial Cognition

As a word, cognition originates from Latin. Latin philosophers used the word cognitio as a translation of the Greek gnosis, which the Western philosophical tradition translates as knowledge (French: connaissance, Italian: conoscenza, German: Erkenntniss) (Brandimonte, 2006). For morphological and spatial analysis, syntactical analysis has been used to understand the morphology of the sectors. This is one of the best ways to quantify the unquantifiable and to conduct a quantitative analysis of the area concerned.

Syntactic Measures

The gated development and its spatial composition of neighbourhoods were studied in detail using the space syntax. The study of street pattern comprises overall configuration and syntactical parameters like depth, connectivity, global and local integration, intelligibility and synergy. After having understood the syntactical parameters, axial map was drawn of the three selected neighbourhood namely Sector 4, 56 and 49 of Gurugram City. The axial map was prepared in Depthmap software, which was created by Alasdair Turner from University College of London. It is an application used for visibility analysis of architectural system. Following parameters of space syntax theory have been compared (Kaushik 2016). These are Connectivity, Local Integration (HH R3), Global Integration (HH or Rn), Intelligibility, and Synergy. Table 1 shows the value of the Intelligibility and Synergy when there are no gates and also when gates are identified and located and the syntactical analysis of the axial plan was done on Depthmap.

Table 1 Comparison of intelligibility and synergy of the three sectors

	Intelligibility without gates	Intelligibility with gates	Synergy without gates	Synergy with gates
Sector 4	0.372276	0.292842	0.761741	0.70017
Sector 56	0.33582	0.319523	0.636327	0.634923
Sector 49	0.129983	0.129235	0.463968	0.412789

Source Author

The location of gates was marked on axial plans and after that syntactical analysis was done on Depthmap. The results show that as soon as we put gates in neighbourhood sectors, it impacts the syntactical parameters in all the sectors. Both Intelligibility and Synergy values decrease with gating. It is important signal that emanates from here. What is the factor that is impacted most? And which in turn impact other syntactical properties of sector morphology? The answer lies in understanding the fact that gating affects the continuity of urban fabric. It creates discontinuity in axis and urban morphology. Connectivity is the base of all other important syntactical properties of morphological parameters. Once it is impacted the same has implications on others as well. It means that gating of neighbourhood leads to un-intelligible environment. We are bound to live in private gated residential environment that is less and less intelligible.

CONGNITIVE MAPPING AND ANALYSIS

Sketch Mapping

According to many scholars, the study of cognitive mapping to gather information about physical environment is related to spatial knowledge; as it tells how people are enabled mentally represent the physical environment they observe through their minds (Garling & Evans, 1991). For measuring the cognitive representation, 40 respondents from each sector were asked to draw their neighbourhood sector. They were asked to draw streets and buildings and also label them. Respondents were informed that the idea behind this exercise was to know how they would orient themselves in their sectors with respect to the major streets and buildings. After the respondents finished their sketch map exercise they were asked questions on why they remember to draw certain roads and not others, as well as the features of the streets. The space syntax approach and method were carried forward in further analysis of the sketch mapping exercises of the respondents.

STATISTICAL ANALYSIS

The data so obtained by the sketch map was compared with the data obtained by syntactical analysis of the actual morphological configuration obtained at the start of the exercise. SPSS 20 software was used to statistically analyse the comparison between the two kinds of data, namely; the one obtained on the basis of actual spatial configuration of all the three sectors and the one obtained after the sketch mapping exercise.

Comparative Analysis of the Differences in Mean Values of Syntactical Properties Achieved through Cognitive Sketch Map Survey

After having achieved the statistical results of correlation and regression, it was important to assess and compare the resultant syntactical properties of the three

sectors achieved through cognitive sketch mapping survey. Accordingly, the Connectivity, Global Integration, and Local Integration of the three sectors were taken for comparison. The Connectivity of street network of Sector 4 was compared with that of Sector 56 and Sector 49 and that of Sector 49 was compared with that of Sector 56. Similar method was adopted for comparison between the other two syntactical properties namely Global Integration and Local Integration. Comparison of related variables is carried out by paired tests. In this test we compare the means of two related samples. The paired test compares the mean difference of the values to zero. It depends on the mean difference, the variability of the differences and the number of data.

The results show that as far as the connectivity aspect is concerned the spatial pattern is similar between Sector 4 and Sector 56. As far as the Global Integration aspect is concerned, the spatial pattern is not similar between all sectors. As far as the Local Integration aspect is concerned, the spatial pattern is similar between Sector 4 and Sector 56. The spatial patterns are similar in case of Sector 4 and Sector 56. This can be attributed to the fact that major part of Sector 56 has been planned and implemented by Government initiative and not in isolated bits and pieces. The planned street network binds the entire neighbourhood in uniform street pattern. This is not the case with Sector 49. As Sector 49 was developed in separate parts by private developers' initiative at different point of time implementing their own disintegrated street pattern and gating system.

Analysis with Respect to Buildings

After the respondents had performed their sketch mapping exercise, they were asked a series of questions. The comparative summary of correlation between building frequency and three syntactical properties pertaining to the building recognition and their marking on the sketch map is reproduced below. One can conclude that Sector 49, which is gated and developed by private initiative at different point of time on the basis of master plans that are independent of the each other, has weak correlation between the building identification frequency and other syntactical properties of the street/axis network.

- In the case of Sector 4, the result shows that there is a weak relationship between Building Frequency as identified by the respondents and Connectivity, Global Integration and Local Integration, with the respective correlational values of r=0.079, r=0.527, r=0.422, indicating a moderate positive relationship other than between building frequency and connectivity.
- For Sector 56, the result shows that there is a weak relationship between Building Frequency and Connectivity, Global Integration and Local Integration with the respective correlational values of r=0.372, r=0.358, r=0.326, indicating a weak/ moderate positive relationship

- In the case of Sector 49, the result shows that there is an extremely weak relationship between Building Frequency and Connectivity, Global Integration and Local Integration, with the respective correlational values of r=0.178, r=0.054, r=0.125, indicating a very weak positive relationship.

On the whole there is a trend of weak correlation between Building Frequency and Connectivity. Whereas the correlation between Global Integration and Building Frequency is higher in the three sectors. Higher Global Integration or we can say the higher global accessibility results in higher building frequency.

The Local Integration and Connectivity follow a decreasing trend with the decrease in the frequency of the buildings as identified in the case of Sector 4 and 56. However this association is not found in the case of Sector 49.

Analysis with Respect to Axis/Streets

In the cognitive survey, the respondents were asked to draw the streets/axis that they remember. It was found that the length and the width of axis have strong correlation with the axis frequency, meaning that more respondents remember longer and wider axis. The relation between the axis frequency and the Connectivity and Global Integration and Local Integration is strong in the case of Sector 4. This is attributed to the fact that Sector 4 layout was planned and executed by Government in totality and not in fragmented manner as in the case of Sector 49. Sector 49 has the fragmented layout of the streets executed by different developers at different point of time. These layouts are gated and are inaccessible to non-residents of that development.

CONCLUSION

Several points can be highlighted from the findings of the study. Firstly, the characteristics of gated and non-gated developments in the context of Gurugram City were identified using non-syntactical and syntactical methods of analysis. The main purpose was however to diagnose and differentiate between both types of development through cognition studies. The spatial configurations of both types of developments were compared with what was obtained through spatial cognitive analysis. The conclusion drawn towards the fact that our built environment is becoming un-intelligible neighbourhoods and are gated and non-porous.

Table 2: Overall comparative correlation between the three sectors

Correlation	Sector 4 Non-Gated, Most Intelligible		Sector 56 Gated and Partly Private		Sector 49 Gated & Private, Least Intelligible	
	Spatial Configuration	**Cognitive Survey**	**Spatial Configuration**	**Cognitive Survey**	**Spatial Configuration**	**Cognitive Survey**
Between Connectivity and Global Integration	Moderate Positive	Strong Positive	Moderate Positive	Moderate Positive	Moderate Positive	Moderate Positive
Between Connectivity and Local Integration	Strong Positive	Strong Positive	Strong Positive	Strong Positive	Strong Positive	Strong Positive
Between Global Integration and Local Integration	Strong Positive	Strong Positive	Strong Positive	Strong Positive	Strong Positive	Strong Positive

Source: Author

The correlation analysis between the three syntactic variables, which are Global Integration, Local Integrations, and Connectivity of all sectors reveals mixed types of relations. The space syntax analysis has shown that layout of Sector 4 is most intelligible, Sector 49 is least intelligible. While comparing the relationship between the three syntactical measures based on actual spatial configuration and that as per cognitive survey, it comes to notice that both these analysis have similar comparative results.

The correlation analysis that was performed on data collected from cognitive survey revealed that the correlations between axis frequency and the three syntactical measures for respondents of Sector 4 are relatively moderate/strong. Global Integration has the highest correlation with axis frequency and the next high correlations are Connectivity and Local Integration. It is, however, worth to mention that in all the three sectors, respondents remember the wider roads more often. As it has already been established that sector layout of Sector 4 (non-gated) is more intelligible as compared to that of Sector 49 which is gated and private. Sector 4 has a better and more legible layout of street network, which is more organised. It is further concluded that travelling/walking and use of particular roads make them easy to remember. The more and more people use the roads more it is likely to become important. The presence of landmarks/ buildings are also important factor that help in memorising the road /axis network.

The interview survey also revealed that due to the Sector 49 being gated, it was difficult for respondents to acquaint them with the spatial configuration. So, they may not remember the roads on which they have rarely got the chance to walk on, hence found it difficult to sketch the map of their sectors. The gated neighbourhood layout was confusing for the residents and not clearly accessible as well. The intelligible configuration of non-gated

neighbourhood has resulted in relatively more accurate axis recognition during cognitive survey. Even the buildings in the more intelligible sectors were recognised and remembered more often as compared to those in the unintelligible sector i.e gated one.

While finding out how much different the sectors' morphological configuration is felt by the respondents as compared to the actual spatial analysis using space syntax, it was found that in all the three sectors the regression analysis results are similar. With Connectivity as the predictor, it was found that it influences the Global Integration and Local Integration, it means that the connectivity in any spatial system influences the other syntactical properties of any spatial layout. Since the connectivity of gated development is poor hence the Global Integration and Local Integration values also decrease in such cases. Finally, the above discussion put forward that in contemporary world when we are moving towards more and more of gated development through the participation of private sector as we are leading towards more un-intelligible neighbourhood environment. The environment has least proximity and access to common citizen. This way we are moving towards a city image that is constituted of private and caged environment. There is a need to look into such practices.

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GLOBAL ENVIRONMENTAL KUZNET CURVE FACTS AND CHALLENGES FOR THAILAND ON EMISSION REDUCTION PLAN

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ABSTRACT

The correlation between country's gross domestic product and environment as reflected by carbon dioxide (CO_2) emission, also known as environmental Kuznet Curve (KC), shows a clear indication on the country's economic development and environmental protection status. In many aspects, economic growth and environment are not always going on a hand-in-hand mode. The most obvious example is seen in the use of natural resources to promote country's economic development, which is stand-off one another. However, environmental Kuznet Curve has shown a fact that environmental protection can be in parallel with the economic development given that country's economics does not largely depend on natural resources. We juxtapose the cross country data on gross domestic product (GDP) and CO_2 emission from many offline and online documents. This paper explores the current facts of global environmental KC and corresponding possible consequences on Bangkok Metropolitan Emission reduction plan and implementation, towards environmentally sustainable development in Bangkok Metropolitan. By examining the global KC, three levels of development of the individual country have been identified in terms of per capita GDP and CO_2 emission. It shows that most Southeast Asian countries are at initial stage of KC-based development.

***Keywords*:** Kuznet Curve, sustainable development, emission, planning system

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INTRODUCTION

A new paradigm in sustainable development has been released as Griggs (2013) defined the sustainable development in the Anthropocene which is "Development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends". This paradigm seems very much people centrist. Traditionally, sustainable development embraces three aspects of environment, economics and social (Pearce, Barbier, & Markandya, 2013; Weaver, Jansen, Van Grootveld, Van Spiegel, & Vergragt, 2017). Thus, within the sustainable development concept, the environment and economic development are expected to go in parallel. However, in fact, environment and development are two words that do not always go hand-in-hand in same direction (Sachs, 2015; Midlarsky, 2018). In most cases, these two entities go in diametrically opposite pathway (Smil, 2016). From the view point of human development, the relationship between environment and development is a sort of love-hate correlation. Development needs environment as resources, while human-being needs an environment and development to support their life. Economic development obviously needs resources for the progress of human capital advancement (Salehi-Isfahani, 2016).

Afrane (2012) asserted that during the low-hanging fruit era of oil production, while developed countries enjoyed blissful economic boom, most underdeveloped countries in Asia and Africa were still struggling for their independence. These two contrasting situations create substantial use of energy resources for logistic supplies and development. In the 1972 UN Conference on the Human Environment, world communities intended to bring the disparities between the industrialised and developing nations together into a common future to delineate the rights of the human family to a healthy and productive environment (Brundtland, 1987). By this platform, the environment and economic development gained equal opportunity to sustain. The sustainable development concept was accepted by the UN General Assembly in 1987.

The diametrical opposition of the natural resources use and economic growth, which is reflected in the global Kuznet Curve by individual country, has been basically the rationale of this study. This becomes the important information to examine the country's individual economic growth and environmental protection status. We intend to explore the dilemma of environmental conservation and economic development by examining current global environmental Kuznet Curve, as it has long been experienced by most developing world with the emphasis on Southeast Asian countries, particularly Thailand, and becomes the strong challenges now and the future. Global cross-country data on per capita gross domestic product (GDP) and carbon dioxide (CO_2) emission have been put side by side from the excerpt of offline and online documents and correlation analysis has been done. The correlation of per capita GDP and CO_2 emission is important to examine the dilemma, as Adams (2001) highlighted that

the dilemma is a notable challenge for many developing countries, as it is problematic and complex to be optimised. To get the full picture of environmental deprivation as the result of economic development in global perspective, it would be wise if the discussion begins with the industrial revolution.

THE GLOBAL OUTLOOKS

The Industrial Revolution

The Industrial Revolution began in Europe in the 1700′s, and spread to the rest of the world, beginning with the United States of America. McLamb (2011) asserted that the Industrial Revolution marked a major turning point in Earth's ecology and humans' relationship with their environment. The Industrial Revolution dramatically changed every aspect of human life and lifestyles (Hartwell, 2017). It was called revolution because of somewhat an abrupt change from agricultural to industrial activities, from manual means to machineries (Stearns, 2018). The effects on the environment would only be seen clearly years later (McLamb, 2011). The use of factories and mass production has also led to a depletion of certain natural resources, leaving the environment permanently damaged (EH Resources, 2015).

Sustainable Development: The Dilemma of Developing Countries

The sustainable development is a very philosophical concept. One of the popular definitions of the sustainable development is based on Brundtland's definition (1988) in Our Common Future, which defines sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. With a strong connection between 'present' and 'future' in the sustainable development concept, we must regard that the natural resources and environment are not the legacy of our ancestors, it rather belongs to our great-great grandchildren. By this philosophy, present generation must conserve existing natural resources and environment for future purpose. The use of natural resources is unavoidable. On the other hand, the uncontrolled natural resources utilisation would mechanically degrade the environment. Therefore, the natural resources utilisation for economic growth and development, amid reconcilable, could not go hand-in-hand with the environmental protection as depicted in Figure 1. Corbridge (1995) asserted that there is no doubt of the ethical domineering of tackling human poverty. Subscribing to this thought, an inquiry arises: must human poverty be eradicated with all cost? Including environmental degradation? If so, it is then acceptable when human poverty is alleviated with the expense of environment. The multiplier effects of alleviating human poverty are tremendous providing that good governance exists. As, poverty has gone, social welfare encroaches, then

education level also improves. With higher education level, production of goods and services increases and economic productivity also increases.

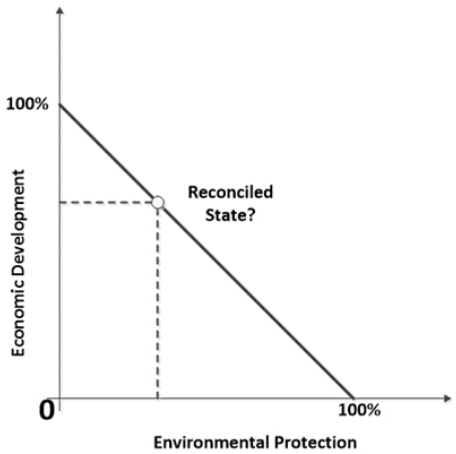

Figure 1 The dilemma between economic development and environmental protection
Source: Permana (2018)

However, the actual process is not that easy as most developing countries lack good governance. Political instability, social unrest, terrorism, and corruption, are, among others, the persistent problems that most developing world must face. In reality, the so-called development process resulting in significant impacts on resources depletion but with obstinate poverty in both rural and urban citizens.

The developing countries seem difficult to cut the environment-development dilemma, and considered irreconcilable (Motel, Choumert, Minea & Sterner, 2014). For instance, Meadows, Randers and Meadows (2005) argued that rising world population, industrialisation, pollution, food production and resource depletion are impossible to continue and will sooner or later become unsustainable and collapse. However, we are confident that environmental protection and economic development are reconcilable. This fact can be easily found from the progress path of developed countries. Western European countries, for instance, experienced the industrial revolution era where the environmental degradation was beyond imagination, but now they are able to cope with the environmental problems while enjoy high economic growth. Barbier (1999) illustrated that the endogenous growth theory in the 1980's brought a fresh and very different perspective on the growth-environment relation, and the environment can equally influence the long-run growth path. Thus, it is perhaps rational to say that decoupling of environmental effects from growth is possible. The key-point is whether or not the authority would be able and willing to reconcile this dilemma in a sensible way. The proper path of

development on agriculture-based, mixed agriculture-industry based, industry-based, and then industry-cum-services as eventual process of development would be worth implementing.

UNIFYING ECONOMIC GROWTH AND ENVIRONMENTAL CONSERVATION: LEARNING FROM CROSS-COUNTRY DATA

There is always cure for all diseases except death. Although many people believe that environment-development dilemma is irreconcilable, but the ways to optimise it are always there. The balance on these two domains can always be negotiated. Using a cross-country data (note: the data could not be presented here as it too long for this limited space), a powerful example of GDP and level of environmental degradation as illustrated by Kuznet curve. Chow and Li (2014) defined the Environmental Kuznet Curve (EKC) as an empirical relationship during the course of economic development where per capita CO_2 emissions first increases with per capita real GDP and later decreases with per capita real GDP. Kuznet curve has been fashionable to depict the sustainability (Farhani, Mrizak, Chaibi, & Rault, 2014).

The curve in Figure 2 perfectly depicts the richer the greener and the poorer the "green". While the left-most part of the curve shows the countries with weak environmental protection, the right-most part of the curve shows the countries with strong protection. This curve tells us that a country with low GDP, the environmental problem i.e. environmental pollution in that country is also low, since no or few polluting industries are in place. The main economic activities are mostly agriculture-based products. The pollution level is therefore low. According to Tierney (2009), the peak point was about USD 8,000 based on GDP per capita in 1985 PPP. However, by using cross-country data in 2010-2015, the peak point is now higher, which is about USD 50,000. The outliers such as Bahrain, Brunei, Oman, Qatar and United Arab Emirates were excluded from the analysis. They are high income countries but their per capita emission is high.

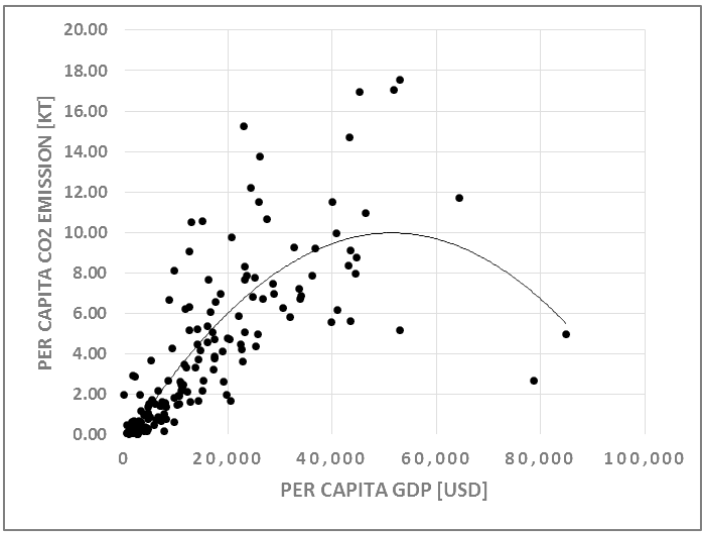

Figure 2 Global Environmental Kuznet Curve (based on cross country data)

Although perhaps the only indicator of CO_2 emission is insufficient to comprehensively show the characteristics of the EKC, however, it seems that some recent studies done in developing cities show that there is indeed a strong connection between economic development, as reflected in the land use changes, and CO_2 emission stemming from transport sector (Permana, Perera, Aziz, & Ho, 2015a; Permana, Perera, Aziz, & Ho, 2015b). However, one can argue that the poverty strongly associates with the environmental degradation (see Duraiappah, 1998; Ravnborg, 2003; Aaron, 2005).

DIFFERENT COUNTRIES, DIFFERENT NEEDS: THAILAND CASE, LEARNING FROM GLOBAL EKC

In consultation with the Kuznet curve, at any given point or period, different countries have different level of development. Thus they have different needs. Switzerland, for example, with per capita GDP PPP 2010 was about USD 84,000, per capita CO_2 emission was only 4.95 tonnes. On a different side, Burundi emitted 0.35 tonne of CO_2 per capita while its per capita GDP was USD 870. Burundi, for sure, will not emphasise their development over environmental protection, since Burundi needs to strongly struggle with the acute poverty problem.

Figure 3 is composed of two super-imposed graphs; (1) countries with different per capita GDP ordered from the smallest to the largest and (2) correlation between environmental conservation and natural resources use i.e. economic growth. It shows that countries with GDP per capita less than USD 10,000 are considered as at the initial stage of development. At this stage, the

economic growth is largely supported by the use of natural resources. Thus, we can expect that in the countries of this stage, the environmental degradation is substantial. However, environmental pollution can be low as fewer industries are in place. The countries are incapable of liberating themselves from the dependency on natural resources use. If the government wisely use the natural resources for mere economic and human capital development, the subsequent stage can be smoothly accomplished. However, in the repressive and corrupt government, the depletion of natural resources use will be much faster than the improvement of people's wellbeing and economic growth.

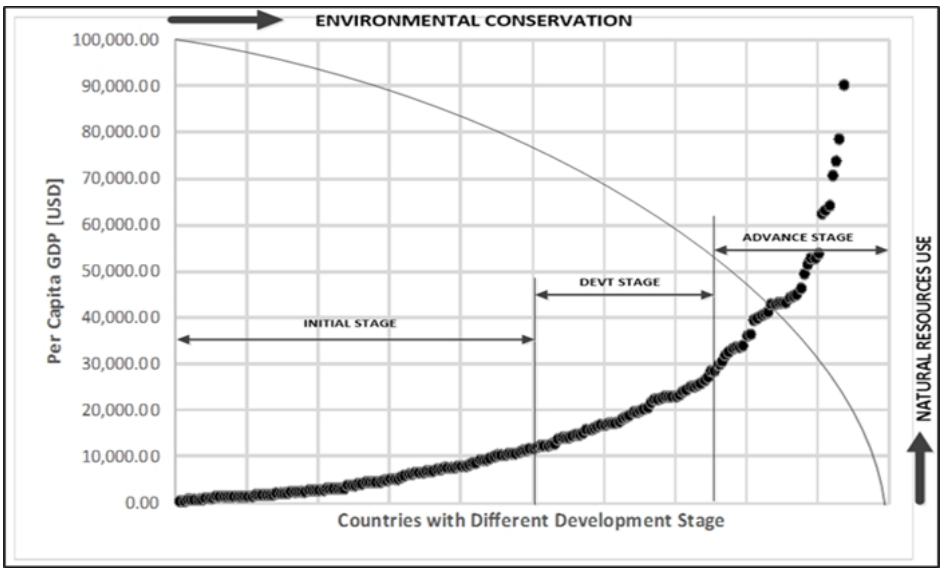

Figure 3 Country's stage of development (based on cross-country data)

The countries will be posed in development stage when their economic growth is not fully dependent on natural resources. Their GDP is about USD 10,000 to 30,000. New industrialising countries will be born at this stage, and the natural resources use and environmental pollution will be more at the commencing stage since industrial sector predominates the economic growth. At the advance stage, when per capita GDP more than USD 30,000, the dependency on natural resources use will be less, although the use of natural resources could not be totally avoided. Both environmental degradation and environmental pollution will be less, because of the ability of the countries to employ greener and cleaner industries. However, there are some countries considered as outliers. These countries enjoy high per capita GDP while the level of environmental pollution is also high. These countries are mostly dependent on single vital natural resources such as oil. These countries do not either place environmental

protection as priority or have technological independency from countries. Or, simply the total population of the country is too small, and industries are mostly run by expatriates.

From the cross-country data presented, it is fair to say that optimising the natural resource use and environmental degradation or pollution is a dynamic process depending on the development stage of the country. One assumption on this circumstances is that a country will follow a traditional stage of development i.e. [agriculture]-[agriculture + industry]-[industry + service]. This is what EKC would eventually affect the emission reduction programmes in a country.

Thailand, with per capita GDP of about USD 6,500 (in 2017) and per capita emission is about 4.3 tonnes CO_2E, is presently at the initial stage of development, in which agricultural-based and industrial-based economy can be considered balanced, but leading towards agro-industry and industrial-based economy. By this stage, the Thailand plan to reduce CO_2 emission is at very fundamental stage covering all possible sectors. The plan to reduce the CO_2 emission is covered in the Thailand Voluntary Emission Reduction Program (T-VER). The objectives of T-VER are basically; (1) to push the development of co-benefit greenhouse gaseous (GHG) emission reduction projects and programmes through certifying carbon credits, (2) to promote voluntary Carbon Market in Thailand, (3) to raise the awareness of climate change by stakeholders, (4) to encourage public and private sector involvement, and (5) to prepare all stakeholders for the future new agreement in Global GHG emission reduction.

The types of projects and programmes covered by T-VER include energy efficiency for households, industries and commerce; alternate energy covering low-emission energy and green energy; renewable energy such as solar power, wind power and biogas; transportation by promoting more public transport e.g. extension of BTS and MRT in Bangkok Metropolitan Region; and waste management by promoting sustainable solid waste management. T-VER has been implemented by Bangkok Metropolitan Authority and Nakhon Ratchashima City Authority; land use and forestry associated programmes have been implemented in the whole of Thailand; and agriculture programmes e.g. the use of non-GHG fertilisers. Many private companies, government-owned companies, government organisation have involved in the implementation of the projects. However, the results could not be reported at this stage since the projects are still on-going.

LESSONS LEARNT FROM GLOBAL EKC FATCS

Sustaining the Potentials

Every country and nation has its own potentials for the advancement of their development. The potentials of the country can be, and definitely, natural resources, human resources, and technological know-how. Unfortunately, the developing world lacks human resources and technological know-how. Thus,

natural resources as the only asset, must be utilised wisely and sustainably. Natural resources must be able to develop human resources, because of the multiplier effect properties of human resources development. With high quality of human resources, technological know-how to develop the country is made available. Japan has no natural resources and a natural disaster vulnerable country. But, Japan has high quality of human resources. Thus, natural resources roles in their development process can be nullified. United Arab Emirates, Qatar and Oman has natural resources. But this potential is not used to develop the capacity of their nations. In the short-term, the need of human resources to run the country is met by hiring high quality expatriates. Financial reward is one of the strongest attractions for professional. UAE, Qatar and Oman are practically run by expatriates who mostly come from developed countries of Northern America and Western Europe. The number of local people in these countries is less than the number of expatriates and migrants workers. Their policies are good for the short-term but not for the long-term, unless they also conducted an intensive transfer of knowledge from the professional expatriates to local people.

Environment: A Resource for Development

Natural resources are definitely vital prerequisite for the development process. No one can avoid the use of natural resources to meet their needs, not even developed countries with advance technology know-how. However, not all resources provided by nature are renewable, most of them are in non-renewable state. Presently, to harvest renewable energy is very expensive and most of them are at preliminary stage. The use of sun and wind energy is still not that advance and with limited energy production, unlike nuclear energy or hydropower energy. Hydropower energy is limited by nature, and it will be no more expansion someday after no more water with potential energy exists. Oil as a prominent source of energy will soon deplete. The replenishment will take millions of years. Thus it is considered as non-renewable energy. On the other hand, the use of renewable energy is not ready yet with respect to technology and mass production. There is almost no low-cost technology presently to utilise renewable energy. Therefore, there is only small fraction of renewable energy use in the world, although there is significant increases. For example, in 2012 the percentage of renewable energy for electricity was about 12.2% and in 2014 this percentage was about 22% (REN 21, 2014).

Producing More with Less

Efficiency is one way to conserve the environment. Efficiency can support sustainability, including sustainable consumption and production. Sustainable consumption and production is about "the use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste

and pollutants over the life cycle of the service or product so as not to jeopardise the needs of further generations" (Oslo symposium, 1994). These flowery words can be shortened by saying that we must produce more with less. The key is efficiency in both production and consumption. When we observe a product for the whole of its life-cycle, we will immediately identify that the production process from exploiting raw material to end of lifetime of the product (cradle-to-grave process) involves a number of inputs i.e. material and energy, and also residuals. Technology, to certain extent, is able to increase the productivity of a stuff that has actually limited capacity. One example is the productivity of farm land. Before the introduction of technology, a hectare of farm land can produce only 5 tonnes of paddy per season. But with the application of technological product for enriching soil nutrients i.e. fertiliser along with good irrigation system, the farm land production can be improved up to 9 tonnes per hectare per season. This case happened in Thailand and some parts of Indonesia.

