



Micro Housing: Typological study and implementation in Malaysia

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Abstract

The micro-housing project introduced by Kuala Lumpur City Council (DBKL) has received cynical rumours amongst the B40 income group due to its impracticality, thus suggesting that micro-housing standard is misinterpreted and simplified. As such, this paper intends to investigate the potentiality of ideal micro-housing that is suitable for the Malaysian context, specifically for the B40 community. Based on a bottom-up approach, this research divides into the micro and macro study. In the micro-study, the focus is specifically on the typological design of micro-housing. Hence this leads to a macro context, which developed the typological analysis in regards to the regional cultural influence. In thoroughly, from seven (7) international precedents, micro-housing can be formulated into four main typologies that include Box, Mobile, Machine, and Props type. These typologies incline towards two (2) cultural domains, namely Possession Domesticity, which demonstrates Westerners influence through technological advancement and Transience Domesticity that portrays Orientalist influenced by the mixture of practicality and human psychology. These attributes tested in three (3) local micro-housing projects that consist of two prototypes by local architect and a built micro-housing project by DBKL. The result shows that both prototypes are potentially ideal. However, DBKL's built project demonstrated a minimal standard of appropriate micro-housing living. It founds that the lack of axiological human needs may lead to a degradation of values and behaviour. Thus, it significantly recommends that the projects reconsider of adapting the psychological needs for the betterment of its user's living.

Keywords: micro-living, adaptable housing typology, regional cultural study, psychological needs

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1.0 Introduction

Issues on the rise of housing prices, deficiency of affordable housing (Edgeprop, 2018), and deserted downtown (Tan.M,2018) have been lately showering the city of Kuala Lumpur. The impact falls on the increasing cost of living, where citizens are forced to live in suburban areas to seek an affordable living. This strategy is a waste due to the expenditure and time spend on daily commuting. While everyone is adapting with an economic saving plan, the B40 group is facing the most significant burden. Their livelihood has been at stake as 'good life' is beyond their reach, and the National B40 Action Plan (UNDP, 2016) is becoming an urgency.

The call for a decent living has been part of the World Urban Forum (WUF9) 2018 strategy held in Kuala Lumpur. In collaboration with Think City, Kuala Lumpur City Council (DBKL) has initiated a think tank forum to propose a new living in the city. The solution is dynamic; a micro home for downtown Kuala Lumpur. This agenda aims to provide an affordable scheme for young generations right in the middle of the city where work is within walking distance, hence, eliminating the dependency on private transport. The scheme also promotes an ideal urban community living with proper public transportation service and urban design and planning strategy.

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Two prototypes are selected; The 'Urban Micro Village' by Tetawowe Atelier and AMC architect (Tetawowe, 2018) and 'Microhouse' by Studio Bikin (Studiobikin, 2018). The 'Urban Micro Village' is designed to fit into two standard car parking lots. The scheme emphasized on *kongsi* area at the ground level where the community living flourished. Meanwhile, the 'Microhouse' focused on vertical development with an innovative marketing strategy. Both prototypes demonstrated the different approaches of micro-living, adapting the global idea into the local market, and thus, attracting high positive responses.

In early 2019, DBKL launched a new micro-housing project known as the 'Perumahan Bandar Jalan TAR'. Located in the heart of downtown Kuala Lumpur at Jalan Tuanku Abdul Rahman (TAR), this project acts as a temporary housing solution for the B40 working adults who are looking for living quarters as a startup of their city career. The proposal aspired to reduce the initial living burden by providing an ample buffer period for the youngsters to accumulate a certain amount of capital towards the betterment of their future. Although the proposal meant for a good cause, it received cynical criticisms. The idea of 'capsule hotel' circulated by DBKL is seen to be temporary and is defeating the housing term. Furthermore, the sharing condition of 4 to 6 persons in one room might act as a 'City Hostel.' These scenarios suggest the misinterpretation and simplification of the micro-housing concept beyond the parameters of local prototypes built during the recent World Urban Forum.

