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Space Organization for Unit Plans in Malaysia - Focus on Landed Properties in Ara Damansara-

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Abstract

Malaysian modern housing typologies (such as bungalows, semi-detached houses and terrace houses) are influenced by international style and constitute unique regional characteristics because they are modified in accordance with climatic conditions and unique social, ethnic housing cultures. This research identified unique characteristics and planning principles of how rooms and spaces of a house are related and organized into coherent patterns of form and space. For the analysis, we surveyed twenty-two residential precincts that identified twenty-five unit plan types for landed properties built in Ara Damansara, Malaysia. The methodology adopted in this study consisted of a document review and field surveys. It is difficult to find unique characteristics of space organization (except for the location of bathrooms) because the form of terrace houses is standardized and limited in design from the aspect of space organization. However, the organization of bedroom space and kitchen space has strong regional characteristics that have become stereotyped for semi-Ds and bungalows. General guideline for areas of unit plans are proposed based on the results of area analysis. We also found that the areas of L + D and MB increase as the total area of the house increases; however, the remaining rooms do not increase in area as long as they satisfy appropriate standards due to the addition of multi-purpose extra rooms. This study only examined limited cases in Ara Damansara and it is difficult to generalize the findings of other new towns in Malaysia. Nevertheless, it is worthwhile to collect and systematically organize data according to typologies. Finally, the authors were able to understand the unique regional design factors to be considered for landed property housing planning in Malaysia.

Keywords

Space Organization, Unit Planning, Housing Typology, Landed Property, Ara Damansara, Malaysia

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Introduction

Background and Aims of Study

New towns have been designed and developed in modern metropolitan Asian cities to solve urbanization problems and provide mass housing for the rapidly increasing middle class. The concept of new towns originated from E. Howard's Garden City (Lee, 2006), but new towns in Asian countries constitute unique regional characteristics because they were modified in accordance with local climatic conditions and housing cultures. Kenneth Frampton (1998) and others discussed Asian

regionalism and described this phenomenon in terms of “contextual modernization.”

New urban housing typologies, such as terrace houses (row houses), semi-detached houses, bungalows (detached houses) and high-rise apartments were outcomes of international styles, but were also transformed to accommodate regional life styles and housing cultures. House forms have now evolved to be designed and settled to fit within a regional context.

A house can be understood as a series of orderly relationships among spaces and people (i.e. these relationships have patterns). Space organization in houses is a more fundamental aspect of the designed environment than shape and material (Rapport, 1977). Space organization is useful to analyze housing design and uncover the underlying compositional principles of unit plans.

This study analyzes the unit plans of major urban housing typologies in Malaysian new towns with respect to space organization. The research has the following detailed objectives: First, extract the basic components that constitute a house (i.e. what kind of rooms or spaces of a house existed in a house according to housing typologies). Second, analyze room dimensions (i.e., size and area of rooms) and find the ratio of each room’s area compared to the total area of a house. Third, understand how various arrangements of rooms can be manipulated to design major space zones of a house. Fourth, study the basic principles of how rooms and spaces of a house are interrelated and organized into coherent patterns of form and space. Finally, we identify unique characteristics of unit planning in Malaysian new towns.

Scope and Methodology of Study

The precise results of this study required the extensive collection of data on a particular new town in Malaysia or during a particular period. Malaysia has yet to construct data on housing drawings that are managed by the government or that are highly reliable; therefore, this study has the limitation of a reliance on data from a particular private sector developer.

This study examined the new township, Ara Damansara, developed by Sime Darby Berhad (SDB)¹, a representative housing developer in Malaysia. The development began in 1999 and is 97% complete. It is known as a popular township² within the metropolitan area of Kuala Lumpur, Klang Valley, a residential

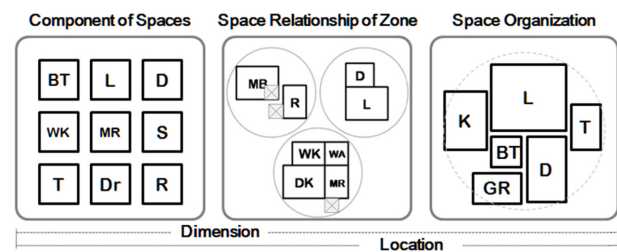


Figure 1. Framework of Analysis

area mostly preferred by Malaysians.

For the analysis, we chose twenty-two residential precincts that amounted to twenty-five housing unit plan types of landed properties built in Ara Damansara, Malaysia. The researcher collected and analyzed drawing plans and related documents while working as an intern at SDB from January 6 to May 1, 2011³, and then conducted field surveys for an accurate understanding during the same period.

Space organization is a morphological approach to understand the essence of a house. The analysis of space organization provides a better understanding of the relationship between the different plan configurations and external forces (social, technical, and functional) that shaped them.

