Examining the Walkability of Planned Neighbourhood in Malaysia: Outcome of a Pilot Study

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Abstract: In Malaysia, urban development has produced many properly planned neighbourhoods. These areas are expected to provide walker-friendly environment. However, all evidences and observations show that urban people even in the planned areas still depend heavily on car in their movement. This raises the need to evaluate the walkabilty of the environment of planned neighbourhoods. As an initial effort, this paper summarises a pilot study carried out on two neighbourhoods in the city of Putrajay in Malaysia with the aim of contributing to building up a solid background on investigating the walkbility of planned neighbourhoods. Quantitative and qualitative research methods were used. Three stages of investigation have been adopted; field observation; questionnaire and interview. Rank analysis and rating analysis and other appropriate techniques were used to handle the collected data. The two neighbourhoods are found to have the most important motivators for their residents' walking. The residents' walking is however, still little. This raises the need for further investigation.

Keywords: Liveable environment - Neighbourhood- Walkability- Walkability assessment criteria- Sustainable environment

Introduction

Amongst other issues, heavy dependency on car and less walking by urban residents are critical issues that are facing the move towards more sustainable and liveable urban environment in various countries. (Lennard, S.C & Lennard, H. 2008). Heavy dependency on car results in increasing environmental pollution and its consequent threats to the health of urban population. It also leads to more consumption of natural resources (Stephen, 2004, Bicycle Federation of American Campaign. 1998). Less walking prevents people from enjoying better health conditions they get from walking. It also increases overweigh which has critical health consequences. "Even small increase in light to moderate activity equivalent to walking for about 30 minutes a day will produce measurable benefits among those who are least active."(Pedestrian and Cycle Information Centre, N. D., 2015). Further, it reduces the opportunity for people to meet and develop friendship and further the opportunity to enhance social interaction. (Godman, R. &Tolley, R., 2003). In the recent decade or so, there has been an increasing concern in the research and in concerned professional fields to promote walking in urban areas.

Walking is not as same as walkability. Walking describes the form of physical activity. Walkability is a term referring to the physical environment where people's walking takes place. It describes the space that is formed by buildings, streets and streetscape (Theresa, A., Glanz, 2011). Pedestrian environment can be described as a walkable environment when it is walking friendly. Various criteria have been developed by various authors to indicate the walkability of the pedestrian environment. Walkability can be defined according to Edmonyon Llewelyn-Davies (2000) cited in Shamsuddin et al (2004) cited in Shuhana Shamsuddin, Nur Rasyiqah Abu Hassan & Siti Fatimah Ilani Bilyamin (2012), by the level of pedestrians' comfort and safety. Edmonton T. C. (2008) has identified the major elements that enhance the walkablity of pedestrian environment as destinations and access to public transit systems, pedestrian network, mix land use and density.

Researchers have developed a wide range of qualitative and quantitative methods for assessing the walkability of pedestrian environment. Those methods include "audits, tools, scales, instruments, checklists, inventories, levels of service, survey questionnaires, and indices" (Praveen K. Maghelal and Cara Jean Capp, 2011, p.6.) and in the recent years, mobile methods where pedestrians are involved to be in direct interaction with the researcher and the environment during the survey. The pedestrian environment assessment methods focus mainly on the micro scale. They have two targets. Firstly, they try to understand more about pedestrians' interaction with the features of the pedestrian environment. Secondly, they aim to define the set of physical features of the environment that motivate pedestrians to go for walking (C.E. Kelly, M.R. Tight, F.C. Hodgson, M.W., 2011). The components of the assessment methods cover long list of criteria to measure various features of the pedestrian environment such as connectivity, pedestrian safety from crime and from traffic, streetscape, road design, pedestrian sidewalk design and others. These components are complicated and not easy to use according to authors such as Clifton et al. (2007) cited in Praveen K. Maghelal and Cara Jean Capp (2011, p.6.), who reported that "In sum, the important factors contributing to 'walkability' are still very much in contention .... Among the complications is the nature of the measures: some aspects of the pedestrian environment can be measured objectively and therefore with more ease, but others are more subjective in nature."