As such, this paper intends to investigate the potentiality of ideal micro-housing that is suitable for the Malaysian environment, specifically for the B40 community. Consequently, the objective of this paper is as follows:

- 1) to identify the function and affordability of micro-housing as an alternative for urban living.
- 2) to analyze the practice of micro-housing through regional cultural context and typological study.
- 3) to determine the ideal design factors of micro-housing for the B40 community in Kuala Lumpur.

2.0 Literature Review

2.1 Definition

Micro housing is a game-changer in the housing industry. Its existence corresponds to several changing factors, particularly the demographic trends, space limitation, and living costs (Resourcefurniture, 2018). There is no particular definition of what micro-housing is. However, a full description provided by the Urban Land Institute (ULI) Report identified micro-housing as a purpose-built unit, typically urban, small studio or one-bedroom using an efficient design that appears more substantial than it is. The size ranges from 280sqft to 450sqft (ULI, 2014). This definition justified the attributes of micro-housing, which in size is considerably 20% to 30% smaller than the conventional unit.

2.2 Current Market Performance and Market Acceptance

2.2.1 Market Performance

From the perspective of market performance, the trend of smaller units has changed in recent years by the shift of the unit typology. Unlike the average conventional housing where size and area of the unit decreases, the current trends lean more towards a smaller studio or one-bedroom apartment. This condition is due to the demand for high-density neighbourhoods created in new suburban areas. Based on the data obtained by the Urban Land Institute (2014), units less than 600sqft has higher occupancy value as compared to other conventional properties.

2.2.2 Consumer Research

Micro-homes are seen most in urban areas. Although the units are limited in space, it has attracted a great deal of attention due to its strategic location, which is surrounded by the excellent provision of infrastructure and amenities such as grocery stores, restaurants, gymnasium, and laundry. Single persons also prefer micro-homes as it allows one to live independently. While many first time consumers are sceptical of living in small units, this perception seemed to change once they have occupied the space. Instead, the satisfaction level proved to be similar to conventional housing. Despite these positive impacts, people often perceived micro-homes as temporary living. Most tenants in the United States have a lower likelihood of renewing their rental (most of the micro-housing in the United States are rentable) when their family and income expanded. This fact is due to more space is needed to satisfy their needs. Furthermore, it demonstrates the inefficiency of unit planning (ULI, 2014).

2.2.3 Lifestyle Living

Micro-homes have evolved to become more trendy and full of lifestyle. It has attracted many, particularly the millennial due to its lower rental rate and simple and creative living. The millennial is known to be typically mobile and is opportunity centric. They avoid hassle and opt for ready to move-in property (Lake.R, 2019). Being a natural influencer, the millennial generate new interest in 'urbanizing authentic' location (ULI, 2014). These characteristics promote the rebranding of micro-housing towards a lifestyle living, thus, influence the target market audience.

Lifestyle in the living context is defined as a composite of motivation, needs, and wants of individuals influenced by cultural, family, reference groups, and social class factors (A.G. Sarip, 2015). According to Wentling (1995), rather than just providing shelter, small housing has transcended itself, giving provisions towards lifestyle-oriented environments. New branding such as Innovation Units, Nano Units, LaunchPad, Eco-Friendly Unit, and Lifestyle Unit are gradually replacing the notions of 'micro' house, which has previously reflected with negative connotations. In parallel to its new branding, the design for micro-living has creatively developed into several

innovative schemes such as convertible furniture with decent storage, large volume, oversize operable window, linear practical kitchen, and extensive landscape outdoor space (ULI, 2014).

2.3 Cultural and Regional Context

2.3.1 Single Space Living

The concept of micro-living is not relatively new. The advent of single space living has long-established with provision given to basic amenities to accommodate a single living needs. The initial design of living was as a single circular space, which later transformed into a rectangular shape due to its practicality in terms of function and constructional detail. The plan later evolved into a more elaborate plan that transpired the single space into collective space with spatial quality becomes an appealing order that governed a particular typological identity (G. Stephen, 1974, 2002).

Technological advancement has significantly influenced the typology of living. The introduction of prefabricated modular objects allows the functions and activities of space to be modified and downsized. The concerns of sustainability also influenced designers to rethink space. Instead of seeing it as a complex system, space is made simple and flexible, hence, dominating the culture in the form of micro-living.

