

Assessment of Physical Environment Elements in Public Low-cost Housing

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Abstract

Acceptable physical environment is one of the main aims of facilities management. Although multiple constraints exist in providing public low-cost housing in Malaysia, the aspects of the physical environment must not be compromised in order to provide better living for the occupants. This paper examines the assessments made on the physical environment elements; the focus is on the elements in the public low-cost housing which consist of facilities, spaces and services offered in each housing unit for the occupants in Johor Bahru. The study data was obtained through questionnaires from 868 participating occupants using convenience sampling. The collected data was analysed using frequency analysis and relative important index (RII). The study revealed that the physical environment elements were crucial for the low-cost housing units. However, the major concern amongst occupants towards the physical environment were safety, security and health, utilities, privacy and location. In fact, the physical environment elements play a crucial role in developing the occupant's comfort and satisfaction. Nevertheless, a few physical elements that are of lesser concern to the occupants such as temperature, humidity, aesthetic and noise still need to be given much attention in order to improve the quality of the environment

Keywords: Physical environment elements; Public low-cost housing

Abstrak

Penerimaan terhadap persekitaran fizikal merupakan salah satu matlamat utama dalam pengurusan fasiliti. Sungguhpun banyak kekangan boleh didapati dalam menyediakan perumahan rakyat di Malaysia, aspek persekitaran fizikal tidak boleh dikompromi dalam menyediakan kehidupan yang lebih baik untuk penghuni. Kertas kerja ini mengkaji penilaian terhadap elemen-elemen persekitaran fizikal di projek perumahan rakyat merangkumi fasiliti, ruang serta perkhidmatan yang ditawarkan dalam sesebuah unit kediaman yang tertumpu di Johor Bahru. Data diperolehi melalui borang selidik yang diedarkan 868 penduduk yang diperolehi berdasarkan teknik persampelan mudah. Data yang diperolehi dianalisis menggunakan pendekatan kuantitatif iaitu analisis frekuensi dan indeks kepentingan relatif (RII). Hasil kajian mendapati bahawa persekitaran fizikal sangat penting dalam sesebuah unit kediaman perumahan rakyat. Walau bagaimanapun, elemen-elemen persekitaran fizikal yang paling dititikberatkan dari perspektif penghuni adalah keselamatan dan kesihatan, utiliti, privasi dan lokasi. Manakala, elemen-elemen persekitaran yang kurang dititikberatkan oleh penghuni seperti suhu dan kelembapan, estetik dan bunyi juga perlu diberi perhatian dalam membentuk kualiti persekitaran yang lebih baik. Secara keseluruhannya, elemen-elemen persekitaran fizikal ini merupakan aspek yang penting dalam membentuk kesejahteraan dan kepuasan penduduk.

Kata kunci: Elemen-elemen persekitaran fizikal; Projek Perumahan Rakyat

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1.0 INTRODUCTION

Public low-cost housing development with emphasis on physical environment has been around since the Eight Malaysia Plan until the Ten Malaysia Plan. The primary objective was to provide quality and affordable housing predominantly for low-

income households. During the Eight Malaysia Plan (1996-2000), a total of 615,000 low cost housing units were built by the public and private agencies. Of these, 248,000 units were built to provide housing to the low-level income group. Initially, Public Low Cost Housing Programme (PAKR) was introduced for the purpose of providing housing for low-income families in

the rural and suburban areas as well as providing basic and social amenities.

The importance of housing quality is not merely physical structure, but is also provides better environment and quality of life [31]. Theoretically, housing is seen as an entity that encompasses a number of aspects such as physical quality, location and services offered in housing [28]. Yet, housing development raises questions on whether it is designed to meet the main goal of particular aspects of the physical environment such as lighting, ventilation, size of dwelling units, etc. Generally, the housing development is seen to not only provide protection to the occupants but also to provide facilities to the residents to carry out their daily activities. Although emphasis has been placed on providing affordable quality residential homes, particularly for the lower income group, there were still a lot of complaints from the occupants with respect to the physical environment. Lack of thorough assessment on the elements of the physical environment in the public low-cost housing creates an ongoing physical environment quality.