Implications to Thailand Country's Planning and Southeast Asia's Perspective

Understanding the facts of Global Environmental Kuznet Curve, it can be concluded that for the Thailand's case, the country is presently moving towards industrial country stage, with agro-industry as the core activities. Additionally, by referring to KC-based development, Thailand is considered as the country at initial stage of the balance between economic development and environmental protection. The planning system of Thailand, in which Department of Town and Country Planning, as the sole agency in charge of country planning, has been comprehensively accommodating the programmes of emission reduction in the plan, as reflected, for example in the T-VER, which involving various stakeholders of the country. As a country at the development stage (referring to Figure 3), Thailand emphasises economic growth with attention to environmental protection and conservation. Malaysia has been on the right track towards emission reduction without hampering the economic growth, by introducing its voluntary reduction of emissions intensity of GDP by up to 40% by 2020 through various programs (MNRE, n.d). The KC also shows Malaysia at the end-phase of initial stage towards next level of development.

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THE ANALYSIS OF VULNERABILITY FACED BY GAHAI AGROPOLITAN PARTICIPANTS

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Abstract

Vulnerability is always related to the poor group. Vulnerability can be defined as being vulnerable to damage or ill effects because of changes in the society and the environment, and the inability to adapt to changes. In-depth understanding is important to probe what action should be taken to achieve the sustainability of the community and its environment. In Malaysia, the government has implemented various eradication programmes on rural poverty, and sustainable livelihoods, such as the agropolitan projects. Agropolitan projects are capable of achieving the objective to eradicate poverty, and the vulnerability faced by project participants which will affect their lives. Therefore, the purpose of this study was to identify the vulnerability of agropolitan participants in Malaysia by utilising the Gahai Agropolitan, Lipis, Pahang project as a case study. This study used simple random sampling and it involved 45 participants of Gahai Agropolitan Project. Data were analysed using the Descriptive Analysis and Exploratory Factor Analysis (EFA). The findings showed that Gahai Agropolitan Project Participants faced multi-dimensional vulnerability in terms of economic, social, and physical and environmental aspects. Therefore, the Ministry of Rural Development (KKLW) and the Rubber Industry Smallholders Development Authority (RISDA) need to pay more attention to reduce the vulnerability to participants of the agropolitan project, and help them to increase their income and improve their lives.

Keywords: vulnerability; Gahai Agropolitan; Malaysia

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INTRODUCTION

Poverty in rural areas has shown a higher rate than in urban areas (Economic Planning Unit, 2015). This situation usually occurs among rural people who are involved in agricultural activities. Poverty is also related to vulnerability. Vulnerability is a very important aspect to consider in creating the basic policy or programme development for sustainable livelihoods. Many of the plans, policies and development programmes implemented do not achieve optimal results and fail because they do not include the context of vulnerability. According to Idrus, Lim and Hadi (2004), a deep understanding of these vulnerabilities is important to understand any action taken to achieve sustainability of the community and its environment.

In Malaysia, the government has implemented various poverty alleviation programmes in rural areas and sustainable livelihoods. In 2007, the government implemented the agropolitan project to continue the programmes of eradicating poverty and increase the sustainable livelihood of poor people in rural areas. The implementation of the agropolitan project was successful when the report showed that the income of the participants was increasing (Economic Planning Unit, 2015). However, the participants are still facing vulnerability. Therefore, the purpose of this study is to identify the vulnerability of participants in agropolitan projects in Malaysia, focusing on Gahai Agropolitan Project, Lipis, Pahang.

LITERATURE REVIEW

Vulnerability is defined as a situation of facing unexpected risks. Based on the basic theory of economics, vulnerability is the exposure to risks and uncertainties about the future that adversely affects the well-being of individuals (Chaudhuri, 2003). Vulnerability is the pressure on the path towards achieving sustainable development. Every development effort, especially in a country that is rushing to develop its economy and community, will face various barriers to sustain the venture. This is partly due to the members of the community itself, and some from various external causes, especially the country's stability to guide development (Hadi, Idrus, Mohamed, & Harman Shah,2006).

Henninger (1998) states that there are five risks that affect an individual's vulnerability which are (i) the environment (flood, drought); (ii) market risk (prices, salaries, and unemployment); (iii) political risks (subsidies); (iv) social risk; and (v) disease. Vulnerability will affect individuals due to various factors such as bad harvest, loss of a job, uncertain expenditure, illnesses, and various other risks and surprises. Serrat (2008) explains that vulnerability affects two situations, which consist of an external factor (shock, seasonal, periodic trends) and an internal factor (inability to achieve well-being in life). Shock external factor includes conflict, pain, flood, storm, drought, plant disease and pests. While that, seasonal factors consist of price and job opportunities. The periodic

trends refer to demographics, the environment, the economy, and technology trends.

According to Christiaensen and Boisvert (2000), there is a difference between poverty and vulnerability. Poverty describes a situation of inadequacy at one time, while vulnerability refers to the probability of experiencing scarce in the future. In other words, vulnerability is a risk that can affect the future of an individual. For example, if individuals have minimal income nowadays, they are considered indigent and susceptible to vulnerabilities, such as loss of jobs that can affect their income.

Ibrahim and Siwar (2017) state that lower-income groups and vulnerable groups face natural disasters. The effects of natural disasters can affect their income and life. Changes in climate and flood can cause heat rise, the occurrence of diseases and growing crop pests, and these affect vulnerability.

METHODOLOGY

This study was conducted in the Gahai Agropolitan Project, Lipis, Pahang. The development of the Gahai Agropolitan Project started in 2007 and expired in 2012. The Gahai Agropolitan Project, Lipis, covered an area of 238.76 hectares involving 50 participants (KKLW, 2012). The selection of Gahai Agropolitan Project, Lipis for this study was based on the criteria that (i) Gahai Agropolitan Project has exceeded development for more than five years, and enabled impact studies to be conducted; (ii) Gahai Agropolitan Project is located in Pahang State, which is one of the states with high poverty rates (Economic Planning Unit, 2015), and is in line with the objectives of the study in assessing the impact of agropolitan projects in eradicating poverty, and (iii) the selection of the Gahai Agropolitan Project was a recommendation from the Ministry of Rural and Regional Development (KKLW) as it is an early agropolitan project of its establishment and shows good performance.

The population of this study was 50 participants of Gahai Agropolitan Project and 45 participants were used as sample. This study used simple random sampling. The determination of the number of sample for this study was based on the suggestion by Krejcie and Morgan (1970).

The study employed quantitative research and case study. This study used questionnaire as the primary data. The questionnaire contained questions related to respondents' profile, the nominal form of questionnaire, and Likert scale questionnaire. The questionnaire used Likert scale questions from 1 to 5, namely: (1) very low vulnerability, (2) low vulnerability, (3) moderate vulnerability, (4) vulnerability, and (5) very high vulnerability. There were three factors of the vulnerability of the study, namely the economic, social and physical aspects and environmental vulnerability aspects. The variables of vulnerability factors consisted of 16 items. The list of variables is shown in Table 1.

Table 1 List of variable in economic, social/physical and environmental vulnerability

Variable	Indicators (Adopted from previous studies)	Literature Review
Economic (3 items)	Loss of income and major jobs	Ghazali (2017); Omar Samsudin, Yussof, & Halim (2016); Serrat (2008); DFID (1999)
	Damage of crops (rubber, vegetables, livestock and others)	
	Fall in crop prices or commodities (rubber and others)	
Social and Physical (7 items)	Home physical conditions (a narrow house or a bad home)	Muyambo (2017); Omar et al. (2016); Arokia Nathen, Selvaratnam, & Abu Bakar (2011)
	Lack of home appliances	
	Lack of basic facilities (room prayer, kindergartens, shop lots)	
	Network problems (highway roads and others)	
	Drug addiction problems	
	School truancy	
	Spirituality	
Environment (6 items)	River and water pollution	Muyambo (2017); Md Akhir, Azman, Hassan, & Md Akhir (2017); Omar et al. (2016); Radin Firdaus, Ibrahim, Siwar, & Jaafar (2014); Serrat (2008); DFID (1999)
	Open burning of agricultural activities	
	Floods that damage crop and property	
	The drought that affects agricultural production	
	Storm that damage crop and property	
	Crop disease attacks (rubber tree disease and so on)	

This study used two methods to investigate vulnerability analysis, namely the Descriptive Analysis and Exploratory Factor Analysis (EFA). The descriptive analysis was used to show the type and percentage of respondents who faced vulnerability. The Exploratory Factor Analysis (EFA) was analysed using SmartPLS 3.0 software. SmartPLS 3.0 combines the factor analysis and regression analysis, and it meets the minimum assumptions in achieving variance explanation, which is a high coefficient of determination (R2) value. Using SmartPLS 3.0 software was suitable for Gahai Agropolitan Project due to the small sample size of 45 respondents.

RESULT

Respondents Profile

The profile of the respondents is shown in Table 2, from which it can be seen that majority of respondents were males at 82.2%, and the rest were females at 17.8%. In terms of age, the results show that respondents aged 46-50 years made up the highest group at 28.9%, followed by respondents aged between 36 to 40 years

and 41 to 45 years, both groups at 22.2%. Respondents aged 35 and below were the lowest in number, at only 2.2%.

Analysis of education level indicates that the majority of respondents have completed secondary education (SPM) at 51.1%, lower secondary school (PMR/SRP) at 17.8%, and primary school education 26.7%. The results also indicate that for most respondents, their number of household members (AIR) exceeds four persons. Only 26.7% of respondents have household members between 3 to 4 person, and 11.1% have household members between 1 to 2 person.

Table 2 Respondents profile

No of respondent, n = 45			
Item	Percentage (%)	Item	Percentage (%)
Gender		Education	
Male	82.2	Primary school/ UPSR	26.7
Female	17.8	Lower Secondary school/ PMR/ SRP	17.8
Age		Secondary school/ SPM	51.1
Below 35 years old	2.2	Higher secondary: STPM/ certificate	2.2
36 – 40 years old	22.2	Number of household members	
41 – 45 years old	22.2	1 – 2 people	11.1
46 – 50 years old	28.9	3 – 4 people	26.7
51 – 55 years old	11.1	5 – 6 people	44.4
56 years old and above	13.3	7 – 8 people	13.3
		More than 9 people	4.4

Source: Field of Study, 2017

Descriptive Analysis

Economic Vulnerability

The economic vulnerability faced by Gahai Agropolitan Project participants is shown in Table 3. The economic vulnerability shows that respondents have faced loss of income and major jobs, damage of crops (rubber, vegetables, livestock and others) and falls in crop prices or commodities (rubber and others). The vulnerability of falling prices of crops or commodities such as rubber and other harvest shows the highest percentage compared to loss of income or major job and damage of crops (rubber, vegetables, livestock and others). The analysis shows that 93.3% of Gahai Agropolitan Project participants faced this vulnerability. However, it can be reduced when participants of the Agropolitan Project sold their rubber yield to RISDA with purchase guarantee according to the market price. This allowed them to get the right price and the provision of a collection place that facilitated the sale process.

Table 3 Economic vulnerability

Types of Vulnerability	n = 45 Percentage (%)
Loss of income and major jobs	60.0
Damage of crops (rubber, vegetables, livestock and others)	53.3
Fall in crop prices or commodities (rubber and others)	93.3

Source: Field of Study, 2017

Social and Physical Vulnerability

Based on Table 4, vulnerability of social and physical aspects such as the physical condition of home (small or dilapidated house), lack of home appliances, lack of basic facilities (religious facilities, kindergarten, and shops), accessibility and connectivity problems (road network, etc.), drug addiction problems, school truancy, and spiritual problems were experienced by participants of the Gahai Agropolitan Project. School truancy was the highest vulnerability of social and physical aspects at 77.8%. This is followed by home physical condition at 20.0%, lack of home appliances (13.3%), drug addiction problems (11.1%), lack of basic facilities (4.4%) and accessibility and connectivity problems (2.2 %).

Table 4 Social and physical vulnerability

Types of Vulnerability	n = 45 Percentage (%)
Home physical conditions (small/dilapidated house)	20.0
Lack of home appliances	13.3
Lack of basic facilities (religious facility, kindergarten, shop)	4.4
Accessibility and connectivity problems (roads network, etc)	2.2
Drug addiction problems	11.1
School truancy	77.8
Spirituality	2.2

Source: Field of Study, 2017

Environmental Vulnerability

Table 5 shows the results for environmental vulnerability faced by the respondents. The highest factor for the environmental aspect was the drought that affected agricultural production (93.3%). Drought affects the yield of rubber, which is the main source of income for agropolitan project participants, thus affects their eaning and their lives. For the vulnerability in terms of crop disease such as rubber tree disease and others, 66.7% of the respondents have had to deal with this problem. Rubber tree diseases such as white root diseases (*penyakit akar putih*), brown root diseases (*penyakit akar perang*) and *penyakit bintik mata burung* are often faced by respondents. However, for Gahai Agropolitan Project participants, the problem of rubber tree disease is managed by RISDA as the implementing agency.

Table 5 Environment Vulnerability

Types of vulnerability	n = 45 Percentage (%)
River and water pollution	8.9
Open burning (agricultural related)	8.9
Floods that damage crop and property	4.4
Drought that affects agricultural production	93.3
Storm that damage crop and property	28.9
Crop disease (rubber tree disease, etc.)	66.7

Source: Field of Study, 2017

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) was analysed using SmartPLS 3.0 (Table 6). The result of this analysis identifies three constructs representing the vulnerability faced by participants of the Gahai Agropolitan Project, namely the economic, social and physical, and environmental vulnerability. The results of the analysis show that only twelve from 16 indicators were accepted as the vulnerability of Gahai Agropolitan Project Participants. The economic vulnerability includes three indicators such as loss of income or major job (0.809), damage of crops (rubber, vegetables, livestock and others) (0.882) and falls in crop prices or commodity (rubber and others) (0.809). While social and physical vulnerability involves five indicators which include the physical condition of the house (small/dilapidated house) (0.825), lack of home appliances (0.801), lack of basic facilities (room prayer, kindergartens, and shop lots) (0.769), communication network problems (0.732) and school truancy problems (0.803). Whereas, the environmental vulnerability includes floods that damage crops and property (0.780), the drought that affects agricultural production (0.893), storm that damages crops and property (0.849), and plant disease (0.865).

To confirm the EFA analysis results, some basic criteria were evaluated to ensure that constructs and indicators obtained were statistically acceptable. There are three evaluation criteria to determine acceptability of EFA results, which are (i) reliability, (ii) internal consistency (Convergent validity), and (iii) discriminant validity. Construct reliability can be evaluated for Composite Reliabilities (CR) and Cronbach Alpha (CA) values. Based on Table 6, all CR and CA values exceed 0.6 as proposed by Hulland (1999). The CR value was between 0.899 and 0.922, and the CA value was 0.831 to 0.887, therefore constructs and indicators had the reliability.

To evaluate the internal consistency (Convergent validity), the study used the value of Average Variance Extracted (AVE) and Factor Loading values. According to Fornell and Lacker (1981), the minimum value of AVE and Factor Loading is 0.5. Based on Table 6, all the vulnerability constructs have an AVE value of more than 0.5, ranging from 0.719 to 0.748. This shows that all the items in the three constructs have internal consistency.

Table 6 EFA results

Vulnerability/ Construct	Indicator	R - Squared value	Cronbach` s α Value	C.R. Value	AVE Value	Factor Loading
Economic	Income	0.644	0.887	0.922	0.748	0.809
	Price of Crops					0.882
	Damage of crops					0.809
Social and physical	Home condition	0.254	0.831	0.899	0.747	0.825
	Home appliances					0.801
	Basic facilities					0.769
	Network connection					0.732
	School truancy					0.830
Environment	Flood	0.411	0.869	0.911	0.719	0.780
	Drought					0.893
	Storm					0.849
	Disease					0.865

Note: Income: Losing the main source of income/main occupation; Price of crop: Damage of crops (rubber, vegetables, livestock and others); Damage of crops: Damage of crop (rubber, vegetables, livestock and others); Home condition: The home's physical condition (narrow or shabby home); Home appliances: Lack of home appliances; Basic facilities: Lack of basic facilities (religious facility, kindergarten, shop); Network connection: Accesibility problems (road network, etc.); School truancy: School truancy problem Flood: Floods that damage crops and properties; Drought: Drought affects agricultural productions; Storm: Storms that damage crops and property; Disease: Crop diseases.

Furthermore, in assessing discriminant validity, the AVE construct must be greater than the shared variance between the construct and other construct models (Chin, 1998). Table 7 shows the correlation of the matrix with the correlation value between the constructs representing the type of vulnerability and the Square Root of AVE in the diagonal region. Based on Table 7, elements outside diagonal are larger than elements inside diagonal based on rows and columns. Thus, there is a discriminant validity.

Table 7 Correlation between construct and shared variance

Construct	Environment	Economic	Social and Physical
Environment	**0.782**		
Economic	0.641	**0.848**	
Social and physical	0.766	0.675	**0.865**

CONCLUSION

In conclusion, Gahai Agropolitan Project Participants face multi-dimensional vulnerability in terms of economic, social and physical, and environmental aspects. Only twelve indicators from 16 indicators are accepted as factors of vulnerability in the Gahai Agropolitan Project. All variables of economic vulnerability were accepted such as loss of income or major job, damage of crops (rubber, vegetables, livestock and others) and falls in crop prices or commodity (rubber and others). Meanwhile, for social and physical vulnerability, only five variables were accepted as factors in Gahai Agropolitan Project which are the physical condition of the house (narrow or shabby home), lack of home appliances, lack of basic facilities (religious facility, kindergarten, and shops), communication network problems and school truancy problems. There are four indicators on the vulnerability of the environment, consisting of floods that damage crops and property, the drought that affects agricultural production, storm that damages crops and properties, and plant diseases. The CR value was between 0.899 and 0.922, and the CA value was 0.831 to 0.887, indicating constructs and indicators reliability. The value of AVE, ranging from 0.719 to 0.748, shows that all the items in the three constructs have internal consistency. Based on this study, the vulnerability can be defined as a difficult situation faced by Gahai Agropolitan Project participants that are affecting their lives. Therefore, the Ministry of Rural Development (KKLW) and the Rubber Industry Smallholders Development Authority (RISDA) need to pay more attention to reduce the vulnerability to the participants of the agropolitan project, and help them to increase their income and improve their lives.

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CONCEPT OF PRIVACY FROM ISLAMIC PERSPECTIVE IN FLOOD EVACUATION CENTRE

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Abstract

The flood events in Kelantan during December 2014 were examples of disasters in recent years that garnered national attention. Emergencies can occur with little or no warning. Floods deprive families of basic food and shelter, and lead to significant social and emotional impacts that linger long after the event. Every year, schools and community areas have been used as evacuation centres. A number of problems faced by the evacuees have been identified, especially in terms of physical facilities such as the lack of privacy for women and families, especially during night time. The objectives of this paper are as follows: (1) to study on the concept of privacy from an Islamic Perspective; and (2) to assess privacy in the context of a flood evacuation centre. The data gathered were tabulated. The research also utilised secondary data from literature. Data were analysed using content analysis and case studies. The data were analysed based on issues raised. Recommendations and suggestion are posed on overcoming the identified issues and problems. This research contributes a review of examples of evacuation facilities that follow Islamic teaching in the context of privacy in evacuation centres.

Keywords: privacy, islamic perspective, flood evacuation centre

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INTRODUCTION

Definition of Privacy from Islamic Perspective

In Islam, Qur'an and *Sunnah* (*Hadith*) are the primary sources of law and references. Qur'an and *Sunnah* provide important Islamic teachings and references on human privacy. As recorded in *Hadith* Arbain Nawawi, no. 12 by Tirmidhi, Prophet (peace be upon him) said "*From the perfection of a person's good faith in Islam is leaving alone what does not concern him*". The hadith shows the importance of being determined and concentrated to issues relevant and related to us to improve our capacity and capability.

Surah An-Nur, verses 27-28, mention that a person is not allowed to enter another's property if he or she does not have the permission from the property owners. The verses emphasise that it is solely and completely in the hand of the owner whether or not to allow someone to enter the area inside his/her house. Here, the area is obstructed with blocking elements such as protected walls or doors. Authorisation to deliver access limitation is explained in Surah An- Nur, verse 58. Tafsir Tabari mentioned the general rule from this verse, which indicated 'the slave' (whom your right hands possess) which can be either male or female, as well as those who have not yet reached puberty, need to ask permission if he or she wishes to access the area of 'their master', especially when the master is taking a rest during three types of privacy. The three types of privacy are (i) property, (ii) meeting, or (iii) conversation and evidence.

According to Marcus and Carter (2007), privacy is a clear specification of what is at stake (what is being kept private) and the parties against which privacy is being invoked (who should not be privy to the information being kept private). Islam protects the privacy of people tremendously. Human beings should be concerned only for their own responsibilities and their own businesses.

Flood Evacuation Centre

Floods cause the destruction of public facilities and properties. Based on the National Security Council (NSC), the massive flood that happened in Kelantan in 2014 was the worst in the history of Kelantan (Azlee, 2015). The water levels at most flood hit area superseded the last biggest flood of 1967, and evacuation and emergency sheltering were extremely challenging.

According to Bologna (2010), the safe evacuation of flood victims in Malaysia is one of the most important emergency response activities after the occurrence of floods or other disasters and hazards. Planning is a crucial component in any safety and health program including emergency action (Nik Nor Ronaidi, 2012).

The December 2014 Kelantan Flood was example of the natural disasters in recent years that have garnered national attention. Emergencies can occur suddenly with little or no warning. Such disasters deprive families of even the

most basic needs such as food and shelter, and pose significant social and emotional impacts that linger long after the event. Schools and community areas have been used as evacuation centres. However a number of problems faced by the evacuees have been identified, especially in terms of physical facilities, such as lack of privacy for women and safety during night time. Privacy and safety are the main factors indicating unsuitable evacuation area especially for families and single women.

The Function of Flood Evacuation Centres

According to Somasundaram and Davies (2014), an evacuation centre is a place where the communities of disaster affected areas assemble. McInerny (2012) also added that evacuation centre is also equipped with technical, financial, social assistance and emotional support. Davis (1978) said that evacuation centre also is "*a place used solely for receipt of service, or a staging point for future action*". The identified services of evacuation centres include (Siti Falindah & Nik Nadrul Hisham, 2015):

a. Food catering;
b. Health and safety;
c. Transportation, volunteers;
d. Site services;
e. Telecommunication; and
f. Special facilities for special needs.

RESEARCH BACKGROUND

Unsuitable evacuation centres are those which (The Malaysian Insider, 2014; Said, Gapor, Samian, & Abd Aziz, 2013):

a. Use a school or multipurpose hall as evacuation centre;
b. Lack facilities and are not suitable for people to stay;
c. Have a shortage of essential necessity such as food;
d. Lack understanding between victims; and
e. Have overcrowded environment and insufficient and unsuitable infrastructures and equipment.

The lack of consideration for the disabled community in evacuation centre was described by a study by Asiah, Ismawi, Mohd Ramzi, Izawati and Che Zulkhairi (2015) as follows:

a. Evacuation centres are completely non-universal and completely inaccessible;
b. A lack of recognition and safety procedures in handling and locating frail senior citizens, people with disabilities and patients with physical conditions; and

c. Lacking in privacy, safety and security, as well as a convenient privacy design that ensure the well-being of relocated disaster victims.

The objectives of this research are (i) to study on the concept of privacy and safety from Islamic Perspective in flood evacuation centres; and (ii) to assess the implementation of the concept of privacy in flood evacuation centres. The gathered data was tabulated. Secondary data was collected from literature review. The data was analysed using content analysis and case studies.

IMPORTANCE OF PRIVACY IN FLOOD EVACUATION CENTRE

Among important elements in building emergency relief centre are personal support and privacy area (Victoria Department of Human Services, 2013). The flood evacuation centre must be designed to protect and maintain the privacy of the affected people. The layout of the flood evacuation centre should have separated space and boundary for both males and females. The concept of boundary is important in planning and designing the architectural space (Abu-Gazzeh, 1993). Flood evacuation centres serve as a temporary home for the evacuees. Hence the centre must be designed with partitions that are convenient and can be promptly put up during flood. The partition could be a wall or a curtain depending on the size and structure of the flood evacuation centre.

Abu Gazzeh (1993) added that there are culture-specific, cognitively-important practices that differ depending on the society in determining whether to put partition or segregation in the space. The facilities must offer the flood victims with individual living space to increase the level of privacy in the evacuation centre. By having a separated area, the evacuees, especially women, have the freedom to change clothes and sleep without fearing for their safety against the opposite gender.

CURRENT PRACTICE OF FLOOD EVACUATION CENTRE IN MALAYSIA

Mercy Malaysia – Evacuation Centre in Perkampungan MERCY Tualang, Kuala Krai, Kelantan, Malaysia

Perkampungan MERCY Tualang has 32 houses with variety of sizes based on evacuees' family size. During early construction, each house was built to a standard size, but as the household size of evacuees was different, MERCY provided a renovation programme that expanded the spaces for more comfort to accommodate larger family size.

Most of the family that stayed in Perkampungan MERCY Tualang were the flood victims from Kampung Bekok and Tualang, Kuala Krai. Flood victims tend to stay in Perkampungan MERCY Tualang around two years before they move to their permanent houses. Perkampungan MERCY Tualang has been

proposed to be turned into a Tahfiz School after all flood victims moved to their permanent houses. Perkampungan MERCY Tualang provided public toilets separated for both females and males. A pondok was provided as a space for social activities. The musolla is located at centre of the area for easy access. Each house was designed with one living room, one bedroom and a veranda. Based on observation, the houses lacked privacy as they are located too close to each other.

Figure 1 Facilities provided in Perkampungan MERCY Tualang, Kuala Krai, Kelantan.
Source: Asiah et al.,2015

Figure 2: Diagram showing the facilities provided in Perkampungan MERCY Tualang, Kuala Krai, Kelantan.
Source: Asiah et al., 2015

Figure 3: Front area of Perkampungan MERCY Tualang, Kuala Krai, Kelantan.
Source: Asiah et al. (2015)

Figure4: House area of Perkampungan MERCY Tualang, Kuala Krai, Kelantan.
Source: Asiah et al. (2015)

Figure 5: Example of other flood evacuation centres in Kelantan, Malaysia.
Source: Asiah et al. (2015)

According to Asiah et al. (2015), the shelters are divided into two categories, which are permanent structure shelters and temporary structure shelters. The weight of the building materials is an important factor. There is a significant difference between heavy structures and lightweight structures. The permanent structures are more comfortable compared to the temporary structures. The temporary structures lacked privacy features. Temporary houses are not comfortable to stay in as the building materials are not suitable for long stays. Segregation between males and females is also an issue. The distance between houses and the building material is not responsive to the lack of privacy issues.

CONCLUSION AND RECOMMENDATION

Based on the findings, it can be concluded that current evacuation centre is not properly designed to meet the need of people especially in terms of privacy. In Islamic teaching, privacy is an important architectural factor as it relates to covering the *aurah*. It is an obligation for Muslims to cover their *aurah*. Since a majority of Malaysians are Muslims, privacy features in evacuation centres should be taken seriously. This paper contributes a review of the existing evacuation facilities that need to be improved in terms of privacy based on Islamic teachings.

It is time for flood evacuation centres to be properly designed with careful consideration of the needs of the flood evacuees. The evacuation centre should be equipped with convenient facilities and accommodation that prevent chances of privacy intrusion. The right to privacy should be taken seriously when creating temporary living areas in evacuation centres. The study recommends improvement in the following areas: accessible toilets in mosques, community halls and schools; better connectivity between buildings and facilities; and privacy-sensitive design of temporary accommodation.

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AWARENESS AND KNOWLEDGE OF TPO (ACT 172) AMONG CONSTRUCTION INDUSTRY PROFESSIONALS AND LOCAL PLANNING AUTHORITY PERSONNEL IN KLANG VALLEY

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Abstract

The need to care for trees, especially in urban areas, has become increasingly important for countries like Malaysia which are developing rapidly. Recognising the fact that construction activities could put trees at risks of death and damage, the Malaysian government introduced Tree Preservation Order (Act 172) in 1996. However, there were cases occurred afterwards whereby matured trees had been cut down for development without consent of the local authorities. This situation has raised many questions about the effectiveness of the TPO (Act 172) implementation, including on how far the TPO (Act 172) has been publicised and understood by those related to the construction industry, a pre-requisite for successful legislative implementation. This study assesses the current awareness and knowledge of the TPO (Act 172) among 60 professionals in the construction industry (PCI) and 47 personnel in local authorities (PLA) within Klang Valley through a questionnaire survey. The results show that the awareness level of TPO (Act 172) among PLA respondents was higher than that of PCI. While most of the PLA got acquainted with the TPO (Act 172) through their organisations, most of the PCI learned it from friends and social medias. It is recommended that the government should be more active in publicising the TPO (Act 172) such as through mass media and awareness campaigns.

Keywords: Tree Preservation Order (TPO), Act 172, local planning authority, construction industry, tree preservation

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INTRODUCTION

In 2016, the value of Malaysian construction projects was reported to reach RM83 billion (Kaur, 2015). Mega construction projects that are being carried out in big cities such as Kuala Lumpur and the surrounding municipalities could increase the possibility of tree damage, and to certain extent, of tree death, if care was not taken. Most of the irregularities and mistakes during construction work that threaten the trees can be avoided through appropriate construction project management, which includes the planning and execution of project activities (Ziemiańska & Suchocka, 2013).