2.3.2 The Aesthetic of Abundance

Micro housing is a microcosm of living. It ventures into the micro notion of home, which often focuses on the way people experience and understand their environment (P.Elia, 2001). It posited as a key in transmitting and codifying an image of oneself to others through appropriate material embodiment. The idea of images and experience in micro-housing has very much rooted in the American consumer-style and culture (P.Dobers, L.Strannegard, 2005). Here, micro-housing is seen as an agent to propagate the idea of 'aestheticization' where the individuality of design signifies a crucial part of living.

In the context of micro-housing, material and object possession becomes the main feature of a space. The aesthetic of abundance embedded in every interior design, including spatial quality, fittings, and fixtures intend to enhance newness and satisfaction among the users. Innovative design ideas and new-sophisticated tools and objects help to optimize and influence the functions and activities of the space.

2.3.3 Zen Harmony

In the context of orientalist, the possession of scarce material becomes the subject of micro-housing. It focuses on the man's central position, where materiality revolves around him (G.Stephen, 2002). The domesticity of living forms a perfect setting, frank and straight forward construction, pure form, no striving for picturesque effect, and no overloading of unnecessary decorations and furnishings. The void of abundance creates an intimate, humane interaction that reflects the social organization (D. Maria, 2001). These conditions resemble the embodiment of Zen harmony (D. Maria, 2001), where material culture becomes transience and less permanence, hence, evoking the sense of self-actualization (G.Pauline, 2001). The void is an essential element in the orientalist micro-housing. The house conceived as a stage with the support of objects. It also promotes the adaptation of living through a single shifting plane that can transform a single space into dual or multiple modes of functions.

2.3.4 The Psychological Needs of Living

Physical surroundings can profoundly influence the psychological aspects of the individuals and give a strong perception of space. The Max Neef Model of Human Scale Development defined human needs into two (2) categories that are existential and axiological needs. The existential human needs focused on the needs of Being, Having, Doing, and Interacting. In contrast, the axiological human needs emphasized the needs of Subsistence, Protection, Affection, Understanding, Participation, Creation, Leisure, Identity, and Freedom. In Maslow's Hierarchy of Needs, human needs are categorized into pyramid hierarchy, starting with the physiological needs, followed by safety, love, belonging, esteem, and self-actualization.

3.0 Methodology

3.1 Qualitative Ethnographic Study

Based on a qualitative ethnographic study, the research emphasized on the contextualization of micro-housing through design, functionality, and regional culture. There are two parameters to be examined; (1) micro study which focused on content analysis and (2) macro study through thematic analysis. As the synthesizing process is a concern, this study is conducted using the bottom-up approach, where micro analysis becomes the basis for the macro study.

3.2 Micro Study: Content Analysis

In the micro-study of content analysis, the design approach and concept are regulated through selected precedent studies from local and international projects. The local precedents are the completed micro-housing project developed by DBKL known as the Perumahan Bandar Jalan TAR, and two award-winning micro-housing prototypes exhibited in the Ninth World Urban Forum held in Kuala Lumpur

in 2018. The international precedents are selected based on highly published and completed projects with seven (7) existing projects gathered from all around the world.

3.3 Macro Study: Thematic Analysis

Data development from the micro-study of content analysis forms the parameters for the thematic analysis. In this macro study, initial data are decoded to identify broad themes and patterns related to cultural and regional evidence of micro-housing. The findings obtained from this analysis are then compared with the local and international approaches of micro-living.

3.4 Limitation of Study

There are no specific guidelines that define the exact typology of micro-housing. The study of spatial layout for each micro-homes is based on the existing micro-housing from all over the world. They are built and widely published in magazines and journals. Also, further exploration of the effectiveness of micro-housing in local context could not be made as there is no local precedence to support this claim.

4.0 Findings

Data from Table 1 shows three (3) examples of micro-housing in Malaysia. The first two are prototypes developed by the local architects. The final example is a recent micro-housing project built by DBKL at Jalan Tuanku Abdul Rahman, which is now under its promotional phase. Each prototype highlights different approaches towards micro-housing with prototype 1, 2, and 3 emphasize the space, objects, and partition, respectively, to define its functions and activities.