In Malaysia, urban development has produced many properly planned neighbourhoods in cities such as Cyberjaya, Putrajaya, the New Town of Petaling Jaya and Nusajaya (part of the Iskandar Malaysia Project). These areas are expected to provide walker-friendly environment. However, all evidences and observations show that urban people even in the planned areas still depend heavily on car. This raises the need to evaluate the walkabilty of the environment of planned neighbourhoods in Malaysia. Evaluating the walkability of a neighbourhood as mentioned above, involves the investigation of its physical environment and the analysis of the reaction of the residents towards the environment. This requires as many case studies as possible and multidimensional methods for investigation. As an initial effort, this paper summarises a pilot study carried out on two neighbourhoods in the city of Putrajay in Malaysia with the aim of contributing to building up a solid background on investigating the walkability of planned neighbourhoods. This pilot study hops also to play the role of a motivator for further research on this subject to contribute to the efforts to produce liveable and more sustainable urban environment.

Objectives

To reach the above mentioned aims, the following objectives were set up:
   a- To examine the walkability of the selected neighbourhoods;
   b- To examine people satisfaction of the walkability of the environment of their neighbourhood

The City of Putrajaya

Putrajay, the first major intelligent garden city in Malaysia, has been developed as a new administrative capital city for the Malaysian Federal Government on an area of 14,780 hectares. By its completion, the city is expected to house 570,000 populations (D. Bt Omar, 2006). The city planning structure is based on the Garden City Concept, encompassing twenty precincts; of which five constitute the Core Area where various activities such as Government, Civic, Commercial, Sports and Recreational are housed (Lee, M.M., 2008). Twelve of the remaining 15 precincts make up the residential neighbourhoods. Each unit was planned to house 15,000 populations and provided with a mix of low, medium and high cost housing (D. Bt Omar, 2006). Each neighbourhood has its own services centre, distinctive boundaries and it is well equipped with a good circulation system (SAbeen, Q and Ho, C.S. 201, Ho Cs. 2006). Permeable fencing with generous landscape treatment such as hedges, shrubs, trees instead of having solid fencing in this city was the first example in Malaysia. This encourages interaction within and outside the neighbourhood (Lee, M.M., 2008, Ho, C.S., 2006). In the same line with Perry's concept, neighbourhood planning of Putrajaya has given high concern to pedestrian movement. Each unit has been provided with well planned network pedestrian walkway and cycle ways. Cross traffic was discouraged through proper design of local roads hierarchy system. The pedestrian walkway system and the local road system are complemented with a public transport system (Ho, C.S.,2006). However, observations as well as research such as that by Sabeen, Q and Ho, C.S. (2011) indicate that residents' walking in Putrajay is relatively low and most of them still use their private cars extensively.

Methodology

Quantitative and qualitative parameters were used to properly carry out the assessment of walkability in Putrajaya. In order to cover a wide range of parameters, the research adopted three levels of investigation: road auditing, questionnaire and interview. Two neighbourhoods of different housing typologies were selected; precinct 14, where
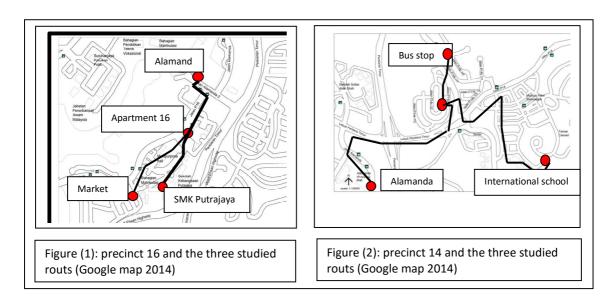
houses are bungalows and precinct 16 where housing is of multi-story apartments. Three routes were identified for auditing in each neighbourhood. Refer figures (1 and 2).The field observation was carried out according to a pre-prepared checklist for evaluating the physical facilities and infrastructure of the neighbourhood that are aimed to serve walking. In the second stage, a questionnaire was designed to enhance knowledge on the parameters that are covered by the auditing and further points such as the investigation of the residents' walking habits, walking purposes, factors promote walking and the respondents' satisfaction on the walking environment of their neighbourhoods. Selected adults were interviewed in the third level for better understanding on their neighbourhoods' walkability. The need to have a comprehensive list of parameters for assessing walkability is pointed at by various researchers such as Kockelman (1997), Frank and Pivo (1994), Kitamura, Mokhtarian, and Laidet (1997), cited in Praveen K. Maghelal and Cara Jean Capp, (2011).

The road auditing was carried out by specialist persons who have architectural background and trained for this purpose. The respondents to the questionnaires were selected randomly from random places in each neighbourhood. The outcome was 30 questionnaires for analysis. 3 people from each neighbourhood were interviewed. To handle the collected data, appropriate statistical techniques such as rank analysis, rating analysis, frequency tabulation were used.