Malaysia has introduced Tree Preservation Order (TPO) in the Town and Country Planning Act 1976 that gives power to the local authorities to preserve any tree or a group of trees and to protect the tress from being felled, topped, lopped, uprooted, damaged or destroyed, for instance, during construction or as the results of development activities. By implementing the TPO (Act 172), it is expected that all the involved parties have understood the order and that all trees are protected during construction projects. However, as elaborated by Nik Adlin, Noriah and Wan Termeze (2017), there have been cases from time to time, such as of the Melaka Raya in 2015 and of the Jalan Cochraine in 2016, in which matured trees were felled without the local authorities' consent. Such cases have raised questions on whether or not TPO has been effectively implemented.

Houde (1997) suggests that for a tree preservation law to be effective, each staff in a local authority must be aware of requirements of tree preservation. In the context of Malaysia, it is important to ensure that the TPO (Act 172) is well understood by the local authorities before it is enforced to the construction industry for better protection of trees. With this in mind, a study was conducted, through a questionnaire survey, on the stakeholders of the public and private sectors related to construction activities to determine their awareness and knowledge on TPO (Act 172). The results could give some insights on the status-quo of publicity efforts carried out by the relevant government agencies to ensure that TPO (Act 172) is well understood by the public, and especially those in the construction industry.

MATERIALS AND METHODS

Questionnaire Survey

General objective of the questionnaire survey was to evaluate the level of awareness and knowledge on TPO (Act 172) among the professionals in construction industry (PCI) and personnel of local planning authorities (PLA) within the Klang Valley. Awareness of TPO (Act 172) was defined as knowing that the legislation exists. Meanwhile, the level of knowledge on TPO (Act 172) was determinable by how thorough its document has been read and understood.

Survey Respondents

Information about companies (contractors) in the construction industry within Klang Valley was obtained through CIDB website (http://smb.cidb.gov.my). To ease the logistic (nearby the main author's office), only contractors in Gombak area were surveyed. They were from the G7 class of Civil Construction category and of CE01 Road & Pavement Works (*Pembinaan Jalan dan Pavmen*) and CE14 Landscapes Works (*Landskap di Luar Bangunan*) sub-category groups (Table 1). These two sub-category groups were selected because they would be the ones who had to deal with decisions regarding the existing trees at the construction sites.

Table 1 The survey respondents

Group	Respondents	Remarks
PCI	Contractors	Class: G7, Category: Civil Construction, Sub-categories: CE01 & CE14, Region: Gombak
PLA	Local Authorities within Klang Valley	1) Kuala Lumpur City Hall (DBKL) 2) Perbadanan Putrajaya (PPJ) 3) Shah Alam City Council (MBSA) 4) Subang Jaya Municipal Council (MPSJ) 5) Petaling Jaya City Council (MBPJ) 6) Selayang Municipal Council (MPS) 7) Ampang Jaya Municipal Council (MPAJ) 8) Klang Municipal Council (MPK) 9) Kajang Municipal Council (MPKj) 10) Sepang Municipal Council (MPSp) 11) Hulu Selangor District Council (MDHS)

The CIDB website accessed on February 2017 showed that they were 77 companies listed in the groups. Out of the 77, 23 companies were not shortlisted because their registered addresses were not in Gombak, but somewhere else in Puchong, Kelang, Petaling Jaya, Seri Kembangan, Puncak Alam, Cheras and Shah Alam. The rest of the companies were contacted through phone calls. 51 of the companies said that they were willing to participate and arrangement were made to deliver the PCI survey questionnaire forms by hand. Two survey forms were then delivered to each of these companies. From the 102 copies, only 60 PCI survey forms were answered and returned (collected at sites).

For the PLA survey, information about each local authority were obtained from their websites, for instance, www.mpaj.gov.my (*Majlis Perbandaran Ampang Jaya*), www.mpkj.gov.my (*Majlis Perbandaran Kajang*) and www.ppj.gov.my (*Perbadanan Putrajaya*). Through the organisation chart of each local authority, the number of personnel from departments most related to the TPO (Act 172), such as Landscape and Town Planning, was determined as well as the number of respondents. A phone call was made to each local authority and a contact person was appointed to receive 6 to 8 copies of the questionnaire forms to be distributed to related personnel in the departments. Out of 70 copies

distributed, the study was able to get back 47 PLA survey forms. Many of the survey forms had not been returned because some of the targeted respondents were working outside of the office.

Questionnaire Form

The questions asked and the choices of answer in the survey form are as shown in Table 2. The questions were grouped into five, each with different intentions: a) as pre-requisite (Q1), b) to know the sources of information (Q2), c) confirming the knowledge (Q3 to Q6), d) to reinstate the good attitude towards trees and the importance of the TPO (Act 172) (Q7), and e) to allow self-evaluation by the respondents (Q8).

Table 2 Questions and the choices of answer

No.	Question	Choices of aAnswer
Q1	Do you know or have heard of the Tree Preservation Order?	a. Yes b. No
Q2	How do you know TPO or where have you heard about it? (can choose more than one answer)	a. Head office/management b. Radio/TV/newspaper c. Friends/social media d. Others
Q3	TPO (Act 172) is part of the following Act:	a. *Akta Bandaraya Kuala Lumpur* 1971 b. *Akta Kualiti Alam Sekitar* 1974 c. *Akta Perancangan Bandar dan Desa* 1976 d. Combination of the above Acts
Q4	TPO is an order: (can choose more than one answer)	a. Not to cut down all trees b. Not to cut down preserved trees c. Not to cut down trees of a girth > 0.8 m d. To cut down dead trees e. To cut down dangerous trees f. To replace the trees that have been cut down
Q5	In the TPO (Act 172), 'felling a tree' includes cutting down, topping, lopping, uprooting, damaging or destroying a tree.	a. Agree b. Disagree
Q6	If found guilty of violating the rules of the TPO, one can be (can choose more than one answer)	a. Fined RM100,000 b. Jailed for 6 months c. Fined RM100,000 and jailed for 6 months d. Fined not more than RM10,000 e. Jailed for not more than 6 weeks
Q7	Trees are important, therefore I agree that (can choose more than one answer)	a. The TPO is implemented by the Govt. b. The developers and contractors are to comply with the TPO as much as possible.

		c. The Govt is to ensure that the TPO and the regulations are understood by the people
Q8	The level of my knowledge and understanding of TPO are:	a. High b. Medium c. Low

The first question was very straightforward, and the answer would decide whether or not the respondent's next answers were to be taken into consideration. In other words, if a respondent answered "No" for question number 1, then the rest of his answers would not be used. Question number 2 was to know how the respondents were informed about the TPO (Act 172), whether from their organisation, mass-media (radio, TV, newspaper), friends (social media) or other sources. The given choices of answer would provide bases in determining the effectiveness of roles played and methods used by the respective parties responsible for the publicity of the TPO (Act 172).

Questions number 3 to 6 were designed to evaluate whether or not the respondents have read or seen statements of the TPO (Act 172). If they had, albeit briefly, then the selected answer for question number 3 must be "c. *Akta Perancangan Bandar dan Desa 1976*" (Town and Country Planning Act 1976). Those who have answered other than "c." could be considered as never read or seen the TPO (Act 172) statements. The logic behind this assumption was that the TPO (Act 172) is part of the *Akta Perancangan Bandar dan Desa* 1976, thus without reading the Act 172, one would not have an idea about the Tree Preservation Order.

For questions 4 to 6, only those who understood the TPO (Act 172) statements, whether generally or thoroughly, could select the right answers. For example, in question 4, the most accurate answer is "b. Not to cut down preserved trees" (see clause 35A (1) and (2a) on page 60 of the Act 172). Furthermore, for question 5, the respondents who had thoroughly read and understood the TPO (Act 172) (Laws of Malaysia, 2006), especially the clause "felling a tree" includes cutting down, topping, lopping, uprooting, damaging or destroying a tree;" of Part 1 Interpretation 2. (1) on page 10 could pick the right answer which is "a. Agree". Question 6 was related to the clause 35A (4) on page 61 which says "Any person who contravenes any provision in the tree preservation order commits an offence and is liable, on conviction, to a fine not exceeding one hundred thousand ringgit or to imprisonment for a term not exceeding six months or to both.". As such, the right answers for question 6 are "a.", "b.", and "c.".

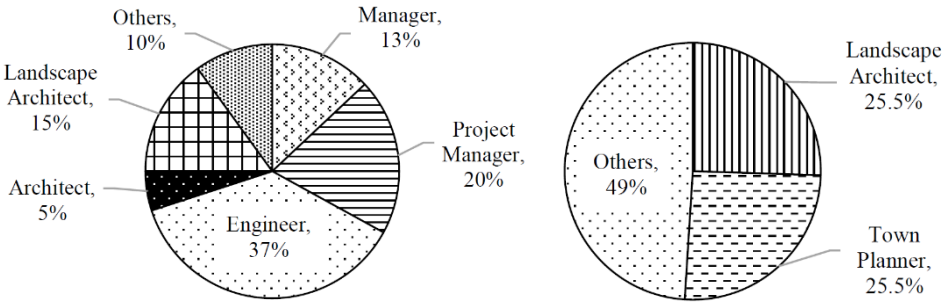
Question 7 was to reinstate, subliminally, the notion among the respondents that trees are important, therefore the TPO (Act 172) must be seriously promoted, implemented and enforced to ensure that it will be effectively protecting the trees. Lastly, through question 8, the respondents could declare their levels of knowledge and understanding of the TPO (Act 172) as either high,

medium or low. However, regardless of what level they think they were at, their answers for questions 3 to 6 could validate or invalidate their claims.

RESULTS AND DISCUSSION

Demographic Profile of Respondents

In terms of gender, most of the PCI respondents were male (87%) and 55% had more than 10 years of experience. The biggest group in post category was Engineer (37%), followed by Project Manager (20%), Landscape Architect (15%) and Manager (13%). Others were either Clerk of Work, Assistant Engineer or Technical Assistant (Figure 1(a)).



(a) PCI (b) PLA

Figure 1 Post of respondents: (a) the construction industry and (b) the local authorities

Unlike those of PCI, the PLA respondents were consisted of slightly more female (53%) than male and almost half (47%) of them had been working for more than 10 years. By post, the numbers of Landscape Architect and Town Planner were equal and they made up more than half (51%) of the total respondents (Figure 1(b)). They could be from the departments of landscape and of town planning, respectively. Other respondents (49%) from the both departments and other tree related departments were Assistant Landscape Architect, Assistant Agriculture Officer, Assistant Town Planner, Park Manager, Arborist and Agriculture Officer.

Questionnaire Results

The results of the questionnaire survey for both PCI and PLA were compared (in terms of percentage) and are as shown in Figure 2 to Figure 9.

Basic Awareness of TPO (Act 172) – Q1

The answers to the first and straightforward question (Figure 2) reveal that 5 respondents (8%) and 1 respondent (2%) from PCI and PLA, respectively, declared that they did not know and have not heard about the TPO (Act 172), thus their answers for the next questions were ignored. Therefore, for the rest of questions, answers from only 55 PCI respondents and 46 PLA respondents were taken into account.

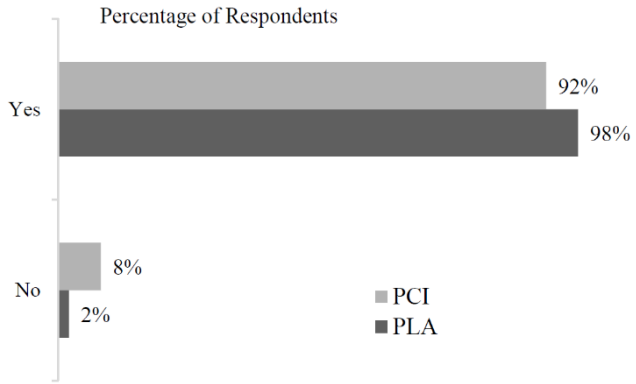


Figure 2 Respondents awareness of TPO (Act 172) (Q1)

Sources of the TPO (Act 172) Information – Q2

The main sources of information of the TPO (Act 172) were found to vary between PCI and PLA (Figure 3). The PCI respondents knew the TPO (Act 172) mainly from friends and social media (62%) while the PLA respondents learnt it from their office management and bosses (50%). From these results, it could be concluded that the local authorities might have conducted activities to deliver information about the TPO (Act 172) to their employees. Meanwhile, the low percentage (16%) ticked by PCI for the 'Head office/management' would mean the lack of efforts by the construction companies to teach their staff about the TPO (Act 172). The results further revealed that the mass-media (Radio/TV/newspaper) had a very low impact (0% and 4.3%) to the public as far as the TPO (Act 172) information dissemination is concerned.

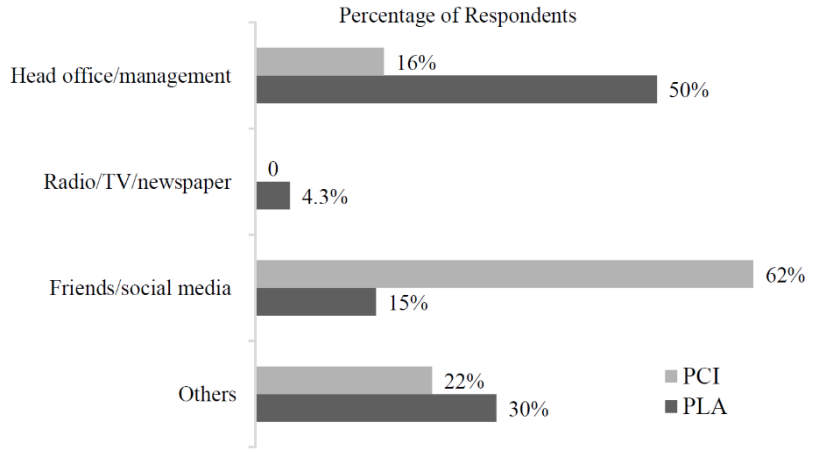


Figure 3 Sources of TPO (Act 172) information learnt by the respondents (Q2)

Testing the Knowledge on TPO (Act 172) – Q3 to Q6

Perhaps, the best way to test whether or not a person have read the TPO (Act 172) document is by asking what Act the TPO is under (Q3). Those who have read the document should know the right answer, which is the *Akta Perancangan Bandar & Desa* 1976 (Town and Country Planning Act 1976). As shown in Figure 4, the percentage of the respondent who ticked the correct answer were significantly different between PCI and PLA, which were 10% and 80%, respectively. These facts imply that even though most respondents from the construction industry have heard about the TPO (Act 172), most of them have not read the TPO (Act 172) document. As for PLA, the high percentage proves that the respondents have undertaken more formal learning or courses on the TPO (Act 172), probably organised by their bosses.

The next question (Q4) was to know how each group understood the principles of the TPO (Act 172) by looking at the most ticked answers (Figure 5). As far as the main purposes of the TPO (Act 172) is concerned, i.e. trees that are meant to be preserved should not be felled, PCI respondents were very right to choose answer 'b.' (84%). Ironically, PLA respondents did not choose 'b.' as the best answer, but rather 'c.' which refers preserved trees as that with a girth exceeding 0.8m. The statement in the Act 172 regarding these bigger trees (see clause 35H (1) on page 64 of Act 172) can be confusing and might seem to those who have read it (most of the PLA respondents) as the main principle of the TPO (Act 172).

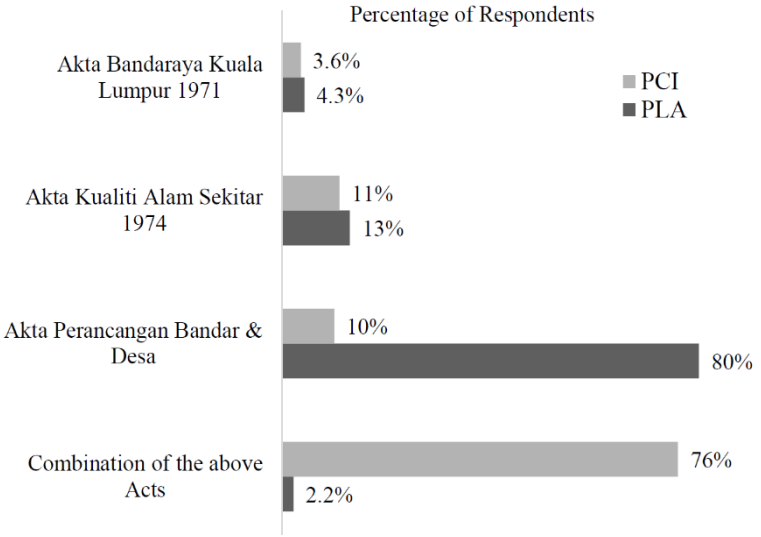


Figure 4 Respondents answers when asked which Acts the TPO is under (Q3)

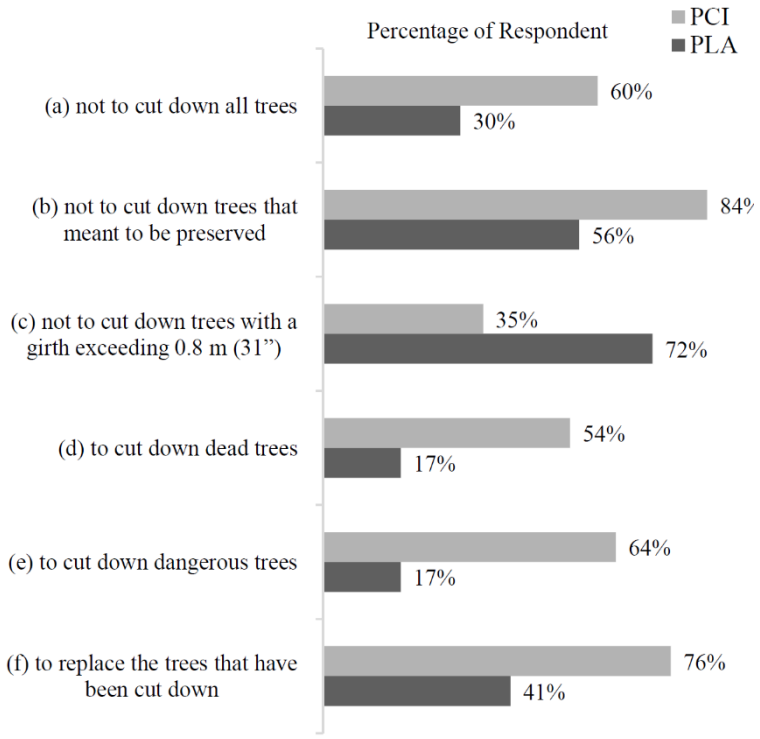


Figure 5 Respondents answers when asked about principles of the TPO (Act 172) (Q4)

The answers for Q5 (Figure 6) were again could reflect how the respondents, especially in the PLA group, got it right – basically because they have read the TPO (Act 172). The percentage (83%) was very close to that of the correct answer for Q3 (80%). Furthermore, about two-third of PCI respondents (67%) also guessed it correctly, even though they were presumed (through their answers for Q2) to never have read the TPO (Act 172) document. Perhaps, instinctively, the PCI respondents understood the basic principle of the TPO (Act 172), therefore trees that are meant to preserved must be protected not only from being felled, but from being damaged as well.

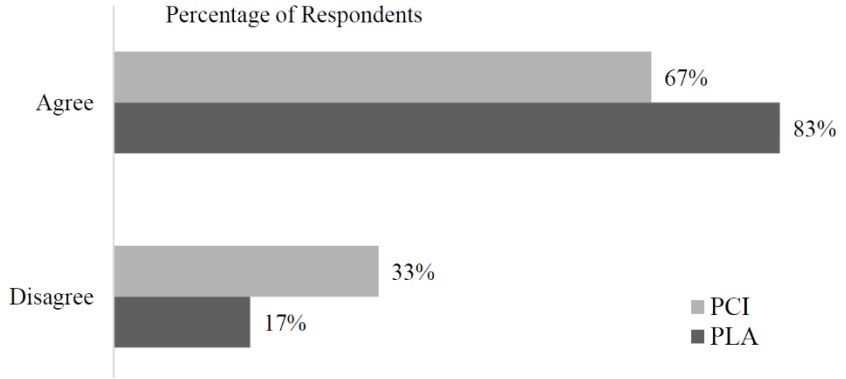


Figure 6 Respondents answers when asked if the term 'felling a tree' in the TPO (Act 172) document is to include 'cutting down, topping, looping, uprooting, damaging or destroying a tree' (Q5)

Figure 7 displays the answers for the question (Q6) regarding court punishments for those who have violated the rules of the TPO (Act 172). For those answers 'a., b. and c.' are all correct but those who also answered 'd.' or 'e.' could be considered failing to answer the question rightly. For PCI, 20% of the respondents answered 'd', while for PLA 22% got it wrong. This results could imply that many have yet to realise the fact that violations of TPO (Act 172) rules are considered as very serious offences by the government, therefore heavy punishment must be imposed, both in terms of fine and jail.

The Importance of Trees and the TPO (Act 172) – Q7

When asked about the important of trees (Figure 8), and how the stakeholders (government and the construction industry) should play their roles in promoting and implementing the TPO (Act 172), PCI respondents displayed a sense of responsibility by selecting mostly (94%) the answer 'b.' – an oath to obey the rules. Similarly, albeit at the lower percentage (76%), PLA respondents exhibited the concept of a good governance by ticking 'c.' mostly – a promise to educate the people regarding the TPO (Act 172) and its rules and regulations.

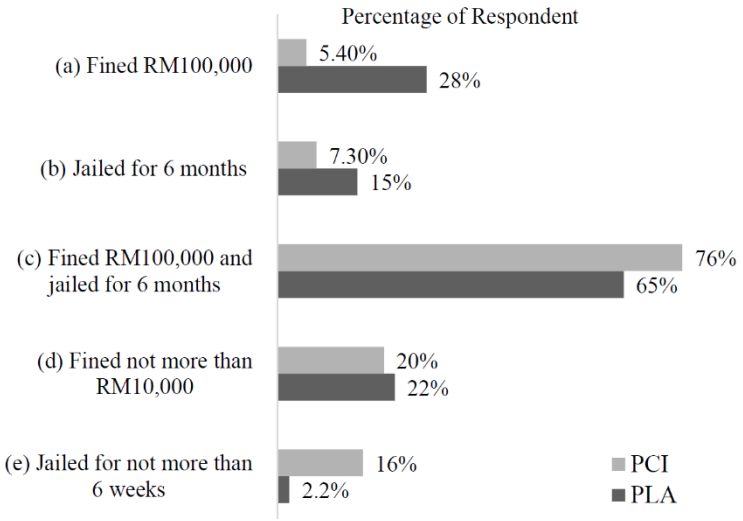


Figure 7 Respondents answers when asked about the punishments for those who violate the rules of the TPO (Act 172) (Q6)

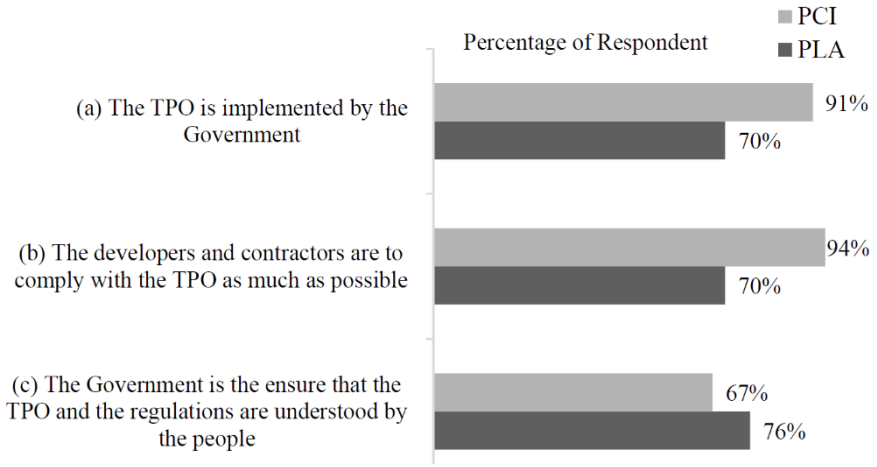


Figure 8 Respondents answers regarding the TPO (Act 172) implementation, compliance and promotion (Q7)

Self-Evaluation: Level of TPO (Act 172) Knowledge – Q8

The last question (Q8) allowed the respondents to evaluate the level of their knowledge on the TPO (Act 172). As shown in Figure 9, more than two-third of PCI respondents (71%) have considered themselves as having 'low' level of knowledge on the TPO (Act 172), the other less than one-third (29%) have professed their level as 'medium' and none have called themselves as 'high'. On

the other hand, most of PLA respondents (74%) have ticked 'medium' level and the rest of them have declared 'low' (13%) and 'high' (13%).

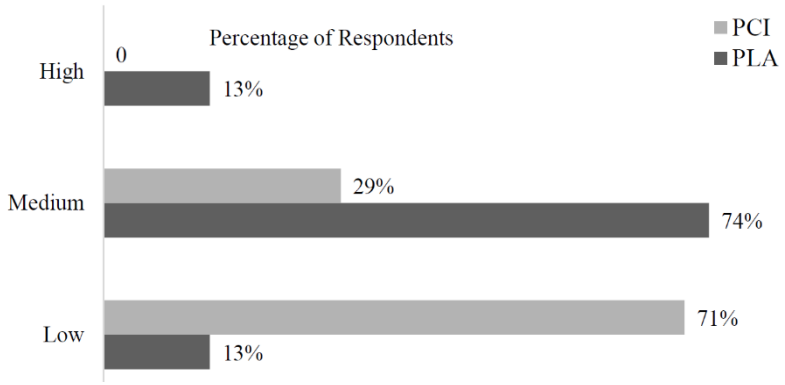


Figure 9 Level of knowledge on the TPO (Act 172) declared by the respondents (Q8)

SUMMARY OF FINDINGS AND CONCLUSION

With regards to the awareness, in general, it was found that most of the respondent knew the existence of the TPO (Act 172) introduced by the government. Furthermore, the findings suggest that while most of respondents from the local authorities (PLA) have read the TPO (Act 172) document, most of those from construction industry (PCI) have not. Both groups of respondents have displayed positive attitudes towards the importance of trees and the TPO (Act 172) but PLA respondents had more confidence about their knowledge on the TPO (Act 172).

Next, while most of the respondents from the local authorities (PLA) got acquainted with the TPO (Act 172) through their organisation and management, most of the professionals in the construction industry (PCI) learned it from friends and social media. The fact that the mass-media (Radio/TV/newspaper) was not considered at all by the PCI respondents as the source of information regarding the TPO (Act 172) could reflect the lack of publicity made by the governments, either at the federal, state or local level. Thus, it is recommended that the government, who has a substantial control over radio/tv/newspaper, to use the mass media and campaign to educate the public on matters surrounding the TPO (Acts 172) as effectively as it has done for other issues such as dengue prevention, drugs addiction and road safety. Perhaps, at the the local government level, the authorities could use billboards at roadsides to inform the public about TPO (Act 172) and its enforcement.

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EMPOWERING COMMUNITY MOVEMENT: EMPRICAL EVIDENCE

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Abstract

The living environment in which humans dwell in and are surrounded by, and thus include the immediate built environment, is fertile ground for personal development leading to community advancement. *Issue:* Ample amount of studies have been carried out on the influence of personal empowerment (PE) on community movement (CM). Little attention was given to the empirical evidence of the impact of PE on CM. *Purpose:* This paper sets out to confirm the statistical predictability of CM based on PE. *Approach:* Multiple Correlation and Multiple Linear Regression were executed to assess linear associations and parameters of linear equations to predict CM components based on PE items. *Findings:* Majority of PE items were significant predictors of CM components and '*setting goals and striving to meet goals*' was the strongest predictor of CM.

Keywords: community movement, personal empowerment

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INTRODUCTION

Interdependency between human and other humans (HIH) is a significant causal agent of subjective sustainable well-being (SSWB). Understanding HIH helps architects plan and design houses, cities and other kinds of human habitations to enhance individual empowerment resulting to improved community development. Awareness deficits on HIH and SSWB can lead to users' dissatisfaction, alienation and eventually weak community interaction. Personal empowerment (PE) and community movement (CM) are dimensions of HIH. Many authors have theoretically recognised the positive impact of PE on CM. This paper measures the statistical predictability of CM based on PE.

LITERATURE REVIEW

Case studies based on articles from selected Asian Journals from the year 2011 onwards highlight conditional factors and potential determinants of Community Movement (CM). Table 1 summarises these findings.

Table 1 Conditional factors and potential determinants for community movement

Conditional Factors	Potential Determinants	References
Sensory overload (over-stimulation from the environment due to overcrowding - how long the neighbourhood has been established, the diversity composition of its people and the surrounding developments), and the degree of cohesion	collective actions (taking actions together for a common objective), inclusion (embracing), trust, and belongingness	Hamdan, Yusof, & Marzukhi (2014)
Social capital, participation, awareness, concern and care for each other, inter-racial relationships, sense of belongingness, a sense of trust and approach on shared life values and shared social obligations.	proactivity, tolerance, a sense of trust and protection (the feeling of safe and assured), and shared values	Ahmad Marzuki et al. (2014)
Social embeddedness (a set of relationship defined as institutional), perceived support from friends, family and neighbours, availability of assistance when needed and availability of someone to count on	Willingness to help others, friendliness (sociability), closeness (strong connection), trust, and shared values	Ibrahim & Hamid (2014)
Sense of integration (incorporation of community members), safety and trust among neighbours, trust among people in general, trust among members in formal groups, openness to communicate and discuss any issues concerning the community	Civic engagement (collective actions to resolve issues of public concerns), awareness (concern on others and local issues), trust and helpfulness	Chong, Ten, Er, & Koh (2013)
Inconsistent priorities (conditions regarded as more important), motives (the stimulus to an action) and contexts of needs (circumstances of requirements)	Shared values, ability to compromise, empathy (the ability to understand others)	Mahadi & Sino (2013)
Participation (attendance in organized activities), trust (maintaining social interaction), and social network (offer help, readiness to help and resources of help).	Self-help (the use of one's own effort to achieve things), trust, and participation	Nawaz (2017)
Willingness to celebrate diversity: appreciate each other's contribution, helping others in needs. Ethnic composition and geographical population – the lesser diversity, the higher willingness to tolerate others.	Tolerance to diversity (to accept something foreign to one's own through openness, appreciation, helpfulness and respect of others)	Yassin et al. (2013)
Racial microaggression (indirect and subtle form of racism in everyday life intentionally and unintentionally executed by the perpetrators and often catch the recipients off-guard)	Egalitarian behaviours (actions upon the belief that people are equal and deserve equal opportunities)	Lino, Hashim, & Ricardo (2017)
Trust (reliable surrounding), and fear of the unknown (unpleasant emotion of something unfamiliar)	Social interaction, tolerance, respect, open mindedness	Rahyla (2017)

Meaningful activities (activities that have important purposes, useful qualities, and consequential)	Volunteering (freely offering to undertake tasks),	Tunku, Rahman, & Campus (2017)
Attitudinal factors (instrumental values, desirability of volunteering, attitude and satisfaction from volunteering) and motivational factors (altruism, egoism, religiosity, social obligation, political interest)	Volunteer commitment (keenness to offer assistance), and solidarity (mutual support within a group)	Thomas, Selvadurai, Er, Lyndon, & Moorthy (2011)
Gender – female score higher in Islamic religiosity (striving, universality, integrity, respect, surrendering, trust, humility, and practical spiritual consciousness).	Tolerance, moderation (restraining self from something extreme)	Ortega & Krauss (2013)

The findings from the case studies generate three significant components of CM: (i) Proactive Participation (CMa), (ii) Affability and Respect for Diversity (CMb) and (iii) Belongingness (CMc).