Table 2 demonstrates the strategies for micro-living taken from seven (7) samplings of the existing micro-homes from the United States, Europe, and the Asian continent. Based on the findings, each of the micro-homes has an average floor area of 200sqft to 450sqft. Each unit also provides different contents, intentions, and aims for micro-living.

Data in table 2 are then investigated in table 3 to determine the correlation between the typological context of micro-housing and its regional cultural stems. Four (4) typological themes identified; Box, Mobile, Machines, and Prop type. The themes are categorized based on the attributes of the object, compatibility, system, and environmental factor. These attributes displayed an inclination to two (2) most canonical cultural influences, namely Possession and Transience Domesticity. The Possession Domesticity represents the westerners' approach, while the Transience Domesticity signifies the orientalist approach. A similar context, the micro cube and micro window house possess similarities with the orientalist approach while other micro-housing types seemed to lean towards the westerner approach.

5.0 Discussion

5.1 Local Micro Housing Approach and Typological Study Similarity

Based on table 4, the typological domain for prototype 1 possesses strong similarities with the Prop Type. With emphasis given to the volumetric of space, prototype 1, focuses on creating volume and void. It creates a duality of space that provides segregation between the private or a confined sleeping area located on the upper level and semi-private or semi-confined indoor communal area at the ground level, which opens out to the outdoor communal area known as *kongsi*. Concerns are also given to the maximization of light, air, and view through large openings, which is similar to the micro cube and micro window house. The approach for prototype 1, is highly influenced by the orientalist with functions and activities defined by the spatial layout.

In prototype 2, the insertion of objects or prefabricated modular furniture with skeletal shells as the framework for the micro house demarcates the boundary of micro-living. The concept possesses profound similarities with the Machine Type as space is made flexible and maximized through prefabricated objects that can fold, move, expand, elevate, and convert into various sets of functions. The spatial layout opens out to a large outdoor communal area. The design also allows stacking and overlapping of units to create a compact vertical village. Unlike prototype 1, prototype 2, highly links to the westerner approach whereby the objects possessed by the users define the functions and activities of space.

The approach in prototype 3, is relatively different from the existing typological domains of micro-housing. The only similarity seen but in a very minimal way is the prefabricated modular wardrobe. Unlike prototype 2, this object does not signify function as a whole, but it is merely an object within a space that accommodates the need of the user. The demarcation of space is through partitions that create a cubicle or a unit. The concept for prototype 3, resembles the Capsule Hotel, where it only provides sleeping and bathing facilities. The prototype 3, could correspond to the Box Type through modification of objects into a compact package of prefabricated modular furniture.

5.2 The Influence of Psychological Needs of Living in the Local Micro-Housing

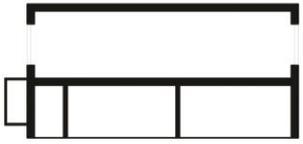
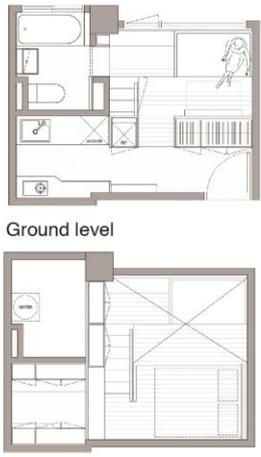
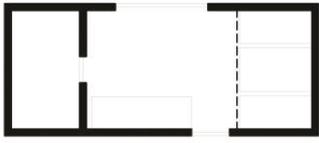
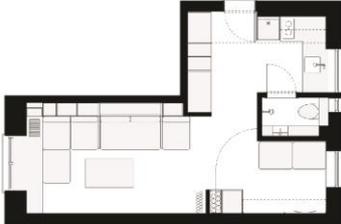
Prototype 1 to 3 categorized the concerns of the psychological needs of living into two (2) categories; human needs into concerns that include personal space, privacy, withdrawal and territoriality, and spatial behaviour, which consists of spatial adaptation, crowding, and influence of space. The human needs into concerns engage with the fundamental aspects of needs for living while the spatial behaviour involves the values of living. These categorizations of needs are cross-checked with the Max Neef Model and Maslow Hierarchy of Needs.