In addition, failure to achieve quality housing will cause other more serious implications such as social problem amongst the residents, environmental pollution, mental health and high density [31]. Thus, a specific study on the elements of the physical environment should be identified so as to overcome complaints and to prevent recurrence of the same issues. Therefore, the development of low-cost housing is given emphasis by the government to provide comfortable and ideal housing especially for the low income household; the measurement of occupant's response towards the physical environment elements plays an important role.

This paper aims to present the physical environment elements for public low-cost housing based on occupant's preference.

■ 2.0 LITERATURE REVIEW

2.1 Public Low Cost-housing in Malaysia

Historically, public housing was implemented before the independence era in the year 1957, yet public housing concept was known as 'institutional quarters'. Public housing were built by the Public Works Department during the British governance in the year (1876-1957) [28]. Institutional quarters refer to government housing facilities such as the health institution, educational institution and district offices built especially for British workers that work with public institution. The only program that aims to prepare housing for local residents are the resettlement of Chinese into an area which was known as New Village.

The post-independence era public housing concept had been transformed from preparing housing only for government officers to a new home-owning democracy concept; it was the first program that include local residents. Rural public low cost housing that was initiated focused on providing housing to households with income below RM300.00 a month. On February 2002, the ministry council approved a proposal to change the policy and strategy of implementation; public low cost housing that were under state projects are now implemented under federal projects with the new name Public Housing Project (rent). Public Housing Project (rent) aims to place squatters and to provide housing for the lower income household group.

The concept, design and size of a housing project for the homogenous nature in Malaysia and all dwelling units are required in the planning and design specifications established by

the National Housing Standard for Low Cost Housing Flats (CIS2). Specifications for the different types of flats are divided into 2 groups; big cities and small towns. The types of PPR flats consist of buildings made up of 11 to 14 or 16 floors up to 18 floors in the big cities, and 5 floors in the small cities. However, the area of each residential unit available in the PPR area should not be less than 60 square meters or 650 square feet. Furthermore, the specifications for the construction of residential units in the PPR comprises of 3 bedrooms, living room, kitchen, 2 toilets and bathrooms and each unit should be rented at a rate not exceeding RM124.00 per month

2.2 Physical Environment Elements

One of the primary aim of facilities management is to provide an acceptable physical environment for the owners and occupiers of any premises. Quality of the development environment should include and consists of aspects of an appropriate design and layout of a friendly environment, the use of quality building materials and the provision of adequate public facilities with the comfort and safety of the community in mind. The quality of the environment should not focus only on the personal space but should include the development of the external environment and public space. There are some elements of the physical environment that can affect the mental development population e.g., noise, neighbourhood and density. Therefore, it can be concluded that good housing is fundamental to the health and lives of people [13]. The physical environment is one factor that influences the activity of the population in various ways [1]. Friedman, Zimring and Zube (1980) have listed some of the factors having the most influence in the context of:

1. Environmental features such as noise, air quality, drainage and topography, vegetation and aesthetics.
2. Land use such as the type and quality of the neighborhood, the density and diversity of land use
3. Support facilities such as accessibility, transport and security

Quality housing development is linked to the elements of the physical environment that is planned. Physical environment elements are arranged and designed to assess the quality of a dwelling unit. However, previous studies clearly stated the elements of the physical environment is only focused on certain elements and there is no specific guidance in the evaluation process. Therefore, the study was conducted to examine the elements of the physical environment to facilitate the process of building performance evaluation. 12 main elements that will improve the quality of life and a priority to the population have been identified. Elements of the physical environment are represented by indicators that contribute to the process of building life cycle in a long time. Table 1 shows the elements of the physical environment as well as the indicators that contribute to improving the quality of life of building occupants and building performance

Table 1 Physical environment elements and indicators

Physical Environment Elements	No. of Item	Sources
Safety, Security and Health	4	[15, 6, 8, 9, 16 & 39].
Lighting	2	[6, 9, 40 & 41].
Ventilation	4	[14, 16, 21, 42-43].
Temperature and Humidity	4	[8, 33, 43-44]
Noise	3	[22, 25 & 41]
Aesthetic	4	[5, 13 & 16]
Dwelling Unit Features	9	[9, 15-16 & 21].
Location	9	[5, 9, 12, 15-16 & 40]
Utilities	8	[12, 15,-16, 20 & 41]
Housing Condition	5	[14, 16 & 26]
Crowding/ Density		[20 & 27]
Privacy		[9, 10, 16, 33, 41-42]

3.0 METHODOLOGY

The data collected through convenience random sampling were from questionnaire survey that were conducted within the public low-cost housing occupants in Johor Bahru. A Sum of 868 occupants were involved in the data collection process which commenced in November 2011 and ended in January 2012.