Table 2 Components and determinants of community movement

Definition of CM	Components	Indicators	Code
Sense of inclusiveness expressed in open and friendly interaction, awareness and helpfulness in the social network and initiatives to be more engaged	Proactive Participation	conscious of new updates	CMa
		participating enthusiastically in organized activities	
		assuming responsibility when foreseeing community issues	
	Affability and Respect for Diversity	approachable to people of different ethnicity and religion	CMb
		approachable to people of different ranks and status	
		enjoying social interaction with community	
		adapting and adjusting fast to new social environment	
	Belonging-ness	ability to influence shared decisions	CMc
		offering assistance voluntarily when necessary	
		feeling sense of belonging with the community	

Personal Empowerment (PE) manifests in the opportunity to exercise control, voice and choice with regards to social surroundings. Qualities adhere to PE include (i) self-motivation with regards to goal orientation, autonomy and self-regulation (Chin, Khoo, & Low, 2012; Kok, 2016), (ii) social acceptance and coherence with others (Nesbit, Jepsen, Demirian, & Ho, 2012; Kadir, Omar, Desa, & Yusooff, 2013; Zamani, Khairudin, Sulaiman, Halim, & Nasir, 2013), and (iii) composure, stability and resilience (Sulaiman et al., 2013; Sipon, Nasrah, Nazli, Abdullah, & Othman, 2014).

Table 3 Determinants of personal empowerment

Definition of PE	Indicators	Code
Self-esteem in taking control over life along with sense of composure to progress in the social environment	setting goals and striving to meet goals	PE1
	striving and working hard even for easy goals	PE2
	monitoring behaviours to suit with situations	PE3
	knowing when somebody is offended	PE4
	ensuring others are comfortable when making deals	PE5
	able to be friendly with distasteful persons when necessary	PE6
	able to work out solutions during stress and difficulties	PE7
	tackling problems efficiently in unexpected conditions	PE8
	feeling energetic for daily routines and activities	PE9
	having hardly distracted and focus mind	PE10

Based on theoretical underpinnings, this research hypothesises that CM components are predictable by PE. The following sections provide empirical evidence to the predictability of CMa, CMb and CMc based on PE items.

METHOD

A sample of 4,315 was gathered after the data screening process. The Malaysian respondents were given an 11-point Likert scale to respond to questionnaire items which include the components of CM and the ten (10) PE items. Pearson correlation analyses were conducted to observe if there were linear associations between the CM components and PE items. Ensuing correlation analyses, multiple linear regression analyses were conducted to estimate parameters of the linear equations used to predict values of CMa, CMb and CMc from PE items.

RESULTS AND DISCUSSION

At 95% confidence level, there were statistically significant positive correlations between (i) CMa and each of PE items, (ii) CMb and each of PE items, and (iii) CMc and each of PE items. The null hypotheses claiming there are no statistically significant correlations between (i) CMa and respective PE items, (ii) CMb and respective PE items, and (iii) CMc and respective PE items were all rejected.

Table 4 Multiple Correlations between PE items and CMa, CMb and CMc

H_0	There is no statistically significant correlation between CMa and respective PE items
H_0	There is no statistically significant correlation between CMb and respective PE items
H_0	There is no statistically significant correlation between CMc and respective PE items

Correlation Strength Threshold (Dancey & Reidy, 2004)										
0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
zero		weak			moderate			strong		perfect

DV	Stats	PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
CMa	r	.385**	.384**	.362**	.352**	.343**	.353**	.347**	.340**	.352**	.322**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
CMb	r	.416**	.420**	.415**	.367**	.404**	.352**	.371**	.351**	.372**	.331**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
CMc	r	.420**	.430**	.421**	.390**	.419**	.362**	.383**	.373**	.397**	.358**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315

Statistical Interpretation of Multiple Correlation Analyses	
CMa	At 95% confidence level, there were statistically significant and moderate correlations between CMa and (i) PE1 (r =.385, p = .000); (ii) PE2 (r =.384, p = .000); (iii) PE3 (r =.362, p = .000); (iv) PE4 (r =.352, p = .000); (v) PE5 (r =.343, p = .000); (vi) PE6 (r =.353, p = .000); (vii) PE7 (r =.347, p = .000); (viii) PE8 (r =.340, p = .000); (ix) PE9 (r =.352, p = .000); (x) PE10 (r =.322, p = .000).
CMb	At 95% confidence level, there were statistically significant and moderate correlations between CMb and (i) PE1 (r =.416, p = .000); (ii) PE2 (r =.420, p = .000); (iii) PE3 (r =.415, p = .000); (iv) PE5 (r =.404, p = .000). Additionally, there were statistically significant and weak correlations between

	CMb and (v) PE4 (r =.367, p = .000); (vi) PE6 (r =.352, p = .000); (vii) PE7 (r =.371, p = .000); (viii) PE8 (r =.351, p = .000); (ix) PE9 (r =.372, p = .000); (x) PE10 (r =.331, p = .000).
CMc	At 95% confidence level, there were statistically significant and moderate correlations between CMc and (i) PE1 (r =.420, p = .000); (ii) PE2 (r =.430, p = .000); (iii) PE3 (r =.421, p = .000); (iv) PE5 (r =.419, p = .000). Additionally, there were statistically significant and weak correlations between CMc and (v) PE4 (r =.390, p = .000); (vi) PE6 (r =.362, p = .000); (vii) PE7 (r =.383, p = .000); (viii) PE8 (r =.373, p = .000); (ix) PE9 (r =.397, p = .000); (x) PE10 (r =.358, p = .000).

Three (3) multiple regression analyses were carried out to predict the values of each of dependent variables (i) CMa, (ii) CMb and (iii) CMc given the set of PE explanatory variables (PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9, and PE10).

Table 5 Multiple Linear Regression – PE predicting CMa

H_0
There will be no significant prediction of CMa by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.449	.202	.200	1.34629	1.649

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1971.479	10	197.148	108.772	.000
Residual	7800.959	4304	1.812		
Total	9772.439	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.651	.128		28.439	.000	3.399	3.903
PE1	.115	.020	.135	5.624	.000	.075	.155
PE2	.068	.023	.076	2.910	.004	.022	.114
PE3	.049	.021	.054	2.362	.018	.008	.089
PE4	.056	.022	.058	2.566	.010	.013	.098
PE5	-.010	.021	-.011	-.473	**.637**	-.052	.032
PE6	.125	.020	.131	6.245	.000	.086	.164
PE7	.016	.023	.017	.680	**.497**	-.029	.060
PE8	-.017	.024	-.020	-.709	**.478**	-.065	.030
PE9	.065	.023	.075	2.773	.006	.019	.111
PE10	.031	.019	.038	1.630	**.103**	-.006	.067

A multiple regression was generated to predict CMa based on PE items. R value of .449 indicated a satisfactory level of prediction (R > 0.4). The Durbin-Watson statistic was 1.649 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 108.772, p = .000, with an R^2 of .202; indicating that the proportion of variance in CMa that can be explained by PE items was 20.2%.

At 95% confidence level, PE1 (B = .115, t = 5.624, p = .000), PE2 (B = .068, t = 2.910, p =.004), PE3 (B = .049, t = 2.362, p =.018), PE4 (B = .056, t = 2.566, p =.010), PE6 (B = .125, t = 6.245, p =.000) and PE9 (B = .065, t = 2.773, p =.006) were significant predictors of CMa. On the contrary, it was found that PE5 (B = -.010, t = -.473, p = .637), PE7 (B = .016, t = .680, p = .497), PE8 (B = -.017, t = .680, p = .497) and PE10 (B = .031, t = 1.630, p =.103) were not significant predictors of CMa.

Personal Empowerment (PE) items account for 20.2% of Proactive Participation (CMa). Seven (7) of PE items were significant predictors of CMa.

Table 6 Multiple Linear Regression – PE predicting CMb

H_0
There will be no significant prediction of CMb by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.485	.235	.233	1.35845	1.692

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2442.280	10	244.228	132.345	.000
Residual	7942.545	4304	1.845		
Total	10384.825	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.675	.130		28.369	.000	3.421	3.929
PE1	.113	.021	.129	5.478	.000	.072	.153
PE2	.072	.024	.078	3.073	.002	.026	.119
PE3	.098	.021	.106	4.724	.000	.057	.139
PE4	.000	.022	.000	-.009	**.993**	-.043	.043
PE5	.104	.021	.112	4.848	.000	.062	.146
PE6	.062	.020	.063	3.069	.002	.022	.101
PE7	.040	.023	.044	1.755	**.079**	-.005	.086
PE8	-.035	.024	-.039	-1.443	**.149**	-.083	.013
PE9	.063	.024	.071	2.659	.008	.017	.109
PE10	.021	.019	.026	1.127	**.260**	-.016	.058

A multiple regression was generated to predict CMb based on PE items. R value of .485 indicated a satisfactory level of prediction (R > 0.5). The Durbin-Watson statistic was 1.692 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 132.345, p = .000, with an R^2 of .235; indicating that the proportion of variance in CMb that can be explained by PE items was 23.5%.

At 95% confidence level, PE1 (B = .113, t = 5.478, p = .000), PE2 (B = .072, t = 3.073, p =.002);, PE3 (B = .098, t = 4.724, p =.000), PE5 (B = .104, t = 4.848, p = .000), PE6 (B =.062 , t = 3.069, p =.002) and PE9 (B = .063, t = 2.659, p =.008) were significant predictors of CMb. On the contrary, it was found that PE4 (B = .000, t = -.009, p =.993), PE7 (B = .040, t = 1.755, p = .075), PE8 (B = -.035, t = -1.443, p = .149) and PE10 (B = .021, t = 1.127, p =.260) were not significant predictors of CMb.

Personal Empowerment (PE) items account for 23.5% of Affability and Respect for Diversity (CMb). Six (6) of PE items were significant predictors of CMb.

Table 7 Multiple Linear Regression – PE predicting CMc

H_0
There will be no significant prediction of CMc by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.500	.250	.248	1.34241	1.652

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2582.930	10	258.293	143.333	.000
Residual	7756.035	4304	1.802		
Total	10338.965	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.478	.128		27.169	.000	3.227	3.729
PE1	.094	.020	.107	4.605	.000	.054	.134
PE2	.081	.023	.088	3.481	.001	.035	.127
PE3	.081	.021	.088	3.955	.000	.041	.121
PE4	.033	.022	.034	1.539	**.124**	-.009	.076
PE5	.106	.021	.114	4.985	.000	.064	.147
PE6	.048	.020	.049	2.401	.016	.009	.087
PE7	.018	.023	.020	.785	**.433**	-.027	.062
PE8	-.023	.024	-.026	-.954	**.340**	-.071	.024
PE9	.080	.023	.090	3.431	.001	.034	.126
PE10	.041	.019	.049	2.174	.030	.004	.077

A multiple regression was generated to predict CMc based on PE items. R value of .500 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.652 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 143.333, p = .000, with an R^2 of .250; indicating that the proportion of variance in CMc that can be explained by PE items was 25%.

At 95% confidence level, PE1 (B = .094, t = 4.605, p = .000), PE2 (B = .081, t = 3.481, p =.001), PE3 (B = .081, t = 3.955, p =.000), PE5 (B = .106, t = 4.985, p = .000), PE6 (B = .048, t = 2.401, p =.016), PE9 (B = .080, t = 3.431, p =.001) and PE10 (B = .041, t = 2.174, p =.030) were significant predictors of CMc. On the contrary, it was found that PE4 (B = .033, t = 1.539, p =.124), PE7 (B = .018, t = .785, p = .433) and PE8 (B = -.023, t = -.954, p = .340) were not significant predictors of CMc.

Personal Empowerment (PE) items account for 25% of Belongingness (CMc). Seven (7) of PE items were significant predictors of CMc.

Table 8 Summary of findings

		IV (Predictor Variables) - β									
		PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
DV (Outcome Variables)	CMa	**.135** ✓	**.076** ✓	.054 ✓	.058 ✓	-.011 ✗	**.131** ✓	.017 ✗	-.020 ✗	.075 ✓	.038 ✗
	CMb	**.129** ✓	.078 ✓	**.106** ✓	.000 ✗	**.112** ✓	.063 ✓	.044 ✗	-.039 ✗	.071 ✓	.026 ✗
	CMc	**.107** ✓	.088 ✓	**.088** ✓	.034 ✗	**.114** ✓	.049 ✓	.020 ✗	-.026 ✗	.090 ✓	.049 ✓
✓ = statistically significant predictor; ✗ = not statistically significant predictor											

DV	Indicators	IV	Top 3 Strongest Predictors	β
CMa Proactive Participation	• conscious of new updates • participating enthusiastically in organized activities • assuming responsibility when foreseeing community issues	**PE1**	**setting goals and striving to meet goals**	**.135**
		PE6	able to be friendly with distasteful persons when necessary	.131
		PE2	striving and working hard even for easy goals	.076
CMb Affability and Respect for Diversity	• approachable to people of different ethnicity and religion • approachable to people of different ranks and status • enjoying social interaction with community • adapting and adjusting fast to new social environment	**PE1**	**setting goals and striving to meet goals**	**.129**
		PE5	ensuring others are comfortable when making deals	.112
		PE3	monitoring behaviours to suit with situations	.106
CMc Belonging-ness	• ability to influence shared decisions • offering assistance voluntarily when necessary • feeling sense of belonging with the community	PE5	ensuring others are comfortable when making deals	.114
		PE1	**setting goals and striving to meet goals**	**.107**
		PE3	monitoring behaviours to suit with situations	.088

The empirical evidence reveals that the majority of PE items significantly account for CMa, CMb and CMc. PE1 which stand for 'setting goals and striving to meet goals' was in the top three strongest predictors for all components of CM — thus suggesting that community members' goal setting and commitment to attain those goals are the key to community advancement. Goal setting calls for inspiration, while commitment requires concentration and sense of dedication. Designs strategies that exhibit respect to local history and regional character,

well-designed and -maintained civic buildings, as well as mixed land uses to allow various activities can revitalise communal happenings and promotes a sense of belongingness. Such conducive neighbourhoods empower community members to restore social and economic fabric leading to positive community movement.

CONCLUSION

HIH in SSWB accounts for personal development in relation to the surrounding context. This paper proves that community movement is a significant outcome of personal empowerment. The results warrant for further tests on the constructs explained in this paper.

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MEASURING ATTRIBUTES AND BEHAVIOURAL PATTERNS OF STREET LIVELINESS IN URBAN AREA

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Abstract

Streets are essential elements of the form and function of the urban environment. A growing body of research has pointed out that the more human activities in the street, the more interesting the city will be. Streets showcase the community and connect people. They are the most comfortable social environments that provide aesthetical and interactional pleasure for everyone. This paper presents the outcomes of a study which measured street liveliness based on the attributes and behaviours of the pedestrians. The aim of this study was to examine how people experience the liveliness at various times for various activities on the street. To achieve this, the study applied a case study method by looking at one of the streets that showed a diversity of activities with a unique shopping experience and liveliness in Kuala Lumpur called Jalan Masjid India. The method involved two types of data collection techniques, which were site observations, and pedestrian counts. Results which consisted of behavioural mapping and activity analysis revealed that Jalan Masjid India has its own merits in terms of street liveliness, function, and urban activities.

Keywords: street, behavioural pattern, street liveliness, urban area

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INTRODUCTION

In the field of urban design, various definitions of public space can easily be found. From good practices around the world, UN-Habitat (2016, p.1) gives the definition of public space as "all places publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive." Each public space has its own spatial, historic, environmental, and economic features. When it comes to the street as a public space, Jacobs' (2011) theory explains that the street is an interesting space. Besides being the vital organ of the city, the tangible facilities between the streets and their sidewalks framed by the buildings permit the streets to become a vibrant place. Koohsari et al. (2015) stated that open spaces influence physical activity in three ways. First is the setting where people engage in physical activity. Next, the public space is a destination for people to socialise, and finally, it can be a route to pass through and reach another destination. Hence, as a thoroughfare, the physical activities are related to active travel, such as transiting, cycling, walking, and running. In short, these three settings contribute to different types of physical activity behaviours.

The aim of this study is to evaluate how people experience the liveliness of the street at various times for various activities. The intention of this study was to understand public street life, and to provide recommendations that could shape public space liveliness. Observational data was used to gain the behavioural patterns on the street and appreciate its physical aspects. Pedestrian counts were conducted to understand the urban activities and public life of the street. The findings focused on strengthening the method applied to promote improvements in evaluating the street as a successful public space.

Streets as Fundamental Shared Spaces

In an urban environment, the elements that complete its form and function are the streets. Streets are defined as linear three-dimensional spaces enclosed on opposite sides by buildings. Back in the old days, the role of the street was seen as a major thoroughfare for vehicular traffic, while the urban fabric was usually dense, and buildings were built next to one another, and flushed with streets (Sulaiman, Ayu Abdullah, & Hamdan, 2017). In between these connected masses, the facades of the buildings created the wall of open spaces, finely forming a mesh of street grid on a small scale that defines streets and squares. Roads, streets, boulevards, and avenues act as channels of efficient movement, and as visual elements. Besides their primary purpose, streets also connect people. As interesting as they can be, streets are not only physically a space and a channel of movement, but also a place. They are the most fundamental shared public spaces, and the most vital organs of the city. In contrast, their dullness will reflect the city itself (Jacobs, 2011).

While their role from various perspectives is understood, as a place, streets also reveal the community, and connect people. These connected masses

of buildings create frontages, medians, and streetscapes not only as a route for traffic, but also as a space for connectivity and activities. While they are still accessible by cars, pedestrians are dominant in these most comfortable of social environments, where one can analyse the form and qualities to find their value. Sulaiman et al. (2017) wrote that, through the concept of shared spaces, integrating the needs and demands of different forms of movement adds tremendous value to the streets as the activities are not only for drivers, but are now also safe for cyclists, transit vehicles and users as well as pedestrians of all ages and abilities.

Connecting People and Places

Traditionally, the street is used as major access for transporting movements. Sholihah and Heath (2016) highlighted that the movement can be walking, riding horses, camels and other animals, using animals to pull carts, cycling, and driving cars and motorcycles etc. As a link from one point to another, the form of movement is purely for circulation. Now that the role of the street as a place is understood, the experience on the street will determine the success of it.

By auditing the transportation nodes, accessibility points, and traffic lanes, the street typology can be ascertained. These tangible qualities help to formulate data on its movement patterns as well as physical and visual linkages and identify the existing functions and activities within it. Commonly, the access and linkage qualities are evaluated by the connections of one area to the surrounding, visually and physically. Carmona, Tiesdell and Oc (2010) pointed out that the sense of movement is visually dynamic, and it provides the opportunity for social interaction and cultural exchange. The wayfinding within the area is relatively good when a user finds it easy to get to and from a place, and when it is also visible both from a distance and up close. Conveniently, it should also be very well connected to public transit to get to adjacent buildings, with good signage so that it leads people to the place easily.

As a shared place, the number of activities in the street becomes great when users have more chances to take part in them although that also depends on the street. When people will find more reasons to come or return to a place as well as have something to do in it, the better the place will be.

METHODOLOGY

This study employed a case study method as it required a close study of pedestrians on a street. Masjid India Street, or widely known as Jalan Masjid India, was chosen as the case study because of its character as a downtown or market street. Also, the length of the street is suitable to conduct the study while the place itself is vibrant for commerce and able to handle a high volume of pedestrians and high levels of activities throughout the day. In a formal design treatment, downtown streets with high levels of pedestrian activities, distinctive

visibility, generous sidewalks, and good amenities for the users should be selected.

To analyse the movement of Jalan Masjid India, the researchers used direct observations, and the counting approach as tools to measure its attributes and behavioural patterns. Mehta (2014) stated that an effective method to understand the selected location where people gather for activities to engage in is by mapping the active and passive activities of those people. On the other hand, in studies on understanding public life, counting is the cheapest method to do so, and can give the numbers for comparisons of attributes between different geographic areas, or over time (Gehl & Svarre, 2018).

To be able to use both methods, the survey points were carefully selected to capture the needs of the research in registering the number of people who were moving or stationary at the spot. The sample size selected was 18 pedestrians using systematic random sampling, which was based on a similar study carried out by Fauzi and Aditianata (2018). To calculate the pedestrian movement per hour, the count was conducted for precisely ten minutes, and repeated. The sample size was set to be easy for observation, and calculation intervals were selected in such a way to avoid fatigue for the observer as the process required a great amount of focus. Times of observation were divided into three periods: morning (08:00-10:00), afternoon (12:00-14:00), and evening (16:00-18:00), and the ideal number of pedestrians passing a point ranged from 8 to 18 pedestrians per minute per metre.

Nodes or observation points were determined by identifying the active points in front of opened and closed facades along the street. To conduct the observations, Jalan Masjid India was divided into three (3) block sections to ease the process. Each block section was 100 metres, a considerable yet walkable distance, and the total blocks in the study area were within 300 metres. Figure 1 below demonstrates the flow of tasks in conducting the study.

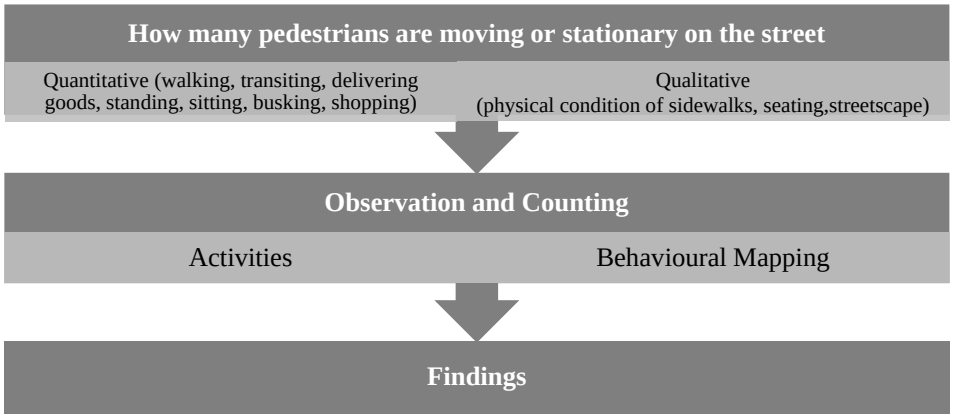

Figure 1: Study approach

Jalan Masjid India – The Case Study

Jalan Masjid India is in the old heritage zone in the vicinity of Masjid Jamek, which has a strong sense of character amidst heritage buildings, contemporary architecture, and preserved facades. This area is famously known for the community's commercial activities, and as a trading area. The vibrancy of Jalan Masjid India is not the only reason for it being the most popular tourist attraction, but here, one can also find the mosque that holds 150 years of history. The activities make the street lively and active. At every festive month, especially during the month of Ramadhan for Muslim believers, and Deepavali for the Hindu believers, this street is the main destination for people to come and shop for their festive preparations, simply because of its vibe and sense of place. Daily, the public finds that this street serves as a vital transit, and observes a significant number of people on foot, whilst various activities from commercial to leisure purposes take place along this street. Figure 2 demonstrates the location of Jalan Masjid India in Kuala Lumpur surrounded by several landmarks, while Figure 3 shows the 300-metre stretch of the street determined for the study.

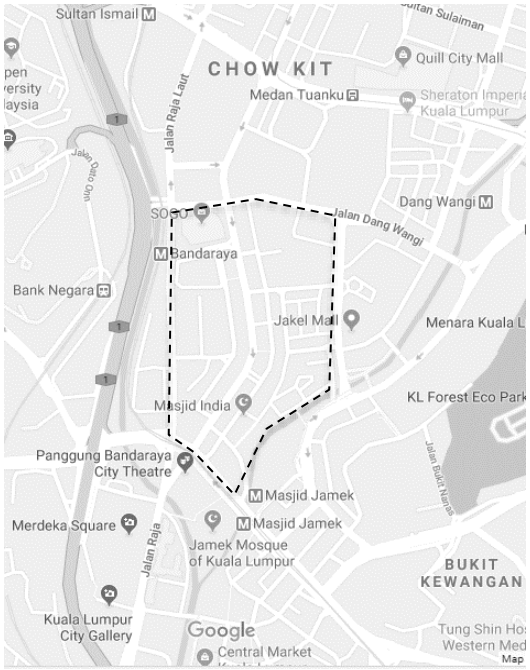

Figure 2 Key plan of Jalan Masjid India
Source: Google Maps (2018a)

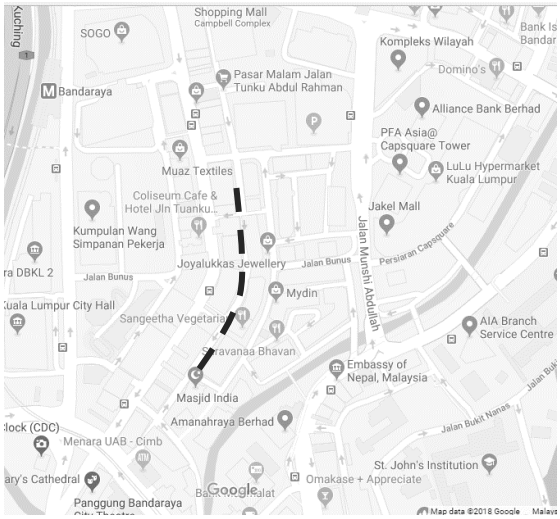

Figure 3 Section of Jalan Masjid India as the case study stretching about 300m
Source: Google Maps (2018b)

RESULTS AND DISCUSSION

In most Malaysian towns, streets play an important role as settings for activities. With the tropical weather, activities are drawn outdoors, and are more active in the evening (Heng, Low & Hee, 2010). The physical character of a street is also very much influenced by the activities taking place in it as well as within the buildings flanking it. For each of the three selected sections of Jalan Masjid India, the results of the findings were summarised in a table and a behavioural mapping of the dynamic (active) and static (passive) activities.

Based on the results, the flow of movement on Section 1 shown in Figure 4 gradually increased to a more dynamic situation from morning to afternoon. Active activities like walking and transiting were very significant in the afternoon, and a balance of static activities also took place in the afternoon. The streets were very lively in the afternoon, where users of the area were seen as comfortable, with them chatting and waiting on the street, sitting by the sidewalks and resting, and people-watching under a tree, all of which are summarised in Table 1. A lot of the activities took place on the street itself regardless of the weather condition. From the observations, the physical condition of the street and the sidewalks were good to foster both the active and passive activities that took place during that time. As the street was busy with its trading activities, the researchers discovered that the workers and traders were transporting goods during peak hours until evening. This is shown in Figure 4 and Table 1.

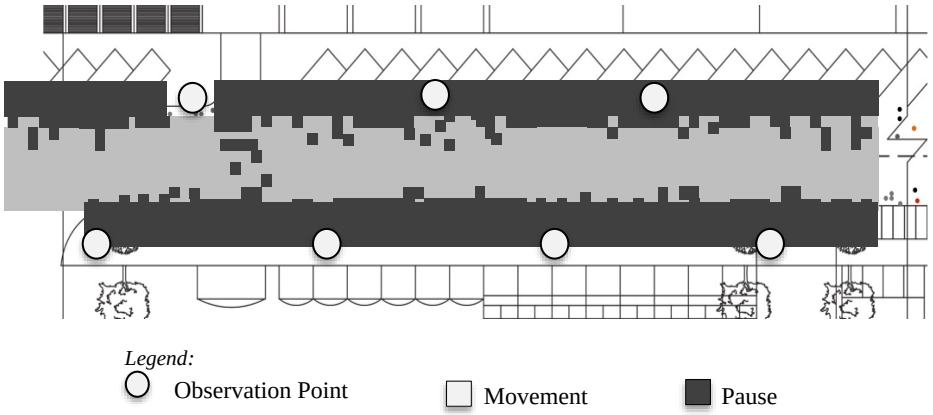

Figure 4: Movement and pause points on Section 1 of Jalan Masjid India (Length: 100m)

Table 1 Summary of number of pedestrians passing by observation points and engaging in dynamic and static activities for more than 3 minutes on Section 1 of Jalan Masjid India throughout the day (Length: 100m)

	Activities	Morning			Afternoon			Evening		
		8:00	9:00	10:00	12:00	13:00	14:00	16:00	17:00	18:00
Dynamic	Walking	7	8	7	4	15	17	12	15	12
	Passing By / Transiting	7	9	12	5	18	18	16	17	15
	Transporting Goods	1	0	3	0	4	3	2	3	2
Static	Sitting	2	1	3	2	6	10	3	4	7
	Waiting	4	2	5	2	8	7	6	5	8
	People-Watching	1	0	2	1	5	8	5	4	3
	Chatting	2	3	4	4	5	12	7	9	12
	Window Shopping	0	0	0	0	3	6	5	8	9
	Busking	0	0	0	0	0	3	0	2	0
	Shopping	1	5	8	8	5	16	5	7	7
Total Activities Engaged by Pedestrians		25	28	44	26	69	100	66	74	75

In Section 2 (Figure 5), the study revealed that there was a balance of active and passive activities which took place here. The tree-lined sidewalks attracted more passive activities like sitting, waiting, chatting, and people-watching from afternoon to evening. This is because the physical condition of the sidewalk gave a sense of security for the users to just pause within the space. However, the flow of movement did gradually rise in the afternoon. The existing physical condition of the sidewalks could not support the larger volume of

pedestrians at the crossings in these parts as seen in Figure 5. Some passive activities, and the display of items from the shops had also occupied the space for pedestrians to walk in this section.