The analysis framework adopted for this research was approached from three levels: basic components (which constitute a house), space relations of major zones and principles which control the space organization of a house (Fig. 1).

Brief Introduction of Ara Damansara

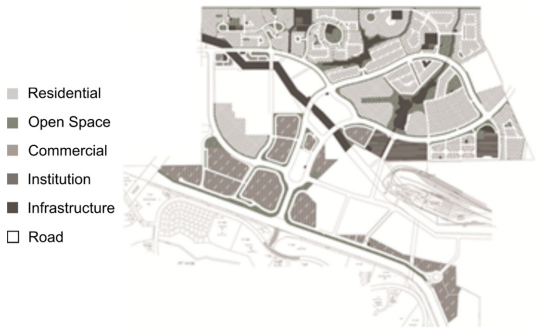
In terms of administrative districts, Ara Damansara belongs to the Petaling Jaya (PJ) district⁴ in Selangor in Malaysia. The first new town in Malaysia, PJ has an area of 24,018 acres and a total population of 486,040 and is located 11 km from the capital city of Kuala Lumpur (KL). Ara Damansara boasts good accessibility and habitability and is close to Sultan Abdul Aziz Shah Airport (former Subang International Airport) and Saujana Golf and Country Club. It has been developed to create a pleasant urban environment and to provide housing to diverse classes in order to encourage social mixing.

Regarding land use, Ara Damansara (total area 734.43 acres)

has been developed according to: residential area 36.62%, commercial area 13.97%, open space 14.46%, and institutions and infrastructure 34.95%.

Housing typology has been developed in Ara Damansara with notable diversity that ranges from low-cost apartments to luxurious bungalows. A total 3,429 households have been provided: terrace houses (43.42%), bungalows (6.3%), semi-detached houses (semi-Ds; 4.78%), apartments (32.84%), and condominiums (11.66%)⁵ (Table 1).

Table 1. Overview of Ara Damansara



Land Use		Area	Percentage
Total Area		734.43 acre	100.00%
Residential		268.94 acre	36.62%
Commercial		102.62 acre	13.97%
Open space		106.18 acre	14.46%
Institution		42.59 acre	5.80%
Infrastructure		214.10 acre	29.15%
Number of Total Housing Units		3,429 units	

Residential Composition	Typology	Area acres (%)	No. of Housing Units (%)	Housing Unit Density (units/acre)	Population Density (Persons/acre)
	Bungalow	54.41 (20.23%)	216 (6.30%)	3.97	19.85 (Persons/acre)
Semi-D	18.90 (7.03%)	164 (4.78%)	8.67	43.38 (Persons/acre)	
Terrace	156.36 (58.13%)	1,489 (43.42%)	9.52	47.61 (Persons/acre)	
Apartment	20.42 (7.59%)	1,126 (32.84%)	55.14	275.71 (Persons/acre)	
Condominium	16.00 (5.95%)	400 (11.66%)	25.00	125.00 (Persons/acre)	
ETC	2.85 (1.07%)	34 (1.00%)	11.93	59.65 (Persons/acre)	
Total		268.94 (100.00%)	3,429 (100.00%)	Average 12.75 (units/acre)	Average 63.75 (Persons/acre)

Overview of the Objects of the Study

This study is limited to bungalows, semi-Ds, and terrace houses, which all belong to landed property⁶. The exact objects collected in the analysis of the study are 1,761 housing units in twenty-two residential precincts⁷ that represent twenty-five unit plan types. Bungalows have been planned for three residential precincts, with 142 housing units in an area of 48.04 acres. Semi-Ds have also been planned for three residential precincts, and the number of housing units amounts to 130. This figure is similar to those for bungalows, but in an area of 18.92 acres that exhibits a higher density than bungalows. Terrace houses (planned for thirteen residential precincts with 1,489 households) represent the largest

Table 2. The General Information of Cases

Case No.	Lot No.	Project Name	Housing Typology	Area (Acres)	No. of Housing Units	Housing Unit Density	Dev. Year
1	A1	D'Embun	Terrace	13.14	99	7.53	2000
2	A2	D'Bayu	Terrace	8.54	100	11.70	2000
3	A3	D'Pelangi	Terrace	10.14	97	9.56	2000
4	A4	D'Mutiara	Terrace	7.87	60	7.62	2000
5	A5	Claremont	Terrace	8.33	54	6.48	2001
6	A6	Chelmsford	Terrace	4.75	46	9.68	2001
7	A7	Palemo	Terrace	11.26	101	8.96	2001
8	A9	Berkeley	Terrace	12.00	127	10.58	2001
9	A10	Calarossa	Terrace	9.75	102	10.46	2002
10	A17	Winchester	Terrace	17.48	188	10.75	2003
11	A18	Atilia	Terrace	14.23	171	12.01	2003
12	A19	Alissia	Terrace	20.10	204	10.14	2004
13	A20	Casarina	Terrace	18.77	140	7.45	2004
N ₁				156.36	1,489	9.52	
14	A11	Lauren, Lincoln & Lancaster	Semi-D	6.53	40	6.12	2001
15	A12	Carra, Cardossa & Chester	Semi-D	6.57	42	6.39	2002
16	A13	Cameo, Casey & Carrington	Semi-D	5.82	48	8.20	2003
N ₂				18.92	130	6.87	
17	A14	Royal, Regent	Bungalow	21.28	67	3.14	2002
18	A15	Imperial Avenue	Bungalow	9.76	33	3.38	2004
19	A22	Imperial Promenade	Bungalow	17.00	42	2.47	2005
N ₃				48.04	142	2.96	
N ₁ +N ₂ +N ₃				223.32	1,761	7.89	