Case Study Neighbourhoods: Findings And Discussion

Auditing

Three routes were selected in each neighbourhood and numbered as 1, 2 and 3. In precinct 16, Route number (1) extends from Apartment precinct 16 to SMK School. It is about 600 meters length. Rout 2, is from apartment precinct to a shopping area ("Pazar") and of 700 meters length. Rout 3 starts at the residential area and ends at Alamanda shopping mall. Refer figure (1). In precinct 14, Route 1 extends from the residential area to the nearest bus stop. Its length is about 500 meters. Route2 goes from the residential area to the Nexus International School while route 3 starts at the residential area and ends at Alamanda shopping mall. Refer figure (2). Table (1) summarises the outcome of the field observation (auditing) in the selected six routs. The findings are as in the following.

Figure (1): precinct 16 and the three studied routs (Google map 2014)

Figure (2): precinct 14 and the three studied routs (Google map 2014)

Precinct 16

All the parameters related to safety and to the street frontage, its cleanness and attractiveness were positively rated in the three routes. The presence of safety features makes people feel more secure and safe from traffic while walking and is consequently expected to encourage people to go for more walking. The good quality of street frontage is expected to help walkers in getting more enjoyable time. The majority of the parameters related to pedestrian walkway quality were positively reported by the auditors. The good quality pedestrian makes the walker feel comfortable while walking. Good connectivity may positively encourage people to walk particularly to reach the

facilities. Some other parameters were recorded negatively in the three routes. There are no places to stop and rest such as benches and seats, particularly for elderly and children. The presence of such elements helps people to have more enjoyable walking. It also helps them to go for longer walk since they have the opportunity to rest on the rout. What makes things worse is the absence of shaded and sheltered places along the three routes. Putrajaya is located in the tropical zone where temperature is high and rain fall is heavy throughout the year. Walking in the sun shine cause sweating which makes the person feels uncomfortable, while walking in the rain makes clothes wet. Walking in both conditions is even worse. Walkers need protection for sunshine and rain. The three routs share one more negative point as they do not have tactile installed along them. This no doubt is a critical point for blind people.

Table (1): Checklist for walkway auditing and auditing outcome (survey 2014)

Criteria	parameters	Precinct 16						Precinct 14					
		Rout 1		Rout 2		Rout 3		Rout 1		Rout 2		Rout 3	
		yes	No	yes	No	yes	No	yes	No	yes	No	yes	No
Pedestrian quality	There aren't four-way intersection along the rout	*		*		*		*			*		*
	There is sufficient space for people with prams and wheelchairs	*		*		*		*		*		*	
	People can walk side by side	*		*		*			*	*		*	
	Shadow is provided either by big trees or by shelter		*		*		*		*		*		*
	There is tactile along the walkway		*		*		*		*		*		*
	There aren't broken segments along the walkway		*	*		*		*		*			*
	There are places to stop and rest such as benches and seats, particularly for elderly and children		*		*		*	*			*		*
	The rout leads to the neighbourhood facilities	*		*		*		*	*				*
	The rout leads to public transport stop	*		*		*		*		*		*	
Safety	Zebra crossing is properly located wherever needed to help pedestrian to cross	*		*		*			*	*		*	
	Walkway is safely separated from the car road	*		*		*		*		*		*	
	There is enough time at the traffic light to cross the road	*		*		*		*			*	*	
	Walker can notice security features such as CCTV	*		*		*			*		*	*	
Surroundings	The rout is clean and free from unwanted odour		*	*		*		*		*		*	
	The street frontage is clean and looking interesting and attractive		*	*			*	*		*		*	

Some tiles in route 1 but not in route 2 and 3, are lifted up by the over-growing tree roots and are not well maintained or repaired. The other parameter related to the surrounding environment namely, the rout is clean and free from unwanted odour is rated positively in routs 2 and three and negatively in rout 1. The auditors reported that in route 1 there was no dustbin or garbage area provided along the route and thus people just threw the litter into landscape tube along the route.

Comparing the outcome of auditing the three routs shows that they have almost the same number of positive and negative ratings. Rout one and two have 9 positive points each, while rout three has 10. As long as the parameters in the checklist were not given different importance, it can be said that the pedestrian environment of the three routes in precinct 16 is nearly of same quality. The three routs according to auditing, need improvement on the street frontage, tactile along the walkway, places to stop and rest, shadow and protection from rain.
Precinct 14

The quality of pedestrian in this precinct seems to vary from one route to another. The vast majority of the ratings were found different in the three routes. There is four-way intersection along route 2 and 3 but not along route 1. People can walk side by side in rout 3 but not in route 1 and 2. Places to stop and rest such as benches and seats, particularly for elderly and children were found in route 1 but not in route 2 and 3. There are broken segments in rout 2 but not in route 1 and 3. Only rout 2 leads to the neighbourhood facilities. This route doesn't lead to public transport stop while the other two routes do. The three routs however, share positive and negative rating for some parameters. The positive point is that there is sufficient space for people with prams and wheelchairs while the negative points are the absence of tactile along the walkway and the absence of protection from sunshine and rain. The assessment of safety through auditing shows that the three routes in precinct 14 share positive rating only for the sufficient time given by traffic light. The other parameters have different rating for different routes (Refer to table 1).

