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B-01-02, Jalan SS7/13B, Aman Seri, Kelana Jaya
47301, Petaling Jaya, Selangor Darul Ehsan, MALAYSIA
Tel: +603 78770637 Fax: +603 78779636 Email: mip@mip.org.my

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"Whoever travels in search of knowledge is on Jihād until he returns"

(Transmitted by Tirmidhi & Darimi)

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(2015-2017 Session)

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MESSAGE FROM THE PRESIDENT

Dear Readers,

As in the past, MIP is once again conceitedly to present its thirteenth volume of Planning Malaysia. Since its inauguration in 2003, the Journal has been well-received by the members as well as the academic community. This is due to the interest of knowledge seeking and improvement among the members. The articles touched on a wide spectrum of our daily planning issues. It is indeed a great achievement for the Institute as we strive to encourage more members and academics to write and share new ideas on planning and urban development.

Urban and Regional Planning is a very broad based subject that covers technical and political processes concerned with the control of the use of land and design of the urban environment, including transportation networks, to guide and ensure the orderly development of settlement and communities. The wide ranging topics in this issue reflect the various dimensions of sustainable cities and urban planning that is holistic and comprehensive. One of the key objectives of this issue is to provide a platform for town planners to share new ideas and experiences on cities and urban planning. Such new ideas are by researches, studies undertaken or actual hands-on experiences of planners. Thus, I hope this issue provides a better insight to all readers of the broad dimensions that urban or town planning has and the role of town planners play in the growth and development of the nation.

Apart from the planning circle, Planning Malaysia is also extended to various planning related organisations, institutions of higher learning as well as to all members of the institute. We anticipate to eventually extend the circulation of this journal to non-planning related organisations and institutions that has indirect role in planning within and outside the country. We hope this issue will serve the purpose and we welcome any feedback for the improvement of the forthcoming issue.

As a preside President, I would like to acknowledge and congratulate the journal's Editor-in-Chief, Professor Dato' Dr. Mansor Ibrahim and his team for the dedication and continuous support to the Institute.

Thank you and happy reading.

Md Nazri Mohd Noordin
PRESIDENT
(2015-2017)

PREFACE

Sustainable urban development: Built environment in focus

Today, with more than half of the world population residing in urban areas, urban development has become an extremely significant global phenomenon and this trend continues. Due to the scale and speed, the urban development offers both opportunities and challenges. Through the phenomena such as the concentration of population, buildings, infrastructures, innovation and industry, cities and urban growth centres significantly produce economic growth and offer vast majority of employment opportunities, which subsequently contributes to poverty reduction. Cities are also the centres of modern living where indicators of general health and wellbeing, literacy, technological advancement, culture and social mobility are typically highest. The growth, however, has been not without challenges. Urban development brings congestion and pollution, social segregation and traffic gridlock. It also escalates the environmental and social risks. Today, cities consume 80% of the energy generated worldwide and are responsibility for around 85% of global GHG emissions. Due to this significance, for the first time, sustainable urban development becomes one of the key agendas in the newly announced SDGs (#11).

This special issue of Planning Malaysia gathers a total of thirteen articles contributed by the scholars from rich range of the Built Environment disciplines to address and shares the issues and possible solutions contributing to the sustainable development of urban future. For that, we divide them into six broad themes, which include urban environment as its core, demographic-focused studies on the elderly, sectoral research into housing and labour supply in construction industry, mobility for urban living with different groups of community, building level sustainability and conservation as part of urban development resiliency.

The urban environment theme consists of three articles with different focus. "Sustainable urban development through urban consolidation policy in Shiraz, Iran" highlights the initiatives at policy level, followed by "An initiative based assessment frame for smart city" which outlines the measurable indicators for a smart city. The authors of "Environmental psychology: The urban built environment impact on human mental health" on the other hand, explores the psychological dimensions of built environment impact.

The second theme is the demographic study with special attention given to the elderly group. "Elderly policy framework and active ageing in Malaysia" reviews the policy required for active ageing and sustainable neighbourhood design for elderly while the distribution of existing health care facilities for elderly is addressed in "Elderly and community health care facilities: A spatial analysis".

Sectoral research papers included in this special issue are "Sustainable housing affordability in East Malaysia" where the authors focus on the trade-off of building affordability housing in the case of Sabah, and "The challenge of labour shortage for sustainable construction" brings up the factors influencing the labour supply in construction industry and the possible solutions.

Interestingly, both the papers "Incorporating walking in travel to work: An insight from the Kuala Lumpur community" and "Campus walkability in Malaysian public universities: A case study of University of Malaya" despite targeting on different user groups, highlight the importance of walkability under the mobility in urban environment theme.

Sustainability at building level is discussed in three articles i.e. "Prevention of Aedes breeding habitats for urban high-rise building in Malaysia", "Energy efficiency policy for existing typical campus buildings in the University of Malaya" and "Preferences of student residents towards sustainability with the concept of bioclimatic design". The first article highlights the environmental health issue faced in urban areas in Malaysia while the second article explores the formulation of Energy Management System as the possible option for energy saving at campus level. The third article discloses the feedback on the concept of bioclimatic design at the level of student residential building.

Last but not least, is the paper on "Synthesising an effective incentives system in safeguarding heritage village in world heritage site of Melaka and George Town" that summarises the constraints to the existing incentive programs in the world cultural heritage sites of Malaysia and recommends the way of moving forward.

In terms of geographical coverage, the special issue includes mainly the case studies in Malaysia, but without failing, to include Australia and Iran, thanks for our colleagues' fruitful international collaboration. Within the country, we have articles researching on Kuala Lumpur and specifically into our beloved campus of the University of Malaya, apart from reaching far to the Malaysia Borneo.

In short, this special issue intends to send a clear message about sustainable urban environment that it covers a wide range of disciplines and should be approached holistically in an integrated manner. While we strive into researching the individual disciplines with solid arguments through empirical evidence, we also recognise the necessity to embed the socio economic factors into the urban spatial application under one umbrella. For that, we have transformed our knowledge to the next level, more need to be done. As a continuation of the Special Edition issue, the future edition may look into the symbiosis of the built and natural environment in meeting the total sustainability of the urban development. As for now, happy reading, planners at heart, planners at work!

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SUSTAINABLE URBAN DEVELOPMENT THROUGH URBAN CONSOLIDATION POLICY IN SHIRAZ, IRAN

Mozhgan Samzadeh[1], Zunaibi Abdullah[2], Saari Omar[3] & Aniza Abdul Aziz[4]

[1,2,3,4]*Department of Architecture, Faculty of Built Environment*
UNIVERSITY OF MALAYA

Abstract

In the past few decades, cities from various parts of the world have faced with unplanned and uncontrolled physical expansion due to inappropriate policies. Among different solutions against urban sprawl, the dominant sustainable cure is the so-called 'Urban Consolidation'. This paper aims to explore urban sprawl characteristics and present its cause and effect on the sustainability criteria of Shiraz city, Iran. It is confined to an exploration of population growth and physical expansion of the city. The data has been collected from governmental organizations and documents. This paper examines UC policy implementation in the inner city of Shiraz to control low-density urban sprawl. As the result, this paper discovers that the policy emphasizes on the higher density housing development in existing urban areas considering the capacity of infrastructures and facilities' availability prior to calculate housing targets to decrease the demand for Greenfield development. It concludes with a brief discussion on the challenges to achieve sustainable urban development goals in the city through UC strategies.

Keywords: Urban Sprawl, Sustainable Development, Urban Consolidation Policy, Higher-density Housing, Iran.

[1]Research assistant at University of Malaya. Email: mozhgan.s@um.edu.my

INTRODUCTION

The need to tackle rising urban sprawl

Globalization, industrialization and rapid rate of population growth in the cities have become critical issues of concern to most national governments worldwide (Jiboy, 2011). Specifically, among such are; the Millennium Development Goals Summits, the 2002 world summit in Johannesburg, and the La-Havana UN (Oladunjoye, 2005) sustainable cities documentation of experience programmed among several others. In each of these summits, member nations reiterate the need for good and effective governance as a means of achieving sustainable development in the cities (Oladunjoye, 2005; UN-Habitat, 2007; UNDPI, 2008).

In order to explain and justify this global issue of development, a World Bank Report in 2000 and another of the International Monetary Fund in 2006, had indicated that about 66 percent of the world's population lived in the countryside in the early 1950s; however, current estimate by the United Nations has put the world population at 6.572 billion people, of which 3 billion (about 50%) now live within the urban areas, and by 2030, about 61 percent of the world population is projected to live in the cities; and this growth is expected to occur mainly in developing countries (United Nations, 2004; UNCHS, 2007; UNFPA, 2007; Daramola & Ibem, 2010).

Roughly built-up areas of cities currently cover 400,000 km^2 of the Earth's surface, and this number is rising quickly: Estimates of its predicted additional increase by 2030 range between 700,000 km^2 (Angel et al., 2005) and 1,200,000 km^2 (Seto et al., 2012). Cities in developing countries are expected to triple their built-up land area from 200,000 km^2 to 600,000 km^2 or more, and cities in developed countries will increase their built-up land area from 200,000 km^2 to at least 500,000 km^2 (United Nations Population Fund, 2007).

The process of fringe development has been observed and interpreted in the context of "Dissolution of Urban Structure" (Burdack, 2002). Blurring the urban-rural line and shifting relationship between city and countryside happened as results of dissolution of urban structure. A key term of the discourse is 'urban sprawl'. *"Sprawl is a result not just of population growth but also of new lifestyles that require more space" (Jaeger & Schwick, 2014).*

Rapid population growth increases the demand for residential land, housing, and urban infrastructure. The high demand for housing and limitation of urban areas increase housing prices in the inner city (Samzadeh, 2014) and as a result, people move further out of the city centre where affordable housing is available (urban sprawl). This paper aims to explore different attributes of urban sprawl

and present its cause and effect on the sustainability criteria of Shiraz city to eliminate and control suburban development. The work presented in the paper is confined to an exploration of population growth and physical expansion of the city.

LITERATURE REVIEW

Urban sprawl in Iranian cities

During the past one hundred years the Iranian urban fabrics have been transformed from compact traditional morphologies to less compact patterns and lower population densities. The street networks have changed from curvy streets and dead-end allies in the traditional fabrics to semi-gridiron networks in 1950s and 1960s and complete gridiron after 1980. The population densities decreased continuously during the last decades and the length of the urban trips became longer. Today for residents living in new districts, many destinations are not within the walking distances. On the other hand, the new urban planning system emphasized on motorized transportation. Thus most of the planning efforts are put on improving the quality of wide streets and highway systems, while drawing people to local centres and planning neighbourhood amenities are almost forgotten.

This paper aims at reviewing the policy and strategy, which have been taken by local government to combat urban sprawl in Shiraz city as a *role model for other metropolitan cities* (Gozaresh, 2008). The main result that is expected is providing the planners of Iran and other countries with a basic concept for controlling urban sprawl. Bunker et al (2007) argues that the successful implementation of the local government strategies will depend on three main factors: (1) the degree to which the strategy reflects the planning issues being faced by the city, (2) whether policies and funding will support implementation of the plan, and (3) the way that councils choose to interpret and implement the plan.

Urban Consolidation (UC)

Urban consolidation is a policy measure that addresses the problem of urban sprawl (Malenic & Han, 2015) such as, irreversible damage to ecosystems by scattered and fragmented urban development in greenfield areas (Brueckner, 2000; Burchell et al, 1998); reduction of green space (Brunner & Cozens, 2013); increase in energy consumption by encouraging the use of private vehicles (Downs, 1999), causing traffic congestion (Ewing, 1997), air pollution (Johnson, 2001), and sometimes increase in carbon emissions (Gray et al., 2010).

Although the causes and patterns of urban sprawl in developing and developed countries are different, depending on the context in which they occur, recommended solutions are similar with some modifications. In terms of

sustainability the dominant view is still that increasing urban residential density, often called 'urban consolidation', is a universal urban sustainability solution (Birkeland, 2012). Smith (1997) defines Urban Consolidation as *"the process of increasing and/or maintaining the density of housing in established residential areas in order to increase or maintain the population densities of those areas".* Buxton and Tieman (2005) also described this phenomenon as *"an intensification of built form and activity within a particular urban area".* The concept of 'intensification' of urban land, caused by increased pressure on infrastructure and services, is a recurring concern accompanying urban consolidation.

UC as an affordable densification alternative strategy used around the world and defined as a *"serendipitous solution to a range of pressing urban problems, including urban sprawl, car dependency and lack of affordable housing in urban areas" (Bunker et al., 2002).*

One of the most important targets of UC is to increase use of infrastructure services and facilities provided in existing urban areas. This illustrates an economic profit, as it requires cost reduction on new urban infrastructure. Likewise, O'Connor et al (O'Connor et al., 1995) agrees that *"the underutilization of facilities in established areas as well as the 'isolation and deprivation of suburbia', are major drivers for urban consolidation"*. UC considered as a method to create vibrant, accessible, and well-connected urban environments.

RESEARCH APPROACH

The adopted research approach in this paper is an applied urban research. *"Applied urban research focuses on the processes and outcomes of urbanization with the goal of acquiring a sharper understanding for policy-making purposes and providing a better quality of life for those of us living in urban centres" (Andranovich & Riposa, 1993).* Applied research is characterized as a policy focus approach. It means that the research is collaborative, problem oriented, and conducted to provide potential solutions to geographically bounded urban problems (Lerner & Lasswell, 1951). The focus of this research is to review the urban consolidation policy and housing targets in Shiraz city through the Master Plan and HUD Strategies, and also examine the role of local municipal council in the process of implementation of this policy.

Materials and methodology

The study utilized the environment statistical data, surveys and urban plans released by the housing and urban development organization, municipality and central statistical office of Shiraz city. Urban development plans have been respectively classified for the last two centuries to study effective factors on

urban sprawl. Statistical data are collected from the 20 years' knowledge of the study area. The sixth municipal council in Shiraz city has been considered as a role model for other municipal councils in terms of implementation of urban consolidation strategies to control urban sprawl through building higher density housing in existing urban areas.

THE CASE STUDY – SHIRAZ

Urban sprawl in Shiraz

Shiraz is located on latitude 29° 33' North and longitude 52° 36' East. It is capital city of Fars province and the fifth most populated city in Iran that is confronted with the problems created by the clashes between low density and urban sprawl. According to the last official census [2006], Shiraz population [1,312,146] has been enormously increased from 170,656 in 1956, over the last few decades.

When the land use for the average resident increases, it is named Per Capita Sprawl and it causes the urbanization of surrounding rural land. The land used per person is the total land area divided by the total number of people. This is the inverse of population density, which is the number of people per unit area of land. When per capita land consumption goes up, density goes down; when per capita land consumption goes down, density goes up (Movahed, 2008). Table 1 shows per capita land consumption of Shiraz from 1921 to 2006.

Table 1: Shiraz Per Capita Land Consumption from 1921 to 2004

Year	P.C.L consumption (m/p)
1921	About 47
1971	127
1991	152.8
2004	151.7

Source: Shiraz Central Statistical Office

According to statistics data, Shiraz has expanded by 46 times since 1921 while the population has risen by only 15 times. Therefore, the city has encountered with urban sprawl. The growth of Shiraz city in recent 80 years has occupied on former agricultural land and rural areas specially, agricultural lands which have been ideal for its expansion. It has displaced agricultural activity to less productive areas (Movahed, 2008). Considering physical development of Shiraz to the agricultural realm, the need to take preventative measures in terms of preserving natural spaces and available potential resources is essential.

Evolving approaches to urban consolidation policy in Shiraz

Many gardens of Shiraz began to vanish in the past 30 years. These sites have become highly attractive for new residential and commercial developments (Figure 1). During much of the twentieth century, Shiraz urban form mainly consisted of low-density separate houses or single-family detached homes (Master Plan, 2007). Human population growth, migration, and increasing private automobile ownership are the most important factors forming urban development in Shiraz.

Although planning policy in the 1980's recognized the need for more compact development, low-density housing development continued as the preferred form of housing. The prevailing tendency was to eliminate residential development from larger centres in order to make ideal urban environments (MPO, 2007).

In 1990's, the Management and Planning Organization required municipal councils to prepare Residential Development Strategies to accommodate additional dwellings in existing urban areas (MPO, 2007). This heralded the start of a focus on residential development in city centres with good accessibility. *"A more prescriptive approach to the location of higher density forms with the explicit promotion of development around key transport nodes and urban centres" (Bunker et al., 2002).* The focus on higher density housing in city centres has intensified, and become the main concern of the Master Plan Housing Strategy.

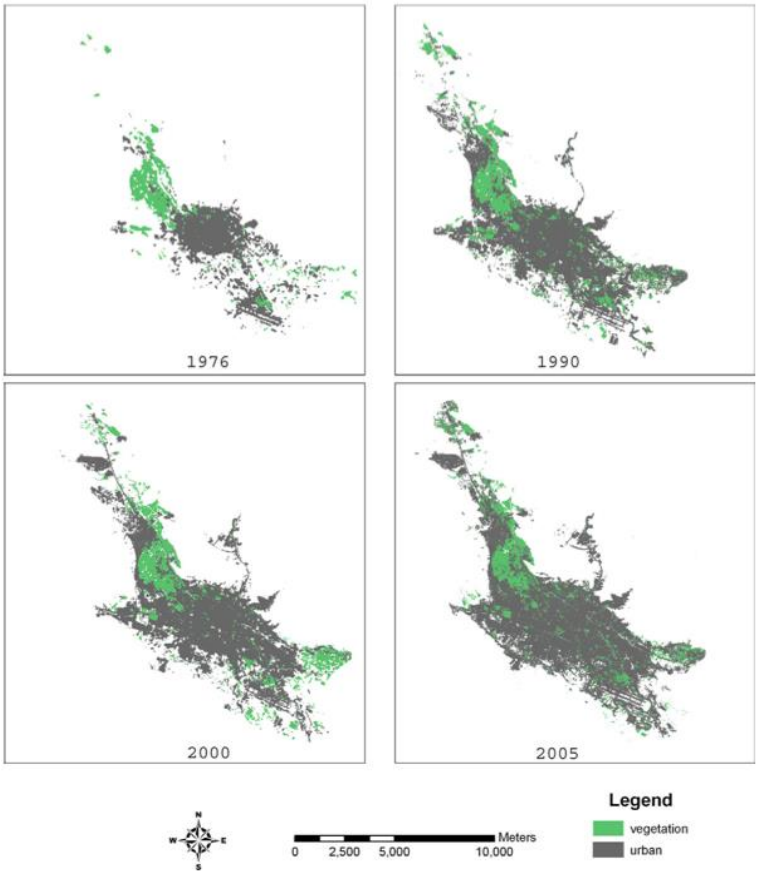

Figure 1: Urban Growth of Shiraz 1976 – 2005
Source: (Sarvestani et al., 2011)

RESULTS

Shiraz Master Plan

The latest Master Plan [Detailed Plan Review] of Shiraz as titled "The Guide to Urban Development in Shiraz City", aimed at achieving the socio-environmental and economic policy that will guide urban development in Shiraz for the next 10 years [2007-2017]. The Master Plan Housing Strategy as an integral part of planning policy illustrates the housing challenges that will be encountered, as the Shiraz population is estimated at 1.65 million over the next 10 years (MPO, 2007). The Housing Strategy defines as "the principal planning document outlining the implementation of the policy of urban consolidation across the city" (Gozaresh, 2008). The key objectives for new housing development in Shiraz are:

1. Implementation of inner city development strategies through the higher density housing pattern
2. Selecting suitable sites for higher density housing appropriate with the level of demand, capacity of infrastructures, transport network, services, and role of the area in the region
3. Plan for higher density housing near 'mixed-use' areas
4. Renew local centres
5. Improve housing affordability
6. Improve the quality of new development and urban renewal (MPO, 2007).

The housing strategy aims to reinforce the UC policy through providing higher density housing in existing urban areas of Shiraz city to accommodate 244,000 new dwellings by 2021 (MPO, 2007). Municipal councils carry out this goal through implementation of housing targets within existing urban areas. The key purpose of this strategy is to avoid housing development on Greenfield sites, to deal with urban sprawl problems.

Housing and Urban Development (HUD) strategies

The Housing and Urban Development organization published Housing Development Strategies for eight municipal districts of Shiraz city in 2008 in line with the rules, regulation, and goals of Master Plan Strategy. These strategies encourage local municipal councils to get involved in this important initiative: 'future housing development to accommodate additional dwellings must be concentrated in and around city centres, where access to core services and facilities by individuals through public transport, walking, and cycling is locally available'. The 'Proposed urban physical divisions of Shiraz city set by HUD, as a key focus enabled municipalities to monitor the potential development of lands in urban areas to accommodate additional dwellings (Table 2).

HUD Strategies emphasize the importance of city centres' classification within the municipal districts of Shiraz city, based on types of shopping centres, medical facilities, recreational facilities, and public transportation available (Table 3). Table 3 shows the hierarchy of city centres to determine the housing targets. In this table, a "Major centre" is described as a centre with a radius of 1000 meters, and estimated to accommodate 13500-18000 housings (The HUD Strategies, 2008).

Table 2: Proposed urban physical divisions of Shiraz city

Divisions	
Housing unit	**Housing unit**

Housing complex	**90-200**	**Housing complex**			
Neighbourhood	400-600	3-5	**Neighbourhood**		
District	700-1250	8-10	2-3	**District**	
Quarter	1800-3000	15-20	4-5	2	**Quarter**
Area	3500-5000	30-40	8-9	4	2	**Area**
Region	13500-18000	120-160	32-34	16	8	4

Source: Pour-Mohammadi (2008)

All Major centres are supposed to have an equal level of services, recreational facilities, and public transportation. In order to accommodate additional housings for 244,000 new dwellings in urban areas of Shiraz city, the MPO provides the HUD Strategies to facilitate achieving the housing targets between municipal councils. These Strategies are the outcome of discussion, agreement, and cooperation between provincial and municipal offices.

Table 3: Hierarchy of Shiraz urban area centres

Centre type	**Elements of centre**	**Catchment area (Meters)**	**Centre housing target (expected average number of dwellings)**
Major centre	Major shopping and business centre serving the region with large shopping malls, specialist retail, medical services, office and residential buildings, council offices	1000	13500-18000
Area centre	One or two supermarkets, community facilities, medical centre, schools; usually a more residential origin than an employment destination	800	3500-5000
Quarter centre	A strip of shops and surrounding residential area within a 5 to 10-minute walk. Contains a small supermarket, hairdresser, and take–away food shops.	600	1800-3000
District centre	A small strip of shops and adjacent residential area within a 5 to 10-minute walk	400	700-1250
Neighbourhood centre	One or a small cluster of shops and services.	150	400-600

Source: The HUD Strategies 2008

DISCUSSION - IMPLEMENTATION OF STRATEGIES

The strategic approach to UC policy in Shiraz city was examined through the Master plan and the HUD strategies. In order to convert the strategies' goals

into actions, the municipalities have been regarded as the most responsible organ at the municipal level.

The Master Plan and HUD Strategies both devoted one chapter to *"Monitoring Governance for Implementation*" comprising duties and responsibilities about implementation of the strategies. The HUD Strategy also includes provisions for further financial support and infrastructure. Moreover, the Master Plan Strategy needs the Local infrastructure strategy to prepare Outline Plans for urban development, transportation, education, and health projects. However, it is noteworthy that in the local infrastructure strategy, there is no commitment for financial support and infrastructure in urban fringe. Therefore, the major focus of local infrastructure strategy is on improving infrastructures and services within urban areas of Shiraz metropolitan city to combat urban sprawl.