area (70%) of the total 156.36 acres⁸ (Table 2).

The housing supply per year was also analyzed and examined. The highest number was 407 housing units (23.1%) in 2003 and the lowest number was 42 housing units (2.4%) in 2005. Unlike terrace houses, which are supplied relatively uniformly, bungalows and semi-Ds require more time to develop because resident satisfaction is an important and time-consuming factor. These types of units are therefore supplied at a rate of approximately one residential precinct per year.

Analysis

Terrace Houses

The typical layout of spaces in terrace houses involve having the living room (L) and the dining room (D) at the front in the ground floor, and the kitchen (K) and guest bedroom (GB) at the back. A wet kitchen (WK) is not provided (excluding A3) for terrace houses; however, a multi-purpose “work area” space that can substitute for the wet kitchen (WK) is provided next to a dry kitchen (DK). Two main types of Terrace houses (standard and the corner) are provided.

Corner type space organization is similar to the standard type; however, it is characterized by relatively larger room sizes. In case of the standard type, the number of bedrooms (B) amounts to three; in case of the corner type (A5, A6, A10, A17, and A18), the number of provided bedrooms can even amount to four. Because they share bearing walls on both sides, terrace houses are narrow in frontage widths and considerably long in terms of side length.

Due to this narrow and long shape of the houses, the layout configuration alternatives in this type are limited and stereotyped. The housing unit plan configuration of this terrace house is fixed as: master bedroom (MB) with a private bathroom (BT) at the front, and two bedrooms (Bs) at the back, sharing a bathroom (BT).

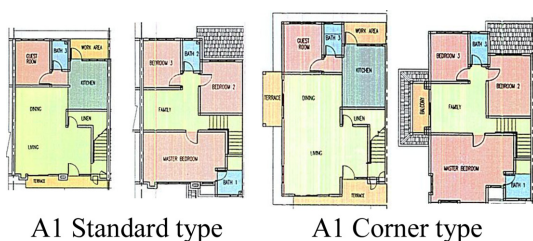


Figure 2. Typical Types of Terrace House

Table 3. Component of Spaces in Terrace Houses

Basic	Public		L		D		DK		E	
	Private	L2	MR	GR	R2	R3	B1	B2	B3	
Transition	Public/Private	T	WA	S	C					

As a result of calculating the areas of terrace houses, the gross built-up area of the standard type ranges from a minimum of 1,710 sq ft to a maximum of 2,520 sq ft, with an average of 2,186 sq ft. On average, the area of L + D is 435 sq ft (19.8%) and that of the family living room (L2) is 159 sq ft (7.3%), respectively. The area of L + D for units with a gross built-up area equal to or less than 2,100 sq ft is less than 400 sq ft. however, the area of L + D for units with a gross built-up area more than 2,100 sq ft has a maximum of 571 sq ft.⁹ The total area of bedrooms is 534 sq ft (24.5%) on average, and the area of MB, which takes up the greatest area of these rooms, is 279 sq ft (12.8%), followed by B2 with an area of 135 sq ft (6.2%), B3 with an area of 120 sq ft (5.5%), and GB with an area of 116 sq ft (5.3%), featuring similar areas. The area of K amounts to an average of 126 sq ft (7.6%), distributed comparatively evenly (Table 4).

Semi-Ds

Semi-Ds¹⁰ constitute an intermediate type between terrace houses and bungalows in terms of space organization and dimensions. The basic relations of the rooms in the ground floor are identical to terrace houses. Semi-Ds have a K space that is more subdivided than in terrace houses such that the wet kitchen (WK) is planned separately from the dry kitchen (DK) and is connected to the work area, even having a drying yard outside. The number of rooms amounts to four, and while MB and B2 are provided with a private BT, B3 and B4 share a BT (Table 5). An outdoor space (balcony) larger than that in terrace houses is planned in the back with a car porch space intended to accommodate two cars. Both bungalows and semi-Ds are planned for three residential precincts. While the former features ten unit types and therefore diverse, the latter features only five unit types, and is very limited in the choice of floor plans. Three of the five unit types of semi-Ds are identical with respect to space organization except for the L+D relationship.

