

## LEGIBILITY OF NEIGHBORHOOD PARKS AND ITS IMPACT ON SOCIAL INTERACTION IN A PLANNED RESIDENTIAL AREA

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### Abstract

*Neighbourhood parks are designed to provide opportunities for leisure and communal activities for the residents. However, studies have indicated that social interactions in these spaces are not at a satisfactory level. In the urban design context, a good public space should be legible to the observers. Legibility refers to the apparent clarity of the cityscape that directs people's movement, pattern of activities and form of interaction in public spaces. This paper discusses park's legibility and its impact on social interaction within a neighbourhood. The results presented are based on a questionnaire survey and a mental mapping exercise conducted with residents in the city of Putrajaya, Malaysia. The results demonstrate a strong relationship between the park's legibility and the social interactions among the park users. A clear structure of the setting and fewer sight obstacles found within the parks influence residents' pattern and the Intensity of outdoor activities. The findings contribute to the development of legible environments in neighbourhood park design, its positive impact on social interaction, and social bonding among the residents.*

**Keywords:** Legibility; Social Interaction; Neighbourhood Park; Putrajaya

### INTRODUCTION

Public open spaces are designed to fulfil human needs (Al-Bishawi & Ghadban, 2011), and social interaction is one of the most important needs (Hatfield et al., 1994). Hence, neighbourhood parks as crucial public open spaces for social activities, afford opportunities for contact which include proximity and convenient access to public facilities, particularly in urban residential areas (Azmi & Karim, 2012). Green open spaces within the parks allow residents to sit, relax and meet one another. These spaces support physical activities, social interactions, enjoyment of nature and provide an escape from hectic city life (Brown et al., 2013) towards a better quality of life. However, increasing urban growth had contributed to the weakening of the social cohesion and social attachment in urban areas despite all the efforts to promote public parks in cities during the end of the last century (Greenbaum, 1985; Ujang, 2014). Various studies in many parts of the world have identified the lack of social interaction in a form of shared experiences among residents in urban residential areas (Hari & Kujala, 2009). In this context, the physical living environment has been identified as one of the main factors that influence residents' outdoor activities and the use of public spaces for social interactions (Gehl, 2010). Social interaction is influenced by the configuration of spaces that leads to numerous opportunities for social contact in public places (Lelévrier, 2013). Findings from previous studies raise a legitimate question: despite the presence of all the physical elements of social interactions and wellbeing in public parks - why the social interaction among park users is still low? How coherent is the visual and physical environment to influence the social use of public spaces? This paper examines the neighbourhood parks of a planned city in Putrajaya, Malaysia to understand the relationship between legibility in park design and its influence on social interaction.

## MAKING BETTER PLACES

The core of urban design concern is making better places for people (Carmona et al., 2010). The concept of place deals with the relationships between human and land. A place is constructed by the physical form, activity, and meaning (Tuan, 1977). It is important to examine primarily the concept of “sense of place” to comprehend what stimulates people to interact with their environments. Sense of place is the principal concept relating to a place that describes the liaison between human beings and their spatial settings (Jorgensen & Stedman, 2001). One of the important constructs that define sense of place is place identity which is defined as the bond between the personal identity and the physical environment (Proshansky et al., 1983). This relationship is shaped as a result of a mental construction process of the information received from the landscape, which is transformed into a cognitive image (Yeung, 1996). The clarity of this image is attributable to certain order and coherence in the structure of the physical environment. Therefore, to develop the sense of place and identity, it is fundamental to examine the clarity and legibility of the physical setting, in this case, the neighbourhood parks in relation to their social use and functions.