Initially, the municipal council allocates sites in and around city centres close to public transport nodes for higher density housing development. In this regard, the Master plan strategy needs to allocate higher density housing in different city centres in order to prevent over intensification. This approach provides a more sustainable development of a city centre. Different municipal district has experienced different height of housing block. The sixth municipal district proposed and carried out the merit option of having a maximum of six-storey building height, which became a good model for other municipal districts across Shiraz city (Samzadeh, 2014). The sixth municipality has specifically provided the consideration of the socio-economic and environmental conditions of each site for higher density housing development in their housing strategy.

As a result of a comprehensive and collaborative planning to analyse every single selected site for higher density housing, the sixth municipal council emphasized on considering factors such as proximity to: public transport systems, healthcare services, education sectors, employment sectors, sports and recreation centres, shopping centres, walkability, infrastructure capacity and funding, land ownership patterns, community opposition, and the potential in combination housing form in their development proposal.

In addition, the proposed six-storey height limit in the sixth municipal district is considered as the most appropriate option socially and economically with the least threat of negative effect on the neighbouring areas. Likewise, Searle (2004) and Jacobs (1961) also recommended the suitability of five-six storey building height located within walking distance of shops and services. They declared their support for the creation of inner city environments with higher density housing near 'mixed-use' areas to ensure accessibility, vitality, and diversity within the inner city environment.

The sixth municipal council has reached a high level of coordination in the implementation of the urban consolidation objectives through the master plan and HUD strategies. The sixth municipal council prepared a Key Design

Principles along with the housing strategy prior to actual implementation of improvement to identify sites.

CONCLUSION

This paper tried to encourage focused research on urban sprawl, which is rapidly spreading in Shiraz city. As discussed the common responsible factors of urban sprawl were population and per capita land consumption growth. UC policy, as the land use aspect of the compact city approach and a universal urban sustainable solution (Birkeland, 2012), tends to increase housing density in established residential areas to improve the long-term sustainability of the city, decrease the demand for Greenfield development, and finally control urban sprawl. The focus of UC policy in Shiraz is on centralizing housing in close proximity to the city centres and transport nodes. The experimental justification of this approach is that shopping centres, medical facilities, recreational facilities, and public transportation, all are easily accessible within city centres. This approach is important from two perspectives:

1. Providing opportunities to improve overall levels of vitality in city centres
2. Restricting the spreading housing across low-density suburbia.

This idea is in accordance with the opinion of Bunker et al (2002) and Searle (2004), who agreed that *concentrating housing around the city centres increases accessibility and connectivity within the urban environment*. Initially, the housing strategy formed based on zoning opportunities and the potential of lands in each LGA to increase the housing density in Shiraz. The capacity of infrastructures and facilities' availability within different city centres have been considered in urban areas to calculate housing targets as Bunker et al (2002) stated that housing targets should be locally sensitive. Moreover, the importance of providing adequate infrastructure, funding, and services has become more apparent to meet the UC goals. The weak point of the Master plan strategy is that it is limited to economic and demographic oriented (Samzadeh, 2014). This orientation shows the 'big picture' approach of the master plan. Therefore, the municipal council is required to prepare a more detailed analysis to recognize the capacity of each service for development. This paper concluded that the housing strategy prepared by the sixth municipal council could successfully pave the way to reach the UC goals by considering the relevant mentioned factors. This paper hopes to stimulate professionals, urban decision-makers, and executive officials to articulate and strengthen the dynamics of management, qualification, and renovation in order to achieve sustainable urban development goals.

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AN INITIATIVES-BASED FRAMEWORK FOR ASSESSING SMART CITY

Yasmin Mohd Adnan[1], Hasniyati Hamzah[2], Melasutra Md Dali[3], Md Nasir Daud[4] & Anuar Alias[5]

[1,2,4,5] *Department of Estate Management, Faculty of Built Environment,*
[3]*Department of Urban & Regional Planning, Faculty of Built Environment*,
UNIVERSITY OF MALAYA

Abstract

Smart Cities have grown in prominence due to advancement in ICT and the new paradigm of sustainable city management and development. Whilst many authors have proposed guidelines and framework for Smart City implementation, less attention has been given to the assessment of Smart City performance. The mainstream Smart City assessment framework generally entails the quantitative assessment of factors, elements and initiatives categorised under the Smart City dimensions. However, this approach is problematic and impractical because it requires a large amount of different baseline data that is often at times unavailable due to various reasons. This paper describes an alternative framework for smart city assessment, one that is based on the modification of Giffinger's to make it amenable to leaner data. The proposed assessment framework was adopted to assess the smart city performances of Seoul, Singapore, and Iskandar Malaysia which were then compared. With the use of the framework for the performance assessment, the city that has performed better than the others is able to be identified.

Keywords: Smart City, Assessment Framework, Dimensions, Initiatives

[1]Senior Lecturer at University Malaya. Email: yasmin_alambina@um.edu.my

INTRODUCTION

The Smart City concept has received increasing attention during the last decade along with the rapid technological advancement, whereby unleashing the 'smart' potentials of a city has been recognised as a strategy to maintain the city's relevance in an increasingly connected world. Malaysia has joined the smart city bandwagon with the recent move to declare and promote Iskandar Malaysia as the pioneer smart city in the country. Numerous studies have been undertaken on smart city assessment framework (see for instance Carli *et.al.* 2013; Neirotti *et. al*. 2014). They invariably work their frameworks from Giffinger *et. al*. (2007)'s original six dimensions. These dimensions are the *Economy*, *People*, *Governance*, *Mobility*, *Environment* and *Living*.

The need to measure smart city arises at least for two reasons: to be able to establish the smartness of a city in relation to the other cities and, more importantly, to identify smart features in which the city lags in order to target for improvement for the city. Unfortunately, the mainstream framework is quite problematic to use. The main challenge lies in meeting the requirements of the data it needs. This situation arises mainly because of the data requirements. Not only the process is tedious but can also be problematic given the nature of the data it requires. This is particularly when some of these data reside within private domain and is not released to the public, or that they are unavailable simply because they have yet to be collected.

This paper discusses an alternative framework for assessing city smartness performance, one that provides a more heuristic approach to such exercise. It intends to illustrate how this approach could offer a simpler computational methodology through lower qualitative requirement on input data for assessing the Smart City performance of three (3) Smart Cities, namely Seoul, Singapore and Iskandar Malaysia. The selection of the Smart Cities was guided by the aim to compare existing Smart City achievements in Malaysia with other Smart Cities in the neighbouring region. Whilst there are obvious socio-economic, political, geographic and environmental differences, Malaysia has more in common with Korea and Singapore compared to Western countries. Although not involving a large number of countries, this paper involves an in-depth examination of the three cities' Smart City initiatives and programmes against the cities' functions and prevailing institutional factors. In doing so, the study of the Smart City achievements would be more meaningful as it is framed against the context, rather than exists in a standalone framework.

SMART CITY – A DEFINITION

Although 'Smart City' has now become a term within the realm of sustainable development, the quest for a universal definition continues to present a

challenge (Vanolo, 2014; Yanrong et al., 2014). Concepts such as intelligent cities, virtual cities, digital cities, information cities, wireless cities, future cities are often used interchangeably with 'Smart City'. In practice, the term 'Smart City' has been interpreted in various ways by the public and private sectors to suit their agenda (Yanrong *et. al.*, 2014). The prevailing views of the definition tend to focus on the central role of technologies, specifically information and communications technology (ICT) and smart computing, in shaping cities' livability and sustainability. The smart city is then regarded as an urban laboratory, an urban innovation ecosystem, a living lab, an agent of change (Schaffers *et. al.*, 2012). In an alternative view, a city is considered 'smart' when investments in human and social capital and traditional (transportation) and modern (ICT-based) infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory government (Caragliu *et. al*., 2009).

While defining smart city remains an unresolved issue, researchers seem to go along well with the idea of six dimensions to a smart city, as propounded by Giffinger. According to the idea, the six smart city dimensions are *smart economy*, *smart people*, *smart governance*, *smart mobility*, *smart environment* and *smart living.* These dimensions were constituted as indicators for city smartness, to indicate the extent to which a city is smart. To develop the instrument to gauge the smartness of a city, Giffinger proceeded to construct criteria and indicators based on these six dimensions and, in the process, derived seventy-four (74) assessment indicators. The reader is referred to Giffinger *et. al.* (2007) for a fuller description. Giffinger's model has exerted major influence in this domain of enquiry to be regarded as the mainstream framework, with it having received more than 400 citations.

The 'Mainstream' Smart City Assessment Framework

The mainstream assessment framework by Giffinger involves collecting, collating and analysing quantitative data for each smart city dimension. For example, under smart environment, the required data includes CO_2 emission, hours of sunshine and level of particulate matter. A number of authors have adopted this approach including Carli *et. al.* (2013), Lombardi (2012) and Neirotti *et. al.* (2014).

The mainstream approach above requires the availability of rich datasets, whether from the authorities or the private sectors. This may work well with cities in developed countries but can be a major problem elsewhere, particularly in less developed economies. For many cities, there is no data to support analysis on a significant portion of Giffinger's assessment indicators. Data is not available simply because no authoritative body or agency is made responsible to collect such information so far, or that such information cannot be accessed for being private and confidential. As this study has discovered, the

constraint on data severely limits the utility of the mainstream approach for assessing cities for smartness comparison, even when the cities lie within the same region. The problem had triggered this initiative to explore an alternative assessment framework, one that exercises flexibility with the data, relying on what information one can get.

PROPOSED ALTERNATIVE SMART CITY ASSESSMENT FRAMEWORK

To overcome the restrictiveness inherent in the mainstream framework above, an alternative approach is proposed here with a heuristic outlook to offer. Rather than work with fixed indicators, this approach examines initiatives undertaken to make a city smart and proceeds to analyse the initiatives qualitatively. Data on the initiatives is extracted from government reports, official websites and government online publications. This is followed by field visits to the cities involved to conduct key informant interviews with stakeholders (city officials, urban research and management organisations, and researchers) as well as to validate information that has been secured through third party sources. The visits also enable documentary evidence to be gathered and ground observation to be made. The aim is to ascertain the smart city initiatives practiced by each city and to observe the extent to which the initiatives have been practiced in relation to the score table which this study developed based on smart city descriptors (see Table 1).

Smart City Descriptors Score Table

Drawing from the factors under each dimension from Giffinger's and Iskandar Malaysia's models, the measurement and description of the initiatives identified under each dimension are developed. A summary of the descriptors is shown in Table 1 (Score Table) below. By using these descriptors, a comparative review is made on the smart city initiatives through the achievement level identified through the descriptors for the selected cities: Seoul, Singapore and Iskandar Malaysia. The achievement levels were divided into four, namely, Basic, High, Advanced and State-of-the Art. A heuristic analysis informed by the initiatives and fieldwork observation then guided the assignment of levels for each smart dimension for each city. A visual depiction of the results can then be represented by a radar diagram showing levels of achievement of the Smart Dimensions between the three (3) cities.

Table 1: The Descriptors for the level of achievement under each dimension

Smart city dimension	City's level of provision	
Smart Economy	Basic (1)	Facilitating local economic activities (infrastructure, facilities, economic support system)
	Medium (2)	Economic growth and value creation

	Advance (3)	Innovative economic growth
	State of the Art (4)	Integrated economic hub
Smart People	Basic (1)	Provision and accessibility to basic level of infrastructure and programmes for the training and education towards enhancement of skills and knowledge
	Medium (2)	Provision and creation of elaborate human capital improvement environment with physical and non-physical platforms for the advancement of knowledge, skills and sharing ideals
	Advance (3)	Creation of a conducive ecosystem that attracts and develops human capital through physical and non-physical platform with advanced technological features for the advancement of knowledge, skills and sharing ideals towards a caring and open mind set
	State of the Art (4)	Development and creation of a conducive ecosystem that attracts and develops human capital through the adoption of state of the art ICT and technology driven educational and training towards the cosmopolitanism, caring and open mind set
Smart Governance	Basic (1)	Provision of basic public and social services
	Medium (2)	Public participation in decision-making
	Advance (3)	Public-private partnership
	State of the Art (4)	Fully transparent government with ICT that provides real-time policy conveyance and input
Smart Mobility	Basic (1)	Basic transportation and connectivity to ease movement
	Medium (2)	Full accessibility and some connectivity that further enhanced movement
	Advance (3)	Full accessibility and full connectivity together with an efficient traffic management system
	State of the Art (4)	Full accessibility and full connectivity together with a sustainable traffic management system
Smart Environment	Basic (1)	Provisions for safe and clean environment
	Medium (2)	Protection of the environment
	Advance (3)	Enhancement via green technology in the environmental management system
	State of the Art (4)	Usage of ICT in the sustainable environmental management
Smart Living	Basic (1)	Provision of communal amenities and cohesive social environment
	Medium (2)	Provision of extensive communal amenities and cohesive social environment
	Advance (3)	Availability of varieties and options for global communal amenities with cohesive social and living environment
	State of the Art (4)	Creation of comprehensive global communal amenities with cohesive and integrated social and living environment towards community well-being.

Assessing Smart City

Through the above exercise, the cities' smartness categories by dimension are attained. To be capable of a quantitative treatment, the smartness category is then associated with numerical value, putting the achievement of the smartness

category on a scale of 1 to 4 with each scale corresponding to each category. An analysis of Smart City initiatives between the selected cities was undertaken.

THE CONTEXT

Seoul, Singapore and Iskandar were selected as case studies based on commonality of several factors including culture, socio-economy, political, geography and city functions.

Case 1: Seoul

Seoul is the capital and largest metropolis of South Korea. It has a population of an estimated of 10.04 million in 2013. The population of Seoul in 2013 is estimated at 10.44 million (World Population Review 2016). In 2013, the city government announced the city's new vision for 2030 through the 2030 Seoul Plan. It presents measures for realizing the city's long-term vision, namely, a happy city for citizen based on communication and consideration, focusing on the achievement of 'five major key issues.' In terms of the city's spatial development, it also involves significant reforms of traditional approaches (Seoul Metropolitan Government, 2015). The 'Smart Seoul 2015' and Korea Research Institute for Human Settlements (2013) reports provided the conceptual underpinnings of Smart Seoul, the use of smart technologies and mobile-web applications to provide citizen-centric services and the role of technical standards as the precondition for smart city functionality (ITU-T Technology Watch Report, 2013). The current initiatives are mainly implemented and monitored by the Seoul Metropolitan Government.

Case 2: Singapore

Singapore is one of the world's major commercial hubs, with one of the busiest ports and the fourth-biggest financial centre. Singapore's total population was 5.54 million as of June 2015 with 1.63 million non-resident populations (Singapore Department of Statistic, June 2015).

Within the Smart City context, it has the vision of transforming Singapore by building the World's first Smart Nation by harnessing technology to the fullest with the aim of improving the lives of citizen, creating more opportunities, and building stronger communities.

In order to be a smart city, Infocomm Development Authority of Singapore (IDA) has been established to develop information technology and telecommunications within Singapore with a view to serve citizen of all ages and companies of all sizes (Infocomm Development Authority of Singapore, 2015). IDA does this by actively supporting the growth of innovative technology companies and start-ups in Singapore, working with leading global IT companies as well as developing excellent information technology and telecommunications infrastructure, policies and capabilities for Singapore.

Case 3: Iskandar Malaysia

The vision of Iskandar Malaysia is that of 'Strong and Sustainable Metropolis of International Standing'. In 2012, Iskandar Malaysia was declared as a pilot Smart City project for Malaysia (IRDA, 2013). Based on economic opportunities, the Smart City initiative for Iskandar Malaysia was endorsed by the government in the Global Science and Innovation Advisory Council in May 2012. The rationale for Smart City agenda was five-pronged; (i) Induces multiplier effect for economic growth and job creation nation-wide towards achieving a better lifestyle (ii) Alignment with initiatives listed in the 24 approved and endorsed blueprint (iii) Alignment with other on-going projects and initiatives in Iskandar Malaysia (iv) An easier and more efficient lifestyle and business environment based on technology (v) Creates high motivation towards achieving Iskandar Malaysia's vision – Strong and Sustainable Metropolis of International Standing (IRDA, 2015).

Iskandar Malaysia was chosen to pioneer the Smart City movement in the following areas

1. Developing a National Framework for nationwide implementation.
2. Realizing policy objectives related to ICT applications and Green Technologies.
3. Developing sustainable implementable model for industry driven approach.
4. Identifying and recommending required enabling issues and related success factors for sustainability of the programme.
5. Identifying ongoing and new locations and early win projects.
6. Addressing local capability building.

The Smart City framework for Iskandar Malaysia is based on the three main dimensions of sustainable development, namely economy, environment and social. From these basic sustainable development dimensions, six dimensions were adopted for Iskandar Malaysia Smart City. From the fieldwork, it was revealed by Iskandar Malaysia Comprehensive Development Plan II (CDP II) that the six dimensions adopted by Iskandar Malaysia Smart City are adapted from the model by Giffinger et.al. (2007).

Findings AND DISCUSSION

Through the examination of documents and observations of the initiatives at the respective cities as well as the official reports prepared by the respective authorities overseeing the smart city movement, these sources provided the information that portrayed the current city development under the six (6) dimensions. Thus, the level of achievement under each dimension for each dimension is determined as shown in Table 2 below.

Table 2: Level of Initiatives Provision for case studies

	Smart Governance	Smart Economy	Smart Mobility	Smart Living	Smart People	Smart Environment
Seoul	4	3	4	3	4	3
Singapore	4	4	4	4	4	4
Iskandar Malaysia	3	2	2	2	2	3

Generally, all 3 cities showed smart city dimensions above the 'medium' scale. This means that all the cities surpassed the basic provision of smart cities initiatives. In terms of Smart Governance, Seoul and Singapore indicated 'State of the Art' levels of achievement whereas Iskandar showed an Advanced level of smart governance provision. In terms of Smart Mobility and Smart People, Seoul and Singapore showed 'State of the Art' provisions compared to Iskandar which achieved Medium level. For Smart Environment and Smart Living, Singapore led in the provision 'State of the Art' level followed by Seoul (Advanced level) and Iskandar (Medium level). Finally, for Smart Economy, Singapore showed its leadership ('State of the Art' level) whilst Seoul and Iskandar only achieved Advanced level.

It is found that Singapore and Seoul lead when it comes to the provision of Smart City initiatives in almost all Smart City dimensions. It is evident that Singapore outperforms all other cities in this respect, scoring 'State of the Art' achievement level on all the dimensions. Seoul follows, with comparable strengths on all dimensions except smart economy and smart people. When comparisons are made to the level of achievements for the initiatives under the six (6) Smart City dimensions, Iskandar Malaysia may not achieve the high level of provision as compared to the more developed cities.

The results of the determination of the level of provision is then plotted on a radar chart and is graphically shown as in Figure 1 below:

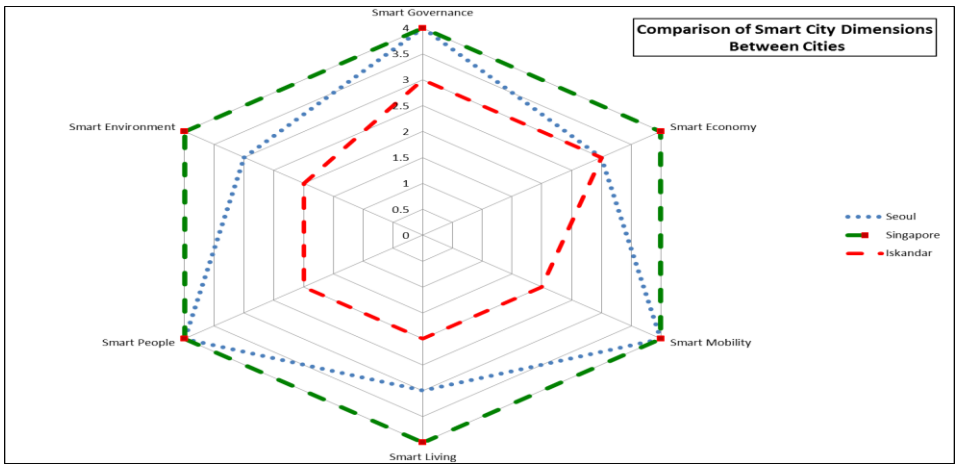

Figure 1: Radar Chart Comparing Smart City Dimensions between cities

It must be understood that the above radar chart represents a visual reflection of the selected cities at 'first instance' i.e. without considering the prevalent aspects that may have influenced the cities' development in the past. Each city was developed according to the visions of the city management which could be shaped by the countries' national agenda.

CONCLUSION

The mainstream assessment framework for smart city initiatives has proved problematic to use because of its data requirements. Non-availability and poor quality are data issues that hinder effective and efficient assessment of city smartness. This paper has proposed a simpler approach (a modification of Giffinger's) based on qualitative assessment of initiatives data. To ensure the reliability of this alternative framework, multiple sources have been relied on. The multiplicity of sources promotes a high degree of triangulation on the data.
In an exercise to compare city smartness performance, the alternative framework was deployed to assess three cities within the Asia Pacific region namely Seoul, Singapore and Iskandar Malaysia. As the outcome, Singapore emerged as the Smart City leader followed closely by Seoul. Iskandar Malaysia, which started Smart City initiatives more recently, has some way to go to close the gap.

This research contributes to the Smart City literature by introducing an alternative framework for Smart City assessment. The proposed heuristic framework eliminates the requirement for large volume of baseline data that can be almost impossible to obtain for various reasons. Therefore, this proposed model enables a simultaneous assessment of many cities at once.

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ENVIRONMENTAL PSYCHOLOGY: THE URBAN BUILT ENVIRONMENT IMPACT ON HUMAN MENTAL HEALTH

Chen Wang[1], Suzaini M. Zaid[2] & Nurhanisah Nazarali[3]

[1,2,3]*Faculty of Built Environment*
UNIVERSITY OF MALAYA

Abstract

Growing urban population has increased environmental demands and also affects human health. As the global population becomes more urbanized, there is a concern that it will negatively affect not just physical health, but also mental health. Mental health can be categorized and studied through many different approaches, such as psychology, psychiatry, clinical and sociology. This paper aims to highlight the comparison of mental health of rural and urban dwellers, in terms of environmental psychology (EP) through the Eysenck Personality Questionnaire (EPQ). A survey questionnaire was distributed to respondents in Petaling Jaya to represent the urban area, and Pontian to represent the rural area. The survey questionnaire was analysed using one-way ANOVA analysis, and suggests a relationship between behaviour and age, but also in relation to 'living area' influence that suggests urbanization affects a person's environmental psychology. The findings suggest that urban dwellers are more prone to certain personality traits that can be detrimental to a person's mental health

Keyword: Psychology, urban behaviour, urban psychology, mental health, urbanization

[1] Associate Professor at University of Malaya. Email: derekisleon@um.edu.my

INTRODUCTION

According to the World Health Organization, the urban population of the world is now at approximately 54% of the total global population and continues to grow (WHO, 2016). As more and more people become urbanized, personal physical and mental health changes according to the urban landscape, where understanding of environmental psychology (EP) and environmental behaviour, (EB) is becoming a more pressing issue to human health. According to Gärling (2001) and Gifford & Sussman (2012), there are several unclear variables that affect a person's Environmental Level of Concerns (ELC), such as age, gender and socio economic status. To identify which environmental problems are directly connected to human behaviour, human behaviour need to be investigated comprehensively. This paper briefly highlights a comparative study of environmental psychology between urban city dwellers in Petaling Jaya and rural area of Pontian, Johor.