Upon analyzing the areas of semi-Ds, the gross built-up area is 3,120 sq ft. Within this area, the areas of L + D and L2 amount

Table 4. Space Organization and Area of Terrace Houses

Terrace Houses												
A1		A2		A3		A4		A5,A6				
A7,A9		A10		A17		A18		A19				
A1	A2	A3	A4	A5,6	A7,9	A10	A17	A18	A19	Aver	%	
L+D	347	343	571	433	508	355	447	508	397	453	435	19.9
L2	143	152	144	176	180	110	164	161	180	206	159	7.3
GR	115	84	-	111	118	145	101	125	102	117	116	5.3
MR	201	189	280	273	296	343	311	296	238	278	279	12.8
R2	123	100	167	150	121	163	117	125	155	117	135	6.2
R3	100	82	163	125	119	140	116	125	100	107	120	5.5
DK	116	98	94	208	132	131	114	121	127	107	126	5.8
WK	-	-	45	-	-	-	-	-	-	-	45	1.8
BT1	35	53	69	48	53	53	48	60	60	48	53	2.4
BT2	33	30	45	50	40	45	40	37	37	30	43	2.0
BT3	33	27	48	33	40	45	40	37	37	30	42	1.9
ETC	209	237	346	257	295	292	268	311	316	177	275	12.6
ER	355	315	548	446	348	518	414	174	351	580	358	16.4
GBA	1810	1710	2520	2310	2250	2180	2170	2100	2250	2186	100	

L+D (Living and Dining), L2 (Family Living), GR (Guest Room), MR (Master Bedroom), R2-4 (Bedroom 2-4), DK (Dry Kitchen), WT (Wet Kitchen), BT1-7 (Bathroom 1-7), Other: T (Terrace), S (Stair), ER (Extra Room): WA (Work Area), SA (Study Area), MR (Maid Room), UT (Utility), DY (Dry Yard), ST (Storage), DR (Dressing Room), MT (Multipurpose Room), CP (Car Porch)

Table 5. Component of Spaces in Semi-Ds

Basic	Public	L	D	DK	E						
	Private	L2	MR	GR	R2	R3	R4	B1	B2	B3	B4
Transition	Public/Private	T	WA	WK	S	C					

Table 6. Space Organization and Area of Semi-Ds

Semi-Ds									
A11		A12		A13A		A13B		A13C	
	A11	A12	A13A	A13B	A13C	Aver.	%		
L+D	541	535	482	500	476	507	16.3		
L2	236	240	297	236	236	249	8.0		
GR	104	126	160	160	160	142	4.6		
MR	364	296	277	277	277	298	9.6		
R2	134	120	112	112	112	118	3.8		
R3	105	120	121	121	121	118	3.8		
R4	105	124	121	121	121	118	3.8		
DK	158	241	211	211	211	206	6.6		
WK	103	-	91	91	91	94	3.0		
BT1	53	75	64	64	64	64	2.1		
BT2	66	47	54	54	54	55	1.8		
BT3	38	45	57	57	57	51	1.6		
BT4	-	45	57	57	57	54	1.7		
ETC	609	482	339	253	242	385	12.3		
ER	604	73	212	212	212	661	21.2		
GBA	3220	3250	3100	3020	3010	3120	100		

to 507 sq ft (16.3%) and 249 sq ft (8.0%), respectively, and is nearly identical for all types. The total area of rooms amounts to an average of 652 sq ft (21%), with the MB occupying an area of 298 sq ft (9.6%) and the three remaining B being identical, each

occupying an area of 118 sq ft (3.8%)¹¹ (Table 5).

The total area of K is 300 sq ft (9.6%) on average consist of DK with an area of 206 sq ft (6.6%) and WK with an area of 94 sq ft (3.0%).

Bungalows

The typical layout organization of spaces in bungalows are identical to semi-Ds; however, there are additional spaces such as the pantry, maid room and utility rooms. The K space in the back is more subdivided than in semi-Ds. DK and WK are separate with a breakfast area provided.

GB is planned as a large area, greater than those in terrace houses by approximately 135 sq ft on average. Another additional bungalow space is the dressing room, which did not appear in the terrace house and appeared only in two cases in semi-Ds.

Six BT spaces are provided for bungalow units, with a maximum of seven in some cases (four cases). Bungalows are characterized by specific-purpose rooms such as a work area, a study room, a storage room, a maid room, a utility room, a drying yard, and a multi-purpose room. This increase in area is accounted for by the diversity of extra rooms supplied rather than individually enlarging the area of each room despite larger bungalows than other housing typologies. These extra rooms take up 36.7% of the total area (Table 7).