3.1 Instrument

This study was using questionnaires as the main source in collecting data. Identifying the elements of the physical environment that had influence on the preference level of the occupants was very important during the design of the questionnaires. For the purpose of this research, questionnaires were designed in a simple, and easy to understand format for the respondents. This was to avoid any problems during the process of distributing the questionnaire. Socio-demographic questions are general in nature and do not contain personal questions. Questions asked are related to race, gender, age, occupation, marital status, monthly average income and the duration of occupancy of the existing flat. Sixty questions were designed to measure the residents' perception towards the physical environment; the questions were formulated using the five point Likert-scaling ranging from '1' for extremely unimportant, '2' for unimportant, '3' for neutral, '4' for important, '5' for extremely important of particular elements. Data were analysed using frequency analysis and factor analysis as carried out by the Statistical Package for the Social Sciences version 19.0.

3.2 The Reliability of Instrument

The Croanbach Alpha shows that the value of the elements of the physical environment is 0.959, higher than recommended index 0.7. The values obtained reflect that all the elements of the physical environment that are identified can be used as a tool in accordance with the level of preference amongst occupants in Public low-cost housing.

3.3 Data Analysis

The collected data were analysed using simple analysis method which is the frequency statistics analysis. Relative Importance Index (RII) is a technique for identifying the relative importance of each element of physical list that were listed in the literature [30]. The main purpose of this technique is to determine the position of each element and the physical environment indicators are considered important by the respondents. RII will

be measured based on the results of frequency analysis using the formula set out below [29].

$$\text{Relative importance index (RII)} = \frac{\sum w}{A \times N}$$

Where RII = relative importance index, 'w' is the weighting given to each elements by respondent range from 1 to 5. 'A' is highest weight for example 5 in this case; 'N' is total number of respondents. The RII ranges are from 0 to 1 and the elements will rank based on the highest value. The highest RII shows the important physical environment based on occupants preference and vice versa. The results are shown in the Table 2.

4.0 RESULT AND DISCUSSION

4.1 Respondents and Background

Public low-cost housing involved in case study were residents in Johor Bahru, who have occupied their homes for more than 5 years. Respondent's socioeconomic status is important to determine the entitlement to occupy the dwelling unit in public low-cost housing. The majority of respondents are self-employed taxi drivers, businessman etc., with a reasonable monthly average household income of RM500-RM1000. Meanwhile, the highest education level achieved amongst respondents is the Malaysian Certificate of Education (Sijil Pelajaran Malaysia). In fact, the highest number of households with a family of 4 to 6 persons makes up 57.4% of the respondents. The majority of respondents have occupied the flats for 3 to 4 years 51.4% (466 people).

4.2 Occupant's Preference

Based on the RII for physical environment elements shows Table 2, RII and the ranking of all physical environment elements are shown in Table 3. According to the ranking of all physical environment elements, the most important physical environment and the least important physical environment according to occupant's preference are discussed as follows:

Table 2 Relative importance index for physical environment elements and indicators