Some of the variables have been classified as pro-environmental behaviour (Gifford, 2014) encompassing***: Childhood Experience;*** puts emphasis on the fact that children can also engage in pro-environmental behaviour (Cheng & Monroe, 2012), particularly who spent time in wilder nature than domesticated one (Wells & Lekies, 2006). This means, compared to adults, they are more likely to spend time in nature (Thompson, Aspinall, & Montarzino, 2007). ***Knowledge and Education;*** refers to the fact that there is a direct relation between having correct knowledge and making knowledgeable pro-environmental choices. However, knowledge in this case may be also self-reported knowledge as well (Fielding & Head, 2012). Recently, the analysis of 15 knowledge surveys related to environmental knowledge within American context indicated that the Americans are knowledgeable in terms of environmental problems such as renewable resources, what damages natural habitat, and where and how garbage is collected. However, they are less knowledgeable about current environmental issues such as global warming, energy and so on (Robelia & Murphy, 2012). ***Personality;*** it seems openness is one of the Big Five personality factors, and is firmly tied to pro-environmental activities (Fraj & Martinez, 2006) and frequent pro-environmental behaviours. There is empirical evidence that conscientiousness, agreeableness and openness are strongly connected to environment engagement personally or nationally (Milfont & Sibley, 2012). Consideration of future consequences related to engaging in sustainable behaviour (Corral-Verdugo & Pinheiro, 2006; Milfont & Gouveia, 2006), such as using public transportation are linked to personality (Joireman, Van Lange, & Van Vugt, 2004). On the other hand, internal locus of control and self-efficacy, such as less use of cars (Abrahamse, Steg, Gifford, & Vlek, 2009), recycling (Tabernero & Hernández, 2011; Tang, Chen, & Luo,

2011), and less electricity utilization (Thøgersen & Grønhøj, 2010) are directly linked to greater pro-environmental intentions and behaviour. Generally speaking, the link between ones' value and pro-environmental behaviour is being moderated by locus of control (Engqvist Jonsson & Nilsson, 2014).

Values and Worldviews; values' dimensions and its association with environmental concerns has been studied extensively (Gifford, 2014). From political, economic, and technological perspectives, individuals who value free-market canons, view technology as eradicator of environmental issue and strongly believe that economics is a progress measurement indicator, and tend to have less concern about the environment (Heath & Gifford, 2006). Individuals who appeal to environmental values tend to increase pro-environmental behaviour (Gifford, 2014) than those who appeal to self-interest values (Bolderdijk, Steg, Geller, Lehman, & Postmes, 2013), or even those who have a combination of both (Evans et al., 2013). Other factors related to individual's concern for the environment are Felt Responsibility, Moral Concerns, and Commitment; Frugality, Diversity, and Empowerment Attitudes; Place Attachment; Norms, Habits, and Defaults: Behavioural Momentum; Effect; and Demographic Factors (Gifford, 2014).

THE RELATIONSHIP BETWEEN PSYCHOLOGY AND ENVIRONMENT

The most common elements found to affect personal environmental behaviours (EB) are architecture, landscape design, urban planning, geography, sociology, anthropology, education, psychology, ergonomics, and industrial design (Günther, 2009). A study done by Evans (2013) suggests that types of houses also affect a person's psychology and mental health, where symptoms of psychological distress like anxiety and depression were linked to a low-income population that was dwelling in a high-rise urban area. Environmental psychology can be defined as the impact of physical environment on human beings, and the impact of human beings on the physical environment (Gärling, 2001). However, EB and EP are quite personal to a person's predisposition and elements of vulnerability, as to how they react and adapt to environmental demands (Zubin & Spring, 1977). Consequently, people who suffer high personal vulnerability will have a harder time to adapt to their environmental demands. Therefore, it is important to understand the relationship between the urban environment and human psychology, to discover behavioural adaptation to urban living conditions.

The study of psychology and the environment can be divided into two (2) sub-disciplines: conservation psychology and eco-psychology (Saunders, 2003). Conservation psychology is the study of human interaction with the natural environment, while eco-psychology is the study of human interaction with man-made environments and the reciprocal correlation to human

psychology (Saunders, 2003). Eco-psychology has recently transformed into the study of urban environmental psychology, which have suggested that the transformation of the urban area has customized certain activities that are only distinctive of urban city inhabitants (Moser, 2012). One example is the growing obesity epidemic, where the urban environment has reduced the possibility for greater physical activity in children (Ding & Gebel, 2012; van Loon & Frank, 2011; Ding et. al., 2011; Pont et. al., 2009). The urban form clearly had an effect on parental perceptions, such as the neighbourhood area where the children had to travel, safety, as well as on the transport options available to the household (McMillan, 2005). These factors determined whether the children were allowed to walk, cycle or take transportation to school (McMillan, 2005), which would determine the amount of physical activity the child would partake every day to school.

METHODOLOGY

The methodology used to conduct this research was through quantitative analysis. A survey questionnaire was conducted as part of the quantitative analysis, with a total of 50 questionnaires were distributed online and in person, through random sampling technique. 100% of the respondents returned the questionnaire, making a sample size of 50 respondents. The survey questionnaire was carried out for both a rural area and an urban area, to compare the characteristics of rural and urban inhabitants. The Petaling Jaya region was selected for the urban area case study, and Pontian region in Johor State as the rural area case study. These areas decisively selected based on sociodemographic characteristics of people occupying the regions such as abilities, attitudes, and personality traits as well as temporary characteristics of knowledge, skill and motivation toward environmental psychology. The survey questionnaire consisted of both selective answers (yes or no questions) and open-ended (or semi-structured) questions. The survey questionnaire in this research aims at revealing to the extent to which sociodemographic characteristics are related to environmental psychology and pro-environmental behaviour. A quantitative sampling approach draws a representative sample of the targeted population, to consequently generalize the results back into the population (Marshall, 1996).

The population of Petaling Jaya and Pontian for 2010 was 1.78 million and 150,306 people respectively (Department of Statistics, 2010), which makes the total population size for both the case study areas of approximately 1.92 million people. However, with limited timeframe to conduct the survey questionnaire and the limited access to such a big population, this research narrowed the access to a targeted population of 0.001% from the actual population size of the case study areas. Consequently, the research has narrowed the targeted population size to 1,932 people. Therefore, with a

confidence level (power) of 85% and confidence interval (precision) of ±10%, the estimated sample size was calculated at n=51. Finally, the sample size was determined and limited to 50 respondents for a more rounded figure, and as there was very limited timeframe to conduct the survey questionnaire and very limited access to the targeted population size.

The survey questionnaire was designed based on the EPQ, which was designed to measure personality traits of psychoticism, extraversion, neuroticism, and social desirability (Eysenck & Eysenck, 1975). Individual personality can be defined as character, temperament, intellect and physique, which determine the individual's unique ability to adjust according to the environment (Eysenck & Eysenck, 1975). The EPQ is a well-established personality assessment tool that can be used in several contexts, such as clinical, health, education, psychological, organization and such (Pedro, et. al., 2016). Therefore, the EPQ was determined as the most suitable assessment tool to investigate the relationship between human being's relationships with the urban environment. Scientifically, the environmental psychology is of central importance in applied psychology, considering a theoretical and methodological foundation for environmental planning, design, and management. Therefore, we consider the socio demographic factors from a macro point of view, such as income, employment status, home ownership, household size, stage of family cycle and psychological factors of beliefs, attitudes, motivation and intentions, personal and social norms, behavioral controls in which they are known as pro-environmental indicators.

Using Statistical Package for Social Science (SPSS) Version 22.0 Software, data from the questionnaires was analyzed, in order to provide quantitative indications of qualitative judgments. With the correlation between the questionnaire and the factors, Post Hoc Multiple Comparison Test had been used in analyzing the data to get a better and understandable view. The data collected was also analyzed using one-way ANOVA, in identifying the influence of respondents' gender towards the EPQ. The EPQ designed with the aim of assessing the personality traits, encompassing psychoticism, extraversion, neuroticism, and last but not least social desirability. Its mechanism stands for assessing impulsivity (acting on impulse) in the psychoticism (to indicate qualities commonly found among psychotics) sub-scale and assessing sensation-seeking along with venturesome (to take risk or disposition to venture) in the extraversion sub-scale.

FINDINGS

The respondents were members of the public within the Petaling Jaya region and Pontian, Johor and selected at random. A total of 50 respondents was surveyed and it was found that 52% of the respondents were residing in urban

area (Petaling Jaya), while 48% of the respondents were residing in rural area (Pontian, Johor) (refer Table 1).

Table 1: Respondent's Residence

	Rural	Urban	Total
Frequency (No. of Respondents)	24	26	50
Percentage (%)	48	52	100

Table 2 and Table 3 present findings of the respondent's profile according to both rural and urban respondent, categorized by gender and age, respectively.

Table 2: Respondent's Gender

	Rural	Urban	Total
Male	12	11	23
Female	12	15	27
TOTAL			50

The age range included in the survey questionnaire is concentrated on the working age population of 16 to 55 years, where work related stress could affect a person's mental health condition (Health and Safety Executive, 2015) that could make this working age group more vulnerable to mental health issues.

Table 3: Respondent's Age Group

	Rural	Urban	Total
16 – 25	12	13	25
26 – 35	6	7	13
36 – 45	3	4	7
46 – 55	3	2	5
TOTAL	24	26	50

Represented in Table 4, the one-way ANOVA was conducted on identifying the influence of the respondents' gender towards the Eysneck questions. The analysis shows that only the question 4 that affected by the gender with a significant value less than 0.05, which is 0.004. On the other hand, the rest of the questions have value more than 0.05 indicating that the gender of the respondents did not influence the data collection in identifying the behaviour and personality of the respondents.

Table 4: The Influence of Gender Group of Respondents towards EPQ

		Sum of Squares	df	Mean Square	F	Sig.
Are you a talkative person?	Between	.570	1	.570	2.355	.131

	Groups					
	Within Groups	11.610	48	.242		
	Total	12.180	49			
Do you ever feel 'just miserable' for no reason?	Between Groups	.001	1	.001	.004	.952
	Within Groups	10.499	48	.219		
	Total	10.500	49			
Are you rather lively?	Between Groups	.570	1	.570	2.355	.131
	Within Groups	11.610	48	.242		
	Total	12.180	49			
Would it upset you a lot to see a child or an animal suffer?	Between Groups	1.587	1	1.587	8.971	.004
	Within Groups	8.493	48	.177		
	Total	10.080	49			
Are your feelings easily hurt?	Between Groups	.001	1	.001	.004	.952
	Within Groups	10.499	48	.219		
	Total	10.500	49			
Are all your habits good and desirable ones?	Between Groups	.039	1	.039	.425	.518
	Within Groups	4.461	48	.093		
	Total	4.500	49			
Do you tend to keep in the background on social occasions?	Between Groups	.570	1	.570	2.355	.131
	Within Groups	11.610	48	.242		
	Total	12.180	49			
Do you prefer to go your own way rather than act by the rules?	Between Groups	.094	1	.094	2.469	.123
	Within Groups	1.826	48	.038		
	Total	1.920	49			
Do you sometimes talk about things you know nothing about?	Between Groups	.039	1	.039	.425	.518
	Within Groups	4.461	48	.093		
	Total	4.500	49			
Do you prefer reading to meeting people?	Between Groups	.570	1	.570	2.355	.131
	Within Groups	11.610	48	.242		
	Total	12.180	49			
Do you enjoy practical jokes that can sometimes really hurt people?	Between Groups	.094	1	.094	2.469	.123
	Within Groups	1.826	48	.038		
	Total	1.920	49			
Are you a worrier?	Between Groups	.001	1	.001	.004	.952
	Within Groups	10.499	48	.219		
	Total	10.500	49			
As a child did you do as you were told immediately and without grumbling?	Between Groups	.039	1	.039	.425	.518
	Within Groups	4.461	48	.093		
	Total	4.500	49			
Do you think marriage is old-fashioned and should be done	Between Groups	.039	1	.039	.425	.518

away with?	Within Groups	4.461	48	.093		
	Total	4.500	49			
Do you sometimes boast a little?	Between Groups	.094	1	.094	2.469	.123
	Within Groups	1.826	48	.038		
	Total	1.920	49			
Do most things taste the same to you?	Between Groups	.005	1	.005	.042	.838
	Within Groups	5.275	48	.110		
	Total	5.280	49			
Have people said that you sometimes act too rashly?	Between Groups	.233	1	.233	2.617	.112
	Within Groups	4.267	48	.089		
	Total	4.500	49			
Do you always wash before a meal?	Between Groups	.390	1	.390	1.611	.210
	Within Groups	11.610	48	.242		
	Total	12.000	49			
Have you ever insisted on having your own way?	Between Groups	.001	1	.001	.004	.952
	Within Groups	10.499	48	.219		
	Total	10.500	49			
Would you like other people to be afraid of you?	Between Groups	.010	1	.010	.046	.831
	Within Groups	10.870	48	.226		
	Total	10.880	49			
Do people tell you a lot of lies?	Between Groups	.094	1	.094	2.469	.123
	Within Groups	1.826	48	.038		
	Total	1.920	49			
Are you always willing to admit it when you have made a mistake?	Between Groups	.211	1	.211	3.888	.054
	Within Groups	2.609	48	.054		
	Total	2.820	49			
Would you feel very sorry for an animal caught in a trap?	Between Groups	.025	1	.025	.121	.730
	Within Groups	10.055	48	.209		
	Total	10.080	49			

Additionally, it was found that age is a factor that affects the respondent's behaviour in the EPQ test, as represented in Table 5. The majority of respondents have the significant result with lower than 0.05 which indicating that the age influencing the behaviour. The questions with lower than 0.05 are questions number 1, 2, 3, 5, 7, 9, 10, 12, 14, 16, 18, 19, 20, 21 and 23. There are a few questions that show the total influence of age towards the behaviour based on the significant value of 0.00. Thus, Post-Hoc Multiple Comparison Test was also carried out to identify specific means difference for each of the age range for each question. The Post-Hoc test revealed that the significant value of two age groups, namely 26-35 and 36-45 is higher than 0.05. This is proven by the

significant value, which is 1.000 As for the question 6, the significant value of ANOVA test shows that it exceeding 0.05, which is 0.140. In proving the relationship between the sensitivity towards the behaviour, the mean difference of the age range provided, and the age of 16-25 and 26-35 carries the same mean difference, standard error and significant value. The same significant value is 0.209.

Table 5: The Influence of Age Group of Respondents towards EPQ

		Sum of Squares	Df	Mean Square	F	Sig.
Are you a talkative person?	Between Groups	8.143	3	2.714	30.930	.000
	Within Groups	4.037	46	.088		
	Total	12.180	49			
Do you ever feel 'just miserable' for no reason?	Between Groups	4.500	3	1.500	11.500	.000
	Within Groups	6.000	46	.130		
	Total	10.500	49			
Are you rather lively?	Between Groups	8.143	3	2.714	30.930	.000
	Within Groups	4.037	46	.088		
	Total	12.180	49			
Would it upset you a lot to see a child or an animal suffer?	Between Groups	.584	3	.195	.943	.428
	Within Groups	9.496	46	.206		
	Total	10.080	49			
Are your feelings easily hurt?	Between Groups	4.500	3	1.500	11.500	.000
	Within Groups	6.000	46	.130		
	Total	10.500	49			
Are all your habits good and desirable ones?	Between Groups	.500	3	.167	1.917	.140
	Within Groups	4.000	46	.087		
	Total	4.500	49			
Do you tend to keep in the background on social occasions?	Between Groups	7.257	3	2.419	22.602	.000
	Within Groups	4.923	46	.107		
	Total	12.180	49			
Do you prefer to go your own way rather than act by the rules?	Between Groups	.080	3	.027	.667	.577
	Within Groups	1.840	46	.040		
	Total	1.920	49			
Do you sometimes talk about things you know nothing about?	Between Groups	2.843	3	.948	26.305	.000
	Within Groups	1.657	46	.036		
	Total	4.500	49			
Do you prefer reading to meeting people?	Between Groups	7.257	3	2.419	22.602	.000
	Within Groups	4.923	46	.107		
	Total	12.180	49			
Do you enjoy practical jokes that can sometimes really hurt people?	Between Groups	.080	3	.027	.667	.577
	Within Groups	1.840	46	.040		
	Total	1.920	49			
Are you a worrier?	Between Groups	4.500	3	1.500	11.500	.000
	Within Groups	6.000	46	.130		
	Total	10.500	49			
As a child did you do as you were told immediately and without grumbling?	Between Groups	.500	3	.167	1.917	.140
	Within Groups	4.000	46	.087		
	Total	4.500	49			
Do you think marriage is old-fashioned and should be done away	Between Groups	2.843	3	.948	26.305	.000
	Within Groups	1.657	46	.036		

with?	Total	4.500	49			
Do you sometimes boast a little?	Between Groups	.080	3	.027	.667	.577
	Within Groups	1.840	46	.040		
	Total	1.920	49			
Do most things taste the same to you?	Between Groups	3.051	3	1.017	20.995	.000
	Within Groups	2.229	46	.048		
	Total	5.280	49			
Have people said that you sometimes act too rashly?	Between Groups	.500	3	.167	1.917	.140
	Within Groups	4.000	46	.087		
	Total	4.500	49			
Do you always wash before a meal?	Between Groups	7.809	3	2.603	28.573	.000
	Within Groups	4.191	46	.091		
	Total	12.000	49			
Have you ever insisted on having your own way?	Between Groups	4.500	3	1.500	11.500	.000
	Within Groups	6.000	46	.130		
	Total	10.500	49			
Would you like other people to be afraid of you?	Between Groups	5.120	3	1.707	13.630	.000
	Within Groups	5.760	46	.125		
	Total	10.880	49			
Do people tell you a lot of lies?	Between Groups	.263	3	.088	2.432	.077
	Within Groups	1.657	46	.036		
	Total	1.920	49			
Are you always willing to admit it when you have made a mistake?	Between Groups	.240	3	.080	1.425	.248
	Within Groups	2.580	46	.056		
	Total	2.820	49			
Would you feel very sorry for an animal caught in a trap?	Between Groups	3.920	3	1.307	9.758	.000
	Within Groups	6.160	46	.134		
	Total	10.080	49			

The influence of living area was also identified in the EPQ, as presented in Table 6. The significant value of living area that influencing the behaviour is only for the question number 2, 4, 5, 12, 19, 20, 22 and 23. A factor analysis was carried out in identifying the factor of living area affecting the people's behaviour.

Table 6: The Influence of Living Area of Respondents towards EPQ

		Sum of Squares	df	Mean Square	F	Sig.
Are you a talkative person?	Between Groups	.001	1	.001	.002	.964
	Within Groups	12.179	48	.254		
	Total	12.180	49			
Do you ever feel 'just miserable' for no reason?	Between Groups	1.413	1	1.413	7.467	.009
	Within Groups	9.087	48	.189		
	Total	10.500	49			
Are you rather lively?	Between Groups	.001	1	.001	.002	.964
	Within Groups	12.179	48	.254		
	Total	12.180	49			
Would it upset you a lot to see	Between	2.234	1	2.234	13.666	.001

a child or an animal suffer?	Groups					
	Within Groups	7.846	48	.163		
	Total	10.080	49			
Are your feelings easily hurt?	Between Groups	1.413	1	1.413	7.467	.009
	Within Groups	9.087	48	.189		
	Total	10.500	49			
Are all your habits good and desirable ones?	Between Groups	.013	1	.013	.137	.713
	Within Groups	4.487	48	.093		
	Total	4.500	49			
Do you tend to keep in the background on social occasions?	Between Groups	.001	1	.001	.002	.964
	Within Groups	12.179	48	.254		
	Total	12.180	49			
Do you prefer to go your own way rather than act by the rules?	Between Groups	.074	1	.074	1.920	.172
	Within Groups	1.846	48	.038		
	Total	1.920	49			
Do you sometimes talk about things you know nothing about?	Between Groups	.013	1	.013	.137	.713
	Within Groups	4.487	48	.093		
	Total	4.500	49			
Do you prefer reading to meeting people?	Between Groups	.001	1	.001	.002	.964
	Within Groups	12.179	48	.254		
	Total	12.180	49			
Do you enjoy practical jokes that can sometimes really hurt people?	Between Groups	.074	1	.074	1.920	.172
	Within Groups	1.846	48	.038		
	Total	1.920	49			
Are you a worrier?	Between Groups	1.413	1	1.413	7.467	.009
	Within Groups	9.087	48	.189		
	Total	10.500	49			
As a child did you do as you were told immediately and without grumbling?	Between Groups	.013	1	.013	.137	.713
	Within Groups	4.487	48	.093		
	Total	4.500	49			
Do you think marriage is old-fashioned and should be done away with?	Between Groups	.013	1	.013	.137	.713
	Within Groups	4.487	48	.093		
	Total	4.500	49			
Do you sometimes boast a little?	Between Groups	.074	1	.074	1.920	.172
	Within Groups	1.846	48	.038		
	Total	1.920	49			
Do most things taste the same to you?	Between Groups	.062	1	.062	.571	.454
	Within Groups	5.218	48	.109		
	Total	5.280	49			
Have people said that you sometimes act too rashly?	Between Groups	.013	1	.013	.137	.713
	Within Groups	4.487	48	.093		

	Total	4.500	49			
Do you always wash before a meal?	Between Groups	.013	1	.013	.051	.822
	Within Groups	11.987	48	.250		
	Total	12.000	49			
Have you ever insisted on having your own way?	Between Groups	1.413	1	1.413	7.467	.009
	Within Groups	9.087	48	.189		
	Total	10.500	49			
Would you like other people to be afraid of you?	Between Groups	1.085	1	1.085	5.318	.025
	Within Groups	9.795	48	.204		
	Total	10.880	49			
Do people tell you a lot of lies?	Between Groups	.074	1	.074	1.920	.172
	Within Groups	1.846	48	.038		
	Total	1.920	49			
Are you always willing to admit it when you have made a mistake?	Between Groups	.166	1	.166	3.005	.089
	Within Groups	2.654	48	.055		
	Total	2.820	49			
Would you feel very sorry for an animal caught in a trap?	Between Groups	1.785	1	1.785	10.330	.002
	Within Groups	8.295	48	.173		
	Total	10.080	49			

Generally, the data can be summarized as Table 7 below. Accordingly, the answers where calculate to average a mean of 1.56. A one-sample t-test was conducted to validate the significance of differences between sample means with the number of samples, 50 respondents. It shows the mean, standard deviation and standard error mean for each of the questions.

Table 7: One-Sample Statistics T-Test of the EPQ

	N	Mean	Std. Deviation	Std. Error Mean
Are you a talkative person?	50	1.4200	.49857	.07051
Do you ever feel 'just miserable' for no reason?	50	1.7000	.46291	.06547
Are you rather lively?	50	1.4200	.49857	.07051
Would it upset you a lot to see a child or an animal suffer?	50	1.2800	.45356	.06414
Are your feelings easily hurt?	50	1.7000	.46291	.06547
Are all your habits good and desirable ones?	50	1.9000	.30305	.04286
Do you tend to keep in the background on social occasions?	50	1.5800	.49857	.07051
Do you prefer to go your own way rather than act by the rules?	50	1.9600	.19795	.02799
Do you sometimes talk about things you know nothing about?	50	1.1000	.30305	.04286
Do you prefer reading to meeting people?	50	1.5800	.49857	.07051
Do you enjoy practical jokes that can sometimes really hurt people?	50	1.9600	.19795	.02799
Are you a worrier?	50	1.7000	.46291	.06547

As a child did you do as you were told immediately and without grumbling?	50	1.9000	.30305	.04286
Do you think marriage is old-fashioned and should be done away with?	50	1.1000	.30305	.04286
Do you sometimes boast a little?	50	1.9600	.19795	.02799
Do most things taste the same to you?	50	1.1200	.32826	.04642
Have people said that you sometimes act too rashly?	50	1.9000	.30305	.04286
Do you always wash before a meal?	50	1.4000	.49487	.06999
Have you ever insisted on having your own way?	50	1.7000	.46291	.06547
Would you like other people to be afraid of you?	50	1.6800	.47121	.06664
Do people tell you a lot of lies?	50	1.0400	.19795	.02799
Are you always willing to admit it when you have made a mistake?	50	1.0600	.23990	.03393
Would you feel very sorry for an animal caught in a trap?	50	1.7200	.45356	.06414
AVERAGE		1.56	0.37367	0.05285

Part B of the EPQ test was also included in the survey questionnaire, in order to identify personality characteristics of people living in different areas, i.e. rural versus urban areas. Table 8 represents the personality findings of the respondents.