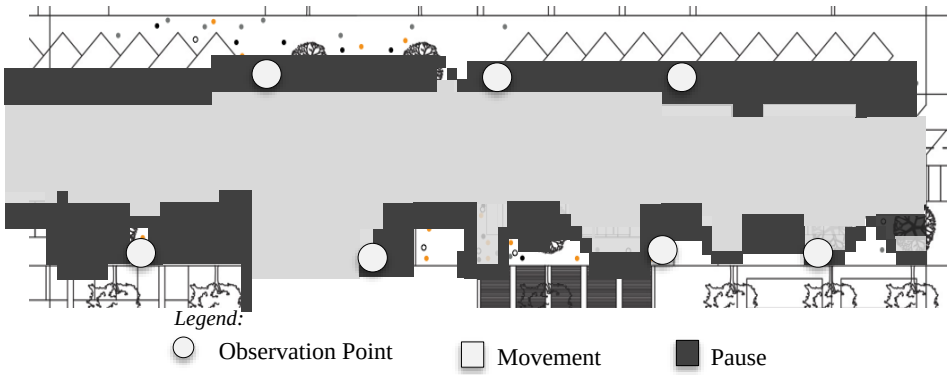

Figure 5 Movement and pause points on Section 2 of Jalan Masjid India (Length: 100m)

Table 2 Summary of number of pedestrians passing by observation points and engaging in dynamic and static activities for more than 3 minutes on Section 2 of Jalan Masjid India throughout the day (Length: 100m)

	Activities	**Morning**			**Afternoon**			**Evening**		
		8:00	**9:00**	**10:00**	**12:00**	**13:00**	**14:00**	**16:00**	**17:00**	**18:00**
Dynamic	Walking	5	8	6	10	15	17	12	15	12
	Passing By / Transiting	8	9	12	8	18	18	16	17	15
	Transporting Goods	0	0	3	2	4	3	2	3	2
Static	Sitting	1	1	3	2	5	7	7	10	10
	Waiting	2	2	5	2	8	7	10	9	12
	People-Watching	2	1	0	1	5	4	5	4	3
	Chatting	2	3	4	4	8	12	7	9	12
	Window Shopping	0	0	0	0	3	6	5	8	9
	Busking	0	0	0	0	0	3	0	2	0
	Shopping	0	4	2	8	8	16	10	15	7
Total Activities Engaged by Pedestrians		20	28	35	37	87	90	79	92	82

Table 2 above demonstrates the movement overflowed onto the street level itself. Pedestrians created their own imaginary lane to comfortably shop, walk, transit, and transport goods next to moving vehicles along the street. At the main intersection, conflict between pedestrians and vehicles occurred, slowing down the movement of vehicles in the area. Nevertheless, the liveliness, movement, and pause of movements in these parts of Jalan Masjid

India continued throughout the day as the main intersection of the road allowed users to move from one place to the adjacent.

It was also discovered that Section 3 of Jalan Masjid India (Figure 6) showed that the movement here was more dynamic from late afternoon to evening. This area had a different network of users and needs. The sidewalks seemed calmer than other sections of the street, and were not filled with any obstructions, pop-up hawkers, or buskers. Noticeably, static activities took place around natural attractions nearby curbs and streets, and the physical condition of the sidewalks was comfortable to foster both dynamic and static activities. This is presented in Table 3. The streets also connected users to a nearby intersection that was important considering the potential flows and volumes of movements of all user groups heading to Jalan Masjid India. However, pedestrian conflicts were visible in the evening especially with vehicles exiting parking areas from a nearby building and by-passing secondary roads to the main road.

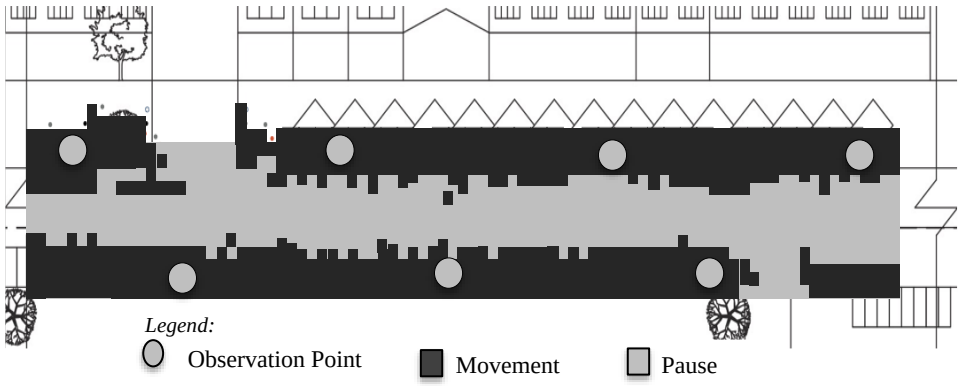

Figure 6 Movement and pause points on Section 3 of Jalan Masjid India (Length: 100m)

Table 3 Summary of number of pedestrians passing by observation points and engaging in dynamic and static activities for more than 3 minutes on Section 3 of Jalan Masjid India (Length: 100m)

	Activities	**Morning**			**Afternoon**			**Evening**		
		8:00	**9:00**	**10:00**	**12:00**	**13:00**	**14:00**	**16:00**	**17:00**	**18:00**
Dynamic	Walking	3	8	3	3	10	11	12	15	12
	Passing By / Transiting /	4	5	5	5	15	8	16	17	15
	Transporting Goods	2	2	4	3	4	3	2	3	2
Static	Sitting	2	1	3	2	6	10	3	4	7
	Waiting	4	2	5	2	8	7	6	5	8
	People-Watching	1	0	2	1	5	8	5	4	3
	Chatting	2	3	4	4	5	12	7	9	12

Window Shopping	0	0	0	0	3	6	5	8	9
Busking	0	0	0	0	0	3	0	2	0
Shopping	1	2	3	3	5	10	5	5	5
Total Activities Engaged by Pedestrians	19	24	29	23	61	78	61	65	74

Movement along Jalan Masjid India

The movement along Jalan Masjid India was represented by the public, which included people of all abilities and ages sitting, walking, pausing, and resting on the streets. The study area was evaluated and found to be well connected and easy to access. However, on some days, especially weekends, and during peak hours on weekdays, conflicts between pedestrians and vehicles seemed visible due to the activities that were simultaneously taking place.

The physical condition of the Jalan Masjid India sidewalks was found to be satisfactory for walking. The continuous design spaces were adequate to link users to and from adjacent places. The evaluation indicated that the sidewalks were wide and comfortable enough to accommodate high numbers of users with minimal clashes as summarised in Tables 1, 2, and 3 above. The major pause points in the movement, as shown in Figures 4, 5, and 6 earlier, were mainly the vendors, street stall operators, and owners of commercial storefronts. Adequate spaces were allocated to these users that support the vibrant, active, and engaging street environment.

The overall movement and pause points of Jalan Masjid India were good for a street environment, where the buildings create frontages, and its streetscape showcases the people using the space for connectivity and activities. However, to improve the quality of the street, regular cleaning and maintenance is required to support the commercial activities along the street. Besides that, protection from extreme weather should also be incorporated to ensure an enjoyable street experience for the users.

CONCLUSION

The findings of the study revealed that the movement and activities along Jalan Masjid India were very lively with a significant number of people on foot noted throughout the observation exercise. These people brought life to the street throughout the day even though there were conflicts between pedestrians and vehicles which were visible at certain times. Despite the extreme transitions between rainy and hot days, the results proved that users were still comfortable walking to adjacent places. Thus, clearly, Jalan Masjid India is functional, and its physical character acts as a comfortable mode of movement for users.

The potential of the street as a great public space is seen as possible if the street design and soft landscape were more defined and focused. The study concludes that the walkability of the street is good although there were some challenges, such as poorly maintained footways, and broken pavements. The

research also identified the active and passive areas that can foster engagement of interactions, and that an urban designer must avoid the creation of empty spaces that are not well-connected to the pedestrian network on a larger scale.

Ultimately, from the study, it can be determined that some changes can be made to the street as it seems flexible enough to adapt without affecting current core businesses of the street through a flexible street management approach. Through this tactic, the character of Jalan Masjid India as a downtown market street was highlighted using design treatments while still allowing it to handle a high volume of pedestrians and activities. The planning of the design treatments should also consider the street context and limits as well as potential flows and volumes of movement of all user groups coming from nearby streets into Jalan Masjid India. Gradually, this will give time for users to adapt to the changes, and the street's liveliness, function, and urban activities. Henceforth, the street will be able to function to full capacity, where people can enjoy many social and outdoor activities.

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PERSONAL EMPOWERMENT AS DETERMINANTS OF ORGANISATIONAL OPPORTUNITY

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Abstract

Architects can influence workplace behaviours and manoeuvre workers' emotions through aligning design strategies with human moods. Design sustains organisational well-being through strengthening space occupants' empowerment, leading to better work performances. *Issue*: Existing research has limited empirical evidence on the impact of personal empowerment (PE) on organisational opportunity (OO). *Purpose*: This paper aims to verify the statistical predictability of OO based on PE. *Approach*: Multiple Correlation and Multiple Linear Regression were carried out to assess linear associations and parameters of linear equations to predict OO components based on PE items. *Findings*: OO components were predictable by the majority of the PE items and '*monitoring behaviours to suit with situation*' was the strongest predictor of OO.

Keywords: organisational opportunity, personal empowerment

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INTRODUCTION

Human interdependence with other humans (HIH) plays a big part in architectural psychology as designers now gain a new set of criteria in improving emotional aspects of spatial designs. HIH is one of the potent causes of subjective sustainable well-being (SSWB). Personal empowerment (PE) and organisational opportunity (OO) are dimensions of HIH. Space qualities have a tremendous impact on occupants' way of thinking, patterns of actions and, thus promote PE, leading to improved concentration, willingness to act, and ultimately, OO. Over time, extensive literature have discussed the positive effect of PE on OO. This paper assesses the statistical predictability of OO based on PE.

LITERATURE REVIEW

Case studies based on articles from selected Asian Journals from the year 2011 onwards highlight conditional factors and potential determinants of OO. Table 1 summarises these findings.

Table 1 Conditional factors and potential determinants for organisational opportunity

Conditional Factors (Keywords)	Potential Determinants	References
Job security (stability and continuance of one's job), organisational commitment (sense of oneness with organisation), social comfort (feeling of trust with social environment) and quality of work (quality of experience of employees-organisation relationship).	Co-workers involvement and belongingness (willing to contribute, participate, share, volunteer), and sense of responsibility	Sarina & Mohamad Adli (2012)
Financial well-being (ability to meet current and ongoing financial obligation, and moderation in spending (restraining self from excessive expenditure)	Productivity (effectiveness), and self-control (ability to control oneself or desires)	Mokhtar, Husniyah, Sabri, & Abu Talib. (2015)
Time-based constraint (the time demands of one role are incompatible with those of another), strain-based constraint (strain experienced in one role interferes with participation in another role), and behaviour-based constraint (behaviour pattern appropriate to one domain are inappropriate in another).	Emotional intelligence (ability to recognize and react to owns and others' emotions), self-control (ability to control oneself) and social support (perception that one is cared for)	Panatik, Zainal Badri, Rajab, Abdul Rahman, & Mad Shaha (2011)
Work-family conflict (incompatible demands between career and family roles), and personal adjustment (balancing conflicting needs or certain requirements against the surrounding obstacles)	Self-esteem through adaptation (confidence in self-worthiness resulting from one's interaction with others)	(Rashid, Nordin, Omar, & Ismail (2012)
Work ethics (principles that hard work is virtuous and believing in moral benefits of work), and passiveness in taking charge (reluctant to do more than what were minimally required to do).	Organisational commitment (accountability, integrity, teamwork and participation, effort and proactivity)	Salin (2013)
Goal orientation (the ability to take charge and focus on demanding tasks), bravery (courageous character), achievement motivation (the need to success or attaining excellence), and job performance	Dominance (influence over others), openness (frankness), cheerful (optimistic), confidence, and imaginative (inventiveness)	Halim, Zainal, Omar, Hafidz, & Othman (2013)
Job insecurity (behavioural withdrawal, perceived powerlessness to maintain a desired continuity experienced, and concern the possibility of being retrenched in the future)	Optimism (hopefulness and confidence for the future), and confidence in hierarchy and ranks of the organisation	Ho, Sambasivan, & Liew (2013)
Safety culture (an outcome of values, attitudes and behaviours concerning safety in the workplace), safety training, resource allocation and management.	Commitment (dedication), and leadership (guiding and inspiring others)	Ismail, Ahmad, Ismail, &

		Janipha (2012)
Sense of empowerment given to employees in relation to freedom to perform, and positive emotions translated in job satisfaction.	Competence (capability and efficiency) and task meaningfulness	Aziz & Ennew (2013)
Social-oriented achievement (an inclination to achieve a standard of excellence set by significant others (e.g. teachers, parents) that is pursued and evaluated according to the ways and the standards determined by others)	Security (the state of feeling safe) and conformity (behaving in accordance to accepted conventions or standards set by society)	Liem, Martin, Porter, & Colmar 2012)

The findings from the case studies generate three significant components of OO: (i) Fluency and Versatility (OOa), (ii) Encouraging Interaction (OOb) and (iii) Collaborative Engagement (OOc).

Table 2 Components and determinants of organisational opportunity

Definition of OO	Components	Indicators	Code
Optimism and openness expressed in exchange ideas and encouraging interactions that insinuate hope and positive prospect for the future in the working environment	Fluency and Versatility	sense of clarity and understand of tasks and roles at work	OOa
		flexible in handling different work roles and diverse tasks	
	Encouraging Interaction	sharing the same stance with my co-workers	
		motivating and assisting co-workers at their work	
		cherishing co-workers' accomplishments	OOb
		valuing ideas and suggestions from co-workers	
	Collaborative Engagement	being engaged in decision-making process	OOc
		delivering ideas and suggestion constructively	
		sharing skills and knowledge eagerly with co-workers	
		optimistic with the hierarchy at the organisation	

Personal Empowerment (PE) manifests in the opportunity to exercise control, voice and choice with regards to social surroundings. Qualities adhere to PE include (i) self-motivation with regards to goal orientation, autonomy and self-regulation (Fatimah, Lukman, Khairudin, Wan Shahrazad, & Halim, 2011; Chin, Khoo, & Low, 2012; Kok, 2016), (ii) social acceptance and coherence with others (Fatimah et al., 2011; Nesbit, Jepsen, Demirian, & Ho, 2012; Kadir, Omar, Desa, & Yusooff, 2013; Zamani, Khairudin, Sulaiman, Halim, & Nasir, 2013), and (iii) composure, stability and resilience (Sulaiman, Kadir, Halim, Omar, Latiff, & Sulaiman, 2013; Sipon, Nasrah, Nazli, Abdullah, & Othman, 2014).

Table 3 Determinants of personal empowerment

Definition of PE	Indicators	Code
Self-esteem in taking control over life along with sense of composure to progress in the social environment	setting goals and striving to meet goals	PE1
	striving and working hard even for easy goals	PE2
	monitoring behaviours to suit with situations	PE3
	knowing when somebody is offended	PE4
	ensuring others are comfortable when making deals	PE5
	able to be friendly with distasteful persons when necessary	PE6
	able to work out solutions during stress and difficulties	PE7
	tackling problems efficiently in unexpected conditions	PE8
	feeling energetic for daily routines and activities	PE9
	having hardly distracted and focus mind	PE10

Based on theoretical underpinnings, the research hypothesize that OO components are predictable by PE. The following sections provide empirical evidence the predictability of OOa, OOb and OOc based on PE items.

METHOD

A sample of 4,315 was gathered after the data screening process. The Malaysian respondents were given an 11-point Likert scale to respond to questionnaire items which include the components of OO and the ten PE items. Pearson correlation analyses were conducted to observe if there were linear associations between the OO components and PE items. Ensuing correlation analyses, multiple linear regression analyses were conducted to estimate parameters of the linear equations used to predict values of OOa, OOb and OOc from PE items.

RESULTS AND DISCUSSION

At 95% confidence level, there were statistically significant positive correlations between (i) OOa and each of PE items, (ii) OOb and each of PE items, and (iii) OOc and each of PE items. The null hypotheses claiming there are no statistically significant correlations between (i) OOa and respective PE items, (ii) OOb and respective PE items, and (iii) OOc and respective PE items were all rejected.

Table 4 Multiple Correlations between PE items and OOa, OOb and OOc

H_0	There is no statistically significant correlation between OOa and respective PE items
H_0	There is no statistically significant correlation between OOb and respective PE items
H_0	There is no statistically significant correlation between OOc and respective PE items

Correlation Strength Threshold (Dancey & Reidy, 2004)										
0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
zero		weak			moderate			strong		perfect

DV	Stats	PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
OOa	r	.522**	.511**	.505**	.430**	.463**	.370**	.446**	.422**	.465**	.419**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
OOb	r	.469**	.503**	.497**	.465**	.493**	.437**	.463**	.454**	.468**	.419**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
OOc	r	.513**	.533**	.524**	.491**	.535**	.463**	.486**	.479**	.494**	.449**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315

Statistical Interpretation of Multiple Correlation Analyses	
OOa	At 95% confidence level, there were statistically significant and moderate correlations between OOa and (i) PE1 (r =.522, p = .000); (ii) PE2 (r =.511, p = .000); (iii) PE3 (r =.505, p = .000); (iv) PE4 (r =.430, p = .000); (v) PE5 (r =.463, p = .000); (vi) PE6 (r =.370, p = .000); (vii) PE7 (r =.446, p = .000); (viii) PE8 (r =.422, p = .000); (ix) PE9 (r =.465, p = .000); (x) PE10 (r =.419, p = .000).
OOb	At 95% confidence level, there were statistically significant and moderate correlations between OOb and (i) PE1 (r =.469, p = .000); (ii) PE2 (r =.503, p = .000); (iii) PE3 (r =.497, p = .000); (iv) PE4 (r =.465, p = .000); (v) PE5 (r =.493, p = .000); (vi) PE6 (r =.437, p = .000); (vii) PE7 (r =.463, p = .000); (viii) PE8 (r =.454, p = .000); (ix) PE9 (r =.468, p = .000); (x) PE10 (r =.419, p = .000).

OOc	At 95% confidence level, there were statistically significant and moderate correlations between OOc and (i) PE1 (r =.513, p = .000); (ii) PE2 (r =533, p = .000); (iii) PE3 (r =.524, p = .000); (iv) PE4 (r =.491, p = .000); (v) PE5 (r =.535, p = .000); (vi) PE6 (r =.463, p = .000); (vii) PE7 (r =.486, p = .000); (viii) PE8 (r =.479, p = .000); (ix) PE9 (r =.494, p = .000); (x) PE10 (r =.449, p = .000).

Three (3) multiple regression analyses were carried out to predict the values of each of dependent variables (i) OOa, (ii) OOb and (iii) OOc given the set of PE explanatory variables (PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9, and PE10).

Table 5 Multiple Linear Regression – PE predicting OOa

H_0
There will be no significant prediction of OOa by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.590	.348	.346	1.33143	1.756

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4066.801	10	406.680	229.413	.000
Residual	7629.699	4304	1.773		
Total	11696.500	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	2.842	.127		22.381	.000	2.593	3.091
PE1	.192	.020	.206	9.487	.000	.152	.231
PE2	.074	.023	.075	3.201	.001	.029	.119
PE3	.133	.020	.136	6.557	.000	.094	.173
PE4	.022	.021	.021	1.011	**.312**	-.020	.064
PE5	.108	.021	.109	5.127	.000	.067	.149
PE6	-.024	.020	-.023	-1.210	**.226**	-.063	.015
PE7	.067	.023	.069	2.977	.003	.023	.111
PE8	-.071	.024	-.074	-2.957	.003	-.118	-.024
PE9	.110	.023	.116	4.740	.000	.065	.156
PE10	.060	.019	.068	3.227	.001	.023	.096

A multiple regression was generated to predict OOa based on PE items. R value of .590 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.756 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304) = 229.413, p = .000, with an R^2 of .348; indicating that the proportion of variance in OOa that can be explained by PE items was 34.8%.

At 95% confidence level, PE1 (B = .192, t = 9.487, p = .000), PE2 (B = .074, t = 3.201, p =.001), PE3 (B = .133, t = 6.557, p =.000), PE5 (B = .108, t =

5.127, p = .000), PE7 (B = .067, t = 2.977, p = .000), PE8 (B = -.071, t = -2.957, p = .003), PE9 (B = .110, t = 4.740, p =.000) and PE10 (B = .060, t = 3.227, p =.001) were significant predictors of OOa. On the contrary, it was found that PE4 (B = .022, t = 1.011, p =.312) and PE6 (B = -.024, t = -1.210, p =.226) were not significant predictors of OOa.

Personal Empowerment (PE) items account for 34.8% of Fluency and Versatility (OOa). Eight (8) of PE items were significant predictors of OOa.

Table 6 Multiple Linear Regression – PE predicting OOb

H_0
There will be no significant prediction of OOb by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.586	.343	.342	1.18229	1.760

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3145.099	10	314.510	225.001	.000
Residual	6016.203	4304	1.398		
Total	9161.302	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.075	.113		27.277	.000	2.854	3.296
PE1	.040	.018	.049	2.253	.024	.005	.076
PE2	.115	.021	.133	5.622	.000	.075	.155
PE3	.104	.018	.119	5.742	.000	.068	.139
PE4	.039	.019	.042	2.033	.042	.001	.076
PE5	.109	.019	.125	5.832	.000	.072	.146
PE6	.066	.018	.072	3.783	.000	.032	.101
PE7	.033	.020	.039	1.669	**.095**	-.006	.073
PE8	.009	.021	.010	.411	**.681**	-.033	.051
PE9	.076	.021	.091	3.697	.000	.036	.117
PE10	.031	.016	.039	1.868	**.062**	-.002	.063

A multiple regression was generated to predict OOb based on PE items. R value of .586 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.760 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304) = 225.001, p = .000, with an R^2 of .343; indicating that the proportion of variance in OOb that can be explained by PE items was 34.3%.

At 95% confidence level, PE1 (B = .040, t = 2.253, p = .024), PE2 (B = .115, t = 5.622, p =.000), PE3 (B = .104, t = 5.742, p =.000), PE4 (B = .039, t = 2.033, p =.042), PE5 (B = .109, t = 5.832, p = .000), PE6 (B = .066, t = 3.783, p

=.000) and PE9 (B = .076, t = 3.697, p =.000) were significant predictors of OOb. On the contrary, it was found that PE7 (B = .033, t = 1.669, p = .095), PE8 (B = .009, t = .411, p = .681) and PE10 (B = .031, t = 1.868, p =.062) were not significant predictors of OOb.

Personal Empowerment (PE) items account for 34.3% of Encouraging Interaction (OOb). Seven (7) of PE items were significant predictors of OOa.

Table 7 Multiple Linear Regression – PE predicting OOc

H_0
There will be no significant prediction of OOc by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.625	.390	.389	1.22692	1.714

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	4150.512	10	415.051	275.719	.000
Residual	6478.993	4304	1.505		
Total	10629.505	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	2.242	.117		19.161	.000	2.012	2.471
PE1	.090	.019	.101	4.824	.000	.053	.126
PE2	.108	.021	.115	5.057	.000	.066	.149
PE3	.099	.019	.106	5.289	.000	.062	.136
PE4	.029	.020	.029	1.480	**.139**	-.010	.068
PE5	.162	.019	.172	8.331	.000	.124	.200
PE6	.065	.018	.066	3.583	.000	.030	.101
PE7	.022	.021	.024	1.066	**.286**	-.019	.063
PE8	.012	.022	.014	.563	**.574**	-.031	.056
PE9	.072	.021	.080	3.377	.001	.030	.114
PE10	.052	.017	.061	3.020	.003	.018	.085

A multiple regression was generated to predict OOa based on PE items. R value of .625 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.714 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304) = 275.719, p = .000, with an R^2 of .390; indicating that the proportion of variance in OOc that can be explained by PE items was 39%.

At 95% confidence level, PE1 (B = .090, t = 4.824, p = .000), PE2 (B =.108, t = 5.057, p =.000), PE3 (B =.099, t = 5.289, p =.000), PE5 (B = .162, t = 8.331, p = .000), PE6 (B = .065, t = 3.583, p =.000), PE9 (B = .072, t = 3.377, p =.001) and PE10 (B = .052, t = 3.020, p =.003) were significant predictors of

OOc. On the contrary, it was found that PE4 (B = .029, t = 1.480, p = .139.), PE7 (B = .022, t = 1.066, p = .286) and PE8 (B = .012, t = .563, p = .574.) were not significant predictors of OOc.

Personal Empowerment (PE) items account for 34.8% of Collaborative Engagement (OOc). Sevent (7) of PE items were significant predictors of OOc.

Table 8 Summary of findings

		IV (Predictor Variables) - β									
		PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
DV (Outcome Variables)	OOa	**.206** ✓	.075 ✓	**.136** ✓	.021 ✗	.109 ✓	-.023 ✗	.069 ✓	-.074 ✓	**.116** ✓	.068 ✓
	OOb	.049 ✓	**.133** ✓	**.119** ✓	.042 ✓	**.125** ✓	.072 ✓	.039 ✗	.010 ✗	.091 ✓	.039 ✗
	OOc	.101 ✓	**.115** ✓	**.106** ✓	.029 ✗	**.172** ✓	.066 ✓	.024 ✗	.014 ✗	.080 ✓	.061 ✓

✓ = statistically significant predictor; ✗ = not statistically significant predictor

DV	Indicators	IV	Top 3 Strongest Predictors	β
OOa Fluency and Versatility	• sense of clarity and understand of tasks and roles at work • flexible in handling different work roles and diverse tasks	PE1	setting goals and striving to meet goals	.206
		PE3	**monitoring behaviours to suit with situations**	**.136**
		PE9	feeling energetic for daily routines and activities	.116
OOb Encouraging Interaction	• sharing the same stance with my co-workers • motivating and assisting co-workers at their work • cherishing co-workers' accomplishments • valuing ideas and suggestions from co-workers	PE2	striving and working hard even for easy goals	.133
		PE5	ensuring others are comfortable when making deals	.125
		PE3	**monitoring behaviours to suit with situations**	**.119**
OOc Collaborative Engagement	• being engaged in decision-making process • delivering ideas and suggestion constructively • sharing skills and knowledge eagerly with co-workers • optimistic with the hierarchy at the organisation	PE5	ensuring others are comfortable when making deals	.172
		PE2	striving and working hard even for easy goals	.115
		PE3	**monitoring behaviours to suit with situations**	**.106**

Findings show that majority of PE items significantly account for OOa, OOb and OOc. PE3, designating '*monitoring behaviours to suit with situations*' was in the top three strongest predictors across OO components. The quality of coexisting and coinciding with social surrounding leads to OO. Handling emotions and behaviours consciously and rationally requires regular interactions to learn and acclimatise with the social atmosphere. Architectural planning of workspaces can influence human interactions. For instance, open spaces encourage more spontaneous and coincidental meetings and less pre-planned traditional meetings. Organisations can build networking cultures and encourage collaboration among co-workers leading to better performance and sustained organisational well-being.

CONCLUSION

HIH in SSWB propounds the idea that human expressions and behaviours need coexist harmoniously with concerns of others. This paper evidence that OO is predictable through PE. Statistical modelling on the constructs elaborated in this paper are the next steps in the future direction of the research.

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PREDICTABILITY OF POSITIVE RELATIONSHIPS THROUGH PERSONAL EMPOWERMENT

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Abstract

Designers have long adopted the knowledge from the field of psychology to expand architectural space's emotional impacts. Appropriate design strategies can improve and sustain well-being through instilling the sense of empowerment, leading to positive relationships among space occupants. *Issue*: A large body of the literature has sought to provide a conclusive empirical assessment on the predictability of attitudes and behaviours in positive relationships (PR) through personal empowerment (PE). *Purpose*: This paper intends to determine the predictability of PR based on PE. *Approach*: Multiple Correlation and Multiple Linear Regression were conducted to estimate linear associations and parameters of linear equations to predict PR components based on PE items. *Findings*: Components of PR were predictable by the majority of the PE items and '*monitoring behaviours to suit with situation*' was the strongest predictor of PR.

Keywords: positive relationship, personal empowerment

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INTRODUCTION

Human interdependence with other humans (HIH) is one of the agents of subjective sustainable well-being (SSWB). HIH is the extent of individuals' abilities to dedicate themselves in their social context in return for SSWB. Personal empowerment (PE) and positive relationships (PR) are dimensions of HIH. Spatial designs support developmental milestones contributing to enhance PE. Some studies have theoretically justified the widely diverse ends and means of PE. While there are claims of PE as enablers of PR, empirical evidence is still lacking. This paper assesses the statistical predictability of PR based on PE.