## LEGIBILITY

Legibility is a vital attribute for good and successful places (Ujang & Shuhana, 2012). It refers to the characteristic of being clear enough to be understood (Lynch, 1960). Legible landscape means having easily recognized elements within a setting. It is determined by the quality of the built environment, its clarity, simplicity, continuity, rhythm and the dominance of unity with all the elements of the setting (Gehl, 1971). It is one of the main physical attributes that influences the popularity of a park and its utilization (Karuppanan & Sivam, 2012). Legible spaces strengthen users’ attention, clarifies their perception and their mental cognition towards the spaces. These benefits promote positive relationships between people and the environment and support social connectedness and interaction among residents (Bounds, 2008). Several empirical studies have identified the positive relationships between the legibility of streets, markets and the social interaction (Ujang, 2012; Yeung, 1996). Realizing the importance of social sustainability of neighbourhoods in the globalised urban environment, this study examines the legibility of neighbourhood parks within a planned residential area and its impact on social interaction.

## NEIGHBOURHOOD PARKS

A neighbourhood park is the most important element that supports the sustainability and the economy of living because it offers a space for resident’s connectedness with each other (Neal, 2003). It has an arrangement that promotes the family-like lifestyle for the community (Ratcliff, 1975). They are large public gardens used as a recreational ground within walking distances of residents home i.e. between 400 to 800 meters (Hultsman et al., 1987). Designed as a physical and social space for a pragmatic and effective utilization, a neighbourhood park functions as a unit that provides residents with all the convenient access to public facilities (Azmi & Karim, 2012). It is designed to reflect community and place identity by developing a positive relationship between space, environment, and society (Carmona et al., 2010). Hence the park design influences the social interaction among the users.

## SOCIAL INTERACTION

Social interaction is a process of mutual stimulation and interactivity between at least two people. It includes all forms of communication such as cooperation, competition, imitation, helping, playing, informing, negotiating and bargaining (Hari & Kujala, 2009). Social interaction occurs spontaneously as a result of people moving and gathering in the same space, hence signifying the importance of public places such as neighbourhood parks. Human social interaction can occur through four main behaviours: verbally, attitude or expression, gestures, actions and

postures (Hari & Kujala, 2009). The basic elements of human interaction occurring through the main social behaviour: bodily contact, proximity, orientation, gestures, facial expression, eye movements, verbal and non-verbal aspects of speech (Argyle, 1979). This paper focuses on the level of social interaction among residents in neighbourhood parks in light of the legibility attributes of the elements in the parks.

## METHODOLOGY

This study was conducted to determine the impact of park's legibility on social interaction in the context of urban residential areas. The context of the study is the planned city of Putrajaya, the new federal government administrative centre for Malaysia. The city is located 25 kilometres south of Kuala Lumpur with a population of 86 000 persons (Department of Statistics, Malaysia, 2013). The city was planned as a model for other future sustainable cities in the country focusing on the creation of a healthy urban environment. The city is divided into administrative, commercial and residential areas called precincts. Neighbourhood parks in Precinct 8 and Precinct 9 were selected as the sample areas based on the city's local plan provided by the authority (Perbadanan Putrajaya, 2002). Precincts 7,8,9 and 10 are the major residential areas with complete public facilities and comfortable environment for living. Precinct 8 has a lower density of 12,814 residents, consisting of attached single-unit type of housing. Precinct 9 has a higher density with 41,796 residents. Houses in this latter precinct consist of several high-rise condominiums (Inspection Report of Putrajaya, 2009, p.35). This study further examines the correlation between population density and the frequency of use of neighbourhood parks. The functional factors such as the volume of people have an impact on place legibility (Yeung, 1996); thus, it is assumed that a higher density of residents will provide greater park utilization.

This study employed a close-ended and self-administered questionnaire to measure the impact of independent variables (*Clear Structure* and *View Obstacles*) on social interaction within the parks. Besides, a cognitive map exercise was conducted to confirm the survey results. Both methods had been adopted in various studies on parks' legibility, their value for residents, and social bonds (Shukur et al., 2012; Rasidi et al., 2012; Talen, 2010).