Table 8: EPQ Personality Findings of Respondents

Type of Personality	No. of People		
	Urban	Rural	Total
Extraversion/Introversion	15	14	29
Neuroticism	12	2	14
Psychoticism	2	0	2
Lie	3	2	5
TOTAL	32	18	50

From Table 8, there are four (4) types of personality that can be measured indicating respondents' mental health, which are extraversion/introversion, neuroticism, psychoticism and lie. Extraversion is indicating people that are sociable and active, while introversion is seen as over-aroused. The findings show that both urban and rural areas are likely to develop the same Extraversion/Introversion personality, with 15 urban and 14 rural respondents were linked to the Extraversion/Introversion personality On the other hand, the result shows neuroticism is more likely to develop in urban areas than and rural environment. Neuroticism can be defined as personality of emotional impact that is characterized by high levels of negative affect like depression and anxiety. This means that urban dwellers are more likely to develop depression and anxiety than their rural counterpart.

Psychoticism is another type of personalities, which is less defined than extraversion and neuroticism. It is not only associated with the liability to have psychotic episode (or break with reality) but also with aggression. The result shows only two (2) people with a psychoticism personality and both of them are from the urban environment. This finding suggests that psychoticism could be an effect of the urbanization. This evolutionary phenomenon is not only a demographic shift, but also encompasses, social, economic and psychological changes that comprise the demographic movement. The rapid increase in urbanization globally may lead to a worldwide health and social issue. Notwithstanding of its benefit, it can affect mental health through the increased of factors and stressors such as polluted environment, reduced social support, overcrowded, and high levels of violence. Therefore, there is a need to evaluate the urban built environment psychology considering how the urban built environment impacts on human mental health issue such as neuroticism and psychoticism. Aside from that, the survey findings analyzed that some of the respondents did not give actual answers to the questions, therefore considered lying in the personality. It is found that five (5) respondents from urban and rural environment did not answer the questions truthfully.

DISCUSSIONS AND SUMMARY

The findings from the survey questionnaire using the one-way ANOVA analysis, suggests that gender is not an influencing factor to respondent's behaviour, as the number of variables that is affected by gender was only one (1). This is a plausible conclusion as both genders probably have the same level of understanding and way of thinking about personality traits. However, it was found that age was an influencing factor, as the analysis shows a significant value from ANOVA test that exceeds 0.05, which is 0.140. This suggests a relationship between sensitivity towards behaviour according to the age range provided. In relation to 'living area' influence, it suggests that urbanization affects a person's environmental psychology, as Neuroticism was found to be a significant number (12 respondents) and distinctive trait of urban respondents and compared to only 2 respondents from rural area had this personality trait. Additionally, no rural respondents were found to have any psychoticism traits, whereas there were 2 urban respondents found to have such traits. This is can be the effect of the urbanization and challenges in adapting the urbanization. This paper has highlighted some features of the human psychology that are affected by the urban environment, by using the EPQ test. Further research can be done in reverse, to explore the threshold level of environmental degradation to cater for growing needs of urban city dwellers.

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DEMOGRAPHIC TRANSITION AND SUSTAINABLE COMMUNITIES IN MALAYSIA

Hanan Elsawahli[1], Faizah Ahmad[2] & Azlan Shah Ali[3]

[1,2] Center for Sustainable Urban Planning & Real Estate
[3]Center for Building, Construction & Tropical Architecture
Faculty of Built Environment
UNIVERSITY OF MALAYA

Abstract

As a developing country, Malaysia is undergoing a demographic transition from a high fertility and mortality rural society towards an industrialised society with low fertility and mortality rates. This transition involved an increased growth rate of elderly population. The number of elderly has risen from 1.4 million in 2000 to 2.1 million in 2010 and is projected to be 3.4 million by 2020. A population aging needs to accumulate assets in order to achieve sustainable development goals. This represents the main challenge to planners and policy makers in terms of designing aged-friendly neighbourhoods to meet the elderly needs. This paper aims to review the population aging trends and policy framework available for the elderly in Malaysia. The paper further discusses the sustainable neighbourhoods related to active aging. The paper concludes by identifying fundamental gaps in both knowledge and policy associated with planning for the aging population and successful aging.

Keyword: Demographic Transition, Aging Population, Policy Framework, Active Aging, Malaysia

[1] Senior Lecturer at Dept of Urban & Regional Planning, FBE UM. Email: hmhe@um.edu.my

INTRODUCTION

Population aging has been a phenomenon of developed industrialized countries since the early 70s, as it is believed to be the result of improved medical care and good nutrition. Researchers have argued that population aging is a result of low fertility and increased longevity (Bengtson, Gans, Putney, & Silverstein, 2009; Crawford, 2010; Gardner, 2011). As a result, developing countries are currently experiencing a significant increase in the percentage of its elderly population. Malaysia being a fast developing country has been much concerned to adapt its government policies to meet the needs of its elderly population in order to achieve sustainable development goals.

As a developing country, Malaysia is undergoing a demographic transition from a high fertility and mortality rural society towards an industrialised society with low fertility and mortality rates. This transition involved an increased growth rate of elderly population. Malaysians elderly population is increasing; older people represent 7.7% of the total population (Table 1). This demographic transition has implications for sustainable development goals. Hence, the objectives of this paper are:

1. To review policy framework available for elderly in Malaysia.
2. To examine the impact of neighborhood design on active aging.

Table 1: Population percentage in Major Age Group, Malaysia, 1970-1980, 1991, 2000, 2010

Age Group	1970	1980	1991	2000	2010
0-14	44.9	39.6	36.7	33.5	27.6
15-44	40.7	45.6	47.6	48.8	50.17
45-59	9.2	9.2	9.9	11.6	14.25
60-74	4.4	4.6	4.6	5.0	6.25
75^{+}	0.8	1.1	1.2	1.3	1.5

Source: Department of Statistics, Malaysia, 2010

METHODOLOGY

The study involves both qualitative and quantitative approaches. The qualitative approach included review of elderly trend, housing provision for the elderly and initiatives for elderly using government data from Department of Statistics, Dewan Bandaraya Kuala Lumpur (DBKL) and Dewan Bandaraya Ipoh (DBI). This also involved review of empirical research on the association between active aging and characteristics of the built environment. The quantitative approach involved a pilot study examining the relationship between neighbourhood environmental factors and active aging.

RESEARCH BACKGROUND

This section includes a review of housing provision for the elderly, initiatives for the elderly, policy framework in Malaysia and empirical research on elderly and the built environment.

Housing Provision for the Elderly

Malaysia has formulated its housing policies since the pre-independent period until the latest Tenth Malaysia Plan (2011-2015). However, the housing needs for the elderly have attracted less attention. Sulaiman, Baldry, and Ruddock (2006) argued that elderly housing needs are not met as the housing programme in Malaysia does not include provision of housing for the elderly. The Ministry of Women, Family and Community Development provides homes for the elderly who are frail, with no other social housing alternatives available for the young olds. This greatly affected the living arrangement of the elderly. In Malaysia, the different ethnic groups have different living arrangements for the elderly according to the different socio-economic and cultural backgrounds. However, the structure of Malaysian families is shifting, with a growing trend towards smaller nuclear families. Such living arrangements have implications for planning and preparing adequate services, as it shows that the role of family as the main caregiver of the elderly is declining. Table 2 shows the continued decline in the average household size over the past four decades. This will result in the social isolation of the elderly and a financial burden on the government. Thus policies should focus on providing adequate housing with the necessary services and facilities for the elderly to live independently as it outlines their quality of life and reflects consistency of sustainable development with the demographic transition.

Table 2: Average Household Size, Malaysia, 1980-2010

Household Type	1980	1991	2000	2010
Average household size	5.2	4.8	4.6	4.5
Percentage of nuclear family household	55.2	59.9	65.2	70.3

Source: Department of Statistics, 2010

Furthermore, there could be some factors influencing the Malaysian elderly to stay in their place of residence after retirement, such as the uneven increase in housing prices among the different states in Malaysia. It is evident that the housing prices differ according to location and physical attributes (Fig. 1). Despite the fact that Malaysian housing policies are formulated to ensure that all Malaysians have access to affordable and adequate shelter (7th Malaysia Plan, 8th Malaysia Plan, 9th Malaysia Plan & 10th Malaysia Plan), the Housing

Price Index in Malaysia showed an increase of 75% (Valuation and Property Services Department, 2010).

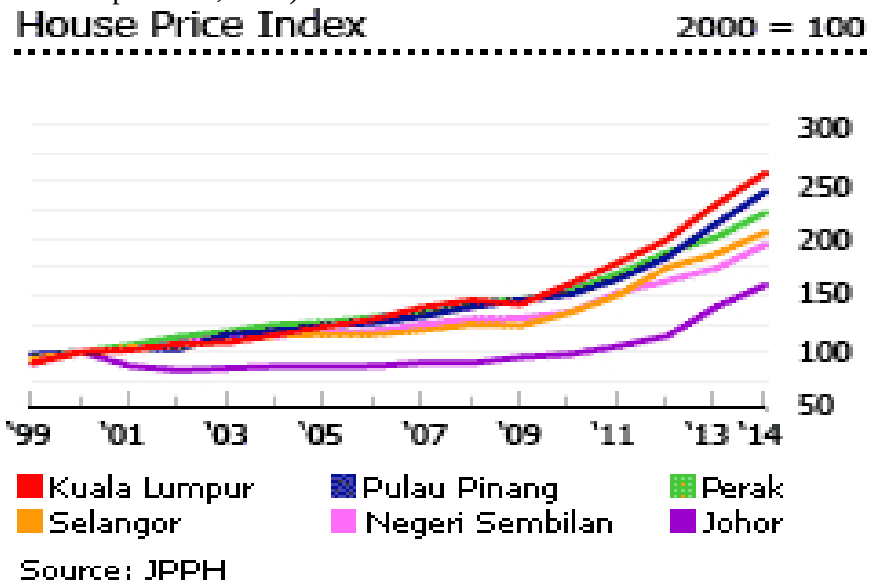

Figure 1: Housing Prices by State, Malaysia, 1999, 2014
Source:www.globalpropertyguide.com › Asia › Malaysia

Initiatives for the Elderly in Malaysia

The Malaysian government has put great efforts and formulated policies for the welfare of its older adults and has been generally successful at both international and national level. At the international level, Malaysia has supported and participated in many programs, conferences and seminars in response to the United Nations 18 Principles of Older Persons (resolution 46/91) and the International plan of Action on Aging, such as:

- The Macao plan of Action on Aging (1999).
- The World assemblies on Aging Spain (2002).
- The Shanghai Implementation Strategy (2002) for the region.
- 5th Asian and Pacific Conference Plan of action on Population and Poverty in Bangkok, 2002.

At the national level, Malaysia held many conferences and seminars to gather the necessary information and draw recommendations in planning for its aging population, for example:

- The National Social Welfare Policy formulated in 1990, identifying the role of families and communities as the main caregivers for the elderly.

- In 1990, Malaysia launched the Caring Society project to discuss caring issues including issues of elderly care.
- In 1992, the first of October was announced as the National Day for the Elderly in coincidence with the International Day of Older Persons.
- In 1993, Malaysia formulated the Care Centre Act to ensure that the elderly care centers and institutions are to standards and meeting the minimum requirement for elderly care.
- The National Policy for the Elderly formulated in 1995 aimed at:
  "To establish a society of the elderly, who are contented, dignified, possessed of a high sense of self-worth, and optimizing their potential, as well as to ensure that they enjoy all opportunities besides being given the care and protection as members of a family, society and the nation"

The policy had three objectives that included encouraging the respect for the elderly in family, society and nationwide, capitalize on the potential on the elderly potentials to remain active and productive and the provision of the necessary facilities to care for and protect them. These objectives initiated a number of action plans and six sub-committees (religion and training, education, health, housing, research and publicity). In line with these, several programs were started and planned. Item 6 of the Action Plan (1996) acknowledged that *"Existing and future houses should include facilities suitable for the elderly to enable them to live comfortably*."

Both the National Policy for the Elderly and the Action Plan are reviewed every ten years after 2005.

- In 1996, the National Advisory and Consultative Council for the Elderly (NACCE) was formed to draw recommendations to assist the government in responding effectively to the phenomenon of population aging.
- In 1996, The Elderly Health Care Program was introduced by the Ministry of Health and established the National Health Council for the Elderly (NHCE).

In 2011 the National Policy for Older Persons (NPOP) and the Action Plan (2010-2020) replaced the National Policy for the Elderly (NPE) 1995 and the Action Plan 1996.

Gaps in the National Policy for the Elderly (NPE)

The National Policy for the Elderly (NPE) was a good step in considering the changing demographics in Malaysia and is a milestone in providing care and meeting the needs for the frail elderly resulting in 15-day care centres built throughout the country. Nevertheless, there are some gaps;

- The action plan (1996) did not cover adequately the housing needs for the young old (active elderly aged 60-75).

- The policy emphasized on social aspects and provisions for the frail elderly and is wedded to traditional theories of how to care for them, rather than reflecting the present status of the elderly, denying the housing needs of the active urban elderly in the process.
- The elderly active lifestyle is mentioned in objective 1 in the Health care Program for the Elderly and not in the housing program:
  "To improve the health of older persons to enable them to lead and enjoy full and active lives through promotive and preventive health care"

The Tenth Malaysia Plan (10MP, 2011-2015)

The Tenth Malaysia Plan was tabled in June 2010 and introduced the programs needed to achieve the vision 2020 objectives, aimed at making Malaysia a developed and competitive country. The plan is based on ten concepts further interpreted into ten main premises. To achieve these concepts, five key strategic thrusts are identified. The fifth thrust relates to planning for the elderly:
The fifth thrust states:
"Building an environment that enhances quality of life"

This includes measures to ensure that the elderly will stay active, productive and healthy as they age. The programs will focus on:

- Enhancing aged-friendly infrastructure.
- Improving access to affordable health care.
- Ensuring provision of adequate housing.
- Improving financial security.
- Improving employment opportunities.

The programs aim at involving the senior citizens in both social and economic activities by covering different domains that include transport, healthcare, housing, financial security and work participation.

The government seems to be committed to promoting healthy aging. The plans provide the broad framework for preparing and planning for the aging population and emphasis should be on the implementation mechanisms that ensure meeting the objectives of the plans. Proper and continuous monitoring of services and activities is of equal importance to put the plans in place.

Elderly and Sustainable Built Environment

Sustainable development that advocate walkable neighbourhoods in relation to physical activity have, for many years, attracted the attention of the urban planning profession. Assuming that active aging is influenced by neighbourhood characteristics, sustainable development goals view neighbourhood design as a means to enhance and maintain the older

individual's access to activities (Michael, Green, & Farquhar, 2006; Satariano, 2010). Li et al. (2005) examined the relationship between the built environment and the walking activity of the elderly at both residential and neighbourhood levels. His results showed that there was a positive relationship between the built environment factors and the walking activity of older people. Similarly, Kaczynski, Potwarka, Brian, and Saelens (2008) argued that the neighbourhood environmental attributes are associated with the active lifestyle of the residents. They found that residents who moved to the neighbourhood designed to promote walkability showed improved social interaction, physical activity and hence improved health.

On the other hand, Dumbaugh (2008); Mendes de leon CF et al. (2009) argued that the perception of their neighbourhood safety (heavy traffic, crime rate..) influences the walkability of older adults. Another study supporting the above findings is the study by Neal M et al (2010) who studied the influence of green streets on the elderly physiological health found that vibrant streets with street furniture encouraged walkability and promoted social interaction.

THE PILOT STUDY IPOH

Target Population

100 respondents residing in Taman Meru, Ipoh, were pilot-studied. The area was selected based on the fact that Perak is the state with a high elderly population.

According to the United Nations age 60^{+} is considered the age for addressing aging issues. The study focused mainly on the active aging among the older adults aged 60-75 years in residential areas. However, the study also included other age group under 60: (45^{+}), to consider changes in active aging needs as people age.

Research Variables

The research is conducted to cast light on active aging provided by certain neighbourhood variables. Active aging is promoted by enhancing social interaction (Chan, To, & Chan, 2006), and physical activity (Handy, Cao, & Mokhtarian, 2008; Rohe, 2009) Table 3.

Dependent Variables: Active Aging

Independent Variables: Neighbourhood Design

Table 3: Research Variables

Dependent Variables	Independent Variables
Active Aging Variables: Physical Activity Social Interaction	Neighbourhood design: 1. Walking, 2. Physical facilitators to walking, 3. Physical barriers to walking,

	4. Convenience, 5. Accessibility, 6. Permeability, 7. Maintenance and 8. Safety

Main Survey

A face-to-face questionnaire was administered on 100 residents aged 45-75 years residing in Taman-Meru. The research employed five items to measure each variable. To avoid lengthy questionnaires that might impact response, the questionnaire was divided into three sections. The first section included the dependent variables. The second section included the independent variables. All questions consisted of five items and based on five-point Likert format. The third section included the demographic characteristics

Data Analysis

The data was analysed using the Statistical Package for Social Science (SPSS) version 16. The analysis included inferential statistics to address casual relations between the variables. This involved the use of Spearman's (rho) correlation to measure the strength and direction of the relationship between active aging and the neighbourhood design variables.

Sample Characteristics

The socio-economic characteristics of the residents show that the majority of the respondents stayed more than 10 years in the neighbourhood, and owned their own homes. There was a prevalence of male and married respondents, 70% aged 56 and above, and the majority had received at least a high school education and had an income level above RM4000.

The researchers further examined the correlation between the dependent variables and the independent variables (Table 4). All factors showed moderate-good correlations with active aging except for walking with physical activity (0.191, p>0.05= 0.057) and convenience with both social interaction and physical activity (-0.006 p>0.05=0.95; -0.023 p>0.05=0.823) in Taman Meru neighbourhood (Table 4).

Table 4: Correlation Coefficients of active aging variables and Neighbourhood Design Variables

Neighbourhood Environmental factors	**TM (n=100)**	
	Social Interaction (*p*-value)	**Physical Activity (*p*-value)**
Walking	0.201**(0.045)	0.191 (0.057)
Facilitators to Walking	0.342**(0.001)	0.329**(0.001)
Barriers to walking	-0.203*(0.04)	-0.247*(0.01)
Convenience	-0.006 (0.95)	-0.023 (0.823)
Accessibility	0.211*(0.035)	0.246*(0.014)
Permeability	0.707**(0.000)	0.637**(0.000)
Maintenance	0.826**(0.000)	0.775**(0.000)

Safety	0.955**(0.000)	0.846**(0.000)

DISCUSSION

The purpose of the study is to provide an understanding of the demographic transition and sustainable development in Malaysia and to explore the neighbourhood environmental factors influencing the sustainability of elderly active aging. The overall trends of senior citizens in Malaysia show an ever increasing aging population that will grow at a quicker pace over the coming decades. As the Malaysian population has aged it became vitally important to consider the consequences of the older population on public policy. The study identified important gaps in knowledge; the first gap is the lack of data on the residential mobility of the elderly at retirement age. The second gap is the linkage between elderly residential mobility and the occurrence of life events (retirement) and health events (declined functional ability). The study also identified the gaps in the National Policy for the elderly; the first gap is the inadequate coverage of active elderly housing needs. The second gap is the focus on social aspects and provisions for the frail elderly and negligence of the young olds needs. The third gap is the emphasis on health programs to promote healthy aging rather than neighbourhood planning and design. Moreover, the study also identified a gap in physical planning literature for healthy aging. Little research recognized the association between neighbourhood environmental factors and healthy aging, with most research dominated by psychological and biological perspectives. The promotion of an active lifestyle through neighbourhood design remain greatly under researched. Jacob. (1961) wrote:

"Failing or failed city areas are in trouble not so much of what they have (which can always be regarded as a base to build upon), but because of what they lack).(Jacobs, 1961, pp. 176-177).

The initiatives introduced by the government in addressing the needs of the aging population have been very successful for the frail elderly, but lacked consideration for the young olds. A comprehensive planning of aged friendly neighbourhoods is required to address the increasing needs of healthy aging among the elderly.

The pilot survey results provided essential insights into the neighbourhood environmental factors that are most related with active aging and highlighted the impact of certain neighbourhood environmental variables on active aging.

CONCLUSION

The purpose of the study is to weave together a literature on aging trend in Malaysia and examine association between neighbourhood designs with elderly active aging.

In Malaysia, the highlighted fact is that the elderly lack good neighbourhood design that promotes healthy aging. Hence, the challenge facing Malaysian planners and architects is to create neighbourhoods that are sustainable to provide quality services and care for the aging population and thus, achieve the objectives of the vision 2020.

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ELDERLY AND COMMUNITY HEALTH CARE FACILITIES: A SPATIAL ANALYSIS

Rosilawati Zainol[1] & Christopher J. Pettit[2]

[1]*Faculty of Built Environment*
UNIVERSITY OF MALAYA

[2]*Faculty of Built Environment*
UNIVERSITY OF NEW SOUTH WALES

Abstract

The trend of ageing at home which is preferred option by the elderly in Australia is to be supported with good community facilities such as community health care facilities. The proximity of these facilities to their homes plays a significant role in their everyday life activity. Thus, this study examines the spatial relationship between elderly's population distribution and also the spatial distribution of community health care. Digital boundaries and population census 2011 data were retrieved from the Australian Bureau Statistics (ABS). Data on community health care facilities, on the other hand, were obtained from the National Health Services Directory (NHSD). Both data were analysed using Local Indicator Spatial Association technique (LISA). Results show there is a mismatch between the placement of community health care facilities and where the elderly reside. This mismatch will later create accessibility problems to the elderly if not tackle properly. They may be required to travel quite a distance to receive treatment and medications. Facilities are to be provided with projections of elderly population distribution in mind. This condition would minimize accessibility issue in the future.

Keyword: local indicator spatial association (LISA), spatial autocorrelation, ageing population, desire to age in place, spatial statistics

[1] Senior Lecturer at University of Malaya, Kuala Lumpur, Malaysia. Email: rosilawatizai@um.edu.my

INTRODUCTION

Longer life expectancy and advancement in medical technology (Orimo et al., 2006) have led to the increasing number of elderly throughout the world, and the most can be seen in developed countries namely, the United States, European countries, Japan and Australia. Davies and James (2011) add a decrease in the rate of fertility and mortality also contributes to a longer life expectancy. There were 3 million people aged 65 and above in Australia according to the 2011 census (Australian Bureau of Statistics ABS, 2012). Australian aged population, 65 years and above has increased from 10.5% to 14% (2012). In its old elderly population, aged 85 years and above has also increased from 0.8% to 1.9% for the past 25 years (AIHW, 2012).

According to the recent census by the ABS, the ageing population prefers to stay at their home and remain active. Therefore, in encouraging an active and healthy ageing, the Australian Government is committed to ensuring that the aged population has access to a "high-quality, accessible and affordable care through a safe and secure aged care system". In responds to the increasing number of ageing population, about 7,933 residential care places and 1,724 community care places were allocated in December 2011 by the Aged Care Approval Round (ACAR) (DoHA, 2012). Community Care, funded by the Australian Government, provides home-based care to the older people and helps them to stay active and connected to their community. According to DoHA (2012) as of 30 June 2012, there were 46,518 Community Aged Care Packages (CACPs) provided to the frail aged people who prefer to live at home. While the government is trying its best to fulfil the needs, it is then worth examining the locations of the community care on whether its placement is within the ageing population catchment. Thus, this study intends to examine the spatial relationship between elderly's population distribution and also the spatial distribution of community health care. This condition is crucial since the services provided at these community health care centres such as pharmacy, health information and referral services, etc. are needed by the elderly.