Comparing the three routs of precinct 14 shows that rout 3 is having the largest number of positively rated parameters. It has 10 positive points. Rout 1 has 7 while rout 2 has 8.

Comparing the auditing of the two precincts clearly shows that some of the parameters were rated totally positively in both the cases, some were rated totally negatively in both of them and some were rated negatively and positively in each case. The last two cases are:

- Tactile and route protection were not found in both the neighbourhoods. Places to stop and rest were totally absent in precinct 16 while they were found partly in precinct 14.
- The street frontage which was a shortcoming in the three routs of precinct 16 recorded three positive ratings in precinct 14.
- Parameters related to zebra crossing location and to the connectivity of the route with the neighbourhood facilities scored two negative ratings each in precinct 14. All their scores in precinct 16 were positive.

The outcome of the auditing clarify that pedestrian environment quality may vary significantly from neighbourhood to another and even within the neighbourhood itself. In addition, although the neighbourhood is well planned, there may be found some shortcomings in producing an environment which is fully equipped for pedestrian.

Questionnaire

Walking habit

When asked about their weekly frequency of walking, 8 (26.7%) respondents claimed that they walk once a week, 10 (33 %) respondents walk 3-4 times a week and 12 (39%) respondents walk every day in Precinct 16. It is clear that the respondents of precinct 16 make little walking. In precinct 14, 9 (30%) respondents claim that they walk once a week, 15 (50%) respondents walk 3-4 times a week and 5 respondents (20%) walk every day. Like the earlier precinct, walking here is also not much per week. If the questionnaire however, included inquiry about the time of walking then, the picture about the amount of walking in each neighbourhood would be clearer.
Walking purpose
 Here, the respondents were asked to rank six walking purposes from one as the highest importance to 6 as the lowest. Rank mean was calculated for the values given by the respondents for each purpose. The highest mean indicates the highest rank for the purpose by all the respondents. The outcome is presented in table (2).

Comparing the means in the case of precinct 16 shows that, the main concern of the respondents' walking is to reach public transport. Entertainment and recreational leisure came as the second purpose for walking. Making physical exercises came as the third purpose. The fourth, fifth and sixth places were occupied by Social interaction (meeting neighbours), Shopping and reaching other services and Visiting neighbours in other buildings respectively. The ranks in precinct 14 came with some differences. While the first, third and fourth ranks were as same as those in precinct 16, the other position in precinct 14 were different. The rank means for Sporting and entertainment were equal putting both in third position. Positions 2 and 5 went to shopping and visiting neighbours respectively.

Walking promoters

The respondents were asked to rank seven factors that are believed to affect the decision to walk, from one as the highest rank to 7 as the lowest rank. Rank mean was calculated for the values given by the respondents for each factor. The highest mean indicates the highest rank given by all the respondents. The outcome is presented in table (3).

Table (2): Walking purposes and the preference of the respondents and its mean (Survey 2014)

Walking purposes	Precinct 16									Precinct 14								
	1	2	3	4	5	6	Total	Mean	Rank	1	2	3	4	5	6	Total	Mean	Rank
Entertainment and recreational leisure	7	7	9	2	3	2	30	**4.23**	**2**	1	6	12	4	3	4	30	**3.53**	**3**
Shopping and reaching other services	1	5	6	3	4	11	30	**2.76**	**5**	6	7	5	5	2	4	30	**3.8**	**2**
To reach public transport	15	7	4	2	0	2	30	**4.96**	**1**	19	7	2	1	0	1	30	**5.33**	**1**
Social interaction (meeting neighbours)	2	0	9	9	5	5	30	**3.0**	**4**	1	1	2	10	8	8	30	**2.43**	**4**
Visiting neighbours in other buildings	0	3	3	7	10	7	30	**2.5**	**6**	1	2	1	2	11	13	30	**2.03**	**5**
Sporting	3	11	3	2	3	8	30	**3.5**	**3**	2	7	7	8	1	5	30	**3.53**	**3**