LITERATURE REVIEW

Case studies based on articles from selected Asian Journals from the year 2011 onwards highlight conditional factors and potential determinants of Positive Relations (PR). Table 1 summarises these findings.

Table 1 Conditional factors and potential determinants for positive relationships

Conditional Factors (keywords)	Potential Determinants	References
Parenting styles and involvement, authorities parenting, work-family balance; economic situation health and safety at home; community involvement; spirituality; density and number of bedrooms.	Involvement, support, resilience, time (ability to spend time with family), and family functioning (fulfilling roles and)	Noraini, Gandhi, Ishak, & Wok (2014)
husband and wife relations, family relationships, achievements, economic situations, standard of living, health, safety, relationship with community, spiritual practices, and basic amenities.	Functioning, involvement, resilience, tolerance (acceptance) and understanding, helpfulness and time with family	Abu Rahim, Ishak, Mohd Shafie, & Shafiai (2013)
Settlement areas (urban area), income (> RM 800), marital status (married) and possess social life skills	Care (feeling concern for), responsibility, and social contact (communication)	Mohamad et al. (2013)
Resilience (strength to cope in stressful situations), financial autonomy (financially independent)	Emotional intimacy, tolerance, responsibility	Shuib et al. (2013)
Gender – women apologize more to the same gender, while men apologize easier to the opposite gender. Women have a 'lower threshold of what constitutes offensive behaviour'. Men tend to apologize when they believe that they have actually offended someone.	Ability to apologise, humility (humbleness), modesty (moderate and unassuming), compassion (empathy and sensitivity)	Turiman, Leong, & Hassan (2013)
Age and number of children negatively correlate with marital satisfaction. Marital satisfaction refers to the perception towards marital relationship in terms of the marriage as a whole, the husband or wife as a spouse, the overall relationship with husband or wife, and the expression of love in the relationship.	Love (deep affection), passion (enthusiasm for someone), intimacy (close familiarity), commitment (sense of obligation), and communication (connecting)	Hoesni, Subhi, Alavi, & Wan Azreena (2013)
Parents' self-esteem (confidence in abilities), family functioning (involvement and communication), and temperament (innate and enduring personality traits)	Conducive (encouraging) and responsive (readily responding) behaviours	Chiah & Baharudin (2013)
Parents' personality factors, parent-child relationship and practices, parental intervention, family sibship size, peer relationship and academic performance	Extraversion (outgoing) emotional stability, and conscientiousness (being careful or vigilant)	Ha & Tam (2013)
Psychosocial well-being (connection between psychological experience and wider social	Problem-solving skills helpfulness, intimacy, tolerance and openness in communication	(Demir et al., 2012)

experience), and social skills (skills facilitating interaction and communication with others)		
Peer-rejection (exclusion from social interaction), isolation (separation from others), criticism (expression of disapproval), strictness (rigidity and stringency), competitions (act of rivalry and supremacy), and emotional dissatisfaction (intense feelings of discontent or feeling disgruntled).	Interaction skills, flexibility (willingness to compromise) cooperativeness (joint action) and nurturance (love, care and attention given to someone)	Vellymalay (2013)

The findings from the case studies generate three significant components of PR: (i) Tolerance and Compassion (PRa), (ii) Sense of Inclusion (PRb) and (iii) Self-Regulation and Benevolent (PRc).

Table 2 Components and determinants of positive relationships

Definition of PR	Components	Items	Code
Positive sense of intimacy, emotional responsiveness and continuous support expressed in personal relationships	Tolerance and Compassion	being flexible to differences in opinions	PRa
		confident (not shy) in expressing care and affection	
		aware and eager to know others' updates	
		offering emotional support whenever it is needed	
	Sense of Inclusion	engaging productively in decision making process	PRb
		ensuring others are engaged in decision making process	
		forgiving of others' weaknesses and mistakes	
	Self-Regulation and Benevolent	self-conscious of own mistakes and quickly apologies	PRc
		motivating and assisting others to fulfil their life goals	
		expressing appreciations to others regularly	

Personal Empowerment (PE) manifests in the opportunity to exercise control, voice and choice with regards to social surroundings. Qualities adhere to PE include (i) self-motivation with regards to goal orientation, autonomy and self-regulation (Fatimah et al., 2011; Chin et al., 2012; Kok, 2016), (ii) social acceptance and coherence with others (Fatimah, Lukman, Khairudin, Wan Shahrazad, & Halim, 2011; Nesbit, Jepsen, Demirian, & Ho, 2012; Kadir, Omar, Desa, & Yusooff, 2013; Zamani, Khairudin, Sulaiman, Halim, & Nasir, 2013), and (iii) composure, stability and resilience (Song, Cai, Brown, & Grimm, 2011; Sulaiman et al., 2013; Sipon, Nasrah, Nazli, Abdullah, & Othman, 2014).

Table 3 Determinants of personal empowerment

Definition of PE	Items	Code
Self-esteem in taking control over life along with sense of composure to progress in the social environment	setting goals and striving to meet goals	PE1
	striving and working hard even for easy goals	PE2
	monitoring behaviours to suit with situations	PE3
	knowing when somebody is offended	PE4
	ensuring others are comfortable when making deals	PE5
	able to be friendly with distasteful persons when necessary	PE6
	able to work out solutions during stress and difficulties	PE7
	tackling problems efficiently in unexpected conditions	PE8
	feeling energetic for daily routines and activities	PE9
	having hardly distracted and focus mind	PE10

Based on theoretical underpinnings, this research hypothesises that PR components are predictable by PE. The following sections provide empirical evidence the predictability of PRa, PRb and PRc based on PE items.

METHOD

A sample of 4,315 was gathered after the data screening process. The Malaysian respondents were given an 11-point Likert scale to respond to questionnaire items which include the components of PR and the ten (10) PE items. Pearson correlation analyses were conducted to observe if there were linear associations between the PR components and PE items. Ensuing correlation analyses, multiple linear regression analyses were conducted to estimate parameters of the linear equations used to predict values of PRa, PRb and PRc from PE items.

RESULTS AND DISCUSSION

At 95% confidence level, there were statistically significant positive correlations between (i) PRa and each of PE items, (ii) PRb and each of PE items, and (iii) PRc and each of PE items. The null hypotheses claiming there are no statistically significant correlations between (i) PRa and respective PE items, (ii) PRb and respective PE items, and (iii) PRc and respective PE items were all rejected.

Table 4 Multiple Correlations between PE items and PRa, PRb and PRc

H_0	There is no statistically significant correlation between PRa and respective PE items
H_0	There is no statistically significant correlation between PRb and respective PE items
H_0	There is no statistically significant correlation between PRc and respective PE items

Correlation Strength Threshold (Dancey & Reidy, 2004)											
r	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
strength	zero		weak			moderate			strong		perfect

DV	Stats	PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
PRa	r	.494**	.511**	.498**	.470**	.470**	.431**	.442**	.427**	.445**	.405**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
PRb	r	.446**	.465**	.461**	.426**	.451**	.382**	.402**	.403**	.419**	.375**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315
PRc	r	.458**	.473**	.480**	.433**	.463**	.386**	.412**	.389**	.420**	.351**
	p	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
	N	4315	4315	4315	4315	4315	4315	4315	4315	4315	4315

Statistical Interpretation of Multiple Correlation Analyses	
PRa	At 95% confidence level, there were statistically significant and moderate correlations between PRa and (i) PE1 (r =.494, p = .000); (ii) PE2 (r =.511, p = .000); (iii) PE3 (r =.498, p = .000); (iv) PE4 (r =.470, p = .000); (v) PE5 (r =.470, p = .000); (vi) PE6 (r =.431, p = .000); (vii) PE7 (r =.442, p = .000); (viii) PE8 (r =.427, p = .000); (ix) PE9 (r =.445, p = .000); (x) PE01 (r =.405, p = .000).
PRb	At 95% confidence level, there were statistically significant and moderate correlations between PRb and (i) PE1 (r =.446, p = .000); (ii) PE2 (r =.465, p = .000); (iii) PE3 (r =.461, p = .000); (iv) PE4 (r =.426, p = .000); (v) PE5 (r =.451, p = .000); (vi) PE7 (r =.402, p = .000); (vii) PE8 (r =.403, p =

	.000); (viii) PE9 (r =.419, p = .000). Additionally, there were statistically significant and weak correlations between PRb and (ix) PE6 (r =.382, p = .000); (x) PE10 (r =.375, p = .000).
PRc	At 95% confidence level, there were statistically significant and moderate correlations between PRc and (i) PE1 (r =.458, p = .000); (ii) PE2 (r =.473, p = .000); (iii) PE3 (r =.480, p = .000); (iv) PE4 (r =.433, p = .000); (v) PE5 (r =.463, p = .000); (vi) PE7 (r =.412, p = .000); (vii) PE8 (r =.389, p = .000); (viii) PE9 (r =.420, p = .000); Additionally, there were statistically significant and weak correlations between PRc and (ix) PE6 (r =.386, p = .000); (x) PE10 (r =.351, p = .000).

Three (3) multiple regression analyses were carried out to predict the values of each of dependent variables (i) PRa, (ii) PRb and (iii) PRc given the set of PE explanatory variables (PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9, and PE10).

Table 5 Multiple Linear Regression – PE predicting PRa

H_0
There will be no significant prediction of PRa by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.583	.340	.339	1.21530	1.645

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3277.434	10	327.743	221.905	.000
Residual	6356.799	4304	1.477		
Total	9634.232	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	2.993	.116		25.824	.000	2.766	3.220
PE1	.104	.018	.124	5.661	.000	.068	.140
PE2	.113	.021	.127	5.383	.000	.072	.155
PE3	.107	.019	.119	5.736	.000	.070	.143
PE4	.086	.020	.091	4.401	.000	.048	.125
PE5	.047	.019	.053	2.457	.014	.010	.085
PE6	.086	.018	.091	4.745	.000	.050	.121
PE7	.025	.021	.028	1.216	**.224**	-.015	.065
PE8	-.035	.022	-.041	-1.617	**.106**	-.078	.008
PE9	.062	.021	.072	2.935	.003	.021	.104
PE10	.040	.017	.050	2.387	.017	.007	.074

A multiple regression was generated to predict PRa based on PE items. R value of .583 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.645 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 221.905, p = .000, with an R^2 of .340; indicating that the proportion of variance in PRa that can be explained by PE items was 34%.

At 95% confidence level, PE1 (B = .104, t = 5.661, p = .000), PE2 (B = .113, t = 5.383, p =.000), PE3 (B = .107, t = 5.736, p =.000), PE4 (B = .086, t = 4.401, p =.000), PE5 (B = .047, t = 2.457, p = .014), PE6 (B = .086, t = 4.745, p =.000), PE9 (B = .062, t = 2.935, p =.003) and PE10 (B = .040, t = 2.387, p =.017) were significant predictors of PRa. On the contrary, it was found that PE7 (B = .025, t = 1.216, p = .224) and PE8 (B = -.035, t = -1.617, p = .106) were not significant predictors of PRa.

Personal Empowerment (PE) items significantly account for 34% of Tolerance and Compassion (PRa). Eight (8) of PE items were significant predictors of PRa.

Table 6 Multiple Linear Regression – PE predicting PRb

H_0
There will be no significant prediction of PRb by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.536	.287	.286	1.31404	1.759

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2998.190	10	299.819	173.637	.000
Residual	7431.725	4304	1.727		
Total	10429.915	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.226	.125		25.747	.000	2.981	3.472
PE1	.081	.020	.092	4.062	.000	.042	.120
PE2	.099	.023	.107	4.335	.000	.054	.143
PE3	.108	.020	.116	5.362	.000	.068	.147
PE4	.051	.021	.052	2.406	.016	.009	.093
PE5	.117	.021	.126	5.637	.000	.076	.158
PE6	.037	.020	.038	1.912	**.056**	-.001	.076
PE7	-.006	.022	-.006	-.254	**.799**	-.049	.038
PE8	.010	.024	.011	.412	**.680**	-.037	.056
PE9	.070	.023	.078	3.042	.002	.025	.115
PE10	.035	.018	.042	1.895	**.058**	-.001	.071

A multiple regression was generated to predict PRb based on PE items. R value of .536 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.759 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 173.637, p = .000, with an R^2 of .287; indicating that the proportion of variance in PRb that can be explained by PE items was 28.7%.

At 95% confidence level, PE1 (B = .081, t = 4.062, p = .000), PE2 (B = .099, t = 4.335, p =.000), PE3 (B = .108, t = 5.362, p =.000), PE4 (B = .051, t = 2.406, p =.000), PE5 (B =.117, t = 3.042, p = .002), and PE9 (B = .070, t = 2.935, p =.003) were significant predictors of PRb. On the contrary, it was found that PE6 (B = .037, t = 1.912, p =.056), PE7 (B = -.066, t = -.254, p = .799), PE8 (B = .010, t = .412, p = .680) and PE10 (B = .035, t = 1.895, p =.058) were not significant predictors of PRb.

Personal Empowerment (PE) items significantly account for 28.7% of Sense of Inclusion (PRb). Six (6) of PE items were significant predictors of PRb.

Table 7 Multiple Linear Regression – PE predicting PRc

H_0
There will be no significant prediction of PRc by PE1, PE2, PE3, PE4, PE5, PE6, PE7, PE8, PE9 and PE10

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.549	.301	.299	1.28381	1.674

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	3055.230	10	305.523	185.372	.000
Residual	7093.701	4304	1.648		
Total	10148.931	4314			

Coefficients

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std Error	β			Lower Bound	Upper Bound
(Constant)	3.361	.122		27.452	.000	3.121	3.601
PE1	.094	.019	.108	4.814	.000	.056	.132
PE2	.086	.022	.094	3.845	.000	.042	.129
PE3	.132	.020	.144	6.726	.000	.094	.170
PE4	.049	.021	.050	2.366	.018	.008	.090
PE5	.117	.020	.127	5.757	.000	.077	.157
PE6	.038	.019	.039	1.982	.048	.000	.075
PE7	.045	.022	.050	2.066	.039	.002	.088
PE8	-.047	.023	-.053	-2.043	.041	-.093	-.002
PE9	.107	.022	.121	4.767	.000	.063	.151
PE10	-.020	.018	-.024	-1.096	**.273**	-.055	.015

A multiple regression was generated to predict PRc based on PE items. R value of .549 indicated an acceptable level of prediction (R > 0.5). The Durbin-Watson statistic was 1.674 which is between 1.5 and 2.5 and therefore the data was not autocorrelated. A significant regression equation was found, F (10, 4304)

= 185.372, p = .000, with an R^2 of .301; indicating that the proportion of variance in PRc that can be explained by PE items was 30.1%.

At 95% confidence level, PE1 (B = .094, t = 4.814, p = .000), PE2 (B = .086, t = 3.845, p =.000), PE3 (B = .132, t = 6.726, p =.000), PE4 (B = .049, t = 2.366, p =..018), PE5 (B = .117, t = 5.757, p = .000), PE6 (B = .038, t = 1.982, p =.048), PE7 (B = .045 t = 2.066, p = .039), PE8 (-.047, t = -2.043, p = .041) and PE9 (B = .107, t = 4.767, p =.000) were significant predictors of PRc. It was found that PE10 (B = -.020, t = -1.096, p =.273) was not significant predictor of PRc.

Personal Empowerment (PE) items significantly account for 30.1% of Self-Regulation and Benevolent (PRc). Nine (9) of PE items were significant predictors of PRc.

Table 8 Summary of findings

		IV (Predictor Variables) - β									
		PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10
DV (Outcome Variables)	PRa	**.124** ✓	**.127** ✓	**.119** ✓	.091 ✓	.053 ✓	.091 ✓	.028 ✗	-.041 ✗	.072 ✓	.050 ✓
	PRb	.092 ✓	**.107** ✓	**.116** ✓	.052 ✓	**.126** ✓	.038 ✗	-.006 ✗	.011 ✗	.078 ✓	.042 ✗
	PRc	.108 ✓	.094 ✓	**.144** ✓	.050 ✓	**.127** ✓	.039 ✓	.050 ✓	-.053 ✓	**.121** ✓	-.024 ✗
✓ = statistically significant predictor; ✗ = not statistically significant predictor											

DV	Indicators	IV	Top 3 Strongest Predictors	β
PRa Tolerance and Compassion	• being flexible to differences in opinions • confident (not shy) in expressing care and affection • aware and eager to know others' updates • offering emotional support whenever it is needed	PE2	striving and working hard even for easy goals	.127
		PE1	setting goals and striving to meet goals	.124
		PE3	**monitoring behaviours to suit with situations**	**.119**
PRb Sense of Inclusion	• engaging productively in decision making process • ensuring others are engaged in decision making process • forgiving of others' weaknesses and mistakes	PE5	ensuring others are comfortable when making deals	.126
		PE3	**monitoring behaviours to suit with situations**	**.116**
		PE2	striving and working hard even for easy goals	.107
PRc Self-Regulation and Benevolent	• self-conscious of own mistakes and quickly apologies • motivating and assisting others to fulfil their life goals • expressing appreciations to others regularly	**PE3**	**monitoring behaviours to suit with situations**	**.144**
		PE5	ensuring others are comfortable when making deals	.127
		PE9	feeling energetic for daily routines and activities	.121

The empirical assessments indicate that the majority of PE items significantly account for PRa, PRb and PRc. PE3 which denoted '*monitoring behaviours to suit with situations*' was in the top three strongest predictors for all components of PR. Thus implying that the ability to 'fit in' in the social sphere highly encourage and enable more positive behaviours in relational well-being. Manoeuvring emotions and behaviours mindfully and rationally demands the commitment to continually watch over personal thoughts and feelings as well as

reactions of others. Architectural design can enhance attentive communications and receptive interactions through space sizes and layouts, furniture organisations, colour choices and many other design strategies. Designers indirectly enrich positive relationships through empowering space occupants, therefore leading to positive relationships and sustained well-being.

CONCLUSION

HIH in SSWB deems well-being that is achievable through a supportive and congruent interaction system. This paper proves that positive relationships are achievable through personal empowerment. The future direction of this research involves statistical modelling on the constructs described in this paper.

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USERS' PERCEPTION ON CHILDREN AT MASJID – PLANNING FOR CHILDREN FRIENDLY MASJID

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Abstract

Masjid is an important institution to know Allah SWT, empower, and unite society. Early exposure of children to masjid is crucial as nurturing them to love masjid is a process towards loving the creator, strengthening their faith, and improving *akhlaq* (behaviour) towards becoming a good Muslim and eventually forming a stable society and nation. However, there have been some negative perceptions on the presence of young children in masjid among the *jamaah* (congregational members). This discourages families in engaging their young children with masjid as early as possible. Eventually, it would hinder them from learning high values of Islam that would strengthen their faith, shape good character, and *akhlaq*. This study aims to identify the perception of the parents or guardian that bring children to masjid as well as other *jamaah* on the presence of children at masjid through a structured questionnaire survey with random sampling approach. Eight masjids within the urban area of Kuala Lumpur and Selangor were involved with the target of fifty respondents each. 55.2% of the 400 respondents were parents/guardians that bring children to the masjid. The findings suggest that respondents welcome the presence of children at masjid as it is deemed suitable as a place for children's education and that masjid should provide educational programmes for them. Crying and playing children seem to distract the *jamaah*. Hence they feel designated spaces for children is deemed necessary.

Keywords: children-friendly masjid, *jamaah*, perception, space for children at the masjid, children's activity

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INTRODUCTION

The term 'masjid' originates from the word *'masajid'* which is the plural of *'sajada'* – which brings the meaning of prostration with full respect and obedience (Abd Wahab, Ab Hamid and Che Man, 2016). In the Al-Qur'an, the word 'masjid' is mentioned twenty-seven times. Masjid is also referred to as the House of God – the place where only Allah SWT is worshipped. A *hadith* narrated by Abu Hurairah: Allah's Apostle said, *"The reward of the prayer offered by a person in congregation is twenty-five times greater than that of the prayer offered in one's house or the market (alone). And this is because if he performs ablution and does it perfectly and then proceeds to the mosque with the sole intention of praying, then for every step he takes towards the mosque, he is upgraded one degree in reward and his one sin is taken off (crossed out) from his accounts (of deeds). When he offers his prayer, the angels keep on asking Allah's Blessings and Allah's forgiveness for him as long as he is (staying) at his Musalla. They say, 'O Allah! Bestow Your blessings upon him, be Merciful and kind to him.' And one is regarded in prayer as long as one is waiting for the prayer."* (Sahih Bukhari, n.d). Masjid is the best place to perform the congregational prayer, and its role goes beyond this as it functions as the centre of administration, marketplace and others particularly during the era of the Prophet Muhammad SAW and his companions. Hence, establishing masjid was among the essential tasks of the Prophet SAW, and the practice continues until today.

In Malaysia, the establishment of the masjid is in line with the Federal Constitution provision as Islam is the official religion of the country. The diverse roles of masjid reflect its inclusiveness of all walks of life. Everyone is welcome to the masjid, particularly in the remembrance of Allah SWT and to strengthen their faith. Hence, masjid has an exceptional place in the heart of the Muslims.

On the inclusiveness, children are no exception. The following *hadith* is referred to. *"The Messenger of Allah (SAW) came out to us for one of the evening prayers (Maghrib or 'Isha'), carrying Hasan or Husayn. The Messenger of Allah (SAW) came forward, put the child down and said takbeer ("Allaahu Akbar") to start the prayer. Then he prostrated during the prayer, and his prostration lasted for a long time. My father said: I raised my head and saw the child on the back of the Messenger of Allah (SAW), so I went back to my prostration. When the Messenger of Allah (SAW) finished praying, the people said to him: 'O Messenger of Allah, during your prayer you prostrated and it took a long time, until we thought that something had happened, or that you were receiving revelation.' He said, 'Nothing happened, but my son was riding on my back, and I did not want to hurry him up until he had had enough"* (Sahih Bukhari and Muslim, n.d). This *hadith* reflects the tolerance level that adults should have when it comes to dealing with young children as the incident took place while the Prophet Muhammad SAW was performing prayer.

The presence of children in the masjid in Malaysia has been discussed by the members of the society and expert at official and unofficial platforms. Mainly the issue is on the unsuitability of their presence at masjid as the children's activities are said to disturb others (Jupiter, 2019). Harsh action such as preventing young children from entering the main prayer hall of the masjid is also reported, while some signs show children are prevented from coming to masjid. Thus, the Mufti of the Federal Territory, Datuk Dr Zulkifli bin Mohamad Al Bakri gives a lengthy explanation on this through his article entitled *"Masjid dan Kanak-Kanak"* in *Bayyan Linnas* number 63 (Mohamad Al Bakri, 2016).

This study aims to identify the perception of the parents or guardian that bring children to masjid as well as other *jamaah* (congregational members that do not bring children to the masjid) on the presence of children at masjid through a structured questionnaire survey. It is deemed crucial to establish this issue from the perspective of those that go to the masjid with and without children, towards identifying the solutions.

LITERATURE REVIEW

Masjid has been an important institution since the era of Prophet Muhammad SAW. Islam is manifested to be a complete code of practice, and a masjid plays a vital role to signify it (Imam, 2000). As a centre of spiritual contents and a platform of communication, it develops the unity and brotherhood among the Muslim communities. The primary activity of masjid is to facilitate congregational *solat* (prayer). Many other events in favours of the daily life of an individual Muslim or a Muslim community are accomplished through a masjid. Thus, masjid has become an indispensable part of the Muslim.

The History of Masjid

The *hijrah* (migration) of Prophet Muhammad SAW with his companions and follower from Makkah to Madinah marked the beginning of the Muslim calendar. On their arrival at Quba - the outskirt of Madinah, they spent a few days there, and the Prophet built the first masjid SAW known as Masjid Quba. When Prophet Muhammad SAW arrived in Madinah, the first task that he embarked on was building a masjid known as Al-Masjid An-Nabawiy or the Prophet's mosque (Omer, 2010). The practice of Prophet Muhammad SAW since the *hijrah* movement continues, and masjid becomes the core element and symbolic feature in Muslim society.

Masjid as Place to Worship Allah

According to Hizan, Ismail and Ispawi (2017), and supported by Laugu (2007), the word 'masjid' in Arabic means a place of worship or a place of doing ritual activities to God. Since the early years of Islam, masjid has been used as a place to worship and perform religious-ritual activities. The meaning is shown by the

Qur'an in Surah At-Tawbah: 19 – *"Have you made the providing of water for the pilgrim and the maintenance of al-Masjid al-Haram equal to [the deeds of] one who believes in Allah and the Last Day and strives in the cause of Allah?"*

Masjid as a Learning Centre

The Prophet SAW used masjid as the centre to spread Islamic knowledge, and he was the first teacher. The basics of the *aqeedah* (belief system), the acts of worship, and the *shari'a* rules (political, economic, social, and judicial) and others are being taught in the masjid. The Prophet SAW also asked Abdullah ibn Saʾīd to teach the Muslims the skills of reading and writing, and within a brief period, some Muslims became literate and so could read and write the Qur'an. The Prophet SAW also took another step to make the Muslims literate by making the literate captives of war gain their freedom by instructing reading and writing to ten Muslim children. Due to the efforts made by the school of Islam to increase people' awareness, masjids which had already been the primary place for worshipping were used as the first base for learning knowledge, and the Qur'an was considered as the first book and text for teaching the Muslims (Oloyede, 2014).

Educating Children as Young *Khalifah*

According to the Oxford dictionary *Khalifah* means 'Deputy or steward; sometimes translated as vicegerent'. According to the teachings of Islam, each individual is a *khalifah* on earth. Muslims, in particular, must strive to adhere to and advance God's will by establishing a society that reflects human dignity and justice. Rahmat and Fahrudin (2018) explained that Prophet Adam AS and his grandchildren act as earth's controllers, and it was also mentioned that among them, there are Prophets, Apostles, Guardians, *Siddiqin* (people who witness the truth), pious people, and worshipers; these people act as God's representative on earth. *"I will create a vicegerent on earth."* (Al-Baqarah, 2: 30). From this Quranic verse, it can be seen everyone is created to worship Allah SWT and carry out his task as a *khalifah* on earth.

Hence, every child is a young *khalifah* who will eventually grow into an accomplished *khalifah* when he is an adult. All parents have the responsibility to ensure the upbringing of their children shall lead towards achieving this purpose by cultivating them with the right *aqeedah* that is, building and strengthening their faith and belief to the oneness of Allah. Thus, parents have to prepare their children with the proper knowledge that will allow them to know and obey the commands of Allah SWT. After the basics of *aqeedah*, they need to be taught and trained to practice good deeds. One of these obligatory deeds is the establishing of prayer - the act that connects the young *khalifah* to his God and is also a form of protection against disobedience (Hassan, 2007). One of the perfect ways to foster these values is by exposing the children to masjid.

Today's Scenario on Children and Masjid

Children may not have been welcomed inside the masjid as they are said to disturb the concentration of some *jamaah* in their *ibadah* among others. Some *jamaah* also may perceive that masjid is supposed to be a place of tranquillity that particular loud sound is taken negatively. A case which was reported in Malaysia by Azmi (2019) where a mother and her children were cast out by a member of the *jamaah* because that person personally felt children is not allowed to be in masjid assuming that they were not clean. A similar case was reported in another country too according to the report by Ghafar (2018) where Mrs Gheny Purbo from Indonesia complained that her three year old son was lifted and placed outside the prayer hall by other *jamaah*. The child was said to disturb other *jammaah's* focus. Such behaviour must not be continued. Masjid should be an inclusive place that all including parents and their kids have the chance to meet the community, learn new things, and build friendship with others. If the society keeps on side-lining children from the masjid, familiarising masjid to them at a later stage would not be effective (Toorawa, 2015).

METHODOLOGY OF RESEARCH

In getting the opinions of the congregational members of masjid on the presence of children at the masjid, a structured questionnaire survey was conducted at eight selected case study masjids, namely:

i. Masjid Al Akram, Kg. Datuk Keramat, Kuala Lumpur
ii. Masjid Ar Rahimah, Kg. Pandan, Kuala Lumpur
iii. Masjid Jamek Kampung Baru, Jalan Raja Alang, Kuala Lumpur
iv. Masjid Abu Ubaidah al-Jarrah, Taman Sri Rampai, Kuala Lumpur
v. Masjid Imam Al Ghazali, Bandar Menjalara, Kepong, Kuala Lumpur
vi. Masjid Muadz bin Jabal, Taman Setiawangsa, Kuala Lumpur
vii. Masjid Saidina Abu Bakar As-Siddiq, Bangsar, Kuala Lumpur
viii. Masjid al Khairiyyah, Taman Sri Gombak, Batu Caves, Selangor

The Jabatan Agama Islam Wilayah Persekutuan (JAWI) or the Islamic Department of the Federal Territory was approached to identify active masjids (*immaratul* masjid) within the Federal Territory of Kuala Lumpur. These masjids are located in urban area and adjacent to the community/residential areas, and have consistent activities such as talks, program for the community and so on apart from the five congregational prayers, and can cater for over 2,000 congregational members at a time.

By adopting a random sampling approach for each masjid, 50 sets of questionnaire were distributed, resulting in 400 respondents in total. The two primary targeted respondents are parents or guardians that bring their children to the masjid, and congregational member without children/do not bring their children to the masjid. The survey questionnaire has four sections:

- Section A: background of respondents (parent, guardian and other *jamaah* members);
- Section B: opinions of parents/guardian that bring their children activities and spaces at masjid ;
- Section C: views of parents/guardian and other *jamaah* members on educational activities of children at the masjid; and
- Section D: opinions of parents/guardian and other *jamaah* members on the needs of physical space for children at the masjid.

The parents/guardian are expected to answer all sections, except for Section B for other *jamaah*. All these masjids are active in organising programmes for the community. Hence, their schedules of activities were identified to get the respondents from a good crowd in distributing the survey questionnaires. SPSS software was used to analyse the survey data.