The survey questionnaire addressed the users' feedback on the physical characteristics and elements of parks, and their level of social interaction by using a 5-point Likert- Scale (1=strongly disagree to 5=strongly agree). The survey involved 378 respondents sampled based on the Morgan table instructions (Krejcie and Morgan, 1970). The sample was selected randomly from the two neighbourhoods. Precinct 9 consisted 68% of the studied population while Precinct 8 provided 32% of the population samples. Thus, the 378 survey questionnaires and sketch mapping exercises were distributed as follow: 257 at Precinct 9 (257) and Precinct 8 (121). The studied population in Precinct 9 lives in 18 blocks of residential buildings with each one containing 12 floors and 16 apartments per floor, for a total of 3,456 apartments. For data analysis, SPSS version 22.0 was used to generate a random selection of 257 cases from the total number of apartments in Precinct 9. The same method of random selection was used for Precinct 8. The age of respondents was 18 years old and above, and they include both male and female samples.

The participants were asked to answer questions about the legibility of the parks (Clarity of Structure and Visual Obstacles), the intensity of social interaction and types of contact while using the parks. This procedure allowed the researcher to examine whether or not parks promote contact between users. A sketch mapping instruction was attached at the end of the questionnaire to support the results of the questionnaire survey. Respondents were requested to sketch and locate on a blank piece of paper the identifiable physical elements of their respective neighbourhood parks, indicating as many details elements as possible.

Data from both mapping output and questionnaire survey were then categorized the legible elements and the level of social interaction identified by the respondents. Based on the Likert

scale description by Bernard (2011), the questionnaire survey results could be classified into four groups with an equal range ( $m=1.0$ ), and the frequencies of the sketched mapping could into four groups with an equal range of ( $f=5$  for Precinct 8 &  $f=7$  for Precinct 9). The sketch mapping results were based on the 50 sketch maps collected from respondents (20 from Precinct 8 and 30 from Precinct 9). The classification is shown in Table 1 and Table 2. The classification is based on Bernard (2011); however the range established follows the Likert scale (1 to 5) for the questionnaire and the number of respondents in both Precincts for the sketch mapping exercise.

Then, Cronbach's Alpha was used to measure the reliability of a set of items or a single uni-dimensional latent construct. The Cronbach  $\alpha$  reliability coefficient was 0.763, which indicates a good questionnaire reliability.

Table 1: Classification of legible elements for mental mapping (Source: Authors).

Frequency (f) 50		Legibility
(f) Precinct 8 (20)	(f) Precinct 9 (30)	
16 - 20	24 - 30	Legible: Highly identifiable
11 - 15	16 - 23	Legible: Moderately recognizable
6 - 10	8 - 15	Illegible: Poorly recognizable
0 - 5	0 - 7	Illegible: Unrecognizable

Table 2: Classification of legible elements for questionnaire survey (Source: Authors).

Means (m)	Likert scale (description)	Legibility	Social Interaction
4.1 - 5.0	Strongly Agree	Highly identifiable	Strong SI
3.1 - 4.0	Agree	Moderately recognizable	Moderate SI
2.1 - 3.0	Disagree	Poorly recognizable	Weak SI
1.0 - 2.0	Strongly Disagree	Unrecognizable	None SI

## RESULTS AND ANALYSIS

### Demographic information

There were slightly more female (52.2%) than male (47.8%) among the 339 respondents participated in the survey. The majority of the respondents were between 26 and 45 years old (41%) The lowest age group were the elderly above 66 years old (4.4%). As for the income of respondents, the majority (70.5%) gain less than RM4000 per month. Regarding education, diploma and bachelor holders took the larger percentage respectively at 32.7% and 42.2%, with only 6.2% master holders. As for ethnicity, there were Malay (86.1%), Chinese (10.3%), and Indian (3.2%).

In addition to the density differences, the most striking feature between the two precincts is mainly the social class variation. Precinct 9 contains the greater number of workers and middle-class residents earning less than RM2000/month that constitute 89.6% and 93.4% of SPM certificate school leavers. However, in Precinct 8, 59% of respondents earn between RM 4000 and 6000. The latter also has more postgraduate degree holders (60% of the Master holders and 100% of PhD holders live in the Precinct 8).