Table 1: Comparison between local World Urban Forum prototypes and Perumahan Bandar Jalan TAR by DBKL

DETAILS		PROTOTYPE 1: TETAWOWE ATELIER & AMC ARCHITECTS	PROTOTYPE 2: STUDIO BIKIN	PERUMAHAN BANDAR JALAN TAR DBKL
AIM & INTENTION		To elaborate the concept of urban micro - shared village within a footprint size equivalent to 2 standard carparks. The assumption is based on the future less dependency on private transportation resulted in the abundance of urban car parking. The scheme emphasis on the flexible - semi public outdoor space paired with a well thought urban planning and programmes.	To promote pavilion as conceptual tool to illustrate the Democratic Living Experiment. Based on the assumption that the skeletal shell is kept and the insertion of fixed elements forms the framework.	A new project aiming in promoting urban living within young workers of B40 community. The scheme is based on co-housing rental premises that enhance community living hence assisting new dwellers in coping with high expenditure of living cost. Occupational period is within 1 year to 18 months, with RM100 monthly fee.
DESIGN & NECESSITY	MICRO PALNNING	<p>GROUND FLOOR PLAN</p> <p>1st FLOOR PLAN</p>	<p>TYPE A - UNIT 300 sqft</p> <p>TYPE B - UNIT 210 sqft</p>	<p>Cubicle 1, 2, 3, 4</p> <p>Window</p>
	EFFECT ON MACRO PLANNING	Each unit is provided with living/dining area, and kitchen at ground level with sleeping area upstairs. Huge void play important role in creating volume. (5m x 5m); area = 37.5 sqm / 416 sqft)	Plan in 2 types ; A - 300 sqft, B - 210 sqft	Every cubicle: 7.2 sqm / 80 sqft Room is divided into 4 bed and 6 bed unit.
	INNOVATION	<ul style="list-style-type: none"> - Sharing communal space called as 'Kongsi'. - Prefabricated house within 2 car parking lot. 	<ul style="list-style-type: none"> - Prefabricated house with 2 flexible layouts. - Prefabricated modular furniture. - Flexible layout in computing original conventional housing unit. - Prefabricated micro mart. 	<ul style="list-style-type: none"> - Prefabricated modular wardrobe
CONSUMER FEEDBACK	REACTION	<ol style="list-style-type: none"> 1) Concern that the prototypes shall lead to a new developments being built in the city. 2) The concept shall only appeal to the younger generation, as older folks found the constricted space and the needs to climb up the micro homes is less practical to them. 3) Does it effect the heritage of the city? 4) Not practical for raising family. 5) Should be design with a good urban planning in conjunction with proper urban park and recreational area. 	<ol style="list-style-type: none"> 1) The initial Capsule hotel concept has a temporary connotation of living and only promotes social urban problem if it is not well managed. 	
	INITIATIVE	<ol style="list-style-type: none"> 1) The prototype intends to reused of unoccupied building in the city and for the people to populate downtown KL. 2) Its an opprtunity to promote affordable urban living to the young executives. 	<ol style="list-style-type: none"> 1) Social initiative by DBKL in helping the B40 community to boost their career in KL . As such, the premises will be kept as preliminary and temporary living until certain period of time. 	

Source: Author

Table 2: A precedent study on micro-housing in a different region

TYPOLOGICAL STUDY	LOCATION	SIZE	INTENTION	INNOVATION	PLANNING
THE LIVING CUBE	Switzerland	Varies: Can accommodate queen size bed with internal storage underneath - (width: 1.5m / length: 3.5m / Height: 2.1m)	Compact modular living storage with upper decking for private (sleeping area) and inner space for wardrobe or storage with outer shelving for TV panneling, open shelves and open wardrobe.	Modular invention for different purpose, size and function.	
MICRO MEZZANINE	Taipei, Taiwan	17.6 sqm / 196 sqft	A renovation project to optimize floor plan and volume. Aim to create a practical proportion of sleeping / living & bathing.	Built in space saving furniture / Creation of mezzanine floor to optimize big volume.	 Ground level Mezzanine level
MICRO MOBILE	Wyoming, USA	Not mentioned.	Designed for ' adventure wherever you go ', with American interior decoration - large kitchen appliances for special function.	<ul style="list-style-type: none">- Moveable : can be attach to the back of vehicle.- Transportable size similar to freight contena.- External finishes blended as wall climbing features.- Mezzanine to optimize volume.- Convertible furniture	
MICRO MACHINE	New York, USA	33 sqm / 370 sqft	Renovation project; aim to function like twice of its size. Stressed on the flexibility notion of machine. It also promote sustainable living through recycled material.	Install with moveable, folding and expandable modular furniture to suit different activity and function. Space saving design furniture. (Refer to appendix 1)	