Table (3): walking promoters and their ranking by respondents, the total number of respondents and the statistical mean of ranking (Survey, 2014)

Walking promoter	Precinct 16									Precinct 14								
	1	2	3	4	5	6	7	Total	Mean	1	2	3	4	5	6	7	Total	Mean
Safety from crime	7	11	5	1	1	2	3	30	5.13	10	10	6	2	1	1	0	30	5.76
Safety from traffic	1	6	11	5	2	4	1	30	4.43	1	4	16	5	2	1	1	30	4.66
A pleasant, clean and comfortable neighbourhood	1	3	4	6	6	4	6	30	3.36	1	4	1	9	5	3	7	30	3.33
Good quality pedestrian walkway	2	2	3	10	7	2	4	30	3.76	0	0	2	4	10	7	7	30	2.56
Parking is difficult in local shopping area	0	1	3	2	8	8	8	30	2.56	1	2	3	3	6	10	5	30	2.96
There are alternative routes for getting from place to place	0	1	3	5	4	9	8	30	2.63	0	0	1	6	5	8	10	30	2.33
Easy walking distance to services	18	8	2	0	1	1	0	30	6.30	18	7	3	1	0	1	0	30	6.30

The first rank in both the neighbourhoods went to the factor related to the location of the facilities in the neighbourhood and to pedestrian connectivity between those facilities and the houses of the neighbourhood. This

factor can be provided by a good design of the neighbourhood where reasonable distribution can be made and good connectivity can be provided in such a way that every facility is easily reachable by all the residents. All the routes of the precinct 16 provide good connectivity with the services and transit stop. In precinct 14, there are shortcomings in connectivity. The second position in both the cases was occupied by safety from crime. This can be reached through urban and architectural design as well as through security arrangements in the neighbourhood such as CCTV installation. Safety from crime arrangements is good in precinct 16 and acceptable in precinct 14 where only route 1 has some shortcomings (refer to table 1). Safety from traffic is ranked third in both the neighbourhoods. Fourth position in the case of precinct 16 was related to the quality of pedestrian walkway. This parameter was given the sixth position in the case of precinct 14. The auditing pointed at critical issues in both the neighbourhood related to this parameter (Table 1). Pleasant, clean and comfortable neighbourhood was given the fifth rank in precinct 16 and fourth rank in precinct 14. Precinct 14, according to the auditing has good quality surroundings while precinct 16 has critical issues related to this parameter. The sixth position in precinct 16 went to the availability of alternative route for getting from a place to another while the seventh position was occupied by that parameter which is related to difficulties in car parking in local shopping area. These two parameters were given seventh and fifth positions respectively in precinct 14.

Neighbourhood pedestrian walkway quality

In this part, the respondents were asked to rate the parameters shown in table (4) from 1 as strongly disagree to 5 as strongly agree. Rating mean for each parameter was calculated. Discussion on reading the means in each precinct is in the following.

Precinct 16

Reading the calculated means for this precinct shows that all the parameters related to safety from crime got a moderately positive rate. Safety from crime was ranked as the highest promoter for walking. It seems that people still do not feel well secure although CCTV can be easily noticed by walkers as the auditing showed.

Factors related to safety from traffic such as the location of zebra crossing and the sufficient time given to cross the road at the traffic light and other factors were rated positively in precinct 16. This means that this precinct provides safe pedestrian environment from traffic. The parameters related to surroundings were moderately rated. Factor related to the surroundings was not highly ranked by the residents of precinct 16, as a promoter for walking. As for the pedestrian walkway quality, the respondents gave high rate to the parameters related to the capacity of the walkway and its safe separation from traffic. The same factors were positively noticed in the auditing checklist. Maintenance of the walkway was moderately rated. While protection from rain and the support to disabled such as blind were rated low. The last two factors were found to be problems in the auditing for this precinct. Pedestrian quality was ranked fourth out of 7 promoters for walking which shows that not much importance was given by the residents of precinct 16 to this factor. Table 4 further shows that, regarding the street quality, the respondents strongly feel the presence of walkways in their neighbourhood and moderately feel that they have alternative routes to move from one place to another. In addition, they feel that there are four-way intersections disturbing their walking. The presence of alternative routes came last in walking promoters ranking.