Physical Environments Elements	Indicators	Level of Importance					RII
		Very low importance (f)	Low Importance (f)	Moderate (f)	Importance (f)	Very importance (f)	
Safety, Security and Health	Cleanliness	0	0	48	49	671	0.962
	Fire safety	0	4	44	213	607	0.928
	Safety from criminals	0	1	47	198	622	0.932
Utilities	Safety from criminals	0	0	49	248	571	0.920
	Electricity	0	1	49	181	637	0.935
	Water Pressure	0	2	57	205	604	0.925
	Sewerage	4	5	72	255	532	0.901
	No. of Sockets	12	37	118	255	446	0.850
	Ladder and Lift	30	44	97	213	484	0.848
	Storage	29	45	194	270	330	0.790
	Drainage	17	25	112	258	456	0.856
	Telephone network	10	28	95	273	462	0.865
	Location	Nearness to town centre	26	49	147	293	353
Nearness to school/ workplace		3	12	93	274	486	0.883
Nearness to police station		0	19	86	269	494	0.885
Nearness to hospital		2	13	90	268	495	0.886
Nearness to market/ shops		5	14	94	314	441	0.870
Nearness to shopping centre		14	37	186	300	331	0.807
Nearness to religious building		5	11	77	240	535	0.897
Nearness to recreational park		11	39	178	322	318	0.807
Ease of access by public transport		10	18	87	260	493	0.878
Ventilation		Fresh air availability	1	6	122	238	501
	Odour	42	67	158	232	369	0.789
	Indoor / Outdoor Air Quality	1	4	151	308	404	0.856
	Air Movement	1	4	157	344	362	0.845
Lighting	Natural lighting	5	24	183	357	299	0.812
	Artificial lighting	3	13	150	380	322	0.832
Housing Condition	Quality of walls	14	47	150	252	405	0.827
	Quality of Floors	14	52	144	253	405	0.826
	Quality of windows	9	54	163	254	388	0.821
	Quality of Doors	10	62	152	257	387	0.819
	Quality of Painting	16	57	198	285	312	0.789
Dwelling Unit Features	Dwelling Size	9	57	211	277	314	0.791
	Size of Living room	6	56	197	273	336	0.802
	Size of Bedroom	7	58	223	261	319	0.791
	Number of Bedroom	7	63	206	284	308	0.790
	Location of Bedroom	9	72	244	272	271	0.767
	Size of Dining room	7	77	245	270	269	0.765
	Size of toilets and bathroom	10	69	236	255	298	0.776
	Laundry and washing area	19	63	244	256	286	0.768
	Size of kitchen	17	69	212	261	309	0.779
	Temperature and Humidity	Heating capacity	12	50	296	320	190
Cooling capacity		9	27	284	338	210	0.764
Humidity capacity		26	78	311	274	179	0.716
Indoor/ outdoor temperature		11	25	286	327	219	0.765
Aesthetic	Building Form	17	79	256	298	218	0.743
	External appearance	17	78	258	311	204	0.740
	Building Height	18	61	280	270	239	0.750
	Colour of Building	22	82	278	283	203	0.730
Noise	Noise from neighborhood	46	108	307	198	209	0.696
	Noise from traffic	54	122	305	189	198	0.682
	Noise from outdoor	42	132	306	194	194	0.684
Privacy		42	46	133	217	430	0.818
Density		51	77	174	217	349	0.770

4.3 Safety, Security and Health

Safety, security and health are ranked as important physical environment elements; almost all of the respondents gave full attention towards these elements. The indicators representing these elements are cleanliness (RII=0.962), fire safety (RII=0.928), Safety from criminals (RII=0.932), Public Safety (RII=0.920). These elements were selected as the main preferences for occupants living in high rise buildings. According to Goh et al (2012) elements of security is the most

important element in describing the quality of life for people in the public low-cost housing due to the criminal cases that have occurred in the neighborhood making this element more important.

4.4 Utilities

The second most important physical environment elements are utilities (RII=0.888) that consists of electricity, water pressure, sewerage, number of sockets, ladder and lift, storage, drainage and telephone network. Utilities in the building are the most important element in each element of the public low cost housing after the elements of safety, security and health. Indicators for these elements are key indicators listed by various researchers.

4.5 Privacy

Privacy was placed as the third important physical environment element (RII=0.818). This element was selected as the third preferable element amongst the occupants. Noise rate would be higher during daytime as it causes disturbances to the other occupants. Voordt and Wegen (2005) found that, generally privacy is needed by the occupants for living.

4.6 Location

The fourth important physical environment element based on occupant's preference are location (RII=0.864). The significant indicator's to represent this element is the nearness to the town centre (RII=0.807), School/ workplace (RII=0.883), police station (RII=0.885), hospital (RII=0.886), market/ shops (RII=0.870), shopping centre (RII=0.807), religious building (RII=0.897), recreational park (RII=0.807) and ease of access by public transport (RII=0.878). Public low-cost housing which have good location will facilitate occupants in their daily activities in order to fulfill their daily needs [35]. Friedmann et al. (1978) explains that the location is classified as support services in the physical environment context.