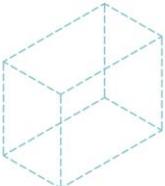
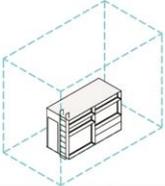
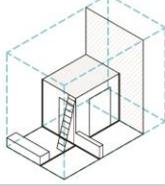
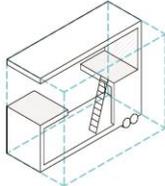
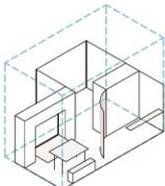
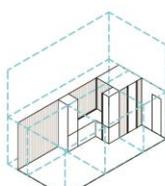
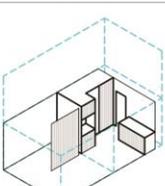
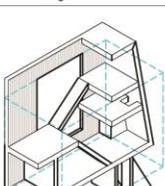
Source: Author

Table 2: A precedent study on micro-housing in a different region

TYPOLOGICAL STUDY	LOCATION	SIZE	INTENTION	INNOVATION	PLANNING
MICRO BLOCK	New York, USA	Unit: 250 -350 sqft / Tower: 35,000 sqft	New project; Intended to serve as systemic new paradigm for cities facing an affordable housing crisis. Tower block contains 55 units. Every unit aim to provide sense of spaciousness, comfort and flexibility. To provide as much air, volume, light, and view.	- Prefabricated off site unit. Modular unit. - Built-in piece furniture that combines sofa, bed, and storage - so the living can be converted into bedroom.	
MICRO CUBE	Sydney, Australia	24 sqm / 270 sqft	A Renovation project: Promote living with less. The design deliberately place importance on selecting, organizing and caring's for one belonging.	- Base on Japanese 5s organization - Sort, Straighten, Shine, Standardized and Sustain. - Bespoke and streamlined joinery is used to provide ample storage. - Used of breathing partition to maximize light and air.	
MICRO WINDOW HOUSE	Sagami Bay, Kanagawa, Japan	Not mentioned	New project: Designed as a - weekend house, built with large window to provide view for the neighbours in the absence of the owner.	- Large opening to accomodate view to the sea. - Ground pilotis to allow for view, tides and urban flow. - Layered levels & loft to maximize volume.	

Source: Author

Table 3: Comparison of the micro-housing typological domain and regional cultural study

TYPOLOGICAL ANALYSIS			TYPOLOGICAL DOMAIN	DOMAIN and RELATION TO MACRO REGIONAL & CULTURAL STUDY	
Parameter		Parameter is based on hypothetical rectangular void - 10ft x 25ft = 250 sqft 10ft x 30ft = 300 sqft - to achieved micro size of home.			
THE LIVING CUBE		Considered as an object, it is flexible in position and modular in size. It provides indirectly two levels of living - thus maximizing the entire space.	BOX TYPE	This type features a package of compact object . Space is derived through objects attributes that emerged from all 6 sided of cubic parameter.	WESTERNER APPROACH This approach is based on the Aesthetic of the Abundance rooted from the American consumer culture. POSSESSION DOMESTICITY Living is based on the possession on the materials. The advent of micro living is merely on the object possessed by the unit. The more objects embedded, the better it will be.
MICRO MEZZANINE		The notions of maximizing space (volume basis) is further developed in this scheme. The mezzanine achieve 1/2 of the area.			
MICRO MOBILE		The notions of maximizing space (volume basis) is further developed in two zonings with additional moveable features.	MOBILE TYPE	This type features a moveable attributes that is compatible to any transportational system i.e road / trailer / ship etc.	
MICRO MACHINE		The notions of maximizing space is now based on machine mechanism - of furniture.	MACHINE TYPE	This type features machinery attributes ranging into modular system, flexible mechanism, and prefabrication .	
MICRO BLOCK		Machine mechanism is fully developed into prefabricated object. The idealistic of mechanical furnitures are embedded in the system			
MICRO CUBE		Prefabrications and machine mechanism is developed into humane approach where environment become part of the design.	PROP TYPE	This type features a combination of machinery attributes of modularity and flexibility and environmental attributes . Here, machinery becomes prop that support the humane living.	
MICRO WINDOW HOUSE		Humane approach is developed into a macro environmental strategy; where society become part of the design agenda.			