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Table (4): Pedestrian environment criteria, rating and the rating mean (Survey, 2014)

Criteria in the neighbourhood	Parameters	Precinct 16							Precinct 14						
		Strongly agree (5)	Agree (4)	Not sure (3)	Disagree (2)	Strongly disagree (1)	Total	Mean	Strongly agree (5)	Agree (4)	Not sure (3)	Disagree (2)	Strongly disagree (1)	Total	Mean
Streets	There are alternative routes for walking from one place to another in the neighbourhood	0	16	0	14	0	30	**3.06**	3	18	2	7	0	30	**3.56**
	There aren't four-way intersections in the neighbourhood	2	25	3	0	0	30	**3.96**	15	14	1	0	0	30	**4.46**
	There are sidewalks along most of the streets	16	12	0	2	0	30	**4.40**	4	22	0	4	0	30	**3.86**
Pedestrian walkway	People can walk side by side	10	20	0	0	0	30	**4.33**	2	23	1	4	0	30	**3.76**
	There is sufficient space for people with prams and wheelchairs	10	20	0	0	0	30	**4.33**	2	23	1	4	0	30	**3.76**
	There aren't broken segments along the walkway	0	19	0	11	0	30	**3.26**	1	10	1	18	0	30	**2.80**
	There is safe separation between walkways and car roads	2	25	1	1	1	30	**3.86**	0	25	0	5	0	30	**3.66**
	The footpath is shaded and protected from rain	1	7	0	12	10	30	**2.23**	0	0	0	22	8	30	**1.73**
	There is tactile along the pedestrian walkway	1	3	1	7	18	30	**1.73**	0	0	0	12	18	30	**1.40**
Surrounding	The neighbourhood area is clean and free from unwanted smells	1	12	2	13	2	30	**2.90**	3	19	0	8	0	30	**3.56**
	The street frontage looks interesting, clan and attractive	0	21	0	9	0	30	**3.40**	2	23	1	6	0	30	**3.90**
Safety from traffic	Traffic along the street I live in makes walking unpleasant	3	3	1	12	11	30	**2.16**	6	6	2	9	7	30	**2.83**
	Zebra crossing are conveniently located at the intersections	5	25	0	0	0	30	**4.16**	7	19	0	4	0	30	**3.96**
	Traffic light gives enough time to pedestrian to cross the road	9	21	0	0	0	30	**4.30**	9	20	0	1	0	30	**4.23**
Safety from crime	Streets are well lit at night	5	18	0	7	0	30	**3.70**	1	15	3	10	1	30	**3.16**
	I feel unsafe walking during daytime	1	8	3	13	5	30	**2.56**	1	11	0	14	4	30	**2.70**
	I feel unsafe walking during night-time	2	8	2	16	2	30	**2.73**	8	12	0	6	4	30	**3.46**
	Security arrangements such as CCTV makes it safe to walk	3	10	5	12	0	30	**3.13**	1	10	2	17	0	30	**2.83**

Precinct 14

In this precinct, the respondents seem to be unsure about the arrangements for safety from crime. They moderately rated all the parameters related to this point. Safety from crime was given high importance in the ranking of walking promoters. Next, it seems that the respondents are satisfied with the safety from traffic. They positively rated two factors and moderately the third one. Safety from traffic was in the third rank in the promoters list made by the residents of this precinct. The factors related to the quality of the surroundings were rated about 4 which indicates the agreement of the respondents on the good quality of the surroundings. The quality of the surrounding environment was ranked by the respondents of precinct 14 as fourth out of seven walking promoters. This indicates the moderate importance given to these factors by the respondents in this precinct. According to the respondents, the quality of pedestrian walkway in precinct 14 seems to have problems. Only one parameter was moderately rated while the rest were negatively rated. The quality of pedestrian environment was ranked sixth out of seven walking promoters. The checklist shows critical problems in the pedestrian environment of the precinct 14. The rating of the street quality may indicate that the respondents are not much happy about this criterion. One parameter was positively rated; another was moderately rated while the third was negatively rated.

Nieghbourhood Walkability Scores

In order to draw a clearer picture for the walkability of each precinct, "walakbility score" as suggested by the research team, was calculated. Walkability score is the average score of the parameters that are linked with and define a walking promoter and are common in both the checklist and the questionnaire. It has been found that four promoters can be selected as they can be linked with and defined by parameters that are common in the checklist and the questionnaire. They are: Safety from crime, safety from traffic, good quality pedestrian environment and pleasant, clean and comfortable neighbourhood. Features that can be of importance to each promoter and common in the checklist and the questionnaire were grouped as in tables (5 and 6). To calculate the likability score for each set of parameters related to each one of the promoters, the following steps were taken:

- Each parameter was assigned 0,1,2 or 3 according to its positive reporting in the checklist
- Each parameter was assigned 5,4,3,2 or 1 according to the rate given to it in by the respondents.
- Each parameter was assigned the score given to the relevant promoter in the promoter rank list.
- The assigned values were summed up. The score is out of the sum up of the maximum value of all the assigned values which will reach as high s 14. Then the equivalent value out of 100 is calculated.
- Then, the average of the scores of each group of parameters was calculated.