### Legibility of the neighborhood parks

#### a) Results from questionnaire survey

Crosstab statistics was used to identify and compare the legibility based on means scores between the Precincts 8 and Precinct 9. Table 3 shows the respondents' feedback on the parks' legibility through the main variables which are Clarity of Structure (Edges, Nodes, Landmarks, Paths and Districts) and Visual Obstacles. There were significant differences in visual obstacles

variable between Precinct 8 (m=2.27), and Precinct 9 (m=3.58). This trend can be associated with several reasons. One of them is the layout of the parks. The Park in Precinct 9 is designed as a concave curve while the Park in Precinct 8 has a convex curve shape. The form of Precinct 9 park is circular thus it has higher visibility when viewed from within the park. The legibility of this park is intensified by the influence of two physical characteristics: 1. the park was laid out on concave curve which allows better views with less sight obstacles; 2. the regular form of the park (circular shape) allows users to see the whole park from a single point (as shown in Figure 2). On the other hand, the convex curve shape of the park in Precinct 8 makes it difficult for observers to view the whole park from a single point. Another factor that might influence the visual obstacles is the lack of face to face seating orientation in the parks in addition to the very few number of seating provided, which is valid for both parks.

Regarding the Clarity of Structure, results indicated a major difference between the two parks. Moderately recognizable elements were recorded in Precinct 9 park (m=3.70), and poorly recognizable ones in Precinct 8 park (m=2.73). The results indicated that the Park in Precinct 8 has significantly lower structures and more view obstacles when compared to Precinct 9 Park. These results suggest that the Park in Precinct 9 is more legible than the Park in Precinct 8.

Table 3: Results on the legibility of the parks in Precinct 8 and Precinct 9 (Source: Authors).

Construct	Variables	Items versus precincts	Precinct 8 N=107			Precinct 9 N=232								
			Legibility			Legibility								
Legibility	Clear structure	Activities in the park can be seen from outside	Poorly recognizable	M	Sd	Se	Moderately recognizable	M	Sd	Se				
		The park is a very noticeable area												
		The location of the park is very convenient												
		There are many gathering places												
		There are many landscape elements												
		The walkways are very comfortable to use												
	Visual obstacles	Activities in the park are so close from each other	Poorly recognizable	M	Sd	Se	Moderately recognizable	M	Sd	Se				
		I can see the whole park from a single point												
		The face to face arrangement of the seating allow me to talk with others												
		The park has direct views with good ability to see												
		The design of the seating make it easy for me to interact with others												
		The beauty of the park makes it more enjoyable to experience												
Carefully designed details of the elements are very attractive														
			2.73	.996	.369	3.70	.761	.234	2.47	.873	.302	3.58	.761	.321

(Where: M = mean. Sd = standard deviation. Se = standard error. N = number of respondents).

b) Results from the sketched mapping exercise

Table 4 ranks the five main components of Legibility namely Paths, Edges, Districts, Nodes and Landmarks, based on the mental maps sketched by the respondents. Results indicated that the Park in the Precinct 8 is less legible than the Park in Precinct 9, with the main differences in Edges (P8: f=06; P9: f= 19) and Nodes (P8: f=10; P9: f= 21). Edges in the sketch mapping outputs were identified by the parks' boundaries and the resting places. For the Nodes, the

researcher identified strategic points like junctions between entrances and the park’s path, as points of orientations for users. From the Figure 1 below, it is obvious that Edges and Nodes in the Park in Precinct 8 are poorly recognized as compared to Precinct 9. These outcomes support the results of the questionnaire survey.

Table 4: Legibility results of the two parks from sketch mapping (Source: Authors).