Source: Author

Table 4: Summary of the comparison between the local prototypes and the typological study and the psychological needs of living

Local Approach	Main Attributes (summarized from Table 1)	Comparison with Typological Analysis and Domain	Comparison with Macro Regional and Cultural Study	New Approach	Psychological Needs of Living	
					Human Needs into Concerns (personal space, privacy, withdrawal, and territoriality)	Spatial Behaviour (spatial adaptation, crowding and the influence of space)
<p><u>Prototype 1:</u> Tetawowe Atelier and AMC Architects</p>	<ul style="list-style-type: none"> ▪ Prefabricated unit located at the abundant car park which covers two car parking lots ▪ Segregation of space with sleeping (private or confined space) located above and semi-private or semi-confined space (indoor communal area) below ▪ Emphasizes on void and volume ▪ Outdoor communal space ▪ Towards sustainable horizontal/ flat village 	<ul style="list-style-type: none"> ▪ Possess similarities with the prop type with the optimization of volume into space ▪ Environmental concerns are given to the act of openness and maximizing light, air, and view which also posed resemblance to micro cube and micro window house 	<ul style="list-style-type: none"> ▪ The approach is more towards the 'orientalism' with the emphasize of modularity and centrality of space ▪ Not much emphasis given to objects 	<p>Shared outdoor communal space is known as 'kongs' which resembles the notion of flat village</p>	<ul style="list-style-type: none"> ▪ The separation of space with sleeping or the private area above and semi-private space below defines the different functions, activities, and role of living. ▪ The physical separation of sleeping through the volume of space marks the territory of personal space and provides a sense of privacy and the need for isolation. 	<ul style="list-style-type: none"> ▪ The limitation of small space is overcome by the segregation of activities in the living environment and the maximization of volume, light, air, and view ▪ The confined and semi-confined space indicates personalization of space mainly for work and relaxation with social engagements conducted outdoors
<p><u>Prototype 2:</u> Studio Bikin</p>	<ul style="list-style-type: none"> ▪ Pavilion as the concept for living with skeletal shell and insertion of objects as the framework ▪ Prefabricated house with flexible layout and prefabricated modular furniture ▪ Large outdoor communal area 	<ul style="list-style-type: none"> ▪ Possess similarities with the machine type which consists of the micro-machine and micro block ▪ Emphasizes the use of prefabricated modular furniture that can fold, move, expand, elevate and convert to different sets of function and activities 	<ul style="list-style-type: none"> ▪ Approach is more towards the 'westerner' with objects embedded within the space that define the micro-living ▪ Not much emphasis given to space 	<p>The large outdoor communal area just outside the unit which when combined will resemble a compact vertical village</p>	<p>The act of personal space, privacy, withdrawal, and territoriality is achieved through the modification of objects within the framework</p>	<ul style="list-style-type: none"> ▪ Adaptation of space through modification of objects ▪ Objects determine the activity and function of space ▪ Personalized and confined and semi-confined spaces are within the framework ▪ The users can conduct social activities at the large communal area located just outside the unit
<p><u>Prototype 3:</u> Perumahan Bandar Jalan TAR, DBKL</p>	<ul style="list-style-type: none"> ▪ A room or space with 4 to 6 cubicles ▪ Prefabricated modular wardrobe 	<ul style="list-style-type: none"> ▪ Very minimal similarity seen which is limited to the prefabricated modular wardrobe ▪ Could possess similarities with the box type through the modification of object into a compact package 	<ul style="list-style-type: none"> ▪ Demarcation of space through cubicles ▪ Minimal resemblance to the 'westerner' approach where loose and prefabricated objects define the space 	<p>Capsule hotel concept</p>	<p>The sense of personal space, privacy, isolation and territory is achieved through partitions which create the cubicles</p>	<ul style="list-style-type: none"> ▪ Not much emphasis given to building amenities and facilities ▪ Despite its limitation, the housing is located in a strategic location with excellent infrastructure and amenities