According to the results of the area analysis, the gross built-up area of the houses is 4,162 sq ft on average, and the area of L + D is 574 sq ft (13.8%) on average, with the latter featuring a diverse distribution ranging from a minimum of 436 sq ft to a maximum of 690 sq ft. The area of L2 amounts to 260 sq ft (6.2%) on average, with the range of change in area less than that for L + D¹². Upon examining the total area of B, and with the exception of MB whose average area is 318 sq ft (7.6%), the remaining rooms are nearly identical in area (B2 with an area of 174 sq ft, B3 with an area of 155 sq ft, and B4 with an area of 160 sq ft). DK amounts in area

Table 7. Component of Spaces in Bungalows

Basic	Public	L		D			DK			E			
	Private	L2	MR	GR	R2	R3	R4	B1	B2	B4	B4	B5	B6
Transition	Public/Private	T	WK	WA	BA	MR	ST	DY	S	C	DR		

Table 8. Space Organization and Area of Bungalows

Bungalows												
A14A	A14B	A14C	A15A	A15B	A15C	A15D	A22A	A22B	A22C	Aver.	%	
L+D	436	519	644	690	573	523	610	670	530	548	574	13.8
L2	209	283	254	332	310	248	280	237	220	223	260	6.2
GR	235	291	195	256	184	228	212	337	250	323	251	6.0
MR	327	419	407	334	270	277	250	328	278	291	318	7.6
R2	179	146	190	190	177	165	170	180	155	185	174	4.2
R3	160	145	150	177	144	160	157	150	160	151	155	3.7
R4	157	116	150	176	182	141	163	158	157	200	160	3.8
DK	237	275	221	241	310	208	250	230	180	345	250	6.0
WK	94	100	126	115	125	146	177	110	80	125	120	2.9
BT1	99	95	98	90	90	87	90	100	98	99	95	2.3
BT2	36	40	45	45	45	45	45	53	53	55	46	1.1
BT3	35	40	45	45	45	45	45	53	53	55	46	1.1
BT4	35	42	40	45	45	45	45	53	53	55	46	1.1
BT5	60	60	61	50	45	47	57	91	90	90	65	1.6
BT6	22	26	32	16	22	27	21	28	26	40	26	0.6
BT7	0	0	0	40	44	58	54	0	0	0	49	1.2
ETC	485	538	568	358	429	545	390	872	591	827	563	13.5
ER	563	525	663	698	633	531	504	302	356	335	964	23.2
GBA	3740	4330	4360	4200	4048	3804	3786	4650	4070	4630	4162	100

to an average of 250 sq ft (6.0%), and WK amounts in area to an average of 120 sq ft (2.9%). The BT located in MB occupies an area of 95 sq ft (2.3%) on average, which is more than twice as large as other BT spaces. The BT located in GB occupies an area of 65 sq ft (1.6%), thus being the second largest in terms of area. The three BT spaces attached to the remaining B exhibit an identical area distribution, amounting to 46 sq ft (1.1%) (Table 8).

Findings: Space Organization

Below are the results of examining the characteristics of space organization in the major zones of a house.

The Relations between L / D / K

When the characteristics of the arrangement of L and D are examined, the A type amounts to nineteen cases (70.4%) and the B type amounts to eight cases (29.6%). The A type arrangement, where the entrance, L, and D are all connected, is prevalent among the existing types. The layout where an outdoor balcony is located next to L (connected by a sliding door) is apparent in all the examined bungalow cases (100%) and in two semi-D cases (40%) (Table 9).

With respect to L/D/K relations, the most prevalent is the LD + K type (63%), where L is in the front, followed by D (which is open), and then K is separated and closed from both L and D. This type is outstanding in terms of visual openness and optimal natural lighting and ventilation. The other apparent relation type is the L +

D + K type (37%), where L, D, and K all are separate. This type (like the LD + K type) provides visual openness that strengthens the territory of each space by adding a difference in floor level among L, D, and K. In addition, the L + D + K type (18.5%; L and D are separated by a corridor), which appears only in large size houses such as bungalows, has the disadvantage of a longer line of flow (user movement) but also the advantage of securing the territory and privacy for each space (Table 9).

The Relations of the K Space

The K space design is quite interesting. DK, WK, and the work area are designed adjacent to one another in all cases; however, there are some discrepancies according to housing typology. With the exception of A3, terrace houses do not have the WK space, which is replaced by the work area. Semi-Ds are classified into two types according to the presence or absence of a work area. The A type amounts to three cases (11.12%), consisting of DK and WK, the latter directly leading to a drying yard outside.