RESEARCH BACKGROUND

This research background sections the context of the key variables which are to be analysed in the ensuing sections of this paper. These include (i) elderly population, (ii) community health care facilities and, (iii) proximity of health facilities.

Elderly Population

The elderly refers to a person aged 65 years old and above. According to the World Health Organization (WHO), this definition is widely acceptable by most of the developed countries. The increasing number of an ageing population requires the government to refine its public policies and economy. Sectors that

are crucial to the elderly include housing, health, income security, residential services and economic opportunities (ABS, 2012).

According to the recent report issued by the Australian Institute of Health and Welfare (2013), many older Australians prefer to age in place. This notion is not a new concept as it has been discussed by previous scholars (Davies & James, 2011; Rantz, Phillips, Aud, Popejoy, Marek, Hicks, Zailetti & Miller, 2011; Beer, Smarr, Chen, Prakash, Mitzner, Kemp, & Rogers, 2012). By staying at their home, they can maintain independence, autonomy and connection for social support (Frank, 2002; Keeling, 1999). Furthermore, by staying at home, the cost of providing institutional care for the elderly can be avoided. Thus this move is favoured by not only the policymakers but also the elderly themselves (Davies & James, 2011; WHO, 2007; J. L. Wiles, Leibing, Guberman, Reeve, & Allen, 2012). As in Australia, there is about 75% of those aged between 65-74 years old own their homes outright and about 82% of those aged 75 years old and above. These are the elderly who desire to age at their home. They claim that proximity to family, community and familiar services as the main reasons to do this (Davies & James, 2011). Thus, a healthy home environment should have a foundation for community care such as health services and care support (Davey, 2006; Lawler, 2001). However, according to Davies and James (2011), there is a decline in elderly's reliance on their children. They believe that the responsibility of taking care of them lies with themselves and the government. Thus, factors such as "affordability, amenity, type of housing, availability of formal care and supports networks" (Davies & James, 2011:117) contribute to their preference to stay at home. Proximity and access to transportation network also influence the independent living. In the context of Australia, the study area for this research, the spatial distribution and proximity to services will be further analysed later in this paper. Figure 1 shows the location quotient of the elderly population.

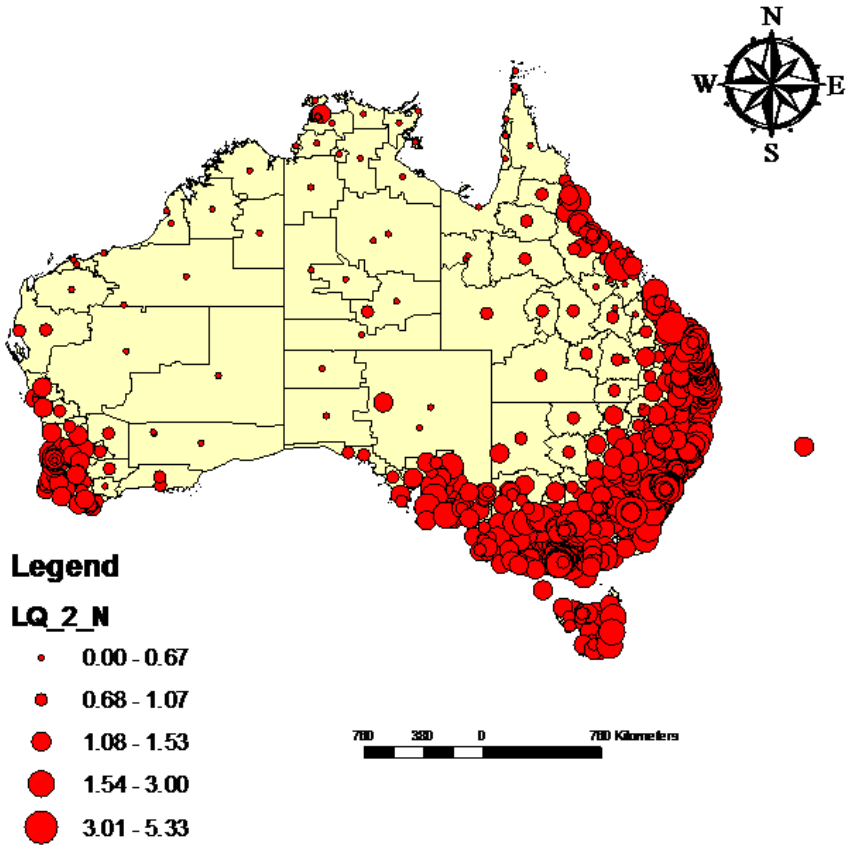

Figure 1: Location quotient for elderly population
(Source: Study analysis, 2016)

Community health care facilities

A significant body of research on community healthcare focuses more on the quality of services provided. This can be seen by works done by previous scholars; i.e. community health nurse home visit (Hosseini, MS, & Tavakol, 2013), role of community nursing in providing integrated care (Rao, 2014), community health workers (Witmer, Seifer, Finocchio, Leslie, & O'Neil, 1995), and, the importance of community health facilities (Adashi, Geiger, & Fine, 2010). In Australia, community health care refers to services that include health information and retrieval, pharmacy, maternal, child and family health, nurse-led clinics, women health clinic, food relief, veteran services, outreach service, social support, community cancer services, culturally tailored health promotion, family planning, immunization, Aboriginal health clinic, home medicine

review, men's health clinic and walk-in facilities. Figure 2 shows the distribution of community health facilities in Australia.

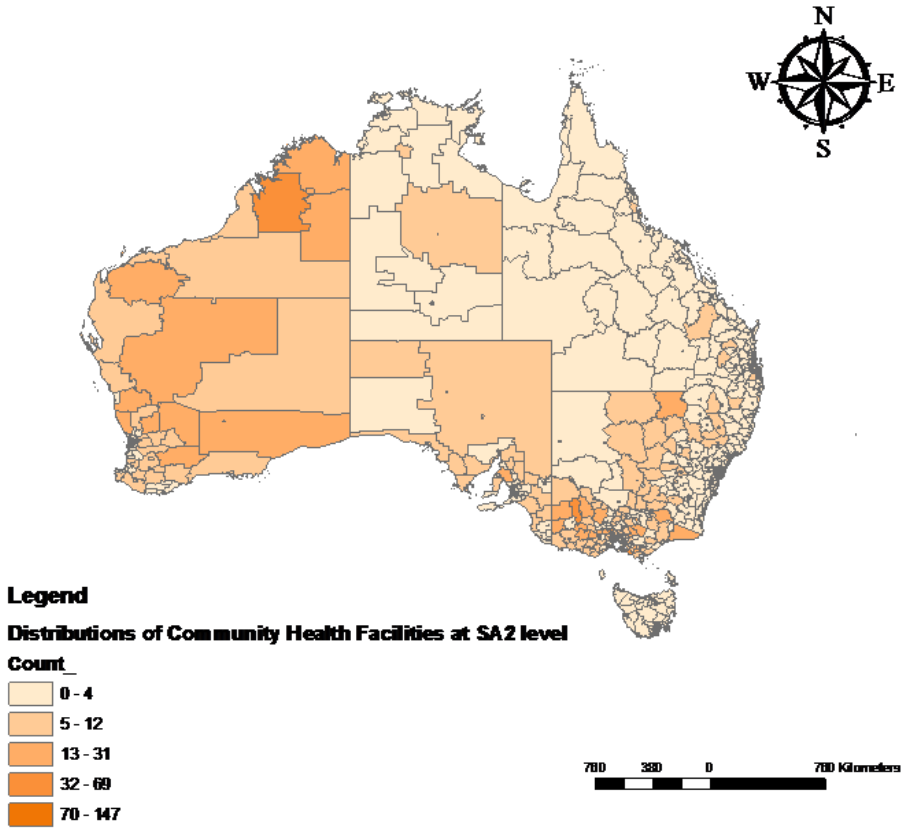

Figure 2: Distribution of community health facilities
(Source: Study analysis, 2016)

Proximity to health facilities

According to Tobler's first law of geography, "everything is related to everything else, but near things are more related than distant things" (Tobler, 1970). Studies have shown that nearness is correlated to high utilization (Nemeta & Bailey, 2000; Shannon, Bashshur, & Lovett, 1986). This finding is not new since Jarvis (1850) had conducted a systematic analysis of the association between distance and use of mental asylums in 1850. Before that Tuke (1814) cited in Shannon et al. (1986) had highlighted the problems of long-distance travelling and the establishment of asylum (Tuke, 1814). In another study, patients claimed that nearness is the reason for choosing health facilities (Fomba, Yang, Zhou, Liu, & Xiao, 2010). Thus, building a series of

small hospitals is much better that building a massive hospital and placed it in the central location (Jarvis, 1850). This situation will not only reduce the burden regarding cost but also reduce the disproportion uses of the hospitals by people from nearby and also from farther places (Jarvis, 1866). Moreover, a deprived neighbourhood can cause environmental stress to both vulnerable and non-vulnerable elderly (Van Der Meer, Fortuijn, & Thissen, 2008). However, the impact is more on the vulnerable ones. Thus, proximity to health facilities plays a significant role in determining healthy environment. This research will focus on the proximity of health care services in the context of Australia, where there is an increasing ageing population and demand for supporting facilities.

METHODOLOGY

This study employs a quantitative approach. All data are secondary data obtained from the Australian Bureau Statistics (ABS) and the National Health Services Directory (NHSD). ArcGIS software packages have been used to conduct the analyses.

Source of data

Australian Government has come up with a new geographical framework called the Australian Statistical Geographic Standard (ASGS) which was effective since July 2011. It has been utilised in the 2011 Census of Population and Housing data release. There the 2011 census data are hierarchically organized through some nested geographies. Mesh blocks which contain about 347,627 units or blocks are the smallest geographical area defined by the ABS (Australian Bureau of Statistics ABS, 2013). In the Australian Statistical Geography Standard (ASGS) 2011 framework, SA1 is the second smallest statistical area level. It has an average population of 400. Its optimal population ranges between 200 and 800 people. The largest in ASGS would be SA4 which constitutes 106 regions with a population in the range of 100,000 to 500,000 (Australian Bureau of Statistics ABS, 2014).

Population data that contain data on the ageing population aged 65 and above according to statistical area level 2 (SA2) were obtained from the ABS website according to catalogue no. 3235.0. The data are updated until 30 June 2012 (Australian Bureau of Statistics, 2012). On the other hand, the data on community health care facilities that contain information on their specific locations were obtained from NHSD. Although the site of community health care is based on longitude and latitude, it still needs to be merged with digital geographical data that have at least statistical area level 2 (SA2) for further analysis. Thus, the statistical area level 2 (SA2) geographic data and also postcode data were obtained from ABS. Both data were merged. The procedures have been undertaken using the ArcGIS software package. Table 1 shows the list of community health care services according to categories. The

distribution of these community health care facilities is quite dispersed throughout the country as will be described and analysed later in the paper.

Table 1: Number of community health care according to categories

Community Health Care Category	Number	Community Health Care Category	Number
Aboriginal health clinic	**231**	Maternal, child and family health	**1655**
Community cancer services	**67**	Men's health clinic	**15**
Culturally tailored health promotion	**49**	Nurse led clinics	**139**
Family planning	**73**	Outreach service	**68**
Food relief	**57**	Pharmacy	**5054**
Further description - community health care	**660**	Social support	**362**
Health advocacy/Liaison service	**288**	Veteran services	**26**
Health information and retrieval	**1607**	Walk-in facilities	**45**
Home medicine review	**14**	Women health clinic	**183**
Immunization	**304**		

Source: Case study data from NHSD, 2015

Method of Analysis

Spatial autocorrelation has been used by various scholars to determine the relationship between locations of a single variable (Griffith, 1992; Douglas, Vogel & Kroll, 2000; Berkelmans, De'ath, Kininmonth, & Skirving, 2004). This statement is related to Tobler's first law of geography which states that everything is connected to everything else but near things matter more (Griffith, 2009; Tobler, 1970). Moran's I is used to measuring this (Getis, 2007). Its analysis output can be classified as positive, negative and no spatial auto-correlation. But this is more of providing global indicators. Likewise, Local Indicator Spatial Association (LISA) allows for the decomposition of global indicators and provides results for each observation (Anselin, 1995). LISA is used in this study to examine the distribution of the community health care services and also the distribution of the elderly. These analyses show the relationship between a unit, in this case, the Statistical Area 2 (SA2) Level and its neighbouring unit (Anselin, 1995). It expands Moran's I capability and provides results in five categories; high-high cluster, low-low cluster, a high-low outlier, low-high outlier and not significant. High-high cluster refers to areas which have high values and are also surrounded by neighbouring areas that have high values too. They share some common attributes in a positive manner. Likewise, low-low cluster indicates the areas with low values and are surrounded by neighbouring areas which have low values. These two clusters show a significantly positive relationship between an area and its neighbours. Nevertheless, the outliers show a slightly different concept. It indicates the values that are highly significant but in a negative relationship. The high-low outliers present areas that have high values but are surrounded by neighbouring

areas that have low values. On the other hand, the low-high values imply that an area has low values but is surrounded by neighbouring areas which have high values. A unit might have high values, but its neighbouring unit might have low values and vice versa. In this study, LISA was carried out to observe the distribution of elderly and also the distribution of community health care.

LISA was carried out first with data on elderly aged 65 years and above and later on the community health care distribution. This technique determines the distribution of elderly's population and the distribution of community health care scientifically.

FINDINGS AND DISCUSSION

Results of LISA analysis show there are significant relationships between the distributions. First is the distribution of elderly aged 65 years old and above. The hotspots of age group are concentrated in the cities in the south-east part of the Australia namely Melbourne, Sydney, Adelaide and Brisbane. In Western Australia, only Dianella falls into a high-high cluster. There are about 510 SA2s that fall into this cluster category. This finding means these areas share a similar number of elderly residents. In addition, the majority of areas in Capital Territory, however, fall into a low-low cluster. Also, Northern Territory and most of Western Australia also have a low-low cluster.

The outliers are displayed as high-low and low-high clusters. The high-low cluster is found in 22 SA2s in the eastern part of Queensland and four SA2s in the western part Western Australia. The low-high outliers are mostly found in Capital Territory, Victoria, and most parts of New South Wales. These outliers show the significant negative relationship between the SA2 areas. This means the SA2s within these areas have a higher number of elderly, but they are surrounded by the areas with a low number of elderly. This is vice versa with the low-high cluster area. Table 2 shows the details. Figure 3 shows the output of LISA analysis on the distribution of elderly aged 65 years old and above.

Table 2: Total number of SA2s according to cluster category for distribution of elderly aged 65

Cluster Category	Number of SA2s (aged 65 and above)
High-high cluster	510
Low-low cluster	423
High-low cluster	26
Low-high cluster	276
Not significant	961

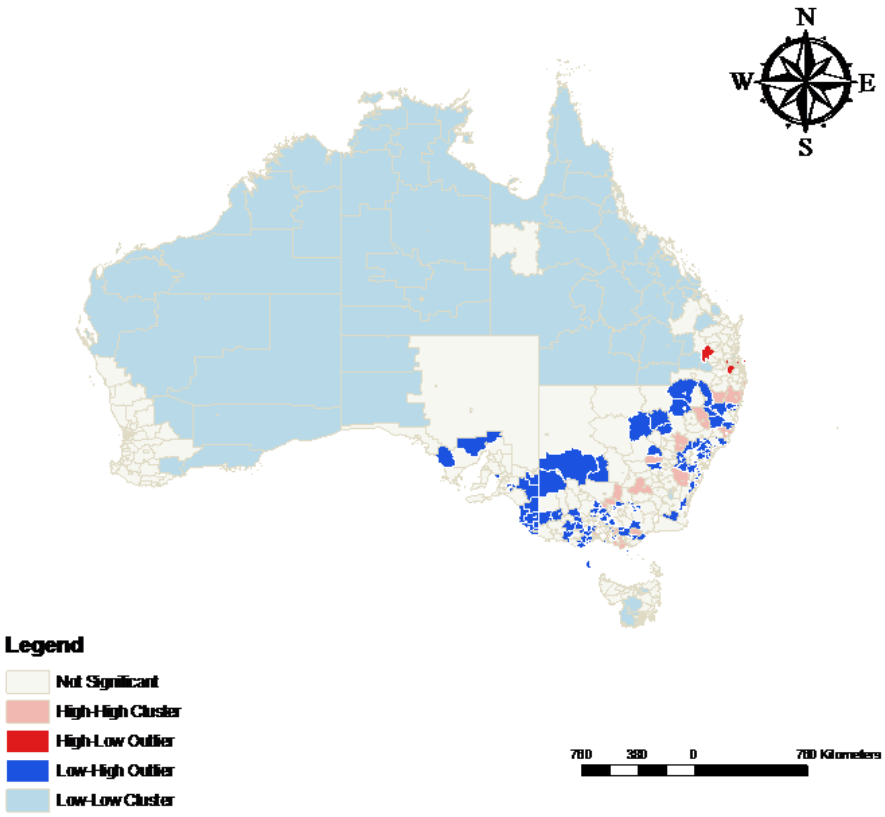

Figure 3: Results of LISA analysis on population distribution aged 65 and above
Source: Study analysis, 2016

However, distribution of community health care reflects a different output. Most of the high-high cluster areas are mostly located in Western Australia (See Figure 4). Nevertheless, there are also found in southern part of South Australia, Victoria, Capital Territory and a small part of southwestern part of New South Wales. In addition, its low-low cluster is found in northern, eastern part of Queensland and north east of New South Wales. It has a bigger cluster for high-high than the low-low category (see Table 3). It's low-high covers the western part of New South Wales. It is also found in the north-western part of Western Australia. Nonetheless, the high-low cluster is located mostly in northeastern part of Australia and a few in the eastern part of the country. Regarding numbers, it has a higher number of high-high as compared to the others except for the not significant cluster.

Table 3: Total number of SA2s according to cluster category for distribution of community health care

Cluster Category	Number of SA2s
High-high cluster	2476
Low-low cluster	739
High-low cluster	1960
Low-high cluster	923
Not significant	48674

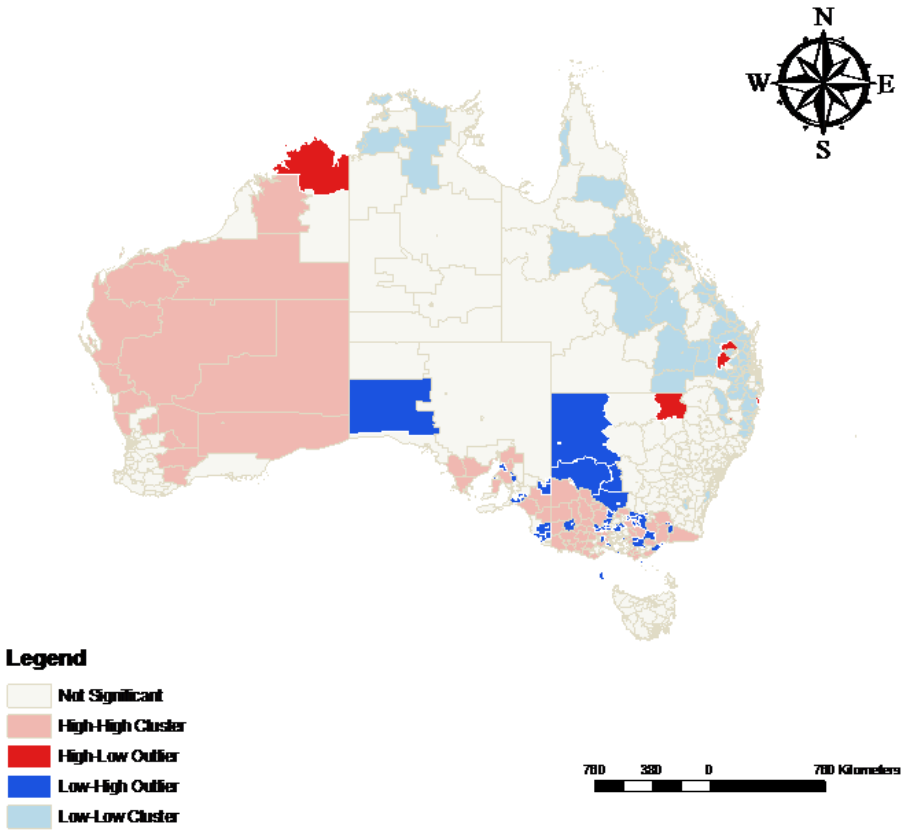

Figure 4: Results of LISA analysis on community health care distributions
(Source: Study analysis, 2016)

The results from LISA analysis show the distribution of community health care facilities does not match with the majority of the elderly's distribution. Most of the elderly are clustered in the south-eastern and southern part of Australia. These areas are the capital cities in Australia which include Sydney, Melbourne, Brisbane, and Adelaide. Historically, these cities are closely associated with the early settlements in Australia (Australian Government, 2016) that began in the early seventeen century. These cities are growing ever since, and concentration of elderly population are still at large in these cities (Australian Historical Population Statistics, 2016).

Whereas, the clustering of community health care facilities is more in areas with a low-low significant number of elderly which are in the northern and western part of Australia. The results indicate there is a mismatch in the location of community health care for elderly residents and where the elderly reside. Thus the notion of the ageing population who desire to age in place as claimed by (Davies & James, 2011; WHO, 2007; Wiles et al., 2012) will not be realized if this condition persists. Furthermore, the findings of this study reveal that the current placements of community health care are obviously not by previous studies carried out by scholars such as Wiles (2005), Javis (1850) and Tuke (1814) who highlighted the importance of proximity in locating facilities to the people who need them.

The trend of elderly population in the next few decades would still be in the state of New South Wales, Victoria, Capital Territory, South Australia and also Queensland. Although the trend of elderly's population might be in these areas, however at the current situation, they need more of the community health care services now. The south-western part of Western Australia should also be observed. These are the SA2s that probably have a high or low number of elderly population, but they are neighbouring with areas that either have a low or a high number of elderly.

The current distribution of community health should be concentrated in the areas that a high number of elderly. Not only the elderly who wish to age in place due to various factors including high cost of staying in residential aged care facilities but also the politicians who would like to them to stay at home as long as possible to reduce the cost of building and maintaining the facilities. With the increasing number of elderly each year, proper budget needs to be allocated for their needs. According to the Australian Bureau of Statistics (2012: 2071.0), the number of elderly will escalate when the baby boomers enter the retirement age. This situation will be in a decade's time. Preparations to welcome the group have to be made earlier as to avoid other implications such as insufficient community health care facilities and inaccessible facilities. Thus, placement of the community health care facilities needs to be near their users to

fulfill the elderly's needs. Furthermore, this will encourage high utilization of the said facilities as claimed by Nemeta & Bailey (2000) and Shannon, et al. (1986).

This study has used LISA, specifically the Local Moran's I statistic in measuring the relationship of a single variable with individual locations. Understanding the spatial clusters of the population and support community facilities is important, and the use of such measure as the I Moran statistic can assist in in evidence-based planning and decision- s. Tobler's first law of geography is used as an underpinning principle in planning for community support facilities. This principle will not just ensure that the infrastructure provided is placed at the best location, but it will also be able to fulfill the needs of the society in improving the quality of life of those individuals wishing to utilise such facilities.

CONCLUSION

This study has not only determined the spatial correlation of elderly population and the distribution of the community health care facilities but also introduced another approach in planning decision making. The mismatch between the placement of community health care services and the locations where the elderly reside will result in poor accessibility to these facilities by the latter. The elderly may be required to travel quite a distance to receive treatment or obtain their medicines and other services. Problems will escalate when the number of elderly increases in areas where these facilities are not available. In addition, the desire to age in place further requires facilities to be located nearby. Thus, planners need to observe this situation regularly. Placement of facilities should be accessible to users especially the elderly since they may require assistance to reach these places.