Items versus precincts	Frequency		Legibility
<b>Edges</b>	Precinct 8	06	Poorly Identifiable
	Precinct 9	19	Moderately Identifiable
<b>Nodes</b>	Precinct 8	10	Poorly Identifiable
	Precinct 9	21	Moderately Identifiable
<b>Landmarks</b>	Precinct 8	16	Highly identifiable
	Precinct 9	23	Moderately Identifiable
<b>Paths</b>	Precinct 8	14	Moderately Identifiable
	Precinct 9	22	Moderately Identifiable
<b>Districts</b>	Precinct 8	11	Moderately Identifiable
	Precinct 9	20	Moderately Identifiable

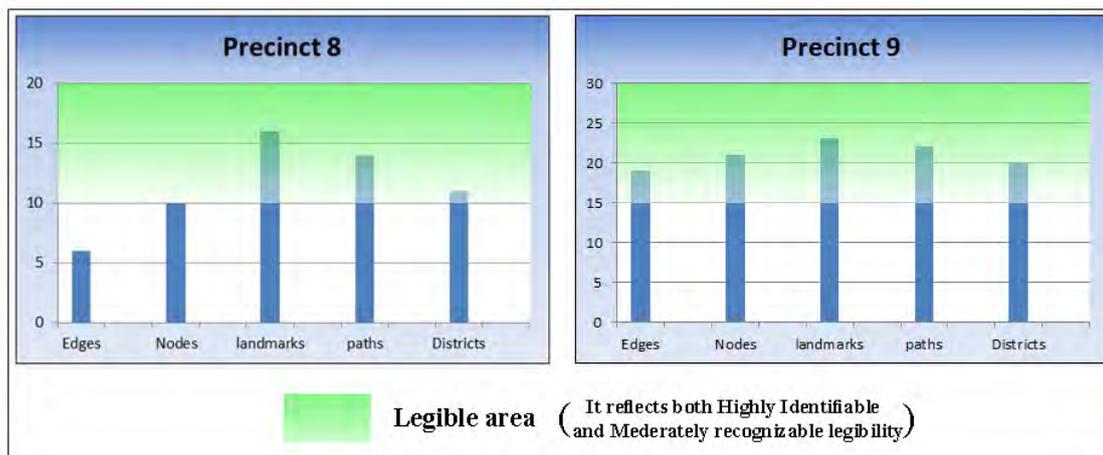


Figure 1. Legibility results of the two parks from sketch mapping (Source: Authors).

### Social interactions within the neighborhood parks

Table 5 shows the level of social interaction recorded in Precinct 8 and Precinct 9 parks. The level of social interaction is measured based on the level of engagement and the ability of the parks to encourage contacts. Firstly, the users’ level of engagement was determined by the duration of visit in the parks. Secondly, the study determined whether the parks promote isolation or contact through the length of meeting among the park users. Results indicate that the mean values of social interaction for both parks ranged from 2.89 to 3.76. The intensity of meeting had the highest mean values ( $m= 3.76$ ) that was recorded in Precinct 9. This result reflects a moderate social interaction. At the same time, the Precinct 8 park recorded a weak intensity of meeting ( $m=2.89$ ). These scores are contributed by the level of visual obstacles and the distance between activities within the two parks. The duration of outdoor activities was relatively high for Precinct 9 ( $m=3.75$ ) which reflects a moderate outdoor duration. On the other hand, the Precinct 8 recorded a weak outdoor duration with ( $m=2.91$ ). These outcomes reflect a lower level of social interaction in Precinct 8 compares to the Precinct 9.

Table 5: Level of Social interaction in the Precinct 8 and Precinct 9 neighbourhood parks (Source: Authors).

Construct	Variables	Items versus precincts	Precinct 8 N= 107			Precinct 9 N= 232		
			Level of SI			Level of SI		
Social Interaction	Engagement with park	I participate in many activities within the park	Weak social interaction			Moderate social interaction		
		The park is quiet and reflect a peaceful ambience						
		The park offers good resting opportunities						
		The park allows more conversing opportunities between residents						
		There are variety of recreational interest						
			M	Sd	Se	M	Sd	Se
			2.91	.932	.491	3.75	.862	.373
	Types of contact	Many occasions for greeting	Weak social interaction			Moderate social interaction		
An occasional discussion								
A friendly discussion								
A warm discussion								
		M	Sd	Se	M	Sd	Se	
		2.89	.991	.379	3.76	.732	.553	

(Where: M = mean. Sd = standard deviation. Se = standard error. SI = Social interaction).