Reading the individual and average scores in the two precincts is presented below.

Precinct 16

As table (5) shows, the average score of the parameters linked with safety from traffic was as high as 86.6%. Safety from crime was ranked second. Safety from traffic which was ranked third scored 86.17%. Good quality of pedestrian walkway which took the fourth rank, scored 62.8 while the fifthly ranked promoter namely pleasant, clean and comfortable environment, scored 54.69. Based on the scores, it is possible to say that highly ranked promoters are positively found in the environment of precinct 16.

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Table (5): Parameters, relevant walking promoters and walkability scores, precinct 16 (Authors, 2015)

parameters	Promoters	Checklist rating	Questionnaire rating	Promoters rank	Maximum score 14	100%
Walker can notice security features such as CCTV	Safety from crime	3	3.13	6	12.13	86.60
Average for Safety from crime						86.60
There aren't four-way intersection along the rout	Safety from traffic	3	3.96	5	11.96	85.39
Zebra crossing is properly located wherever needed to help pedestrian to cross	Safety from traffic	3	4.16	5	12.16	86.82
Walkway is safely separated from the car road	Safety from traffic	3	3.86	5	11.86	84.68
There is enough time at the traffic light to cross the road	Safety from traffic	3	4.30	5	12.3	87.82
Average for safety from traffic						86.17
There is sufficient space for people with prams and wheelchairs	Good quality pedestrian walkway	3	4.33	4	11.33	80.89
People can walk side by side	Good quality pedestrian walkway	3	4.33	4	11.33	80.89
Shadow is provided either by big trees or by shelter	Good quality pedestrian walkway	0	2.23	4	6.23	44.48
There is tactile along the walkway	Good quality pedestrian walkway	0	1.73	4	5.73	40.91
There is broken segments along the walkway	Good quality pedestrian walkway	2	3.26	4	9.26	66.11
The rout is clean and free from unwanted odour	Good quality pedestrian walkway	2	2.90	4	8.9	63.54
Average for good quality pedestrian walkway						62.80
The street frontage is clean and looking interesting and attractive	Pleasant, clean and comfortable neighbourhood	0	3.40	3	6.4	54.69
Average for Pleasant, clean and comfortable neighbourhood						54.69

Precinct 14

Reading table (6) which present the scores for precinct 14, shows that the parameters linked with safety from crime scored 77,23%. This promoter came second in the rank list. Safety from traffic which was given the third rank, scored 77.3%. Good quality pedestrian walkway which occupied the sixth place in the rank list, scored 38.9%. The fourthly ranked promoter namely pleasant and clean neighbourhood scored 77.82%. Based on this outcome, it can be said that the high rank promoters are positively found in precinct 14.

Table (6): Table (5): Parameters, relevant walking promoters and walkability scores, precinct 16 (Authors, 2015)

parameters	Promoters	Checklist	Questionnaire rating	Promoters rank	Maximum score 14	100%
Walker can notice security features such as CCTV	Safety from crime	2	2.83	6	10.83	77.32
Average for Safety from crime						77.32
There aren't four-way intersection along the rout	Safety from traffic	1	4.46	5	10.46	74.68
Zebra crossing is properly located wherever needed to help pedestrian to cross	Safety from traffic	1	3.96	5	9.96	71.11
Walkway is safely separated from the car road	Safety from traffic	2	3.66	5	10.66	76.11
There is enough time at the traffic light to cross the road	Safety from traffic	3	4.23	5	12.23	87.32
Average for safety from traffic						77.30
There is sufficient space for people with prams and wheelchairs	Good quality pedestrian walkway	3	3.76	2	8.76	62.54
People can walk side by side	Good quality pedestrian walkway	1	3.76	2	6.76	48.26
Shadow is provided either by big trees or by shelter	Good quality pedestrian walkway	0	1.37	2	3.37	24.06
There is tactile along the walkway	Good quality pedestrian walkway	0	1.40	2	3.4	24.27
There is broken segments along the walkway	Good quality pedestrian walkway	2	2.8	2	6.8	48.55
The rout is clean and free from unwanted odour	Good quality pedestrian walkway	3	3.65	2	8.65	61.76
Average for good quality pedestrian walkway						38.9
The street frontage is clean and looking interesting and attractive	Pleasant, clean and comfortable neighbourhood	3	3.9	4	10.9	77.82
Average for Pleasant, clean and comfortable neighbourhood						77.82