The B type has a work area that is approached from WK and a utility room approached from DK. As for bungalows, all types provide DK, WK, a breakfast area, a work area, a storage room, and a maid room. The relations are identical despite the slight difference in the location of each room. Entry to the work area, storage room, and maid room is possible only through WK. These ancillary rooms are hidden behind the wall (Table 10).

The Relations between B and BT

In the hot and humid climate conditions of Malaysia, natural lighting and ventilation act as important design components. Because terrace houses share bearing walls on both sides, open air is only accessible from the front and back sides. Therefore it

Table 9. The Space Relations between L/D/K

L+D relations		L+D+K relations		
A type	B type	LD+K	L+D+K	L+D+K
1,3,5,6,7,9, 17,18,19	2,4,10	1,2,5,6,7,9, 10,17,18,19	3,4	-
11,12,13A	13B,13C	12,13A	11,13B,13C	-
15A,15B,15C, 15D,22A,22B, 22C	14A,14B, 14C	14A,15D, 22A,22B, 22C	-	14B,14C, 15A,15B, 15C
19 (70.4%)	8 (29.6%)	17(63.0%)	5 (18.5%)	5 (18.5%)

Table 10. The Space Relations of the K Space

Terrace / Semi-D			Bungalow
1,2,4,5,6,7,9, 10,17,18,19	3,11,12	13A,13B,13C	All type
11 (40.73%)	3 (11.12%)	3 (11.12%)	10 (37.03%)

is common to place MB with a private BT in the front and two rooms in the back, sharing one BT. Here, the location of BT is a major component that determines the arrangement of B. The A type (where BT is placed between two Bs) represents two cases (7.40%) and appears in comparatively small houses. In the B type, BT is located next to a balcony (33.3%) to provide natural ventilation for BT and L2. In the typical layout of terrace houses, L2 is located in a closed space between B without windows, but in type B, natural ventilation for L2 is possible. The C type places a BT in the back, shared only by adjacent rooms to make better use of space. Finally, the D type, though similar to the A type in the basic framework, arranges the rooms linearly so that the area of L2 is greater than in other types, and natural ventilation is possible. As for MB, BT is located in the front in all cases. This relation of B and BT demonstrate the importance of ventilation and lighting as an element of housing in Malaysia.

In comparison to terrace houses, semi-Ds (open on three sides) and bungalows (open on four sides) are more advantageous in allowing each room to access open air, which provides a more free arrangement. They are classified into the E type, amounting to seven cases (46.7%), and the F type, amounting to eight cases

(53.3%). In the E type, MB is clearly separated from other B to secure privacy.

The F type disperses each of the rooms and has a large L2 between rooms with the advantage of encouraging family life rather than private activities.

Bungalows provide all MBs with a BT space as well as an attached dressing room and powder room to diversify the functions of MB and secure privacy. In addition, bungalows provide all rooms with independent BTs (accessible only from each room) and there is a greater tendency to use space independently as the size of the house increases (Table 11).

Findings; Area Analysis

L, D, B, K, and BT spaces are basic components of all housing typologies. Terrace houses generally consist of three Bs and three BTs. Semi-Ds provide four Bs, four BTs, and a WK. The number of BTs increase (basically six and in some cases seven) in the case of bungalows; however, other elements remain identical to those of semi-Ds.

Upon analyzing the proportion of each room's area per total area, the area of L + D is the largest across all housing typology. This is followed by the areas of MB then L2. In the cases of B, GB, and K, the order of area proportion varies according to housing typology. The area of GB is the largest for bungalows, while the area of K is the largest for semi-Ds, and the area of B is the largest for terrace houses¹³.

The areas of L + D and MB increase as the total area of the

Table 11. The Space Relations between B and BT

Terrace			
A type	B type	C type	D type
1,3	2,4,5,10	3,7,9,17	18,19
2 (16.7%)	4 (33.3%)	4 (33.3%)	2 (16.7%)
Semi-D, Bungalow			
E Type		F Type	
11,12	14A,15A,15B,15C,15D,	13A,13B,13C,14B,14C,	22A,22B,22C
2 (13.3%)	5 (33.3%)	5 (33.3%)	3 (20.1%)