### Correlations between density and social interaction

A partial correlation test was performed to describe the strength and direction of the linear relationship between the level of density in the two precincts and social interaction within the parks. This statistical procedure allows the researcher to control and remove the influence of other variables on park legibility, measured in this study.

Table 6 indicates that park legibility and density are positively correlated with social interaction. The bi-variate correlation between density and engagement with park  $r(339) = .60$ ,  $p < .001$ , types of contact  $r(339) = .61$ ,  $p < .001$  are statistically significant. A partial correlation was then computed between density and social interaction, holding constant for park legibility variables (Clarity of Structure and Visual obstacle). If park's legibility variables are the principal determinant of social interaction, the partial correlation between density and social interaction should not be significant. The results suggest that there is a substantial, significant positive correlation between density and social interaction, even after controlling park's legibility' variables, namely engagement with park  $r(339) = .50$ ,  $p < .001$ , and types of contact  $r(339) = .51$ ,  $p < .001$ .

Table 6 Correlation between social interaction and park legibility and partial correlation for density

	Clarity of Structure	View Obstacles	Density	Partial correlation for Density
1. Engagement with park	.703***	.682***	.599***	.503***
2. Types of contact	-.662***	-.689***	.612***	.509***

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$  conventional definition ( $> .500$  = strong correlation)

### DISCUSSIONS

The objective of this study was to determine elements that support the legibility of neighbourhood parks and its impact on social interaction. It is also to determine whether or not the density of a neighbourhood has a positive impact on the intensity of social interaction. A statistical procedure

was used to examine the correlations between independent and dependent variables. Descriptive statistics was applied to determine the impact of park's legibility on social interaction, and inferential statistics was then used to determine whether or not density has a positive impact on the intensity of social interaction.

This study found that park legibility is influenced by various physical attributes. For instance, the visual obstacle influences park legibility. Results revealed a major difference in the level of visual obstacles between the two parks (see Table 3). This might be due to several reasons. Visual obstacles decreased within integrated activities in the park. The more segregated are the activities; the higher is the visual obstacle. Thus, the distance between activities should not be too far and should be visually linked to involve the parks users in active or passive interactions. Visual obstacles could also occur due to the lack of direct view and visibility from a single point. Figure 2 illustrates the overall shapes of the two parks. The overall shape of the park in Precinct 8 (irregular form) and Precinct 9 (regular form) revealed that regular shapes of parks especially circular, oval, square and rectangle are more suitable for allowing a direct view to park users than complex shapes (the combination of two or more regular forms). It is obvious that in Precinct 8 park, the area next to point B cannot be seen by observers staying in the areas next to the points C and D. While in Precinct 9 anyone at points A, B, C or D, can view nearly the entire park.

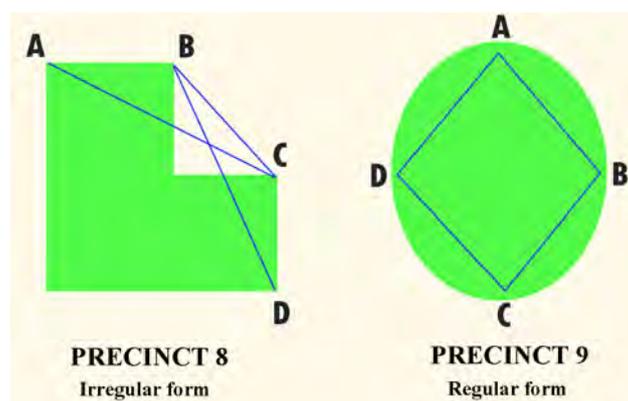


Figure 2: Overall shapes of the parks with possible view obstacles (Source: Authors).