Interview

Precinct 16

Two females (17 and 58 years old) and a male (46) were interviewed. Security issues were the main concern for two of the interviewees (17 and 58 years ole) while the third who is a governmental employee has no problem with security in the neighbourhood. "Safety has to be improved by adding more security features and it would be better to have security guards to guard the neighbourhood area" The 17 years old said. The three interviewees were satisfied with the quality of pedestrian environment. The female interviewee walks or cycle to her school. The 58 years old respondent however, mentioned that along her walkway there is signage in the middle of the walkway so that interrupts her smooth walking.

The three interviewees complained of traffic created by outsides. Cars belong to outsiders are parked at the neighbourhood and the owners go to the nearby shopping mall. This increases traffic within the neighbourhood. The three interviewers appreciated the neighbourhood environment. "There are cleaners and gardeners who come and clean the dried leafs and water the plants in the neighbourhood" claimed the 46 year old man. The main obstacle to

them is the absence of protection from sun and rain along the walkways. "Ii is not easy to walk under the heavy rain as the neighbourhood walkways are not protected" claimed the 17 years old female respondent.

Precinct 14

The three interviewees here are a male 21, a male 60 and a female 32 years old. The discussion showed that although there was no security system installed in the neighbourhood, the interviewees feel safe. Strangers to the area are seldom seen around. "I still feel safe while walking in spite of the absence of CCTV in the area. I however, prefer to walk during daytime. The locality is too quite during the night" said the 60 year retired interviewees. Next, the three interviewees declared that there wasn't much car traffic on the neighbourhood roads. The traffic is heavy on the surrounding main roads. However, it is still not disturbing to cross those roads due to the availability of well organised cross sections. The 32 years old female interviewee mentioned about the presence of motorcycles riders in the locality roads creating noise and making it unsafe to walk during their presence. Then, two interviewees expressed their satisfaction with the walkable distance to the public bus stop. "I walk to the transit stop every working day, It is convenient" the 32 female respondent said. The three interviews however, complained of the exposure of the walkways to rain and to sun shine. "Against walking I prefer to drive when it is raining" said the 60 years old male. The interviewees also complained about the location of the facilities away from the neighbourhood. "Café and grocery shops should be located nearby with no need to cross main roads" said the 21 years old male. According to the three persons, the environment of their neighbourhood is clean and comfortable. Its green elements and other design elements enhance its aesthetic aspects.

Conclusion

The survey has clearly shown that the quality of pedestrian environment may significantly vary from neighbourhood to another and even from one route to another in the neighbourhood. For instance, the parameter of the street frontage is clean and looking interesting and attractive was positively checked in the three routs of precinct 14 and negatively in the three routs of precinct 16. This indicates the complexity of examining the walkability of neighbourhood. This complexity was mentioned by Clifton et al. (2007) cited in Praveen K. Maghelal and Cara Jean Capp (2011).

Easy walking distance to the facilities of the neighbourhood, safety from crime and safety from traffic were ranked as the most important walking promoters by the respondents. Pedestrian walkway quality and pleasant and clean environment were given low ranks.

The two precincts had a set of features that can well serve that set of promoters which were highly ranked by the respondents. Based on this, it can be said that the two precincts have good quality pedestrian environment. The interviews support this result. The outcome of questions related to walking frequency however, indicates low level of walking in both the neighbourhoods. 40% of the respondents in precinct 60 and 20% in precinct 14 walk every day. This result is in line with other research findings such as Sabeen, Q and Ho, C.S. (2011), about little walking in urban areas of Malaysia. Further, The checklist, the questionnaire and the interviews indicate some critical issues in the pedestrian environment of each neighbourhood. The common critical problems are related to:

- Absence of protection of the walkway from rain and sunshine;
- Need for tactile along the routs;
- Need for places to stop and rest such as benches and seats, particularly for elderly and children;
- Maintenance of the walkways.

Although the field observation and the questionnaire indicated positive rating for safety from crime, the interviews showed that people were still concern about security arrangemens in their neighbourhoods.

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Additional Resources:
[1] http://www.marc.org/Community/pdf/walkable_communities.pdf
[2] http://www.pedbikeinfo.org/data/factsheet_health.cfm
[3] http://www.sustainability.utm.my/cipd/files/2011/10/Towards-Putrajaya-Green-City-2025-Implementing-Neighbourhood-Walkability-In-Putrajaya.pdf