ANALYSIS ON *JAMAAH* PERCEPTION TOWARDS CHILDREN IN MASJID

The presentation of the analysis and discussion is structured following the sequence of the sections in the survey questionnaire.

Respondent's Profile (Section A)

Based on the eight masjids studied, 254 (63.5%) of the respondents are male, while 146 (36.5%) are female (figure 1). This could be due to most of the *jamaah* members that attended the masjid during the study is male.

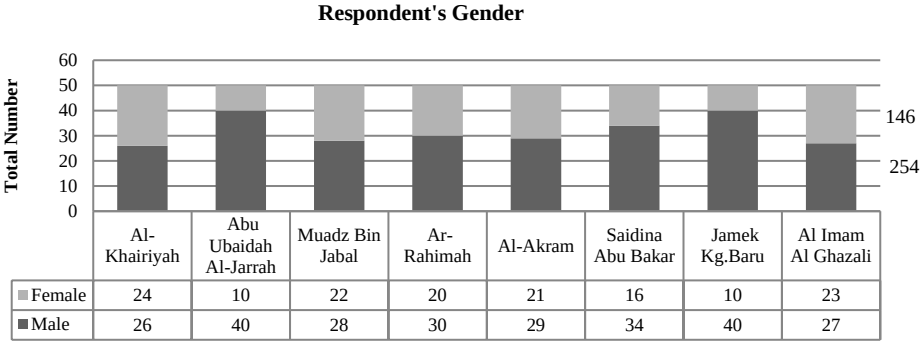

Figure 1 Respondent's gender distribution by masjid

Referring to figure 2, slightly above 55% of the respondents are parents/guardian that bring their children to the masjid, and the majority of them are Malay (91%).

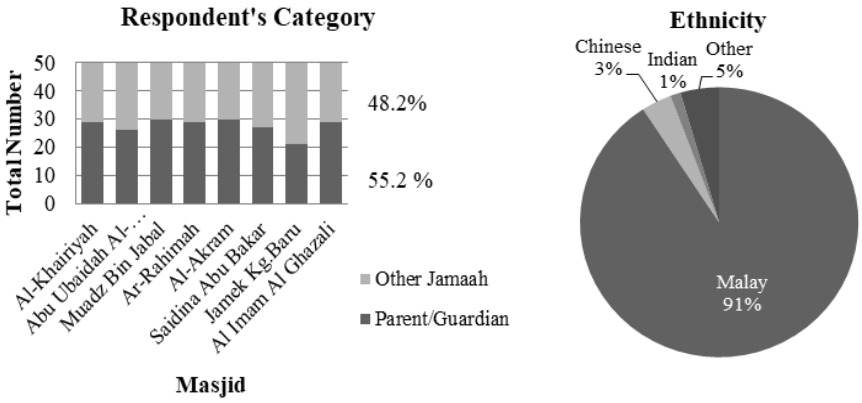

Figure 2 Respondent's Category & Ethnicity

Referring to figure 3, it can be seen that about 64.1% of the respondents are highly qualified with diploma, bachelor degree, master and PhD. 68% of the respondents are employed. They are either working in the public sector, private sector, or self-employed.

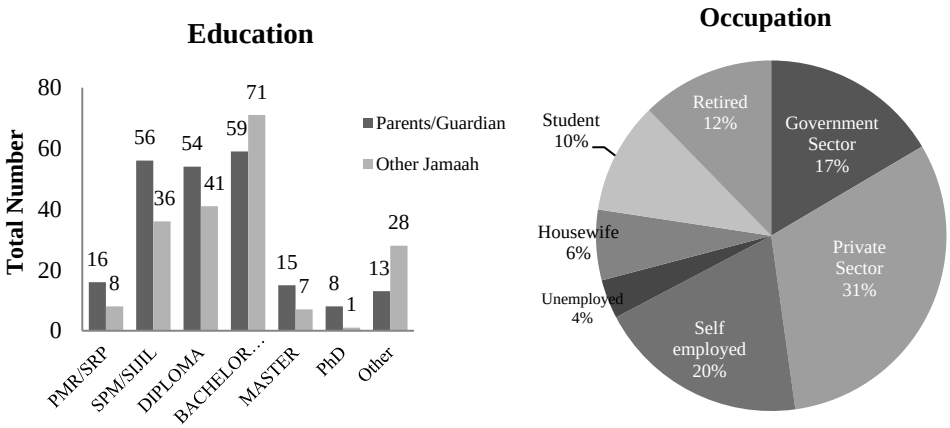

Figure 3 Respondent's educational background and occupation

About 50% of the respondents stay within walking distance from masjid of less than a kilometre (Figure 4). These could be the factor that also encourages the parents/guardian to bring their children to the masjid. From the pie chart, it seems that about 45% of the respondents are reluctant to reveal their household income. Based on those who responded (55%), 33% can be categorised as the

B40 group – with household income below RM3,860 per month as classified by the Ministry of Housing and Local Government.

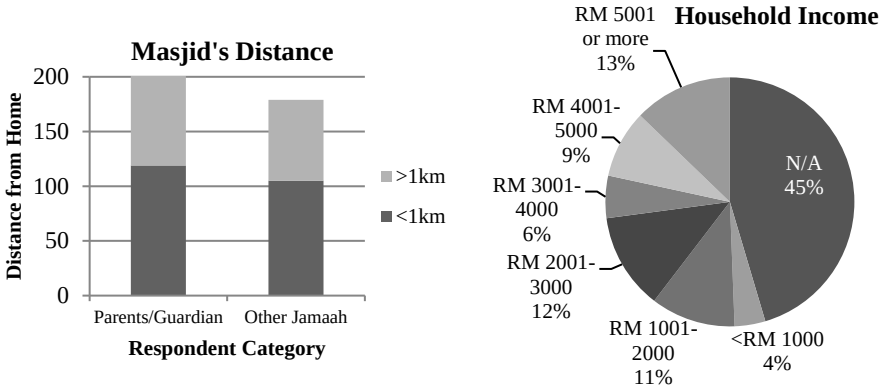

Figure 4 Distance of masjid from home, and household income of the respondents

The Responses from Parents/Guardian on Children and Masjid (Section B)
Based on figure 5, only 1% of the parents/guardian often bring their children to the masjid, 32% stated quite often, while 60% said they occasionally do so. About 65% of the parents with children spent their time in the masjid for less than 2 hours. When investigated further, the month of Ramadhan seems to be their most favoured time to bring children to the masjid. They also seem to choose to bring the children for the five obligatory congregational prayers more than during other activities conducted at the masjid such as the *kulliyyah* (religious talk).

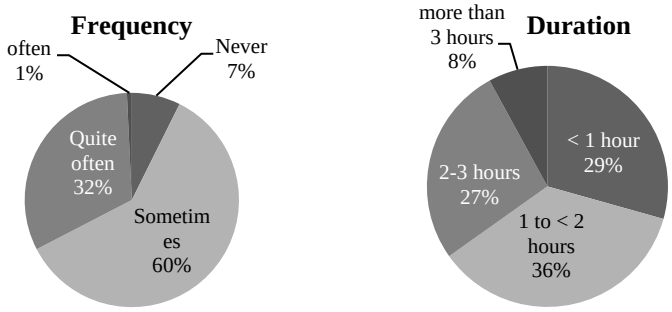

Figure 5 Frequency of bringing children to masjid and duration of stay

The Perceptions of all *Jamaah* towards Children and Masjid (Section C)
There are two parts in the analysis of Section C. The first part is on the perceptions of respondents (parents/guardian and other *jamaah*) on the effect of children's

activities on the *jamaah*; and space for children at the masjid. The second part is on the specific functions of the masjid to children.

Referring to Table 1, 49.3% and 59.5% of the respondents agreed that playing and crying children do distract their focus in the masjid. Hence, it can be seen that the majority of the respondents are in agreement that specific space for children is needed in the masjid (refer to item 4, 5, and 6 of Table 1). Sufficient facilities are deemed crucial to accommodate children while they are in masjid. Nursery seems to be more preferred as the designated space for children (78.6%). 88% of the respondents agreed that *jamaah* comfort is important despite having children together at the masjid.

Table 1 The perceptions of respondents regarding children's presence on their focus and space for children at masjid

No	Statement	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	Children playing at masjid is distracting the focus of *jamaah*	9.5%	23.3%	18%	39.8 %	9.5%
		32.8%			**49.3%**	
2	Crying/tantrum children is distracting the focus of *jamaah*	6.3%	18%	16.3%	45.3%	14.2%
		24.3%			**59.5%**	
3	Sufficient facilities for children shall ease them while in Masjid	2.8%	3.3%	11.3%	46.8%	36.0%
		6.1%			**82.8%**	
4	Designated play space for children would ease them while in Masjid	3.0%	6.3%	11.3%	48.3%	31.3%
		9.3%			**79.6%**	
5	Outdoor play area for children is needed at Masjid	4.3%	18%	15.3%	35.3%	27.3%
		22.3%			**62.6%**	
6	Nursery at masjid is very helpful for children	3.3%	6.0%	12.3%	47.3%	31.3%
		9.3%			**78.6%**	
7	The comfort of other *jamaah* with the presence of children at Masjid is important	2.0%	2.5%	7.5%	48.0%	40.0%
		40.5%			**88%**	

For the second part regarding specific functions of the masjid to children, based on the analysed responses, it can be seen that more than half of the respondents agreed on the following statements:

i. Masjid is deemed suitable to function as a place for children's education;
ii. Masjid should provide educational programmes for children; and
iii. Children's engagement with activities at masjid can help shape the *akhlaq* (good moral) of the children.

The respondent's perception of suitability of masjid as a place for children's education is in line with the suggestion by Nasih Ulwan (2015), who is

a leading scholar on children's early education from the perspective of Islam, where he mentioned that there are three suggested physical places for children's education, namely the home, the masjid, and the school. The respondents were asked to rank activities that can be conducted by the masjid for the children, and the result is shown in Figure 6.

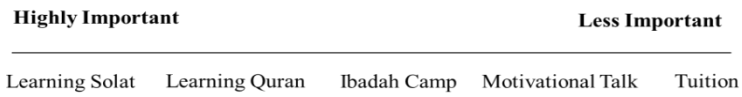

Figure 6 Educational Programmes for Children at Masjid

Learning to perform the *solat* (prayer) followed by learning the Al Quran were deemed as of high importance. Tuition classes that support children academic was ranked as less important. However, based on the visits to the eight masjids involved, five masjids conduct additional tuition classes to support the academic achievement of the children. These classes received good response from the children and their parents. This result in a way reflects that our society may have a strong perception that a masjid must focus on religious activities first and foremost.

The perceptions of parent/guardian and *other jamaah* on the needs of Physical Space for Children (Section D)

Based on the survey, it seems that the majority of the respondents agreed that children should be at the corridor of masjid rather than in the nursery and main prayer hall (Figure 7). This suggests that children are welcome to masjid, but the main prayer hall may not be the best place for them as their nature as children (being active) would distract the *jamaah*. On top of that, respondents also suggested some other spaces such as at the back of the main prayer hall as a suitable place for the children so that they can be visually monitored by their parents.

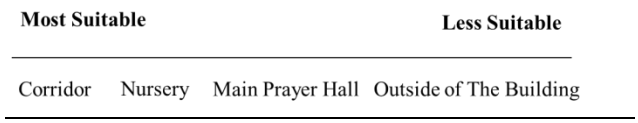

Figure 7 The best place for children in masjid

Looking in general over the eight studied masjids, slightly over 50% of the respondents agreed that the current facilities are sufficient for them to carry any activities together with the children, and 54.3% seem to be satisfied with the facilities (Table 2). It is also interesting to note that about 1/3 of the respondents were uncertain on the sufficiency of the facilities as well as their level of satisfaction as they may not be aware of the said facilities. 56.3% of the

respondents agreed that children should not be in the main prayer hall while *kulliyyah* (religious talk) is in progress, while about a quarter of the respondents were uncertain about this. The majority (78.8%) of the respondents agreed that additional space is necessary to be provided for children.

Table 2 The perceptions of respondents on the current facilities and space concerning children at masjid

No	Statements	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	Facilities provided by the masjid are sufficient to carry out any activities with children	2.3%	14.2%	32.5%	36.3%	14.8%
		16.5%			51.1%	
2	Facilities provided by the masjid are satisfactory to perform any activities with children	1.5%	10.8%	33.5%	41.3%	13.0%
		12.3%			54.3%	
3	Children are less comfortable in the main prayer hall when the *Kulliyyah* is in progress	3.5%	15.5%	**24.8%**	40.0%	16.3%
		19.0%			56.3%	
4	The masjid has to provide additional space for the children in the masjid	2.5%	8.3%	10.5%	41.8%	37.0%
		10.8%			**78.8%**	

CONCLUSION AND RECOMMENDATION

Based on the study, it can be concluded that the congregational members of masjids are mainly the Malay, with moderate to high academic qualification, employed, and stay nearby masjid. It can also be said that the number of *jamaah* that bring children to the masjid is quite low (when combined between 'occasionally' and 'never' categories, the percentage was about 67%. It would be fascinating to study the reason behind this in order to encourage the provison of children-friendly environment at masjid. Generally, the study found that the presence of children may affect the focus of the *jamaah*. The respondents felt that specific/designated space should be provided for children. Finally, it can be said that the presence of children at masjid is welcome, however particular improvement is needed to ensure the comfort of both children and *jamaah*.

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AN ASSESSMENT ON EARLY WARNING SYSTEM: INITIAL SURVEY ANALYSIS

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Abstract

In Cameron Highland, Lembah Bertam area and further downstream villages in Susu Dam area are prone and vulnerable to the highest occurrence of floods especially during monsoon season. Thus, Early Warning System (EWS) were set up to avoid or to reduce the impact of natural hazard turns disasters such as floods, landslides and storms with the aim to reduce the vulnerability and disaster risks that signifies the effectiveness of EWS in the realisation of affected community. To test the awareness and preparedness of community in the selected area, a questionnaire survey was employed as the data collection method. The questionnaire survey was conducted before the direct engagement on the EWS information with the community. Using the mixed sampling method of cluster random sampling, a total of 800 respondents from 11 villages, and 5 main ethnicity groups were involved in the survey. From the result, there was a positive relationship showing that respondents who claimed they knew about the EWS from information signage were those from the older age category and earning higher monthly income. On the other hand, there is a negative relationship between respondents' age and monthly income against other sources that indicates respondents who claimed they knew about the EWS from other sources were those in the younger age category and have low monthly income.

Keywords: early warning system; dam, hazard, Cameron Highland

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INTRODUCTION

Overall, there are 74 dams in Malaysia, which consist of various types and functions. Dams in Malaysia are owned and operated by different agencies such as the Department of Irrigation and Drainage, Water Supply Department, energy supply company (such as TNB), State Government and other agencies according to their respective needs and responsibilities.

Apart from other functions, provision of dams is also essential for the nation's infrastructure to provide for renewable energy of hydropower electricity. Hydropower is the only renewable energy technology that is presently commercially viable on a larger scale. It has four major advantages, namely it is renewable, it produces negligible amounts of greenhouse gases, it is the least costly way of storing large amounts of electricity, and it can easily adjust the amount of electricity produced to the amount demanded by consumers.

However, construction and dam development posed potential hazard to communities, the environment and property, often well beyond their locations. Among the impacts of dam include dam failure that could lead to flood event that cause potential flooding impacts to the community and assets (vulnerability). Thus, this paper explores the community knowledge on the dam failure and flood early warning system at Lembah Bertam and Susu Dam area.

BACKGROUND OF THE STUDY

Hazard is defined as phenomena that poses a threat to people, structures or economic assets and which may cause a disaster (UN-SPIDER, 2015). Disaster could be categorised either man-made or naturally occurring, while vulnerability is the extent to which a community are exposed to loss or damage that indirectly influence their perceptions and willingness to act(Jones et al, 2014).

As recorded in the Global Risks report (World Economic Forum, 2016), the world we are living in is facing issues of climate change, social instability, unmanageable inflation, large scale involuntary migration, biodiversity loss, terrorism, and so forth. It is forecasted that countries like in Asia are likely to experience major natural catastrophes with extreme weather events (World Economic Forum, 2016). Asia accounts for 70% of natural disasters in the world (ADB, 2012). The main reason for this is the fact that Asia Pacific lies within Pacific Ring of Fire, which accounts for 90% world's earthquakes and 70% of world's volcanoes (Jha & Brecht, 2011).

Malaysia is geographically located outside the Pacific Ring of Fire. Therefore, it is relatively free from certain severe crises found in neighbouring countries. However, as shown in Figure 1, Malaysia is vulnerable to natural hazards including floods, forest fires, tsunami, cyclonic storms, landslides, epidemics, and haze.

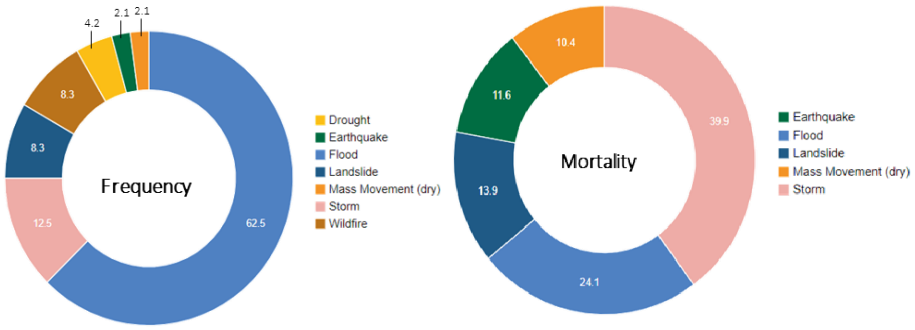

Figure 1 Disaster and risk profile of Malaysia
Source: EM-DAT (Feb. 2015)

Disaster is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses, which exceed the ability of the affected community or society to cope, using its own resources (UNISDR, 2004). A disaster occurrence happens when an impact of hazard affected a vulnerable population that causes damage, disruption and casualties. Therefore, it is important for the Early Warning System (EWS) to be set up to avoid or reduce the impact of natural hazard turn disasters such as floods, landslides and storms with the aim to reduce the vulnerability and disaster risks that signify the effectiveness of EWS in the realisation of affected community. The official United Nations International Strategy for Disaster Reduction (UNISDR, 2009) defines the Disaster Risk Management as:

> *"The systematic process of using administrative directives, organisations, and operational skills and capacities to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disaster."*

The Malaysian government has adopted UN World Conference global plan for natural disaster risk reduction, the Hyogo Frameworks for Actions (2005-2015) and Sendai Framework (2015-2030). Malaysia also undertakes initiatives to mainstream disaster risk management and reduction to be in line with the 11th Malaysia Plan, the nation's primary development plan. Disaster management has consistently been a focus of Malaysia's development policy. Malaysia's National Platform for DRR was formalised in 2013, which involves various stakeholders from different government agencies, as well as collaboration with the private sector. This is reflected through the amount of resources invested to minimise risk factors and facilitate sustainable development, and one of the initiatives is the implementation of the Early Warning System (EWS) to the affected community.

EWS is the representation of a set of capacities needed to generate and disseminate timely with meaningful warning information that enables at-risk

individuals, communities and organisations to prepare and act accordingly, and in sufficient time to reduce harm or loss. According to Mohd Hussain et al. (2018), EWS can be categorised into community managed EWS and community based EWS. A community managed EWS refers to the system managed by community but they are not completely involved in the establishment of the system. Whereas, community based EWS is a system developed, operated and maintained by the community itself. While developing the system, the community would explore external support from different individuals, communities, organisations and institutions. Thus it can be concluded that it is necessary that the community develops and maintains close coordination and links with the stakeholders.

As EWS tends to focus on warning and monitoring on hazards and threats only, hazards and vulnerability should be assessed together to reduce risks. A community which is highly exposed to hazard also experiences a high level of vulnerability and needs a more heads-up warning.

STUDY METHODOLOGY

The initial survey questionnaire was designed to elicit the perceptions of the community before EWS implementation in the settlements. The survey was conducted on a one-to-one interview basis with a total survey population of 800 respondents who reside in the Sultan Abu Bakar (SAB) Dam and Susu Dam areas.

This research employed the method of probability sampling in which it gives an equal opportunity to the population to be included in a sample. Brown (1947) elaborated that a probability or random sampling has the greatest freedom bias but may represent the most costly sample in terms of time and energy for a given level of sampling error. In selecting samples from the targeted sampling, cluster sampling was chosen as it assumed as the best sampling technique for this research. Cluster sampling is advantageous for those researchers whose subjects are fragmented over large geographical areas as it saves time and money (Davis, 2005). Overall, the number of respondents from each village represented 30% of the total village population.

The data retrieved from the questionnaire was analysed using IBM SPSS Statistics Version 23. The first phase of questionnaire survey was done before the community engagement programme with the population. This intended to gauge the response from respondents that could reflect their nature of understanding, awareness and preparedness of the community in Cameron Highlands before the EWS was installed.

The questionnaire survey for this research was divided into three main sections which consisted of Section A: demographic information of the respondents, Section B: information on experience before the implementation of EWS, and Section C: information on experience during the installation of EWS.

RESULT OF INTIAL SURVEY AND ANALYSIS

This section discusses on result of primary data collection in the study area. The discussion starts with analysis on background of respondents followed with descriptive analysis on their knowledge on EWS. Result on respondents' profile is presented in Table 1 below. Based on ethnicity distribution according to village in Table 1 above, the highest percentage for Semai ethnic group with 98.7% were respondents from Kg. Renglas, followed with 96.5% from Kg. Leryar and 93.4% from Kg. Teji. Meanwhile, for Temiar ethnic group, the highest percentage with 44.4% were respondents from Pos Telanuk.

Table 1 Ethnicity distribution according to village

Village	Ethnicity													
	Semai		Temiar		Melayu		Cina		India		Others		Total	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Lembah Bertam	16	6.1	1	0.4	53	20.1	137	51.9	16	6.1	41	15.5	264	100
Sg. Tiang	100	90.1	1	0.9	1	0.9	1	0.9	6	5.4	2	1.8	111	100
Mensun	29	74.4	4	10.3	5	12.8	0	0.0	1	2.6	0	0.0	39	100
Leryar	83	96.5	0	0.0	1	1.2	0	0.0	1	1.2	1	1.2	86	100
Teji	57	93.4	3	4.9	1	1.6	0	0.0	0	0.0	0	0.0	61	100
Bako	10	90.9	0	0.0	1	9.1	0	0.0	0	0.0	0	0.0	11	100
Pos Telanuk	5	55.6	4	44.4	0	0.0	0	0.0	0	0.0	0	0.0	9	100
Susu	78	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	78	100
Habu	31	88.6	2	5.7	2	5.7	0	0.0	0	0.0	0	0.0	35	100
Senangkar	27	90	3	10	0	0.0	0	0.0	0	0.0	0	0.0	30	100
Renglas	75	98.7	1	1.3	0	0.0	0	0.0	0	0.0	0	0.0	76	100
Total	511	63.9	19	2.4	64	8.0	138	17.2	24	3.0	44	5.5	800	100

As shown in Table 2, from the total respondents from Kg. Bako, 54.5% of them claimed they never attended school while the remaining of 45.5% of them had attended at least secondary education level. Meanwhile, 54.1% of total respondents from Kg. Teji claimed they have attended primary school and 34.4% attended secondary school. In addition, from the total 18 respondents who claimed they have certificate or college qualification, 5.7% of them were from Kg. Habu, 5.4% from Kg. Sg. Tiang and 3.1% from Lembah Bertam. However, for respondents from Lembah Bertam, none of the respondents from other villages had obtained university level education.

Table 2 Respondents' educational level distribution according to village

Village	Educational level											
	Never attended school		Primary school		Secondary school		Certificate-college/ institute		University		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Lembah Bertam	41	15.6	75	28.6	129	49.2	8	3.1	9	3.4	262	100
Sg. Tiang	27	24.3	34	30.6	44	39.6	6	5.4	0	0.0	111	100
Mensun	8	20.5	19	48.7	11	28.2	1	2.6	0	0.0	39	100
Leryar	7	8.1	38	44.2	41	47.7	0	0.0	0	0.0	86	100
Teji	7	11.5	33	54.1	21	34.4	0	0.0	0	0.0	61	100
Bako	6	54.5	0	0.0	5	45.5	0	0.0	0	0.0	11	100
Pos Telanuk	0	0.0	3	33.3	6	66.7	0	0.0	0	0.0	9	100
Susu	17	21.8	16	20.5	44	56.4	1	1.3	0	0.0	78	100
Habu	6	17.1	6	17.1	21	60	2	5.7	0	0.0	35	100
Senangkar	3	10	11	36.7	16	53.3	0	0.0	0	0.0	30	100
Renglas	8	10.5	20	26.3	48	63.2	0	0.0	0	0.0	76	100
Total	130	16.3	255	32	386	48.4	18	2.3	9	1.1	798*	100

Note: *2 respondents did not answer the question.

As shown in Table 3, 84.8% of the total respondents claimed they had knowledge on the EWS, while only 15.2% claimed otherwise. A cross tabulation as shown in Table 4 recorded the responses between the source of information how respondents knew about EWS with their knowledge on EWS.

Table 3 Respondents' knowledge on EWS

Respond	Frequency (F)	Percentage (%)
No	122	15.2
Yes	678	84.8
Total	800	100

In Table 4 below, 22.6% of respondents who they knew about EWS claimed they got the information from 'information signage', 4.3% from television and 66.9% from other types of information sources. However, there were also respondents who claimed they did not know about the EWS but answered they heard it from the internet (99.4%), radio (98.4%) and newspaper (98.3%).

Table 4 Respondents' source of EWS information

Source of information	No		Yes		Total	
	F	%	F	%	F	%
Short Message System (SMS)	783	97.9	17	2.1	800	100
Television	766	95.8	34	4.3	800	100
Radio	787	98.4	13	1.6	800	100
Newspaper	786	98.3	14	1.8	800	100

Internet	795	99.4	5	0.6	800	100
Information signage	619	77.4	181	22.6	800	100
Others	265	33.1	535	66.9	800	100

As shown in Table 5, since the critical value of respondents' education level with television as source of information was less than 0.05, thus H_0 that stated no relationship between the variables can be rejected. In addition, information signage against education level (0.000), ethnicity (0.000) and village where respondents lived (0.016) as well as other sources of information with education level (0.001), ethnicity (0.000) and village where respondents lived (0.000) were less than 0.05, therefore the H_0 can be rejected. In other words, education level, ethnicity and village did have an influence on the sources from where respondents received information related to EWS.

Table 5 Chi-square Test between source of information on EWS with educational level, ethnicity and village

Source of information	Education level			Ethnicity			Village		
	%	CV	Value	%	CV	Value	%	CV	Value
Short Message System (SMS)	30	.680	2.305	41.7	.747	2.696	45.5	.443	9.972
Television	**20**	**.001**	**19.936**	33	.195	7.365	45.5	.000	63.958
Radio	40	.085	8.197	41.7	.594	3.697	**50**	**.007**	**16.928**
Newspaper	40	.428	3.843	**41.7**	**.045**	**11.320**	50	.367	10.876
Internet	**50**	**.002**	**17.188**	**50**	**.000**	**34.006**	**50**	**.000**	**71.031**
Information signage	**20**	**.000**	**21.865**	**8.3**	**.000**	**48.604**	**9.1**	**.016**	**21.909**
Others	**10**	**.001**	**17.751**	**0.0**	**.000**	**49.645**	**9.1**	**.000**	**52.402**

Note: % = % cell with count less than 5, CV = Critical value

Another test using the Spearman rho test (Table 6) was also conducted to test the sources of information on EWS with respondents' age, duration of stay and households monthly income. The results show that the significant values of respondents' age against information signage (0.005) and other sources (0.010), respondents' monthly income against information signage (0.000) and other sources (0.000) were less than 0.05, hence, the null hypothesis can be rejected. In addition, the results also show that there was a positive and low relationship between respondents' age (0.100**) and respondents' monthly income (0.124**) against their answer on information signage. The positive relationship shows that respondents who claimed they knew about the EWS from information signage were those in older age category and earning higher monthly income. Meanwhile, the negative relationship between respondents' age (-0.091**) and respondents' monthly income (-0.179**) against other sources indicates that respondents who claimed they knew about the EWS from other sources were those in younger age category and have low monthly income.

Table 6 Spearman Rho test between source of information on EWS with age, duration of stay and household income

Source of information	Age		Duration of stay		Households month income (RM)	
	CC	Sig. Value	CC	Sig. Value	CC	Sig. Value
Short Message System (SMS)	.021	.550	-.041	.246	.025	.481
Television	.053	.133	-.013	.713	.031	.383
Radio	.008	.829	-.056	.114	.062	.080
Newspaper	-.008	.826	.001	.986	.038	.281
Internet	-.012	.740	-.028	.427	.052	.140
Information signage	**.100****	**.005**	.025	.479	**.124****	**.000**
Others	**-.091****	**.010**	.064	.070	**-.179****	**.000**

CC= Coefficient correlation, Sig.value= Significant Value
* & ** Correlation is significant at the 0.05 level (2-tailed)

FINDINGS AND CONCLUSION

Data collection was conducted to gauge respondents' awareness and knowledge on the EWS. The target population was focused on Sultan Abu Bakar Dam and Susu Dam areas. The survey results indicated that only 15.2% claimed they did not know about the EWS. Meanwhile, respondents who knew about the EWS claimed they received the information mainly from 'information signage' (22.6%). In addition, Chi-square test result showed that respondents' education level, ethnicity and village did influence on sources from where respondents received the information related to EWS. On the other hand, Spearman rho test indicated there was a positive and low relationship between respondents' age and their monthly income against their answer on information signage. The positive relationship shows that respondents who claimed they knew about the EWS from information signage were those in older age category and earning higher monthly income. In contrast, the negative relationship between respondents' age and monthly income against other sources indicate that respondents who claimed they knew about the EWS from other sources were those in younger age category and have low monthly income. This shows that respective agencies and local authority should use various medium of information to disseminate awareness and knowledge on EWS to the community that able to cater all categories of community's age, education level and level of income.