The factors that influence the legibility of the physical elements found in this study were in accordance with Gehl (2010) who stated that a public space should be designed based on the integrated activities rather than segregated activities to avoid the problem of sight obstacles. The mental map results also indicate clearly that the most striking differences between the two parks are the edges (see Figure 1), which might explain the apparent differences in the level of legibility. That is what Gehl (2010) called as the “edge effect”. Carmona et al. (2010) also underlined the city spaces’ edges as an important component of the functional dimension of urban design. In Precinct 8 park, edges are treated as a “line” with “no thickness” while in Precinct 9 park, edges are treated as “place”, a zone with “volume” terms used by Alexander (Alexander et al., 1977). Along these edges, there are many attractive zones for standing, stopping, and creating new experiences. Hence, this study found that smooth edges that are rich in intricate details of landscape elements are important contributors for the parks legibility.

In the context of professionalism, planners usually focus on the location and the form of the boundary of parks, while landscape architects emphasize on the appropriate landscape facilities, creating scenic views, and well-designed elements. However, less attention is given to the design of the edges of the park as an element that defines boundaries and place distinction. This finding

is in accordance with Alexander et al. (1977), where he summarizes the importance of edges in making distinctive places.

The study also demonstrates that the clarity of the park's structure influences its legibility. The findings revealed a considerable difference in the Clarity of Structure between the two parks. Landscape elements were moderately recognizable in Precinct 9 park. However; they are poorly recognizable in Precinct 8. These results suggest that the clarity of the park's structure is highly influenced by the landscape cues (paths, edges, districts, nodes, landmarks) as well as the coherence of its structure. This study reaffirms the important role of the apparent clarity of structure which is the core criteria of legibility as proposed by Lynch (1960).

The study further examined the correlation between legibility, social interaction and density. The findings indicate that a strong correlation was recorded between social interaction and park legibility. This outcome is supported by Gehl (1971) who claimed that legibility of a city is determined by the quality of the built environment, which influences residents' outdoors activities. Karuppanan & Sivam (2012) also stated that legibility is one of the main physical attributes that affects the frequency of park's utilization, and encourage users to interact with each other. On the other hand, a partial correlation between density and social interaction revealed that legibility variables are not the principal determinant of social interaction. Results indicated that there is a significant positive correlation between density and social interaction. This finding is supported by other studies which stated that density of population and perceived density within parks have a high relationship with social interaction level (Argent, 2008; Neutens et al., 2012). This finding is in accordance with the core criteria of the functional dimension of urban design indicating that a sufficient density of activity and people has often been regarded as prerequisite for animation and vitality, and for creating and sustaining viable mixed use (Carmona et al., 2010) and essential for urban life (Jacob, 1961). Argent (2008) further suggested many benefits arising from higher development density. Among them are the social benefits through encouraging diversity and positive interaction.

However, this study has a limitation. Due to the broad concept of physical elements, legibility is also determined by several other physical attributes that affect the utilisation of open space including parks. These include image of places, place attachment, permeability, comfort, maintenance, activities and facilities, safety, etc. (Karuppanan & Sivam., 2012). Thus, it is suggested that a more comprehensive study of the physical environment is needed to support a more sustainable level of social interaction in residential areas.

## CONCLUSION

This study highlights the legibility as an important factor in promoting social interactions in public spaces, particularly within residential neighbourhoods. When landscape elements are easily identifiable with a relative order and structure coherence, it allows residents to have a functional sense of place, strengthen their place identity and familiarity with the urban elements.

The findings of the study will contribute to resolving the issue of underutilized neighbourhood parks within a planned residential area. Legible parks in addition to a certain critical level of density may increase the residents' feeling of connectedness within the neighbourhood, strengthen the community cohesion and may help to a certain extent reducing the cultural gap between ethnic groups by providing places to interact. The finding is a step further in the field of urban design, to improve the planning and design of neighbourhood parks towards the development of environmental and social sustainability.

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