This study only applies the LISA technique in analysing the data. Possibly, a bivariate Moran's I can be used to show the significant relationship between the distribution of elderly's population and the placement of community health care in a future study. Furthermore, it does not include projection data in the analysis. The next stage of the research will use demographic population projection data to analyse the expected change in the elderly population and the location of existing health care services systematically.

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SUSTAINABLE HOUSING AFFORDABILITY IN SABAH

Rosli Said[1], Rohayu Ab Majid[2], Anuar Alias[3], Yasmin Mohd Adnan[4] & Muhammad Najib Razali[5]

[1,3,4] UNIVERSITY OF MALAYA, MALAYSIA
[2] UNIVERSITI TEKNOLOGI MARA, MALAYSIA
[5] UNIVERSITI TEKNOLOGI MALAYSIA

Abstract

Sabah is one of the states in Malaysia has shown remarkable growth in housing industry where its housing sector has thrived owing to growing market and active supply and demand dynamics. However, the rapid increase in housing price has created greater concern among the researchers about the sustainability of the housing sector in this country. The aspect of sustainability has seem been neglected by the industry players. Consequently, it will give impact to the environment which contrasts with the aim of the built environment to create sustainable development. This is because affordable housing is always being associated with cheap and low-quality houses. This research is aim to assess the best area in the state of Sabah to build sustainable affordable housing scheme. The results indicate that area with high utility degree is the best area that conforms to the sustainable housing affordability factors. Likewise, an area with a lower ranking in utility degree can be described as a worst-performing area. The originality of this research has contributed to a real picture of sustainable housing affordability in Malaysia, particularly the state of Sabah.

Keyword: COPRAS, MCDM, Sustainable, Housing, Affordability

[1] Senior Lecturer at University Malaya. Email: rosli_alambina@um.edu.my

INTRODUCTION

The National Malaysian Housing Policy requires that the government aspires to accommodate the population with quality and affordable housing. In dealing with housing development, Malaysia has come out with extensive laws covering sustainable development through physical, economic, social and environmental aspects. Environmental performance, water treatment or energy efficiency forms the concept of ecologically sustainable development (Pullen *et al.,* 2010). Although this concept of sustainable development is relatively acceptable in Malaysia, it is still debatable and open to more critical solutions. Abidin (2010) believes that competition between property developers has encouraged them to embrace the concept of sustainability as their main marketing campaign in any of their housing developments.

Although sustainable housing affordability has generated much interest among researchers, none of the local studies has focused on this area. Therefore, this study tries to address that gap with the aim to establish the sustainability area of housing that is considered affordable, at least in the Malaysian context. For this reason, the Multi-Criteria Decision Making (MCDM) framework is utilised through the Multi-Attribute Complex Proportional Assessment (COPRAS) method. In order to gain more insight into the study, this paper is organised as follows. First, relevant literature encompasses the concept of sustainable housing affordability is discussed. Then, follows the discussion on the criteria of sustainable housing affordability and the tools used in assessing sustainability. Then, analysis and conclusion of the paper are presented and discussed.

LITERATURE REVIEW

Defining Sustainable Housing Affordability

Brundtland (1996) defined sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". However, debates among researchers within the scope of this definition retarded the progress of making the concept of sustainability operational. In the most recent definition, sustainability refers to the observation of balancing between the three concepts namely economic development, social equity and environmental protection (Drexhage & Murphy, 2010). In a broader aspect, sustainability would also include social attributes, human values and ecological (Kates *et al.,* 2005)

Medineckiene *et al.* (2010) highlighted the need to consider the current situation of economic, social and built environment in making decision as more and more citizens have come to live in inadequate shelters. Maliene and Malys (2009) further interpret sustainable housing as those that are well available, high quality, economical, ecological, aesthetical design, comfortable, and cosy. Sustainable

housing should also consider not only the short and long-term costs of running a home but also cost-efficiency with good energy, waste, and water management.

The concept of 'sustainable housing affordability' was introduced by Mulliner and Maliene (2011) in which they established an initial system of criteria for sustainable housing affordability, among others, house price, quality and proximity to commercial area, hospital and entertainment. Mulliner and Maliene (2011) further argue that other criteria such as location, social, environment and economic sustainability of the housing shall not be isolated from housing affordability. Mulliner *et al.* (2013) argued that the abandonment of and low demand for housing units is due to their location which is not well connected to jobs, high-quality services and infrastructure. Therefore, sustainability should deal with the major backbone of housing design and a fundamental dimension of housing quality (Morgan & Talbot, 2001). Physical attributes supported by community involvement and the challenge of getting the right 'mix' are the pre-requisite for sustainable housing affordability (Turcu, 2012).

Criteria for Sustainable Housing Affordability

A framework to determine the criteria of sustainability has been developed by Pullen *et al.* (2010). The sustainability criteria set by him consist of the core elements such as efficiency, construction, procurement, affordability, desirability, dwelling sizes, appropriate density, adaptability and social acceptability. Mcalpine & Birnie (2007) introduced strategic indicators to monitor the quantifiable sustainability themes namely, among others, the quality of housing, environment quality, land use, household and commercial waste and local transportation. Table 1 shows the combination of criteria for sustainable housing affordability obtained from previous studies. However, the concept of sustainable housing affordability to be established in Malaysia is not ideal to be implemented in other countries due to different culture, preferences and attitude. This paper will suite suitable elements with local needs from the sustainable and affordable housing theoretical concept.

Table 1: Criteria for Sustainable Housing Affordability

	Sustainable Housing Affordability Factors	Sources
1	House Price	(Burke et al., 2007; Mulliner & Maliene, 2011)
2	House Quality	(Department of the Environment Heritage and Local Government, 2007; Mulliner & Maliene, 2011; The Ministry of Urban Wellbeing Housing and Local Government, 2013)
3	House Type	(Hurtubia et al., 2010)
4	House Finishes	(Fierro et al., 2009)
5	House Design	(Fierro et al., 2009)
6	Interior Features	(Hurtubia et al., 2010)
7	Position of the House in Layout Plan	(Hurtubia et al., 2010)
8	Size of Built-up Area	(Fierro et al., 2009)

9	Size of Land Area	(Fierro et al., 2009)
10	Built-up Area	(Fierro et al., 2009)
11	Age of the House	(Fierro et al., 2009)
12	Topography	(Fierro et al., 2009)
13	Property Interest	(Lu, 2002)
14	Near to Commercial Area	(Mulliner & Maliene, 2011; Samuels, 2004)
15	Near to Hospitals	(Mulliner & Maliene, 2011; Zhu et al.,2006)
16	Near to Post Office	Own research
17	Near to Entertainment	(Isalou et al., 2014; Mulliner & Maliene, 2011)
18	Near to Transportation	(Australian Conservation Foundation, 2008; Mulliner & Maliene, 2011)
19	Near to Place of Worship	Own research
20	Near to Education	(Clark et al., 2006; Mulliner & Maliene, 2011; Samuels, 2004)
21	Near to Workplace	(King, 2008; Mulliner & Maliene, 2011)
22	Environment Quality	(Cowan & Hill, 2005; Zhu et al., 2006)
23	Security	(Hipp, 2010; Samuels, 2004)
24	Traffic Congestion	(Brownstone & Golob, 2009; Shen et al., 2011)
25	Density	(Brownstone & Golob, 2009; Samuels, 2004)
26	View	(Zhu et al., 2006)
27	Exterior Condition	Own research
28	Availability of Waste Management	(Joseph, 2006; Mulliner & Maliene, 2011)
29	Safety Level	(Hipp, 2010; Samuels, 2004)
30	Theme or Concept	Own research
31	Availability of Child Care	(Mulliner & Maliene, 2011)
32	Electrical Supply	(Maliene & Malys, 2009; Mulliner & Maliene, 2011)

Measuring Sustainable Housing Affordability

The assessment of the effectiveness of sustainability application is a complex process which need in-depth analysis and through process. Pullen et al. (2010) stressed the need for a more integrated system-based approach in assessing social sustainability. Meanwhile, Mulliner and Maliene (2011) propose a set of criteria to represent sustainable housing affordability. Therefore, in order to ensure the successful of sustainability concept in housing project, there is a need to establish a systematic concept and approach in Malaysia to be as a guideline and assessment system.

Most housing economist focuses on housing price rather than holistic measures of the condition, locational attributes and neighbourhood characteristic (Bogdon & Can, 1997). In the built environment, a Complex Proportional Assessment (COPRAS) method can be used as a tool to assess sustainable housing affordability. The method is suitable for cases where data are expressed in interval forms (Popović et al. (2012) and used to determine the priority and the utility degree of alternatives (Zavadskas & Kaklauskas, 1996; Zavadskas et al., 2008). COPRAS is particularly useful in making a highly complex decision by applying weight or priorities (Aruldoss *et al.* (2013), involving a careful selection of

resources to ensure the accuracy of criteria, alternatives or factors (Haarstrick & Lazarevska, 2009). COPRAS has gained wide acceptance throughout different sector due to its effectiveness and simple process.

METHODOLOGY

Malaysia sits within the region of South East Asia and made up of Peninsular Malaysia (West Malaysia) and East Malaysia (comprising Sabah and Sarawak). Sabah is the second largest state in Malaysia and also the second most populous state in the country. Greater Kota Kinabalu was chosen as the geographical area of this study. The area represents the most active area for housing development in East Malaysia. The contiguous built-up urban agglomeration around the city goes beyond the south side and into the district of Putatan, and to a lesser but growing extent into the district of Tuaran.

The questionnaires were distributed to residents within six of the most demanded residential areas namely Sembulan, Inanam, Bundusan, Sepanggar, Tuaran and Putatan. The purpose of the questionnaires was to verify and elicit respondents' opinion by assessing their existing housing unit in relation to the proposed criteria that constitute sustainable housing affordability. Out of 600 distributed questionnaires, 497 were answered by valid respondents of which 11% were from Sembulan, 29% from Inanam, 21% from Bundusan, 15% from Sepanggar, 12% from Tuaran and 12% from Putatan.

The questionnaires consist of 26 criteria (F1 – F26) to be chosen by respondents (Table 2). Respondents distinguish each factor based on its relative importance towards sustainable housing affordability. Responses are ranked on a five-point Likert Scale. Likert scale was used because of its simplicity in expressing the respondent level of agreement (Allen *et al*, 2007).

Evaluation of Sustainable Housing Affordability

The data were analysed using COPRAS method which involves five main steps which based on the model developed by Kaklauskas *et al.*(2005, 2007, 2008) and Mulliner *et al.*(2013).

1. The main purpose of this assessment is to measure sustainable housing affordability in the chosen areas to create a ranking of alternatives. Thus, COPRAS can handle such problem involving both positive and negative factors that influence the decision-making. The following formula is used by taking the overall mean score to allow direct comparison between all factors:

$$m_{pq} = \frac{\bar{w}_{pq}}{\sum_{q=1}^{n} x_{pq}} x_{pq}$$

Where x_{pq} is the value of the *p*-th criterion of the *q*-th alternative, and $\bar{w}_{pq}$ is the weight of the *p*-th criterion. The *q* represents alternative residential areas.

Table 2 identifies the selected criteria of sustainable housing affordability in Malaysia and calculates overall mean score for the identified criteria. The table

shows that the highest score went to the 'housing price' and followed by 'the safety level of development area' which is the second most important criterion. The least important criterion is 'near to education' where most respondents did not find it important as compared to the rest of the criteria.

Table 2: Selected Criteria and the Overall Mean Score

Factors	Characteristics	N	Mean Score (overall)
F1	Housing Price	484	4.3657
F2	Housing Type	483	3.7743
F3	Housing Finishes	483	3.7433
F4	Housing Design	483	3.6791
F5	Position of the unit in Layout Plan	482	3.4004
F6	Size of Built-up Area	481	3.5010
F7	Size of Land Area	481	3.5509
F8	Age of the Unit	480	3.7042
F9	Topography	482	3.6349
F10	Property Interest	482	4.0809
F11	Near to Commercial Area	484	3.3843
F12	Near to Hospitals	484	3.7169
F13	Near to Post Office	484	3.3202
F14	Near to Recreation Area, Public Space	484	3.4463
F15	Near to Transportation	484	3.5289
F16	Near to Education	483	3.1222
F17	Near to Workplace	484	3.7748
F18	Environmental Quality	481	3.9730
F19	Security	481	4.1289
F20	Traffic Congestion	482	3.7842
F21	Density	481	3.7318
F22	View	482	3.7884
F23	Exterior Condition	481	3.8274
F24	Availability of Waste Management	481	4.0062
F25	Safety Level	483	4.3292
F26	Theme or Concept	483	3.7702

Table 3 derives the relative weight for each factor, $\bar{w}$ and an individual mean score of each alternative area, which is essential for the next step of using the COPRAS method.

Table 3: The weight and means score for each alternative area

Factors	Weight, q	Sembulan	Inanam	Bundusan	Likas	Tuaran	Putatan
F1	2.620	4.364	4.394	4.465	4.178	4.224	4.509
F2	2.265	3.722	3.542	3.960	3.973	3.931	3.655
F3	2.247	3.778	3.479	3.901	3.945	3.914	3.655
F4	2.208	3.685	3.451	3.911	3.959	3.690	3.455
F5	2.041	3.407	3.106	3.600	3.740	3.569	3.164
F6	2.101	3.685	3.191	3.650	3.726	3.707	3.327
F7	2.131	3.685	3.254	3.677	3.808	3.793	3.364

F8	2.223	3.796	3.468	3.920	3.877	3.810	3.481
F9	2.182	3.519	3.458	3.950	3.795	3.724	3.327
F10	2.449	4.018	3.965	4.400	4.083	4.121	3.818
F11	2.031	3.667	3.496	3.208	2.877	3.263	3.927
F12	2.231	3.719	3.709	3.673	3.616	3.737	3.927
F13	1.993	3.193	3.355	3.426	3.288	3.053	3.491
F14	2.068	3.474	3.418	3.436	3.534	3.228	3.618
F15	2.118	3.579	3.589	3.396	3.562	3.140	3.927
F16	1.874	3.281	2.787	3.480	3.411	2.930	2.982
F17	2.266	4.053	3.922	3.644	3.301	3.702	4.055
F18	2.385	3.895	3.872	4.091	4.096	4.036	3.873
F19	2.478	4.140	3.979	4.150	4.342	4.250	4.055
F20	2.271	3.719	3.564	3.822	4.178	3.839	3.764
F21	2.240	3.643	3.546	3.782	4.110	3.643	3.796
F22	2.274	3.804	3.674	3.653	4.164	3.804	3.800
F23	2.297	3.679	3.681	3.733	4.292	3.786	3.964
F24	2.405	3.965	3.787	4.010	4.288	4.091	4.148
F25	2.598	4.561	4.099	4.376	4.466	4.518	4.218
F26	2.263	3.596	3.631	3.851	4.329	3.643	3.545

2. The weighted results are summarised to normalise the decision-making matrix by calculating the sums of both positive and negative alternatives (Table 4). The sums of S_{+q} of attributes values which provide larger values are preferable (the direction of optimization and maximisation) as compared to other alternatives. The sums of S_{-q} of attributes values which constitute smaller values are preferable (the direction of optimization and minimisation) as compared to other alternatives. The significance (priority) of the comparative alternative is determined on the basis of a greater/lesser criterion values that satisfies sustainable housing affordability. The formula to calculate the sums are as follows:

$$S_q^+ = \sum_{e_p=+} m_{pq}$$

$$S_q^- = \sum_{e_p=-} m_{pq}$$

Table 4: Normalized decision matrix by alternative area

Factors	**Z**	**Sembulan**	Inanam	**Bundusan**	**Sepanggar**	**Tuaran**	**Putatan**
F1	-	0.438	0.441	0.448	0.419	0.424	0.452
F2	+	0.370	0.352	0.394	0.395	0.391	0.363
F3	+	0.374	0.345	0.387	0.391	0.388	0.362
F4	+	0.367	0.344	0.390	0.395	0.368	0.344
F5	+	0.338	0.308	0.357	0.371	0.354	0.314
F6	+	0.364	0.315	0.360	0.368	0.366	0.328
F7	+	0.364	0.321	0.363	0.376	0.375	0.332
F8	-	0.378	0.345	0.390	0.386	0.379	0.346
F9	-	0.353	0.346	0.396	0.380	0.373	0.333

F10	+	0.403	0.398	0.442	0.410	0.414	0.383
F11	+	0.364	0.348	0.319	0.286	0.324	0.390
F12	+	0.371	0.370	0.366	0.360	0.372	0.391
F13	+	0.321	0.338	0.345	0.331	0.307	0.351
F14	+	0.347	0.341	0.343	0.353	0.322	0.361
F15	+	0.358	0.359	0.339	0.356	0.314	0.393
F16	+	0.326	0.277	0.346	0.339	0.291	0.296
F17	+	0.405	0.392	0.364	0.330	0.370	0.405
F18	+	0.389	0.387	0.409	0.409	0.403	0.387
F19	+	0.412	0.396	0.413	0.432	0.423	0.403
F20	-	0.369	0.354	0.379	0.415	0.381	0.374
F21	-	0.362	0.353	0.376	0.409	0.362	0.378
F22	+	0.378	0.365	0.363	0.414	0.378	0.377
F23	+	0.365	0.366	0.371	0.426	0.376	0.394
F24	-	0.393	0.375	0.397	0.424	0.405	0.411
F25	+	0.452	0.406	0.433	0.442	0.447	0.418
F26	+	0.360	0.364	0.386	0.434	0.365	0.355

3. The relative significance H_q of each alternative, based on positive (+) and negative (-), are calculated using the formula below:

$$H_q = S_q^+ + \frac{S_{min}^- \sum_{q=1}^{n} S_q^-}{S_q^- \sum_{q=1}^{n} \frac{S_{min}^-}{S_q^-}} = S_q^+ + \frac{\sum_{q=1}^{n} S_q^-}{S_q^- \sum_{q=1}^{n} \frac{1}{S_q^-}}$$

Where the minimum values S_q^- are cancelled, the higher value corresponds to a more sustainable housing affordability.

4. At this stage, prioritisation is determined by the largest H_q. H_{max} is the optimal value and the best among alternatives. Alternatives are ranked from highest to lowest of relative significance H_q.

5. The degree of utility is determined by comparing each alternative by the one alternative with H_{max}. The area with the highest degree of utility ($ŭ_q$ = 100%) represents an area that most satisfies sustainable housing affordability. Other alternatives will show utility values ranging from 0% -100% indicators of the worst to the best-case scenario. The degree of utility $ŭ_q$ of the alternatives O_q is calculated by the following formula:

$$ŭ_u = \frac{H_q}{H_{max}} 100\%$$

RESULTS & DISCUSSION

The step-by-step procedure in COPRAS assessment produces the final results (Table 5). Table 5 shows that the location that best describes the most sustainable housing affordability is Sembulan as reflected in utility degree of 100%. The second best area is Likas with utility degree of 97.81%. The next suitable area is Bundusan

with utility degree of 96.66%, followed by Inanam at 96.60%. Tuaran has shown the lowest ranking as reflected in utility degree of 96.51% that is slightly lower than Putatan with utility degree of 96.51%.

The results also show that most of the population in Kota Kinabalu concerned with house price as compared to other factors. Surprisingly, the respondents are willing to discount all these factors in favour of housing quality and the environment. Sembulan did score very high in some factors such as high accessibility and low density. The results also indicate that this area is the best performing area in relation to the predetermined factors of sustainable housing affordability. Sembulan scored relatively low in building-related factors such as housing type, finishes, design, interior features and position of the house in layout plan.

Each of the six areas above had almost equal measures of utility shows that the difference between the best alternative (Sembulan) to the worst alternative (Tuaran) is minuscule at 4.5%. This could be translated in layman's terms as the advantages and disadvantages of both areas are almost equal and often interchangeable with one another. In other words, Sembulan proved to be sustainable in terms of housing affordability, and it is the best area to stay as compared to the rest of the alternatives. However, great improvement can be done in the analysis by focusing on a smaller area, i.e. by zoning, precinct or section within the larger area. The key finding shows that the identification of appropriate area would assist in ensuring high quality of life for future affordable housing development. Therefore, COPRAS method has substantially demonstrated its effectiveness in assessing the sustainability of different areas by providing the utility degree of alternatives. Its flexibility could be applied to any region and place, and the weight can be adjusted to suit any context.

Table 5: Final Results of Sustainable Housing Affordability

	Sembulan	Inanam	**Bundusan**	**Likas**	**Tuaran**	**Putatan**
S+	8.650	8.080	8.893	9.039	8.666	8.183
S-	7.667	7.679	8.480	8.424	8.451	7.788
H	17.150	16.567	16.578	16.775	16.378	16.551
Priority	1	4	3	2	6	5
ŭ(%)	100.00%	96.60%	96.66%	97.81%	95.50%	96.51%

CONCLUSION

Overall, the rising of house price and cost of living compel the purchasers to find the best area to allocate themselves in any city. Over time, nothing else can be based upon in their decision-making process other than price and household income. The marketplace has to be reassessed in a more discriminating way in order to find an alternative to what could be the most important to individual and/or society. This paper has adequately demonstrated the necessity to shift our emphasis from the traditional price-income-cost genre towards sustainability-quality-affordability value. Housing affordability is one of the main concerns for any

government. As such, the market players also play a major role in order to make a distinction between cheap housing and sustainable housing affordability as this issue will get even more complicated as we explore deeper into the topic. There is a necessity to have cooperation between the market players to arrive at the conclusion that what makes a house sustainable outside the limitation of simply housing cost. The government through its local authorities could adopt the same methodology for a proper planning of urban dwellings. Property developers may utilise the results to find the best area to improve their future housing development. This would prove beneficial to gain the upper hand against competing rivals. The results and method presented could also be used by the public in determining and deciding the best area to buy future housing units in fulfilling their preferences.

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THE CHALLENGE OF LABOUR SHORTAGE FOR SUSTAINABLE CONSTRUCTION

Faizul Azli Mohd-Rahim[1], Nurul Safwah Mohd-Yusoff[2], Wang Chen[3], Nurshuhada Zainon[4], Sumiani Yusoff[5] & Rafikullah Deraman[6]

[1,2,3,4] *Department of Quantity Surveying, Faculty of Built Environment*
[5]*Department of Civil Engineering, Faculty of Engineering*
UNIVERSITY OF MALAYA

[6]*Department of Building and Construction Engineering Faculty of Civil and Environmental Engineering*
UNIVERSITI TUN HUSSEIN ONN MALAYSIA

Abstract

In line with the principle of sustainable development, construction projects ought to be developed to bring benefits across all aspects, namely economic, social, and environmental. One the other hand, being a complex, fragmented and schedule driven industry, construction projects are frequently subject to problems that constrain their execution. Since construction is a labour intensive industry, the shortage of labour has become the crucial risks that hindering the construction project in achieving sustainability. This paper, in reviewing the concept of sustainable construction, also addresses the influential factors concerning the labour shortages in the construction industry and discusses how these challenges can be managed in producing sustainable construction labours.

Keyword: sustainable construction; labour shortage; technical education; vocational training

[1] Associate Professor at Dept. Of Quantity Surveying, FBE, UM. Email: azli@um.edu.my

INTRODUCTION

United Nation's Brundtland Commission's report (1987) defined sustainable development as the development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Suliman & Omran, 2009). The principle of sustainability is based on the idea that society should use the available resources on a scale consistent with the ability of future generations to meet their own needs (Zimmerman, 2005). During the United Nations' World Summit on Sustainable Development in Johannesburg in 2002, the basic definition of sustainable development has been refined to emphasize the collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development, namely the economic development, social development and environmental sustainability at every levels (e.g. local, national, regional and global) (Delnavaz, 2012).