Hence, variation in methods used by local agencies and authorities in ensuring the information on EWS and disaster awareness are important in catering the differences in demography and socio-economic background of the respondents. Among all methods, one to one or direct engagement of local authority and agencies with the community is significant to increase their understanding and awareness. In addition, the engagement also should be frequent to ensure the community are well prepared in facing the disaster.

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RESPONDENTS' AREA OF PREFERENCE WHEN DISASTER STRIKES: A CASE STUDY OF CAMERON HIGHLAND

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Abstract

Disaster can be understood as the probability or threat of quantifiable damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities that required an immediate action. Therefore, this study intends to understand respondents' preferences of location when disaster strikes their settlements/ villages. Their responses are important to indicate their preparedness when facing disaster. Data collection was employed using the questionnaire survey method to the 11 villages. The selection of population was based on a cluster random sampling to ensure equal probability chances were given to every individual in every village. A total of 847 responses were able to be used for data analysis. The results show that the respondents' knowledge on safe location was influenced by their demographic background. In addition, their experience with disasters and residential area also influenced their area of preference to seek refuge in the event of a disaster. Thus, an active promotion of such information related to risk management and reduction should be varied to cater the unique characteristics of the population.

Keywords: Safe haven, route, disaster, dam, Cameron Highland

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INTRODUCTION

Cameron Highland, Lembah Bertam and further downstream villages are reported to have the highest occurrence of floods especially during monsoon season which makes the areas vulnerable. For that reasons, there are currently two dams that have been constructed in the study area, which include Sultan Abu Bakar (SAB) Dam in Lembah Bertam Hydroelectric Scheme and Susu Dam in Ulu Jelai Hydroelectric Scheme. The development of both dams is seen as one of the achievements in creating a better life for the local societies. Other than one of the entry point projects under the Economic Transformation Programme (ETP), dams provide flood control, supply water and irrigation, provide hydropower, offer recreation benefits and also provide navigation signs.

A disaster is a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses, which exceed the ability of the affected community or society to cope, using its own resources (UNISDR 2004). A disaster happens when the impact of a hazard affects a vulnerable population that causes damage, disruption and casualties. Hence, this paper discusses the responses of a community on their area of preference to seek refuge when disaster strikes. The findings of this study will help to identify the best approach to increase public preparedness and minimising loss of life and injuries in the event of disaster.

STUDY BACKGROUND

The preparation of a disaster preparedness plan within the community is important in relation to disaster management of the community as a whole. Public health and safety in the event of a disaster are strengthened as plans are devised and implemented since disaster often strikes without warning. The best way to prepare for disaster awareness is to create a specific plan of action that can be put as a notice to all community.

Community-based Disaster Risk Management (CBDRM) is a process in which at-risk communities are actively engaged in the identification, analysis, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities (ADPC, 2003). This means that people are at the heart of decision-making and implementation of disaster risk management activities. The involvement of the most vulnerable social groups is considered as paramount in this process, while the support of the least vulnerable groups is necessary for successful implementation. One of the key aspects highlighted in disaster management is the provision of local shelter. Shelters are often located in public school buildings, community hall and others. The designated emergency shelters must be informed to the community in order to make sure they know where to head to when the early disaster warning is issued. Shelter as defined by various authors (Kolen & Helshoot, 2012; Isahak et al.,

2018) refers to a strong building that offers protection and to safeguard people from a helpless situation and is an integral part of disaster risk reduction (DRR).

Seag et al. (2013) identified that shelter provision can be divided into two. One is a temporary shelter for emergency evacuation; while the other is designated for a long-term relief operation. Other authors (Ashar, Amaratunga, & Haigh, 2014; Pannier, 2016) divided the shelter into vertical and horizontal evacuation. Vertical evacuation is the act of people movement within a flood prone area with the aim of reaching a relatively safe place above the water level for example reaching to upper building storey. Meanwhile horizontal evacuation is act of evacuation by going away from the affected area to a safe area using the recommended designated pathway.

A disaster can become uncontrollable once the event is underway. Therefore, preventive steps need to be taken before, during and after a disaster. If a community is not well prepared, control over the disaster event would be usually lost during its occurrence. If each individual in the community is familiar with ways of coping and precautionary measures, then the disruption by a disaster can be reduced (Sampath, 2001).

The implementation of the disaster management plan should be done at community level with support from local authorities, and technical and research institutions. The implementation process will include various structural and non-structural activities such as community training, disaster response drills, community early warning systems, disaster resilient construction of houses, forest plantations, mangrove plantation, diversification of crops, rainwater harvesting, construction of dykes, bridges and so on for vulnerability reduction and hazard mitigation. Hence, evacuation is a common strategy in emergency management. In many hazardous events, the best option is to relocate threatened populations to safer areas (Cova & Johnson, 2003). Evacuation refers to the temporary relocation from areas at risk to areas of greater safety (Cheng, Qian, & Zhang, 2011).

As reviewed by numerous authors, the location of a shelter could be anywhere, as long it is confirmed safe to the victims and declared as a 'green area' and easy to locate for the supply of foods and other items essential for survival. The temporary evacuation centre location needs to be setup at a higher ground level. However, it must be accessible at least by air or land. The shelter location must be on a field with a minimum area of 20 meters by 20 meters (Mat Rasul & Darus, 2016).

However, the success rate for evacuation is dependent on travel time and the available time for evacuation work. For instance, the available time for evacuation can be improved through flood forecasting and warning systems that provide a longer available time and decrease the possibility that residents cannot evacuate to flood shelters related to flood circumstances. Early warning is an

important precondition and allows implementation of more emergency measures (Jamrussri & Toda, 2018).

STUDY METHODOLOGY

A primary data collection on the target population in Cameron Highland was conducted using the closed-ended questionnaire survey method. A total of 847 samples participated in the survey involving 11 villages. This primary data collection was conducted after several meetings between the local authority and respective agencies related to disaster risk management and the population in the study area. A selection of samples from the total population was done by using the mixed method, which involved cluster sampling where samples were calculated to represent 30% of each cluster (11 villages). Cluster sampling is where the whole population is divided into clusters or groups. Subsequently, a random sample is taken from these clusters, all of which are used in the final sample (Wilson, 2010).

The selection of population was based on a cluster random sampling to ensure equal probability chances were given to every individual in every village. However, due to the low response from the respondents, a convenient sampling method was deployed to collect the targeted sample portion.

The survey was conducted on a face-to-face basis. The questionnaire survey form was bi-lingual; English-Malay. This is due to the fact that the Susu Dam area is largely populated by the Semai, Temiar and Malay ethnics, and only a few of them can understand English.

DATA ANALYSIS

This section discusses the results of the questionnaire survey in the study area. The discussion starts with the results on respondents' profiles as presented in Table 1 below.

Table 1 Respondents' profile

Characteristics	Categories	Frequency	%
Age	< 15 years old	37	4.4
	15 - 25 years old	236	27.9
	26 - 35 years old	205	24.2
	36 - 45 years old	152	17.9
	46 - 55 years old	101	11.9
	> 55 years old	116	13.7
Education level	Not attending school	150	17.7
	Elementary School	195	23.0
	Secondary School	435	51.4
	College/ Institute	27	3.2
	University	40	4.7

As shown in Table 1 above, 54% of the total respondents who participated in the survey were aged between 26 to 55 years old, 32.3% aged 25 years old and below while the remaining of 13.7% aged more than 55 years old. From the total of 847 respondents, 51.4% of have finished their secondary school, 23% have attended at least elementary school, while 17.7% claimed they never attended school. Only 7.9% have obtained tertiary education.

A question related to respondents' experience with disaster was also asked during the survey. 100% of respondents from Kg. Bako and Pos Telanok claimed they did not have any disaster experience (Table 2). In contrast, a majority of 66% from Lembah Bertam, followed by 47.8% from Kg. Mensun and 36.1% from the other villages claimed they have experienced with disaster. This shows that respondents who claimed they have experienced disaster came from various residential areas.

Table 2 Cross-tabulation between respondents' experience with disaster with their residential area

Residential area	**Response on experience with disaster**					
	No		**Yes**		**Total**	
	F	**%**	**F**	**%**	**F**	**%**
Kg. Teji	44	93.6	3	6.4	47	100
Kg. Bako	9	100	0	0	9	100
Pos Telanok	3	100	0	0	3	100
Kg. Susu	62	87.3	9	12.7	71	100
Kg. Abu	42	89.4	5	10.6	47	100
Kg. Senangkar	29	96.7	1	3.3	30	100
Kg. Renglas	72	77.4	21	22.6	93	100
Lembah Bertam	88	34	171	66	259	100
Kg. Sg. Tiang	84	70	36	30	120	100
Kg. Mensun	36	52.2	33	47.8	69	100
Kg. Leryar	48	76.2	15	23.8	63	100
Others	23	63.9	13	36.1	36	100
Total	**540**	**63.8**	**307**	**36.2**	**847**	**100**

A question related to population preferences of location/ area to seek refuge when disaster strikes was asked during the data collection. The data was then analysed using Chi-square test against their experience with disaster and location of residential area. The results are shown in Table 3 and Table 4 below.

Table 3 Chi-square test between respondents' preference on area to go when disaster strike with their experience on disaster

Area of Preference	**Respondents' experience with disaster**			
	Value	**p-value**	**% count less than 5**	**Remarks**
Relative's/friend's house	11.128	0.001	0 cells (0)	**Valid, H_0 rejected**
Tok Batin's house	50.003	0.000	0 cells (0)	**Valid, H_0 rejected**
Assembly area/nominated area	22.131	0.000	0 cells (0)	**Valid, H_0 rejected**
Community Hall	49.057	0.000	0 cells (0)	**Valid, H_0 rejected**
Higher ground	28.553	0.000	0 cells (0)	**Valid, H_0 rejected**
Other area	7.503	0.006	0 cells (0)	**Valid, H_0 rejected**

Note: For result to be valid, the % of count less than 5 must be not more than 20%

Table 4 Chi-square test between respondents' preference on area to go when disaster strike with their residential area

Area of Preference	**Residential area**			
	Value	**p-value**	**% count less than 5**	**Remarks**
Relative's/friend's house	87.147	0.000	5 cells (20.8)	Invalid
Tok Batin's house	200.489	0.000	5 cells (20.8)	Invalid
Assembly area/nominated area	75.930	0.000	4 ells (16.7)	**Valid, H_0 rejected**
Community Hall	364.78	0.000	3 cells (12.5)	**Valid, H_0 rejected**
Higher ground	79.953	0.000	3 cells (12.5)	**Valid, H_0 rejected**
Other area	27.335	0.004	12 cells (50)	Invalid

Note: For result to be valid, the % of count less than 5 must be not more than 20%.

From the result in Tables 3 above, since all the p-values for respondents' preference on area to go when disaster strikes with their experience with disaster were less than 0.05, thus, H_0 can be rejected. Based on the result, it can be concluded that respondents' experience with disaster did influence their preference on area/place to go when disasters are expected to happen.

Meanwhile, result of Chi-square for respondents' preference on area to go when disaster strikes with their residential area shows that 3 tested p-values were less than the 0.05 that indicate H_0 can be rejected. This means that respondents' preference to go to designated assembly area (0.000), community hall (0.000) and higher ground (0.000) were influenced by their current location of residential area.

Another inferential test was conducted to explore further on respondents' characteristics based on their preferences of safe area to go when a disaster is expected to happen. The Chi-square test was conducted again between respondents' preference on area/place to go when disaster strikes with their

gender (Table 5). As shown in Table 5, respondents' gender influenced their preference to go to the community hall when a disaster is expected to happen.

Table 5 Chi-square test between respondents' preference on area to go when disaster strikes with their gender

Area of Preference	**Gender**			
	Value	**p-value**	**% count less than 5**	**Remarks**
Relative's/friend's house	0.137	0.712	0 cells (0)	**Valid, H_0 cannot be rejected**
Tok Batin's house	0.058	0.810	0 cells (0)	**Valid, H_0 cannot be rejected**
Assembly area/nominated area	0.489	0.485	0 cells (0)	**Valid, H_0 cannot be rejected**
Community Hall	11.243	0.001	0 cells (0)	**Valid, H_0 rejected**
Higher ground	2.826	0.093	0 cells (0)	**Valid, H_0 cannot be rejected**
Other area	0.045	0.831	0 cells (0)	**Valid, H_0 cannot be rejected**

Note: For result to be valid, the % of count less than 5 must be not more than 20%

Another test using the Spearman Rho was conducted between respondents' preference on area to go when disaster strikes with age, duration of stay and education level. The results are shown in Table 6 below.

Table 6 Spearman Rho test between respondents' preference on area to go when disaster strikes with age, duration of stay and education level

Area of Preference	**Age**		**Duration of stay**		**Education level**	
	CC	**p-value**	**CC**	**p-value**	**CC**	**p-value**
Relative's/friend's house	0.051	0.668	-0.034	0.319	**-0.073****	**0.034**
Tok Batin's house	**-0.109****	**0.002**	-0.025	0.461	**-0.111****	**0.001**
Assembly area/nominated area	**-0.137****	**0.000**	-0.043	0.214	-0.017	0.622
Community Hall	**-0.131****	**0.000**	-0.051	0.138	0.006	0.865
Higher ground	**0.165****	**0.000**	0.044	0.201	**-0.071***	**0.039**
Others	**0.077****	**0.024**	0.042	0.218	0.011	0.744

Note: * and ** Correlation is significant at the 0.01 level (2-tailed). cc= Coefficient correlation

From Table 6 above, since all the p-values of respondents' preference on area to go when disaster strikes against their duration of stay were more than the critical value of 0.05, thus H_0 cannot be rejected. On the other hand, all tested p-values between respondents' age against preferred area except of relative/friend's

house are less than 0.05, thus H_0 can be rejected. In addition, p-values for respondents' preference area of relative/ friend's house (0.034), Tok Batin's house (0.001) and higher ground (0.039) against their education level are less than 0.05, thus H_0 also can be rejected. The result shows that there is a positive and low relationship between the variables which indicates the older the respondents' were, the more they preferred to go to higher ground (0.165**) and others (0.077**) as the option to choose when disaster strikes.

On the other hand, the negative relationship between respondents' age against preference to go to Tok Batin's house (-0.109**), identified assembly area (-0.137**), community hall (-0.131**) and respondents' education level against their preference to go relative/ friend's house (-0.073**), Tok Batin's house (-0.111**) and higher ground (-0.071*) points out that the more their age increased or the higher their education level, the more they disagreed over the preferred area chosen as a safe area when disaster strikes.

FINDINGS AND CONCLUSION

Overall, 66% respondents from Lembah Bertam, 47.8% from Kg. Mensun and 36.1% from the other villages claimed they have experienced with disaster. From the result of the Chi-square, respondents' experience with disaster did influence their preference on area/location to seek refuge during a disaster. In addition, other test reveals that respondents' preference to go to a designated assembly area, community hall and higher ground were influenced by their current location of residential/village area. Moreover, respondents' gender also influenced their preference to go to community hall in the event of a disaster. Another test using the Spearman Rho was conducted and revealed that there is a positive and low relationship showing respondents' who are older preferred to go to higher ground and other areas when disaster strikes. In contrast, the results showing the negative relationship show younger respondents' preferred to go to Tok Batin's house, identified assembly area, community hall. In addition, the lower their education level, the more they preferred to go a relative/friend's house, Tok Batin's house and higher ground.

Findings from the results show that the involvement of various government agencies and the non-governmental sector in executing disaster management is crucial. In order to increase the awareness of an affected community, preparedness programme aimed at minimising the risks caused by natural disasters should be facilitated through various programmes and medium. Awareness and preparedness campaign should also take into consideration of multi-characteristics of the population in ensuring the successfulness outcome of the disaster risk management program. In addition, the lack of information on hazard related risks, vulnerabilities and the preparedness actions to local communities could be the main hindrance to garnering community action. Thus,

the establishment and promotion of such information should be actively organised in disaster prone areas.

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QUALITY OF LIFE ASSESSMENT BASED ON ECONOMIC WELL-BEING PERSPECTIVE: A CASE STUDY OF JOHOR BAHRU AND PETALING, SELANGOR

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Abstract

The definition of quality of life is varied. Different individuals may perceive the quality of life in a different form of other individuals. Over more than four decades, Malaysia has made remarkable achievements regarding its economic growth as well as its socio-economic development. Numerous factors have been identified that may influence the quality of life of the people according to their personal preferences. This article assessed the perception of 100 respondent's lives in two major cities in Malaysia namely Johor Bharu and Petaling. These cities are also the major district in Johor Darul Takzim and Selangor Darul Ehsan. These study also would be focusing on the economic well-being of the individual. The economic individual is economic capacity, transportation, living condition and educational satisfaction.

Keyword: Quality of life, Economic well-being, Selangor, Johor

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INTRODUCTION

Improving the quality of life (QOL) of the itizen has always been the main focus of the Malaysian government and it has been one of the main agendas in the 11th Malaysia Plan 2016-2020. Generally, QOL is about the extent to which human needs are fulfilled concerning their perception of subjective well-being. Thus, it is the role of policymakers and professionals to provide opportunities for people to be able to meet their desired well-being (Costanza et al., 2005). The World Health Organization Quality of Life group define QOL as 'individual's perception of their position in life in the context of the culture and value systems in which they live and with their goals, expectations, standards and concerns' (Phillips, 2006, p.23). Similarly, several authors (Zainal et al., 2012; Gilgeous, 1998) see QOL as the satisfaction of people over various dimensions including material, education, security, physical and living environment that affected by their perception on what they refer as the ideal life. Serag El-Din et. al (2012), described the quality of life as a complex concept that might be defined by various disciplinary. The term 'quality of life' is used solely to describe some physical features, but it describes all types of relationship, dynamics and the reticular relationship that relates to physical features.

LITERATURE REVIEW

The word 'quality' as defined by Oxford Dictionary refers to a standard of something that could be measured against things of a similar kind. In other words, it is the degree of excellent on something. Whilst, quality of life as also encompassing personal advancements, a healthy lifestyle, access and freedom to pursue knowledge, and attainment to a standard of living which surpasses the fulfilment of the basic and psychological needs of the individual in order to achieve social well-being compatible with the nation's aspirations (Economic Planning Unit, 2004). Other than that, quality of life also defines as an individual's perception of their position in life in the context of the culture and value systems in which they live and about their goals, expectations, standards and concerns. It is a broad-ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment (World Health Organization, 2012). QOL is the subject of academic debate in various fields particularly in economics, the field of happiness studies, a research area shared with psychologists and sociologists (Rabe, Osman, Bachok, Rosli, & Abdullah, 2018).

The concept of quality of life is complex because it includes multidimensional of contributory facets such as housing, education, work and environment (Garcia-Mira, Uzzell, Real, & Romay, 2005; Serag El Din et al., 2012). Serag El Din et al. (2012) also agree that quality of life requires multiple approaches from different theoretical perspectives. However, Yahaya (2015) explains that the rapid economic growth reflects the high quality of life for the

people in a country where all population should have an equal opportunity to enjoy the amenities provided by their government.

Generally, Malaysia Quality of Life (MQLI) report was first produced in 1999 until the year 2011. Throughout these years, the major changes in the indicators are including the growing of 10 measurements (in 1999) to 11 major measurements in 2011. Meanwhile, in 2013, the quality of life measurement report was rebranded and introduced as Malaysia Well-Being Index Report consisting of 14 major quality of life measurements. The latest report was more organized with the classification of both economic and social well-being. Components in Economic well-being namely transportation, communications, education, income and distribution and working life.

RESEARCH METHODOLOGY

This study involves the economic well-being sectors in two major districts in Malaysia namely Petaling Jaya district and Johor Bahru district. Petaling is one of the major districts in Selangor meanwhile Johor Bahru is the capital city of Johor. Both Johor and Selangor are among the states in Malaysia that experienced rapid development progress. According to the Department of Statistic Malaysia (2016), Johor hold the highest GDP in Malaysia as compared to the other states. In terms of population number, the population in Johor Bahru was 1,345,191 whilst Petaling was 1,782,375 (DOSM, 2016).

In this research, the method used was quantitative and qualitative. For qualitative research, review of literature, journals, published data from various secondary sources was employed. Driven by the objective formulated based on qualitative analysis, a quantitative method was used to answer the research question. Through questionnaire survey form, the questions were designed to measure respondents' scale of preferences on how they perceived their current economic well-being quality. Random sampling was adopted in selecting the number of respondents from both districts. However, due to the low number of participation from the target population, a convenient sampling method was used that was based on the availability and willingness of respondents. A total of 100 respondents were chosen from both districts and a scale using of 0-10 weas used to measure their perception towards the quality of life.

Specifically, in referring to the Malaysian well-being Index Report, this study focusses on the elements in economic well-being in this study namely economic capacity, transportation, living condition and education satisfaction.

FINDINGS AND ANALYSIS

Socio-Demographic Result

Table 1 Socio-demographic in Johor Bharu and Petaling, Selangor

Socio-demographic		JB (%)	Petaling (%)
Gender	Female	58	58
	Male	42	42
Race	Malay	26	79
	Chinese	71	16
	Indian	2	5
	Others	1	0
Age	Less than 20 y/o	3	0
	21-40 y/o	46	81
	41-60 y/o	40	17
	61 y/o and above	11	2
Marital status	Single	3	41
	Married	33	57
	Divorced	41	2
	Widowed	19	0
	Others	4	0
Household income	RM 1,000 and below	0	2
	RM 1,001- 2,000	13	15
	RM 2,001-3,000	17	31
	RM 3,001-4,000	4	12
	RM 4,001-5,000	13	9
	RM 5,001-6,000	12	12
	RM 6,001-7,000	13	2
	RM 7,001-8,000	20	1
	RM 8,001-9,000	4	0
	RM 9,001-10,000	1	6
	RM 10,000 and above		10
Educational level	Primary school	68	3
	Secondary school	26	20
	STPM/ Certificate/ diploma	5	35
	Degree	1	37
	Master	0	5

Source: Study survey

Table 1 presents the socio-demographic background of 100 respondents from Johor Bharu and Petaling districts. With 58% of female respondents and 42% male respondents, it can be seen that a similar number of gender were recorded in both districts. For Johor Bharu, majority of the respondents who have participated in the survey were Chinese with 71%. Contrarily, 79% of the respondents in Petaling were majority Malay. The majority who participated in the survey were from respondents who were aged between 18 years old and above. Both districts recorded the majority of respondents were from the age

group of 21 to 40 years old (46% Johor Bharu district and 81% Petaling district). Meanwhile, the second-highest age group for both districts were 41-60 years old with a percentage of 40% and 17% respectively. Majority of the respondents in Johor Bharu were divorced meanwhile 57% out of 100 respondents from Petaling are married. Out of 100 respondents, 68% of respondents in Johor Bharu attended primary school. Meanwhile, for Petaling, the highest percentage with 37% claimed they had a bachelor degree.

Comparison on Relative Importance Index (RII): Johor Bharu vs Petaling

Table 2 RII comparison of economic well-being

Elements	RII (Rank)	
	JB	Petaling
Economic capacity		
Household income satisfaction	0.28 (4)	0.63 (2)
Job satisfaction	0.28 (4)	**0.67 (1)**
Monthly income sufficiency	0.49 (2)	0.55 (4)
No problem in commuting cost	**0.74 (1)**	0.61 (3)
Having no problem to buy properties	0.44 (3)	0.40 (5)
Transportation		
Owning private vehicles	0.67 (2)	0.77 (1)
Often use public transportation	0.69 (1)	0.45 (2)
Preference use public transportation in daily	0.64 (3)	0.43 (3)
Living condition		
Living place satisfaction	0.63 (3)	0.74 (2)
Would not mind neighbouring with a foreigner	0.64 (2)	0.58 (3)
House located in a strategic place	0.68 (1)	0.76 (1)
PWD's facilities are adequate in my house area	0.68 (1)	0.44 (4)
Education satisfaction		
Satisfied with current educational level	0.66 (3)	0.73 (2)
Wish to continue study to another level	0.63 (4)	0.58 (4)
Supportive towards children/spouse/ siblings to continue study at another level	0.85 (1)	0.92 (1)
Malaysia educational system generate ideas of students	0.72(2)	0.68 (3)

Source: Author calculation

Relative Importance Index (RII) was calculated based on respondents' scale of preferences in the survey form. For RII, the highest values indicated the highest the scale chose by respondents in measuring their economic well-being. Referring to Table 2 above, the highest RII values for each district are different, in which for JB the highest values that ranked as the first is 0.74 of satisfaction on commuting cost while 0.67 ranked as first for Petaling is satisfaction on current employment. Furthermore, the second-highest value for Petaling ranked as the second is satisfaction related to household income with RII value of 0.63. In contrast, the second economic well being ranked based on satisfaction for JB is relate to monthly income sufficiency with RII value of 0.49.

Meanwhile, the least preferred or representing the highest dissatisfaction on economic well being is the satisfaction on buying properties with 0.40 for Petaling, while household income and job satisfaction are ranked as the least favoured indicators with RII values of 0.28 by respondents from Johor Bahru.

Economic well-being against household income of the respondents

Table 3 Economic capacity against household income

Economic capacity	Household income			
	JB		Petaling	
	CC	P-value	CC	P-value
Household income satisfaction	-.152	.131	.238*	.017
Job satisfaction	-.170	.090	.262**	.009
Monthly income sufficiency	.009	.927	.270**	.007
No problem in commuting cost	.044	.663	.369**	.000
Having no problem to buy properties	.028	.784	.345**	.000

Table 3 indicates the Pearson correlation result between the household income of the respondents against the economic capacity of 100 respondents in both Petaling and Johor Bahru. There is no relationship involved between the two variables mentioned in Johor Bharu as the P-Value more than 0.05. Whilst, the P-value in all economic capacity variables in Petaling district resulted in less than 0.05 which the null hypothesis stated no relationship between the variables cannot be rejected. Referring to Guildford's rules of thumb, household income satisfaction (0.262**), job satisfaction (0.262**) and monthly income sufficiency (0.270**) having a very low positive relationship with the household income variable. On the other hand, having no problem with commuting cost (0.369**) and having no problem to buy properties (0.345**) resulted in a low positive relationship with household income. Hence, it can assume that the higher the respondents' income, the higher the preference on household income satisfaction, job satisfaction, monthly income sufficiency, having no problem in commuting cost and buying additional properties by the respondents in Petaling district.

Table 4 Household income against transportation

Transportation	Household income			
	JB		Petaling	
	CC	P-value	CC	P-value
Owning private vehicles	.109	.370	.058	.566
Often use public transportation	.047	.702	-.129	.200
Preference use public transportation in daily	.119	.326	-.024	.809

Table 4 portrays Pearson correlation result of household income and transportation satisfaction by the respondents. All of the P-Values are more than

0.05 which indicate the null hypothesis stated there is no relationship between variable cannot be accepted.

Table 5 Household income against the living condition

Living condition	Household income			
	JB		Petaling	
	CC	P-value	CC	P-value
Living place satisfaction	.015	.902	.136	.177
Would not mind neighbouring with foreigner	.138	.255	.219*	.028
House located in strategic place	.031	.802	.039	.702
PWD's facilities are adequate in my house area	.021	.863	.294**	.003

Table 5 shows the Pearson correlation result for living condition against household income. Generally, P-value for living condition elements against household income in Johor Bharu is more than 0.05 which the null hypothesis stated there is no relationship between variables can be accepted. Similar result shared by the living place satisfaction and strategic house location for Petaling District. On the other hand, the P-value of having a foreigner as a neighbour (P-value: 0.028) and PWDs' facilities adequacy (P-value: 0.003) in Petaling district are less than 0.05 which the null hypothesis stated there is no relationship between variables can be rejected. Regarding Guilford's rules of thumb, the relationship classified as very low positive relating. It can be assumed that the lower the household income, lower the living condition preferences.

Table 6 Household income against educational satisfaction

Educational satisfaction	Household income			
	JB		Petaling	
	CC	P-value	CC	P-value
Satisfied with current educational level	.114	.349	.071	.480
Wish to continue study to another level	.124	.306	.036	.719
Supportive towards children/spouse/ siblings to continue study in another level	.286*	.017	.141	.161
Malaysia educational system generate ideas of students	.346**	.003	-.141	.163

Table 6 shows the Pearson correlation results in household income against educational satisfaction. Overall, result in JB district shows, there are two variables with p-value less than 0.05 namely supportive towards children/ spouse/ siblings to continue study in another level (p-value: 0.017) and Malaysia educational system generate ideas of the student (p-value: 0.003). This indicates

that the null hypothesis stated that there is no relationship between these variables can e rejected.

On the other hand, p-value in all educational satisfaction variables in Petaling is more than 0.05 which the null hypothesis stated there is no relationship between variables can be accepted.

CONCLUSION

In conclusion, from the RII result, it shows that the respondents in both major cities in Malaysia perceiving their quality of life in terms of economic well-being. It can be seen that both cities perceiving the quality of life in their form which resulted in the different result for both cities. From the result also, it can be assumed that even though respondents in Johor Bharu least satisfied with the household income and their job, respondents in Petaling perceiving both of these elements as the most satisfying elements in economic capacity. Meanwhile, when the respondents in Johor Bharu satisfied with their monthly commuting cost, respondents in Petaling perceive it the other way around.

Hence, it can be concluded that to distinguish the quality of life in any terms it is based on the individual or the community itself since the quality of life contains border concept which affects the individual in terms of surrounding, the economy as well as the community. Quality of life study should be focusing on cross-cultural and regional differences or similarities in different parts of the world (Mohit, 2014). While economic growth leads to improvements in the quality of life, a better quality of life enables the population to participate more fully in economic development (Holdstock & Rowson, 2005).

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