Source: Author

Prototype 1 emphasized the separation of space with sleeping or private area located upstairs and an indoor communal or semi-private area downstairs. This physical separation of space through volume marks the territory of personal space and provides a sense of privacy and the need for isolation among the users. The limitation of space is adapted with the volumetric segregation of activities within the living environment and the maximization of light, air, and view through large openings. In this prototype, one can socialize at the *kongsi* or outdoor communal area located just outside the enclosed unit.

In prototype 2, the use of modified objects helps to achieve a sense of personal space, privacy, withdrawal, and territoriality. Such objects are prefabricated modular furniture which is flexible and can transform into different functions and activities within the living space. Similar to prototype 1, the users can conduct their social activities at the large communal area located just outside the unit.

Unlike prototype 2, prototype 3 creates the act of personal space, privacy, isolation, and territory through the installation of partitions, which demarcate the boundary of the unit or cubicle. This prototype only provides sleeping and bathing facilities without any consideration of space for social engagement. Despite its limitation in size and facilities, the housing is located in a strategic location and surrounded by excellent infrastructure and amenities.

5.3 Significant Differences and Similarities between the Prototypes of Local Micro Housing

The proposal for prototype 1 makes use of the abundant car parks to build micro homes. The spatial layout segregates private and semi-private space with sleeping or a private area at the upper level and indoor communal area or semi-private area at the lower level. The units can duplicate horizontally to resemble a flat sustainable village. The segregation of space through volume defines the functions and activities in the living environment.

Prototype 2, on the other hand, makes use of prefabricated modular objects to create different functions and activities within an open space. The design also allows the units to stack and overlap to create a compact vertical village.

Prototype 3 significantly differs from prototype 1 and 2 in terms of its function. While prototype 1 and 2 can convert to permanent homes, prototype 3, is built purely for temporary living as it only offers sleeping and bathing facilities. Despite these differences, there is a distinct similarity between prototype 1 and 2. Outdoor communal areas are designed in both prototypes to serve as a social engagement area among the community.

6.0 Conclusion and Recommendations

There have been numerous discussions on affordable housing in Malaysia with emphasis given to micro-homes. While various bodies have made several proposals, the approach towards micro-homes has not been fully visualized, not until recently, where DBKL introduced the micro-housing scheme at Jalan Tuanku Abdul Rahman (TAR), Kuala Lumpur in early 2019. Although this initiative received mixed public reactions, it nevertheless opens up to further study on its similarities with the typological domains of micro-housing from all over the world and its relevance to the locality context.

The data and findings revealed that there are significant similarities between the approach taken by Tetawowe Atelier and AMC Architects and Studio Bikin and the existing typological concept of micro-housing. Although these two schemes emphasized on different typological domains, both proposals not only aimed to solve the housing problems among the B40 community, but it also promotes community living through the sustainable village. In these two proposals, living and psychological needs are extrapolated through function and activities that are defined by physical space and objects.

The Perumahan Bandar Jalan TAR has minimal similarities to the existing typological concept of micro-housing. The approach is based on the concept of Capsule Hotel, where living is temporary and that the proposal takes advantage of the surrounding environment to fulfil its basic amenity needs. While the scheme offers an answer to Max-Neef's existential human needs and Maslow's physiological needs, it lacks consideration of the Max-Neef's axiological human needs and Maslow's other hierarchy of needs.

Although the size of physical space has less effect on existential human needs but at of significant effect on axiological human needs, there is indeed no definition or requirement of small space or small living. According to Jacobsen (2013), a space is too small if it prevents the user from performing or accomplishing their activities. In the case of DBKL, regardless of its limitation in size and temporary status, the axiological human needs must be met, and this can only be achieved through creative spatial optimization and maximizing the values of living.

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