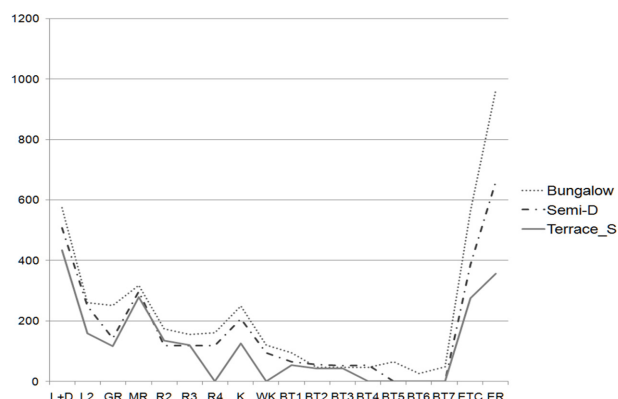


Figure 3. Space Area Analysis According to Housing Typologies

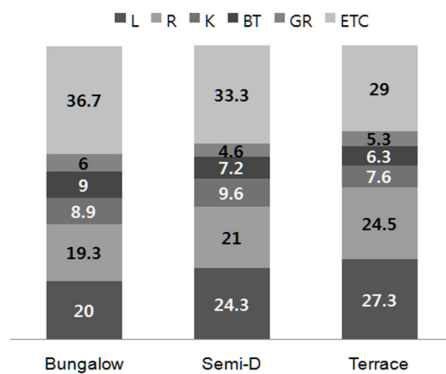


Figure 4. Proportion of Spaces according to Housing Typologies

house increases; however, the remaining rooms do not increase in area as long as they satisfy the appropriate standards. Instead, multi-purpose extra rooms are added (Fig. 3). L + D accounts for the largest area in a house and exhibits the largest area distribution, from 343 sq ft to 690 sq ft. In general, the respective areas of L + D are in the following order: terrace houses < semi-Ds < bungalows, with an area of approximately 70 sq ft increase per type. Otherwise, the respective areas of B excluding MB (average: 137 sq ft) and the total area of BT (average: 47.5 sq ft) are similar across all housing typologies.

The overall area ratio of the major rooms in the total space is as follows. Terrace houses consist of L (27.3%), MB+B (24.5%), K (7.6%), BT (6.3%), GB (5.3%), and other spaces (29%). Semi-Ds consist of L (24.3%), MB+B (21%), K (9.6%), BT (7.2%), GB (4.6%), and other spaces (33.3%), and, with the exception of A11, correspond to the average value of all unit types. Bungalows consist of L (20%), MB+B (19.3%), BT (9%), K (8.9%), GB (6.0%), and other spaces (36.7%). (Fig. 4) Terrace houses have a uniform floor plan in accordance with a plot ratio where the front is narrow but deep. Likewise, semi-Ds exhibit a floor plan and an area ratio similar to the average values. However, the composition of their area distribution also varies because bungalows are comparatively free in arrangement and diverse in the number and usage of rooms.

Conclusion

Based on the analysis, some of the unique issues in space

organization of a house were shown to be as follows: The first issue is the relationship between rooms, bathrooms located at the backside of a house and outdoor space. In terraces and semi-D houses, the width of a house is limited so that units are generally narrow and long in proportion. However, bathrooms are required by law to be exposed to outside air due to the hot and humid climate in Malaysia. Therefore it is challenging in terms of layout configuration to arrange two bedrooms and a bathroom to face the outside. Various attempts were made to allow all bedrooms and bathrooms to be exposed to outside air through different layout configurations.

Another issue is the space relationship between kitchen, utility spaces and the outside. This issue can be more clearly discussed and understood if cooking requirements, housekeeping behavior and culture are scrutinized. With space organization only in perspective, there exists the following hierarchy of space: dry kitchen - wet kitchen- work area - (storage / maid room / dry yard) - outside.

The kitchen space is always located at the back of the house and is designed as a closed space separated from the L or D space. It can be argued that the traditional anthropomorphic ideas¹⁴ are still embodied in contemporary houses.

Housing typologies such as bungalows, semi-detached houses and terrace houses are imported western housing typologies that were prevalent worldwide and were part of what is known as the international style. However these western prototypes were customized and developed to suit a unique social, ethnic and climatic environment of Malaysia.

It is difficult to find the unique characteristic of space organization (except for the location of bathrooms) in the typology of terrace houses that are standardized and limited in design alternatives. However, the space organization of bedroom spaces and kitchen spaces has strong regional characteristics and has become stereotyped in the typologies of semi-Ds and bungalows.

This study only examined some limited cases in Ara Damansara and it is therefore difficult to generalize the findings of this study to all other new towns in Malaysia. It is still worthwhile to try to collect data and systematically organize it according to typologies. The findings of this research can be applied when developing urban housing in Malaysia suitable in a local urban context.

The findings of this study enable an understanding of the identical characteristics of unit designs of landed properties built in Malaysian new towns. It is anticipated that the characteristics of this distinct regional style of Malaysian housing design can be firmly established through the study of additional cases with behavior studies that can be integrated into the results of this study. A comparative study of urban housing typologies among Southeast Asian countries in further research can also provide clear differences and define the identity of each country’s housing design.

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Notes

1. Selected as one of the top three property developers around the nation in the *Edge Malaysia’s* 2012 Top Property Developers Awards (TPDA), SDB is a global corporation with a considerable position in Malaysia as well as throughout Asia.