Therefore, the key issue for sustainable development is the integration of different aspects of sustainability in three main aspects which are the social, economic, and environmental. The relationship between these aspects can be shown graphically by a Venn diagram (Figure 1) composed of three overlapping circles with each circle representing a different aspect (Lozano, 2008). The three overlapping circles symbolize how the core of sustainability requires equal consideration of all aspects where every decision towards solving the problem or improvement has an impact on these three aspects.

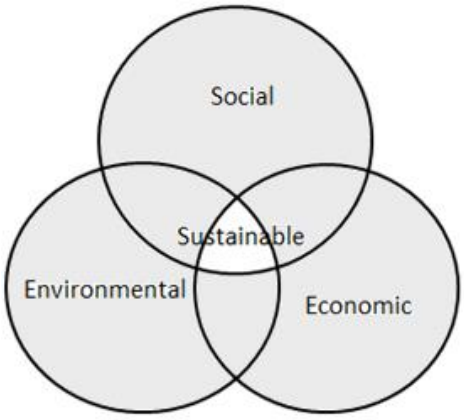

Figure 1: Venn diagram of the three pillars of sustainable development
Source:(Lozano, 2008)

Construction industry is considered to be a major productive industry in Malaysia. For example, in 2014, this industry accounts around 3.9% of the

Malaysia's total Gross Domestic Product (GDP) (Malaysia Productivity Corporation, 2015). The total value of construction work done in the second quarter 2014 recorded a double-digit growth of 10.8% year-on-year to RM25.2 billion (Department of Statistics Malaysia, 2014). These developments has brought significant impacts to the Malaysia's economy and also resulted in other implications especially to the environment and social aspect of the country. This industry occupies the focal position in the economic development (Oseghale et al., 2015) and has created a lot of occupations opportunities to boost up the country's economy.

The construction industry is one of the sectors that play a significant role in the socio-economic growth of a country. Apart from being a major contributor to the overall GDP of a country, it is also responsible for providing the necessary infrastructure to improve the quality of life of a nation. Hence, in order to achieve sustainable development, it is fundamentally crucial for the construction industry to adopt sustainability concept, since it has significant direct and indirect links with the principal of sustainability (Bourdeau, 1999). For example, construction industry consumes high amount of resources, so improving its quality has a significant effect on the sustainability of the whole society (Huovila & Koskela, 1998).

Horvath (2004) stated that about 40% of the world's resource and energy use is linked to the construction and maintenance of buildings. This concern was responded by the sustainable construction practices, a more sustainable way than the conventional construction practice (Hussin et al., 2013).

In order to perform construction projects, labours are one of essential key factor important factors in successive of construction project management. Numerous of construction project have been failed and unsuccessful due to the labour factor. Windapo, A. O. (2016) emphasized where projects failures happen due to insufficient of skillful or qualified tradesmen. The level of supply of skilled tradesmen is attributed to the lack of high-quality basic education, the state of the economy, compulsory certification of worker and an ageing workforce. Besides, he found there is a significant relationship between skilled labour shortages and the requirement that labour be certified and that work output is unsatisfactory when there is no certification requirement. For better understanding, the term of labours are defined as skillful and unskillful worker generally work in construction field.

According to Ahmed et al., (2003), categorized his finding into two categories where internal causes (client, contractor and consultant) and external causes which are beyond the control of the organization. In our paper, as we stressed the contractor cause its about labour managing. Again, author Assaf et al. (2006), piloted a study in construction industry of Saudi Arabia and reported critical causes of delay related to contractor, constructor and client in bigger

construction projects. In general, to evaluate the workers quality and contribution in construction field can be assess by Performance analysis. Table 1.0 state the factors that lead to the failure of a construction projects due the labour factors.

The lack of labour in this industry needs to be taken seriously because it can affect the productivity of the construction projects (Othman, 2014). For example, Baloyi & Bekker (2011) stated that the issue of labour shortages have a significant impact on the construction of football stadiums during the 2010 FIFA World Cup in South Africa when it became the second and third factors of the time delays and cost overrun in the project construction. Therefore, this paper aims to review the concept of sustainable construction, by highlighted the influential factors concerning the labour shortages in the construction industry and discusses how these challenges can be managed in producing a sustainable construction labours.

METHODOLOGY

The research method adopted for this paper is mainly based on a literature review of "sustainable construction" and "labour shortage" in the construction industry. The keywords used in the literature search include sustainable development, sustainable construction, labour shortage, construction labour, skilled labour, workforce planning, and sustainable management. This paper performed a content analysis approach that involves cross-referencing various sources of information in order to identify the challenge of labour shortage in construction industry. The literature analysis revealed 16 factors that influence the availability of labours in the construction industry. Although this paper places emphasis upon sustainable construction industry, the literature review, however the facts not limited to construction industry barely. This paper, in reviewing the sustainable construction concept, explores the relationship between the two topics and discusses how these challenges can be managed in constructing sustainable construction essentially factor of labours.

CHALLENGES IN SUSTAINABLE CONSTRUCTION

Kibert (2005) has defined sustainable construction as "creating a healthy built environment using resource-efficient, ecologically based principles". A construction project is considered to be sustainable only when all the basic principles of sustainability are compatible with each other (Mateus & Bragança, 2011). The basis for the whole process lies in balancing financial, environmental and operational considerations of a construction project (Suliman & Omran, 2009). However, many issues of sustainability are interrelated, and the interaction of a construction project with its surroundings has significant impacts for mankind (Hussin et al., 2013). Being a complex, fragmented and

schedule driven industry, construction projects always facing chronic problems such as poor quality, low productivity, time overrun, over-budget, shortage of workers, construction waste and others (Rahman et al., 2013).

In line with the principle of sustainable development, construction projects should be developed to bring benefits across all aspects, namely economic, social, and environmental. However, developing projects under the fundamental of sustainable construction is complex because the projects are frequently subject to problems that constrain their execution (Wang, 2014). One of the critical problems faces by the construction industry is labour shortages (Hamid et al., 2013; Healy et al., 2011). Since construction is a labour intensive industry, the shortage of labour has direct effect on project performance, especially in term of cost, time and quality (Hajela, 2012; Ibrahim, 2013; Jarkas & Younes, 2014).

In most countries, labour costs comprise 30% to 50% of the overall project costs (Jarkas & Younes, 2014) and hence they are regarded as an important resource of the efficiency and success of the construction project. Apart from the aims to minimize the resource depletion, reducing environmental degradation, and developing a healthy built environment, the fundamental objectives of sustainable construction includes the criteria related to complete a project in accordance with specified time, cost and quality (Vučković et al., 2014) (Figure 2). Nevertheless, the shortfall of human resource has become the crucial risks that hindering the construction project in achieving sustainability (Awe et al., 2010; Becker & Smidt, 2015; Levanon et al., 2014).

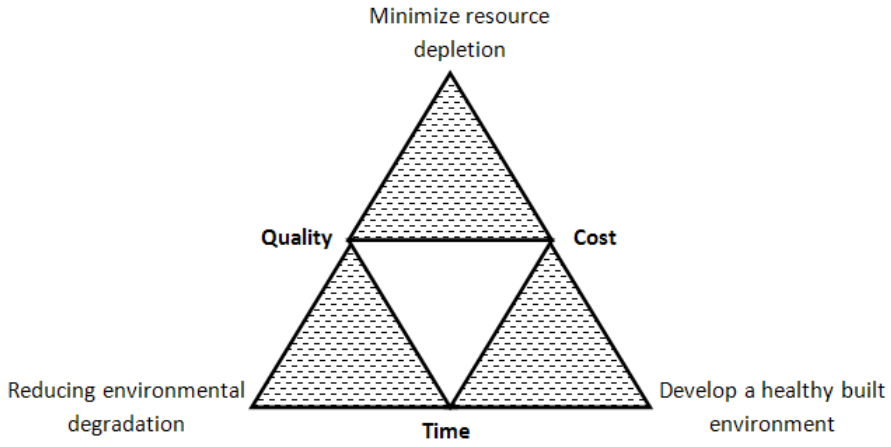

Figure 2: The new paradigm of challenges in sustainable construction
Source: (Huovila & Koskela, 1998)

LABOUR SHORTAGES: FACTORS AND EFFECTS

A productive economy needs skilled labours to produce prolific services. Yusof & Misnan (2009) stated that the construction industry environment is influenced by the availability and sustainability of skilled and productive labours because it is a labour-intensive industry that relies heavily on human capital. Thus, every person employed within the construction process makes a direct contribution not only to the community in general but also to the nation at large (Ward, 1979). The shortage of labours in the construction industry will give negative impact towards the country's development.

The term "labour shortage" is subject to various interpretations rendered by different authors but basically a labour shortage is refers to an "absolute shortfall in the number of workers in a labour workforce" while at other times it also refers to a "mismatch between worker qualifications and the jobs which are available" (Barnow et al., 2013). In general, it is a situation where the demand for labour in a particular market exceeds the supply. There are some indicators within the industry that may be used to determine the supply and demand forces in the economy. According to Golden (2008), the supply forces within a labour market can be evaluate based on unemployment rate, number of workers unemployed, and job openings reported within the industry, meanwhile the gross domestic product, number of workers employed in the labour market and spending within the industry may be used to evaluate the demand forces.

Labour shortages are often portrayed as a major problem for the economies in many countries (Healy et al., 2011). This can be seen in a report by an international accounting firm, Grant Thornton International, that shows globally there is an average of 39% shortfall in skilled workers and the figures are higher in Singapore and Malaysia at more than 60% (Grant Thornton International Ltd, 2012). The Malaysian construction industry is the fourth largest employer utilizing about 1.2 million workers, which is 9% of the country's total labour force (Malaysia Productivity Corporation, 2015). Although construction industry in Malaysia has showed a good performance for the country's economy, this industry actually faced a tight situation in labour market. The risk of labour shortage in Malaysian construction industry can be seen with the escalating number of the foreign workers in construction site (Salleh et al., 2014).

In line with its role in ensuring the sustainability of the construction industry, it is important to identify the chain of circumstances of labour shortage in the construction project. Based on reported studies, the facts were well clarifies the reasons for the shortage of labour in the construction project. The most obvious reason for the shortage of labour is due to the inability to attract new talent when there is an increasing demand within the workforce. Hamid et al. (2013) reported that youth's aversion to low status works, expanding to manufacturing sector which offer better employment conditions, labour

attrition, the widening opportunities for tertiary education, lower birth rate, and emigration of workers to high-wage countries are among factors that contribute to construction labour shortage in Malaysia. Furthermore, the existence of "dirty, difficult and dangerous (3D)" image that have always been associated with this industry has indirectly discouraged many local and new graduates to stay away from entering the construction industry, thus resulting in the shortage of labours (Hamid et al., 2013).

Salleh et al. (2014) identified many factors as having influence on local labour shortage, these include: poor images of construction jobs, poor working conditions, poor site accommodations and services, low wage structure for construction jobs, unattractive jobs, higher education levels, lack of training and skill formation, and skilled workers lured overseas. Healy et al. (2011) found that skill labour shortage get influenced by causes such as specialist knowledge, unsure of long term demand for products or service, recruitment too slow, wages or salary costs too high, lack of availability of adequate training and geographic location of the projects.

Watson (2012) examined the underlying issues surrounding skill shortages in the Australian construction industry and found the funding contributions made to training and skill development, low-level investment to education and training, less investment in apprenticeship system, imbalanced level of labour supply and demand, ageing workforce, and industrial relations, immigration and migration are among factors that have significant effect on labour availability in construction industry. Table 1 is a list of factors of construction labour shortages from previous studies.

Table 1: Factors of labour shortages from previous research

Factors	Previous research
• Ageing workforce	Chini et al. (1999); Mahlberg et al. (2013).
• Change in skill requirements/new technology	Awe et al. (2010); Chini et al.(1999); Healy et al. (2011); Lill (2009); Oseghale et al.(2015); Salleh et al. (2014).
• Dissatisfaction with labour organization	Lill (2008); Oseghale et al.(2015).
• Economy change	Awe et al. (2010); Chini et al. (1999); Zaki et al.(2012); Watson (2012).
• Geographic location	Healy et al. (2011).
• High education level	Hamid et al. (2013); Salleh et al. (2014).
• Increase demand of craft workers	Watson (2012).
• Lack of job security/high mobility/poor treatment	Hamid et al. (2013); Lill (2008); Oseghale et al. (2015).
• Low number of new entrants	Chini et al. (1999); Healy et al. (2011); Ismail & Yuliyusman (2014); Watson (2012).
• Low wages/salary	Chini et al. (1999); Ismail & Yuliyusman (2014); Salleh et al.(2014); Zaki et al (2012).
• Not meeting employer expectation	Awe et al.(2010); Ismail & Yuliyusman (2014); Zaki et al. (2012).

• Poor education/training	Awe et al. (2010); Chini et al. (1999); Ismail & Yuliyusman (2014); Lill (2008); Oseghale et al. (2015); Salleh et al. (2014); Watson (2012).
• Poor construction industry image	Chini et al. (1999); Hamid et al. (2013); Lill (2008); Oseghale et al. (2015); Salleh et al. (2014).
• Poor site safety/working environment	Ismail & Yusliman (2014); Lill (2009); Oseghale et al. (2015); Salleh et al. (2014); Zaki et al. (2012).
• Skill workers migrate overseas	Hamid et al. (2011); Lill (2008); Salleh et al. (2014).
• Unattractive job/lack of worker-oriented career path	Awe et al. (2010); Hamid et al. (2013); Healy et al. (2011); Ismail & Yuliyusman (2014); Salleh et al. (2014); Zaki et al. (2012).

Labour shortage is one of the most important risks in construction projects that may affect the project performance (Baloyi & Bekker, 2011; Othman, 2014), which it capable to change successful projects to those with excessive cost and schedule overruns. Hwang et al. (2015) explored the factor impacting schedule performance of green building projects in Singapore, and found the availability of labourers as one of the most influential factors. Shortage of skilled labour is among the major construction risks considered by general contractors operating in Qatar (Jarkas & Haupt, 2015) as the factor contributing to construction delay. According to REHDA (Real Estate Housing Developer's Association) in Malaysia, the skilled labour shortage is the one of factor contributing of the increasing property price (The Star Online, 2011). The construction labour shortage in Malaysia also has make the industry rely heavily on foreign labours from outside, especially Indonesia and Bangladesh (Hamid et al., 2013).

SUSTAINABLE MANAGEMENT OF CONSTRUCTION LABOUR

In general, the way construction works are planned, scheduled and controlled depends directly on the existence of labours in the construction project. Hence, the labours involves with construction project must be treated as a valuable un-reproducible resources with vulnerable and unpredictable behavior (Lill, 2008). Apart from the development of sustainable building technology and building materials, the responsible party must also focus on labour management strategy in order to achieve sustainability in the construction industry. There are some features that could become the basis during preparing a strategy to manage labour shortages in the construction industry, for example; via educational and training programme.

In order to overcome the issue of labour shortage and unskilled workmanship, one of the initiatives is by introducing the technical and vocational skills training and education (Chini et al., 1999; Karib et al., 2014; Zaki et al., 2012). According to Olsen & Tatum (2012) one of the possible

solutions to the skilled labour shortages lies within vocational educations. The vocational education and training system has crucial role in supporting with the matching of the skills needed by industry with the skills offered by the labours (Richardson, 2009).

There is a wide variety of technical and vocational training programs available nowadays. For example, in fulfilling the objective of providing construction skilled labour, the Construction Industry Development Board (CIDB) Malaysia has established six training centres known as Malaysia Construction Academy and accredited forty private training centres. These training centres have responsibility in providing training to both the existing labours and new labours, focusing on high end specialist trades (e.g. crane operation, welding, painting, and etc.) which has the potential to raise the employability of workers towards earning high wages (Karib et al., 2014). The quality of labours is improved through accreditation and certification under the CIDB Act 520 (Amended 2011).

The production of multi-skilled labours is also an initiative in sustainable construction. Lill (2009) indicated that multiskilling are labour cost savings and fewer workers needed, thus it enables increase in average employment duration. Multi-skilled labours also can generate more saving when they are properly utilized due to lower turnover rates, improved workload and less accidents (Haas et al., 2001). Multi-skilled labour are loyal to their employer because they stay longer on a project and have broader variety of skills (Lill, 2008).

Another strategy to managing labour shortage is by changing the way the work is done. This can be done by substitution of capital and new technology to economise on the shortage of labour (Richardson, 2009). The use of technology is very important for increasing productivity among the limited number of workers, such as by maximizing routine work so that they can perform their specialized tasks that required specific skills.

CONCLUSION

Sustainable construction means the integration of environmental, social and economic considerations into construction business strategies and practices. Sustainable means durable, thus sustainable labours are those which are prepared to fulfil the needs of present time and to preserve the needs for prospective. The sustainability of construction industry is influenced by the availability of skilled and productive labours because it is a labour-intensive industry that relies heavily on human capital. Due to its importance, the construction industry must ensure the availability of sufficient labour in every project. However, managing labour shortage is more difficult to correct than the lack of material. Past researches have revealed a number of factors that caused labour shortage in construction project. Some of the factors are lack of training

and skill knowledge, unattractive and poor images of construction jobs, low salary, and the changes in skill requirements or skill mismatch. In addition, another critical factor is that many young people do not want to do the "3D works" related to the construction project. As the construction activities involve majority of works that are dangerous and difficult, the recruitment and retention of labour become very difficult due to the nature of the work. The lack of sufficient labour in the construction industry needs to be managed seriously as it can affect the productivity of the industry. Therefore, the best strategy to address the shortage of skilled labour lies within the program of technical education and vocational training, because if education and training failed to provide the labours who is required by the industry, the other issues in sustainable construction becomes irrelevant.

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INCORPORATING WALKING IN TRAVEL TO WORK: THE MEANING OF COMMUTING FOR KUALA LUMPUR COMMUNITY

Mastura Adam[1] & Ahmed Abubakar[2]

[1,2]*Department of Architecture, Faculty of Built Environment,*
UNIVERSITY OF MALAYA

Abstract

Progressive increase in the influx of privately owned vehicles and a decrease in the modal share of public transport over the years become a city-based phenomenon. Over-dependence on cars encouraged a sedentary lifestyle, an obesity epidemic, social exclusion and increased carbon footprint. Deficiencies in urban planning have created a spatial separation between employment centers and residential areas. The research focused on investigating how people construct the meaning attributed to commuting mode of travel to work. Using multiple embedded case study research approach, this research focuses on 19 semi-structured interviews with employees from two neighboring but contrasting case study areas of Kuala Lumpur. Synthesis of the employees' experiences on their travel behavior exposed replication logic on the way they perceived walking as part of the transportation mode of travelling to work. The implicit understanding of the walking to work includes; definition of walking to work by the communities, specific walking stages and its' characteristic during am-pm rush hours, the travel pattern and modes of transportation from the origin point (home) to the office, and the understanding of walking benefits to their economy, environment, health and social. These results provide possibility of understanding the needs of people and to promote walking to work as part of transportation mode for commuting in order to overcome the current urban challenges.

Keyword: Travel to Work, Walking Experience, Pedestrian Environment, Resilience, Transformation, Sustainable Transportation

[1] Senior Lecturer at Department of Architecture, University Malaya Email: mastura@um.edu.my

INTRODUCTION

Urban mobility remains a challenge, which requires a resilient approach through the incorporation of the social dimension within the contemporary planning practices (Wikström, 2013). To this end, a pedestrian point of view is critical to influencing the transformation of the environment through the adaptation of resilient based practices. The benefit of walking as the first mode of transportation makes it the most sustainable form to date (Grava, 2003). Walking when compared with other forms of exercises appeared simpler, freer, cheaper and therefore prevalent way of moving from place to place. Morris and Hardman (1997) described walking as the best form of exercise. Several pieces of evidence advanced equate positive health status with active living. Thus, a committee of experts expressed their concern, that the values of physical activity reiterated in Australia exist for more than a decade, yet, participation remains static if not declining because of issues related to human's perception and conveniences. Thus, researchers from different background discipline highlighted on the needs to encourage walking as a means of transportation (Department of Health, 2004; Lee and Moudon, 2006).

Deficiency in urban planning, scarcity and high cost of land and landed properties translate into the spatial separation between people and their place of work (Bauman, 1999). Such land uses are inadequately coordinated with various modes of transportation resulting to the high influx of privately owned vehicle dominating the movement space for daily commuting into the city centre. This phenomenon causes in long hours and inefficient commuting to work due to severe traffic congestion mainly during rush hours. Issues related to environmental outcomes into sustainable transportation dominated the focus of research attention. Thus, the benefit of walking in the transformation of the urban environment, economic and social sustainability has been established adequately in literature in order to make changes in the society's perspective towards walking as part of a transportation mode (Adam, 2013; Giles-Corti, Foster, Shilton, & Falconer, 2010; Lee and Moudon, 2006).

What is lacking, however, is the adoption of walking habit because it has not been viewed, and was not seen as a development with high fruition coefficient to the societies. Insufficient literature to understand the walking attitude to the place of work coupled with the popular misconception that walking is not a transportation option reinforced the indication that there are knowledge gaps in this respect. To bridge this gap, a research focus on a resilient approach cognizant of the pedestrian points of view is imperative. Thus, the study seeks to investigate how people construct the meaning of commuting in their built environment and how walking could be incorporated as part of travel to work.

Knowledge of walking attitude is expected to give insight into useful strategies for incorporating walking to work attitude, not only in Kuala Lumpur (KL) but other places anticipating similar constraints for a sustainable transportation. In this research, the employees' have been selected as a unit of analysis, because they are the majority group that was most likely to seek accommodation outside Kuala Lumpur city centre. Thus, employees' need to make long distance trips every day.

LITERATURE REVIEW

Walkability in pedestrian environments is the extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety. The capacity to move about on foot in a given space connotes walk-ability (Southworth, 2007). Walkability in the pedestrian environment improved with the inclusion of the following: protection, comfort, and safety (Gehl, 2004). Walking and walkability are believed to have a major impact on community life, which mostly happens on the streets (T. Litman, 2011). This topic is widely discussed among the scholars on its benefit and resilience to health, the environment, economy, and social inclusion.

Resilience to Health: Many researchers like to demonstrate a positive relationship between positive health status and active life. Heart diseases and even cancer can be linked to physical inactivity (British Heart Foundation, 2001; Chief Medical Officer, 2004). Consequently, physical inactivity heightened by privately owned vehicles has seen the dawn of our times. Obesity is the order of the day due global rise of inactivity and overeating (Kopelman, 2000).

Environmental resilience: Practically, however, sustainability benefits are relegated to the background. Carbon neutral manner of transportation with all the positive selling point is fast becoming a thing of the past and of those who cannot afford luxurious gratifications accorded by "mechanical civilization". Private vehicles become the easy targets. Walking burns no fossil fuel (Tolley, 2003). Accordingly, mix-mode of transportation promises a better reward for a sustainable future (Department of Health, 2004). Yet, currently, mix-mode transportation is an exception rather than the rule.

Economic Sustainability: Advances made towards attaining a community economic goal include; increase in economic productivity, employment, business activities and investments and are collectively referred to as economic development. Again, it has been established that customers usually walk. Those customers that walk spend more than those that drive (Litman, 2009). Walking promotes low dependency on fuel and its associated costs (British Heart Foundation, 2001).

Social Inclusion: Social benefit of walking is apparent in a neighbourhood community of people with different social class and

background. Quality relationship or "*community cohesion*" among people increases with positive interactions. These *"social capitals"* rely on the quality pedestrian travel path, such as sidewalks and routes. Social interactions and is necessary for virtually every activity that requires people to venture outside of their homes. City centres across the globe are opting for a sustainable and resilient transformation approach, through sustainable urban transportation network (Adam, 2013).