4.7 Ventilation

The fifth important physical environment element is ventilation (RII=0.863); it consists of fresh air availability, odour, indoor/outdoor air quality and air movement. Ventilation is the element that plays an important role; a very congested building, lacking ventilation will contribute towards the deterioration of indoor and outdoor air quality.

4.8 Lighting

Physical environment element associated with lighting (RII=0.849) is the element at the next rank by respondents consisting of natural lighting (RII=0.812) and artificial lighting (RII=0.832). The limited size of the housing unit is highly dependent on adequate lighting to avoid housing unit looking more crowded and dark.

4.9 Housing Condition

The next physical environment element ranked seventh as the most important element is housing condition (RII=0.820), which consists of the quality of walls, floors, windows, doors and painting.

4.10 Dwelling Unit Features

Dwelling unit features (RII=0.784) are ranked as eighth most important physical environment element by the respondents. Indicators representing the use of space in residential buildings

are the size of the dwelling which includes the living room, bedroom, dining room, toilets, bathroom, kitchen and the number and location of bedrooms, laundry and washing area. Based on the results obtained, the dwelling unit features in public low-cost housing is affecting the level of preference, satisfaction and comfort of occupants. It is proved by a study conducted by Türkoğlu (1997), Chi and Griffin (1980).

4.11 Density

Density (RII=0.770) is ranked as the ninth important physical environment element according to respondents. However, the effect of congestion in these flats can negatively affect the quality of the environment and the mental and psychological health of children. A study found that children who live in areas of high density are more prone to social problems and crime [37].

4.12 Temperature and Humidity

Temperature and humidity (RII=0.761) is ranked as the tenth important physical environment elements consisting of Heating capacity (RII=0.744), cooling (RII=0.764), humidity (RII=0.716) and indoor/outdoor temperature (RII=0.765). According to Dark (2006) low and high temperature is a significant contributor to the ill health of the occupants, especially for those living in high density building.

4.13 Aesthetic

Aesthetic (RII=0.759) is ranked as the eleventh important physical environment element. Aesthetic is the element that could not be ignored and it also describes the quality of public housing [33].

4.14 Noise

Lastly, the least preferable physical environment element is noise (RII=0.685) which consist of noise from the neighbourhood (RII=0.696), traffic (RII=0.682) and outdoor noises (RII=0.684). According to Savadisara (1989), elements of noise related to environmental quality from the research conducted in Bangkok showed a greater awareness of noise related element during development will improve the standard of living and consequently provide a more comfortable life for the occupants.

Table 3 Overall relative important index of physical environment elements

Physical Environment Elements	Level of Importance					RII	Rank
	Very low importance (f)	Low Importance (f)	Moderate (f)	Importance (f)	Very importance (f)		
Safety, Security and Health	-	-	25	105	738	0.964	1
Utilities	-	4	71	330	463	0.888	2
Privacy	42	46	133	217	430	0.818	3
Location	-	2	90	403	373	0.864	4
Ventilation	1	2	111	362	392	0.863	5
Lighting	-	11	116	390	351	0.849	6
Housing Condition	9	49	160	278	372	0.820	7
Dwelling Unit Features	4	48	221	336	259	0.784	8
Density	51	77	174	217	349	0.770	9
Temperature and Humidity	5	25	284	374	180	0.761	10
Aesthetic	8	43	259	367	191	0.759	11
Noise	32	128	325	207	176	0.685	12

5.0 CONCLUSION

In general, all the elements and indicators listed in the study are highly emphasised by the occupants in the Public Low-cost Housing. However, there are some elements that should receive more attention and emphasis so as to give maximum comfort to the residents; these include safety, security and health, utilities, privacy and location. This does not indicate that the other elements are of less importance towards improving the comfort of the residents, but the four elements mentioned above tend to affect the physical environment much more than the other elements.

As it is, elements such as dwelling unit features, temperature and humidity focused on a dwelling unit and make different based on the perception of those who occupied residential units. In addition, elements such as aesthetic and noise are given less attention by the occupants as a result of these elements are not affected their daily activities.

Thus, the elements of the physical environment should be given more attention by the Ministry of Housing and developers since the planning stage, in the future in order to provide comfort and enhance the satisfaction level of the occupants.

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