2. According to an interview with a staff member of SDB in charge of marketing, Klang Valley is a residential area preferred by Malaysians, and living here means having accumulated social status and wealth. This staff member explained that joining the league of the most preferred neighborhood in “Klang Valley” is a marketing strategy, and that sales prices were set comparatively higher than those for other areas.

3. The author worked for four months as an intern in Operation 1 Department at SDB, which is in charge of the Ara Damansara Township.

4. The PJ City Council, Majlis Bandaraya Petaling Jaya (MBPJ) is currently divided into sixty-five sections, each planned as an independent neighborhood. Ara Damansara is within PJU 1

Section.

5. There are few differences between apartments and condominiums from the aspect of housing typology. But in Malaysia, apartment (or flat) is regarded as low-cost housing developed as a mass housing equipped with basic facilities for the community. However, a condominium is a higher cost urban mass housing with well-designed landscape and facilities (Ju, S. R. and Saari, B. O., 2010).

6. Housing development in Malaysia is classified into landed property and strata property. Landed property means that sites are divided into lots and residents hold proprietary rights to the land. Housing types such as terrace houses, semi-Ds, clusters, and bungalows belong to this category. Strata property designates land types such as flats, townhouses, condominiums, and apartments, where residents hold proprietary rights to individual living units but share community facilities and hold no proprietary rights to the land.

7. The Seri Pilmoor (bungalows + semi-Ds) estate (104 units) which belongs to landed property is the most luxurious housing type within Ara Damansara. The Seri Pilmoor estate has been excluded from the analysis in the present study because it includes very luxurious houses characterized by large size (6,544 - 8,310 sq ft and three-story structures); a very unique unit design.

8. With an average of 2.96 units/acre and 6.87units/acre, respectively, bungalows and semi-Ds are classified as low-density zones. While they exhibit diversity in density distribution, ranging from 6.48units/acre to 12.01units/acre, terrace houses are classified as a medium-density zone.

Density standards	Density (units/ acres)	Housing Typology
Low density zone	1-8	Bungalow, Semi-D
Medium density zone	9-24	Semi-D, Terrace, Cluster, Town house, Walk-up Apartment
Med-High density zone	25-50	Terrace, Link house Town House, Apartment
High density zone	51-75	Affordable Apartment Apartment, Condominium

Source: Federal Territory Planning Act 1982 / Local Plan

9. Exceptionally, A7 and A9 reduce the area of L and incorporate

an inner yard. They at times are provided in 355 sq ft (15.2%) in area, which is a figure far lower than the average value.

10. The semi-detached house is two houses sharing one bearing wall, with each having a part of the garden. It is generally called 'Semi-D' in local terms, and it combines the benefit of a detached house and the effectiveness of land use of a terrace house.

11. With the exception of A11, all types are nearly identical in area. A11 provides B with smaller areas but MB amounts to 364 sq ft, a far greater figure than the average value.

12. Unlike other housing typologies, bungalows exhibit diverse attempts in terms of floor arrangement. The areas of L, D, and B are large when A15 is cited as an example, in case of A15-A, while the balcony and multi-purpose spaces are reduced. However, A15-C minimizes the area of each room and enlarges the balcony. As for A15-B, the area of each room is reduced to enlarge the K space.

13. Bungalows: ER(964sq ft) > L+D(574sq ft) > ETC(563sq ft) > MR(318sq ft) > L2(260sq ft) > GR(251sq ft) K(250sq ft) > R2(174sq ft) > R3(160sq ft) > R4(155sq ft) > WK(120sq ft) > BT1(95sq ft) > BT5(65sq ft) > BT7(49sq ft) > BT2=BT3=BT4(46sq ft)

Semi-Ds: ER(663sq ft) > L+D(507sq ft) > ETC(385sq ft) > MR(298sq ft) > L2(249sq ft) > K(206sq ft) > GR(142sq ft) > R2 = R3 = R4(118sq ft) > WK(94sq ft) > BT(94sq ft) > BT2 = BT4(55sq ft) > BT3(51sq ft)

Terrace houses: L+D(435sq ft) > ER(358sq ft) > MR(279sq ft) > ETC(275sq ft) > L2(159sq ft) > R2(135sq ft) > K(126sq ft) > R3(120sq ft) > GR(116sq ft) > BT1(53sq ft) > BT2=BT3(43sq ft)

14. Anthropomorphism refers to the perception of a divine being or beings in human form, or the recognition of human qualities in these beings (Wikipedia). Southeast Asians believe that the house can be divided vertically into three sections which resemble the anatomy of the human body: the roof, habitable space and piles representing, respectively, the head, torso and legs of a human being. The association between the house and human body also exists horizontally, with the (representing the face) in the front of the house and the dapur (representing the kitchen) located in the rear of the house (representing the anus). The practice of throwing away daily refuse (such as food scraps) through the back of the kitchen has been likened to the act of defecation (Ariffin, 2001).

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