RESEARCH METHODOLOGY

This study utilizes multiple embedded case study approach (Yin, 2009), which draws on unknowable ontological reality perceived differently by individuals and therefore with deductive epistemology (Sexton, 2003). A case study approach is deemed appropriate to answer the question of why and how (Yin, 2009). In this case, why and how pedestrians choose to incorporate walking to work attitude and how the employees construct the meaning of their working to work, in the research settings. The knowledge of the way in which the study respondents constructed their world was obtained from empirical inquiries through an in-depth semi-structured interview based on their understanding of a real phenomenon being investigated.

Selection of respondents: Judgmental (snowball) sampling that allows the researcher to select respondents based on predetermined criteria in line with the research objectives (Patton, 2002). Sarantakos (2005) emphasises the relevance of purposive sampling in qualitative research, and the need for obtaining representativeness based on strategies that ensure samples match the population characteristics. A total of 19 semi-structured interviews were conducted with employees working in the two case study areas in Kuala Lumpur (KL). The respondents were asked on their general background that includes; their place of origin (home); the travel pattern from the place of origin in the first mile and their final transit to the workplace in KL city centre known as the last mile; The modes of transportation that they used to go to work daily, their perception of walking as a means of transportation, their understanding on the meaning of walking to work and the benefits of walking for health, social, environment and economy.

The criteria for the selection of the respondents are: being an adult employee, walking from the final transit station to the office or from parking spaces (in surrounding areas) to the offices, walking to work during peak hours (AM and PM), and a wide range of job position to get a holistic opinion (senior and junior executives, maintenance personnel and office secretaries). For the purpose of anonymity and ease of analysis, ten (10) respondents (R) works in Office A from Central Business District (CBD) in Site A and nine (9) respondents works in Office B from Kuala Lumpur City Centre (KLCC) in Site

B, were coded as Site A (SA) and Site B (SB) respectively. R1-SA to R10-SA and R1-SB to R9-SB represents the respondent range in SA and SB respectively.

The study area: Two case study areas were chosen as samples, to represent the phenomena in the real life context of people walking in the existing pedestrian environment. The areas are known as Central Business District (CBD) namely as Case Study 1 (CS1) and Kuala Lumpur City Centre (KLCC) as Case Study 2 (CS2); both are located in the city centre of KL. CS1 is a prominent employment district; it was formerly a part of the CBD before World War II. Rapid development during the 20th century has meant that these districts have experienced unplanned development with a disorganised mixture of old and new development. In the contrary, CS2 was developed during the era of globalisation and was envisioned as an urban masterpiece for KL.

RESULT AND FINDINGS

In order to extract meaning from the interviews, content analysis is used to analyse the transcribed interview data. Content analysis of the data aimed at establishing a pattern of responses (Krippendorff, 2012). The assigned coding of the interview data for SA and SB is based on themes. The findings are organised using NVivo 10 software under a tree node structure in three major themes (parent node, child node and leaf node). Implicit understanding of Walking to Work (ImU) theme exposed thick and rich information on how people assign meaning to walking to work. The concepts of implicit understanding of walking to work were established within each case study area as shown in Figure 1.

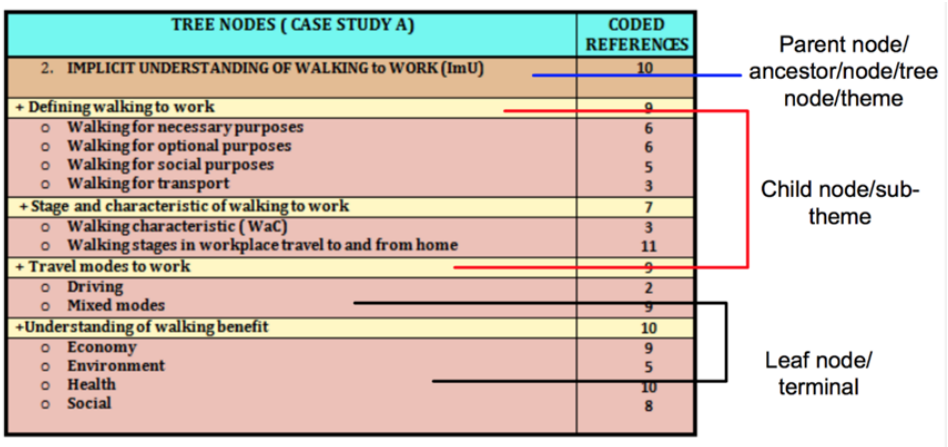

Figure 1: Findings from the implicit understanding of walking to work emerged from Case Study A, as well as in Case Study B respectively

In the searching for within-group similarities and inter-group a difference in pattern, replication logic was employed (Yin, 2009). Respondents were asked about how to define walking to work based on their daily routine and experience. The discussion centred on generating the understanding through the definition of walking to work as understood by the respondents.

The majority of the respondents (95%) for both case study areas strongly stated their reason for walking to work in this area as a necessity whereas walking during the lunch break as walking for social purposes and optional. The result of the cross-case synthesis reveals that although the definition of walking to work depends on the individual's perception, similarities exist between pedestrian perceptions in CS1 and CS2 as shown in Table 1.

Table 1: Synthesis on the definition of walking to work for Case Study 1 and Case Study 2

Case Study 1	Case Study 2
• Walking to work is considered as a destination directed. • The nature of walking to work is purely functional because there is a focus on the origin, the destination and the time gap between the two. • Walking from station to office is described as a straightforward path because there is no room for distractions • Walking is the most appropriate mode of transportation for short-distance trips as an alternative to automobiles. • Walking for a lunch break is considered a regular activity for the purpose of socializing with companions.	• Walking to work as a physical activity that serves the functional purposes categorized as necessary. Walking to work means walking to transit. • Walking with a very specific and set target for the purpose of going to work. • Body and mind focused on reaching the destination, i.e. home or work. • Walking for lunch break is considered as routine practice for the employee • Walking for lunch break is acknowledged as being for the purposes of socializing

The child node 'travelling mode to work' refers to the method or means an individual takes to reach the office within CS1 (Office A) and CS2 (Office B) from their place of origin. For CS1 and CS2, only a few respondents said they drove to the city centre every day, 95% of the respondents mentioned travelling to work using a mixture of transportation modes to commute to the workplace in the city centre (a combination of walking, LRT, buses, cars, etc.). The reason for respondents to incorporate walking as part of their travel modes is to avoid severe traffic congestion, proximity to public transport facilities and awareness of the benefit of walking. Points of origin identified for the respondents from both case studies are many, but all live outside the city-centre, in the KL metropolitan area, or in the adjacent states as shown in Figure 2.

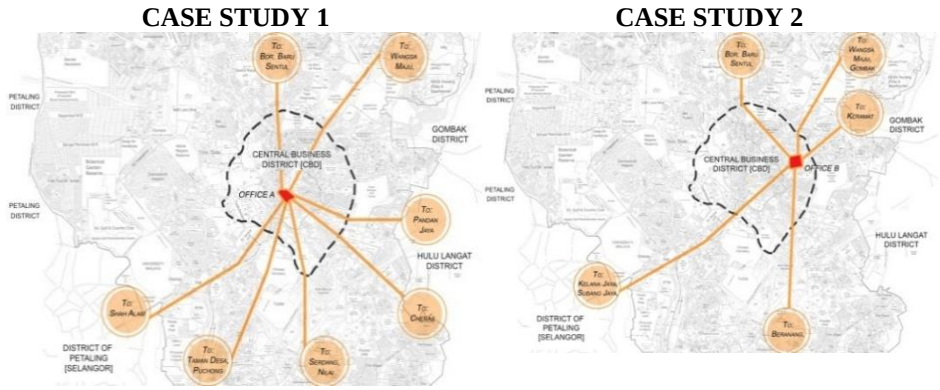

Figure 2: Synthesis on the Travel Pattern to Work for the Case Study 1 and 2

Walking emerges as the main mode of transport from the final transit station as they arrive in the city centre to their destination in Office A (CS1) and Office B (CS2). Respondents comment on incorporating walking habit in their travel to work for their health and agreed that it is able to promote healthy mental state and improves the quality of life. *"... It's a health concern, you're reducing your cholesterol, and you're sharing this road walking from point A to point B, which means I'm familiarizing with the environments and surroundings which make it easy to relax*." (R4-SA). Respondent R3-SB expressed his frustration at those whom he considered as ignorant of the benefits of walking. He said: *"Yes, definitely people don't want to take it seriously because they have no idea of the immediate effect on their health in a positive manner*".

When asked about the benefit of walking economy wise (all the 10 respondents [100%]) from CS1 agreed that walking to work is a part of multi-modal transport, or walking, in general, allows them to be more economical in their expenses. Whereas 80% respondents in CS2 responded in a positive manner that walking helps save money that would have otherwise been spent on monthly travelling expenses. The car users and those who walked or used multi-mode transportation calculated their expenses; the results showed that those who used cars as a mode of transportation spent more on fuel, maintenance and parking on a weekly basis as compared to those who incorporated walking in mixed transportation mode. Respondent (R2-SA) calculated the cost per week as follows: *"If I drive the car to work, in a week I spend, [calculating], over RM150. So I save around RM25 to RM40 per week. I buy fuel at around RM30 per week (on a good week when I have nowhere else to go), parking RM50 and car maintenance maybe around RM100 per month*" (R2-SA).

Only about 50% of the respondents in CS1 took the impact of the automobile as a serious matter, which needs to be addressed, particularly, in relation to the issue of traffic congestion and emissions within the city. Meanwhile, in CS2, 90% of the respondents (8 out of 9) mentioned that they are fully aware of the negative impact of carbon emissions, which are caused mainly by automobiles, on the environment. One of the respondents in CS2 displayed his genuine understanding of the greenhouse effect: *"If I take [drive] the car, do you know how much I alone pollute the earth with the CO and CO_2 emissions? When we talk about walking, that means my car is not moving. If my car is not moving, what does it mean in terms of the environment? It means I saved my share of the environment by not adding to the greenhouse effect that deteriorates the world. Whenever I save fuel, I am not polluting the world. By walking I can save the world"* (R1-SB).

Respondents were asked about the social benefit of walking. Most of the respondents (9 out of 10 [95%]) from CS1 felt that socializing during transportation, especially walking, is important to enliven the surroundings and make the trip a worthwhile one. Nine respondents in CS2 described a positive correlation between walking and social life as tabulated in Table 1 and 2.

Table 2: The replication logic of pedestrian environments' condition and needs for both case study areas based on synthesis of the walking stages and its characteristics

The Stage and Characteristics of Walking to Work	**Replication Logic of Pedestrian Environments Condition and Needs**
17 out of 19 (89%) reported their walking stage during the *AM rush hour* as walking from the final transit point in the city centre in the workplace. The walking characterised as: • Common to walk alone • Fast walking pace • Fear of falling for ladies Body and mind are pressured by time.	• Straight forward and direct routes • Transit choices closer to the workplace • Efficient public transport network and services • Safety and security along the routes • Minimal obstacles on the sidewalks, pathways • Efficient pedestrian infrastructure and facilities.
17 out of 19 (89%) reported their walking stage during the *PM rush hour* as walking from the workplace to the transit point for the home. The walking characterised as: • Walk at a leisurely pace, • Body and mind are more relaxed about time • Have more time to observe the surroundings	• Safety and security along the routes • Looking for more varied uses along the routes such as cafes, retail outlets, artworks • Attractiveness and details of sidewalks and route design • Adequate street furniture and lighting

18 out of 19 (94%) reported walking from the workplace to the eatery during the afternoon break and characterised as: • Fast walking pace • Best time to rejuvenate and refresh the mind and body, • socializing while walking with colleagues	• Looking for more varied uses along the routes such as cafes, food outlets, and retail outlets • focus on the destination to reduce travel time • straight forward and direct routes • safety and security along the routes • minimal obstacles on the sidewalks • efficient pedestrian infra and facilities
18 out of 19 (94%) reported walking from eatery to workplace during the afternoon break and characterised as: • Fast walking pace • walking with colleagues	• straight forward and direct routes • safety and security along the routes • minimal obstacles on the sidewalks • efficient pedestrian infra and facilities

Walking stage and its characteristics are influenced by the type of environment required for walking from the final transit point to the workplace. It is also depends on the time of walking (am-pm rush hour) and the pedestrian environment conditions that suppports their needs as shown in Table 2 above.

Apart from the time, the respondents also giving their feedback on the type of travel modes practiced in CS1 and CS2. This is including the walking stages performed by them to and from home as in the first mile and the final transit at their workplace in KL city centre (the last mile). The results are explained in five categories as follows:

Category 1: Driving from home straight to the office car park → then walking from the car park to the office workplace. 10.6% respondents engaged fully in the car driving with minimum walking.

Category 2: Driving from home to the nearest LRT→ then commuting from the LRT to the next LRT near the office area→ then walking to the workplace from the transit station. 21% respondents incorporated walking with this mixed mode travel pattern.

Category 3: Walking from home to the nearest bus stop → then ride the bus to the nearest LRT station or train commuter → then commute with LRT or train commuter to the nearest station at the office area → then walking to their office workplace. 5.3% respondents incorporated walking with this mixed mode travel pattern.

Category 4: Walking from home to the nearest bus stop, → then ride the bus to the bus stop near the office area, → then walking to the office workplace. 15.8% respondents incorporated walking with mixed mode travel pattern.

Category 5: Walking from home to the nearest LRT station, → then commute with the LRT to the LRT station near the office area, → then walking

to the office workplace. 42% respondents incorporated walking with this mixed mode travel pattern.

Category 2, 3, 4 and 5 also indicated that those who have greater proximity to the public transport from their home to the workplace in the city centre utilizes the facilities. Whereas those who do not will depend on their cars as a means of transportation to travel to work as in category 1.

DISCUSSION

The research set out to investigate how people construct the meaning of commuting in their built environment and how walking could be incorporated as a mode of transportation to the place of work. Although understanding the pedestrian perception is important, various factors influence the pedestrian sensitivity to walking to work. The focus is placed on getting an insight into the actual meaning of walking to work.

Firstly, understanding and meaning respondents attached to walking as a viable tool for mobility can be categorized into four emerging purpose; i) walking for necessary purposes; ii) optional purposes; iii) walking for social purposes, and iv) walking for transportation. Thus, the majority of the respondents considered walking as part of transportation mode a necessity. Respondents that considered walking as optional or for socializing attached the meaning to walking during the lunch break. This finding reinforced the assertion that perceptions and experiences have an influence in making decisions to opt for walking as part of a transportation mode, including public transportation, instead of driving private vehicles (Gehl, 2004).

Secondly, understanding of the benefit of walking by the respondents emerged in four categories: walking for health, economic, environmental and social benefits. Once the benefit of walking is understood, people could develop a positive mind-set that incorporates walking in their daily travel to work. Thus, there is a need to embark on improving awareness of the positive benefits of walking and the modification of the pedestrian environment.

Thirdly, travel mode to work appeared in two ways; driving mode and mixed mode of transportation by the majority of people, who worked in the city centre of KL. This scenario revealed the fact that people need to stay connected even though their travel behaviour emerged complex. Apparently, the current scenario may appear normal, however, in reality, it is not complying with sustainable travelling. Interpretation of Category 2, 3, 4 and 5 shows the possibility of incorporating walking as part of mixed modes of transportation to the workplace. Category 1, however, is purely driving mode, which is not recommended for sustainable transportation for the community.

Fourthly, walking is only effective where the mixed mode of transportation is involved as against the driving mode. The effectiveness can be translated into the economic, social, environmental and above all the health

benefits for workers. Any policy on transportation drafted needs to encourage the community to opt for a mixed mode for the immediate and long-term benefit. An integrated approach that involves various disciplines could be a step change in envisioning and advocating for a quality pedestrian environment that encourages people to incorporate walking in the city (Litman, 2011).

This research also revealed that walking characteristics of workers are determined to a large extent by travel time, characteristic of walking condition and needs. Thus, there is a need to improve physical facilities to support walking and remove barriers that may constitute obstacles and increase time consumption.

SUMMARY

The study reveals that users react to the reality that surrounds them, and that walking is associated with a reduction in car dependency, but sometimes with a negative social status symbol. Synthesis of the travel behaviour from a place of residence of the respondents in the metropolitan periphery to the workplace in the city centre exposed replication logic of the way people travel to work in the city of Kuala Lumpur. The research has explored on the understanding of the meaning of walking to work and its associated benefit to health, economy, environment and health. Ultimately, choices of travel mode are depending on proximity and availability of mix-mode choices. Insight from the perspective of the respondents revealed how employees construct meaning to their traveling modes to answer the research objectives. Respondents have displayed a resilient path through adapting to the current problems of travelling to work in the city of Kuala Lumpur. A holistic understanding of travel behaviour, thus, provides an insight into the transformation towards a sustainable travelling to work conceptually. These findings present an invitation to the stakeholders and researchers for further research in the area of advocating for a mixed mode of transportation for the community.

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CAMPUS WALKABILITY IN MALAYSIAN PUBLIC UNIVERSITIES: A CASE-STUDY OF UNIVERSITI MALAYA

Liow Ken Keat[1], Naziaty Mohd Yaacob[2] & Nor Rasidah Hashim[3]

[1,2,3]*Department of Architecture, Faculty of Built Environment*
UNIVERSITY OF MALAYA

Abstract

Universities are important innovation hubs for sustainable development. As universities worldwide are striving to provide conducive living and learning environments for their students and staff, the mobility of campus users is one of the challenges that have to be overcome immediately. In order to understand the issues of campus mobility, this study was conducted to evaluate a component of mobility, i.e. its walkability features and potential. The location of this study was in Universiti Malaya. We divided the study in two stages: 1. Students' surveys to find out their perceptions on the features, potential and policy on walkability. 2. Direct observations and measurements of the existing walkability conditions (vehicular and pedestrian circulation and the street elements that constitute a walkable environment). The main findings were as follows: Most students perceived the overall walkability environment at UM did not give them a positive walking experience on campus. Street elements that are user-friendly were found to be lacking although there existed some positive ones, e.g. traffic calming devices especially at pedestrian crossing area. Although this is a case study of UM, we feel that the issues are of general interest to other university campuses, especially those located in major cities and having the same organizational structure. We would therefore recommend university management to conduct periodical campus walkability evaluation and to take the user's perceptions seriously so as to provide better adaptation solutions to their campus sustainability projects.

Keyword: *Walkability, Pedestrian-Friendly, Campus Planning*

[1]Student at Universiti Malaya. Email: ken@gmail.com

INTRODUCTION

Universities worldwide are pledging to provide conducive living and learning environments for their students and staff, and so the mobility of campus users is a challenge that many large universities must address as part of their sustainable campus initiatives. Campus walkability is an important component of campus mobility because these users need to have access to a network of connected, direct and easy to follow routes, linking the hostel, faculties, green spaces, public transport stops and other facilities that will enhance their campus experience, which is based on safety, functionality, pleasure and learning (Banning, 1993; Strange & Banning, 2001; Makki et al. 2012).

Walking is commonly associated with many benefits, ranging from reducing air pollution, traffic congestion, solving obesity and other health problems encouraging neighborly interactions and making the urban environment a more enjoyable and safer place to live (Emery and Crump, 2003). There is sufficient evidence on the link between built environment and walking (Handy, 2005). University administrators including the campus planners must therefore continually monitor the built environment attributes that make up a pedestrian-friendly environment, as well as taking into account the campus community's opinions on how to improve walkability on campus.

The main goal when measuring walkability on a university campus is to advance healthy living, lower emissions and improve sustainable transportation (Angelidis et al., 2014). Walkability is a key component in a sustainable transportation network, and provides social benefits as well as benefits to human health, economic stability, and environmental protection (Lewis, 2004; Park, 2008).

In order to understand the level of campus walkability and its relationship with the environment, we have conducted this study in Universiti Malaya, as a case study of a large, well-established Malaysian public university. Universiti Malaya has embarked on creating a better walking environment by constructing better pathways in certain parts of the campus, e.g. the paths around the lake and the area near the main administrative buildings, however, walking paths at many faculties seem to be lacking in proper upgrading and maintenance work (authors' observation). Our basic assumption is that Malaysian public universities have financial, policy or planning constraints that might slow down or hinder the implementation of a walkable campus concept, therefore this study will hopefully reveal some of the problems.

MATERIALS AND METHODS

Study location

Established in 1962 and built in its present location in Kuala Lumpur, Universiti Malaya (UM) is the oldest public university in Malaysia. As a public university, UM's annual student enrolment is high, situated on a vast campus (309 ha) and its management structure is typical of a large organization, as well as its unique location in the middle of Kuala Lumpur city. There are 12 residential colleges and more than 10 learning centres in the university (Figure 1). In 2014, the number of first year students enrolling at UM was 2895, and these students were given residential accommodation in their respective colleges based on their chosen programmes of study (Registration Admissions and Records Section of Universiti Malaya, 2014). The university campus is accessible to the public on most days as the KL, PJ and Damansara gates are open during the day. Besides the university buses that ferry students and staff around the campus, the RapidBus (public transportation) services along the main road (around the lake) by entering/exiting the KL gate to the nearby Universiti LRT station.

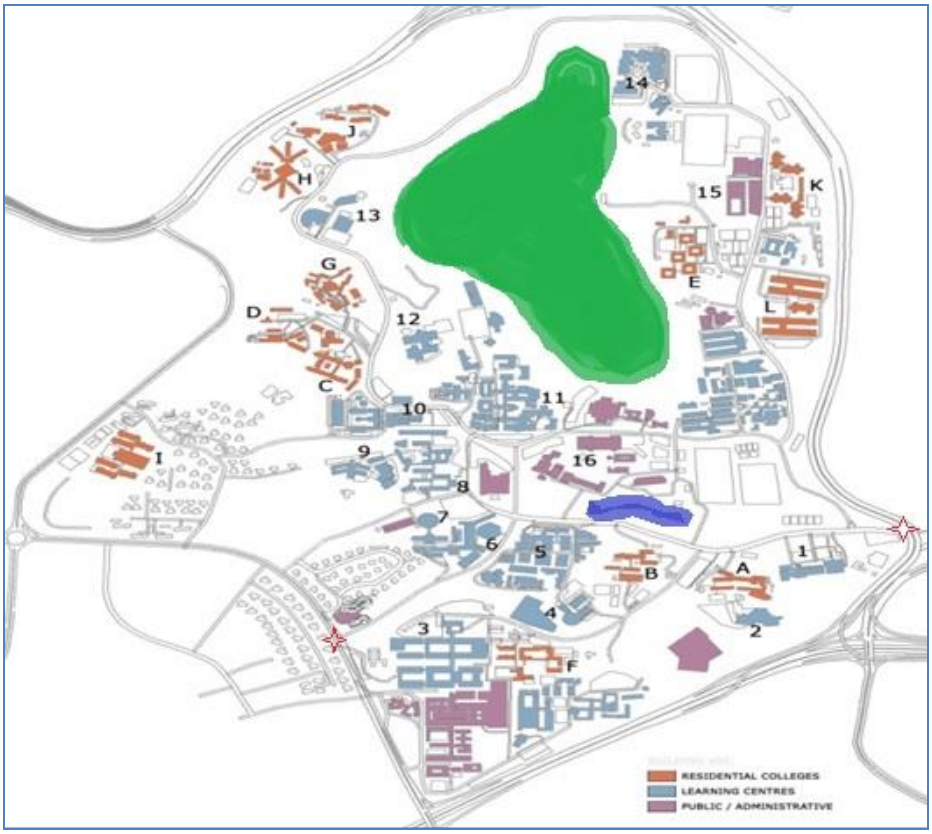

Figure 1: Map of Universiti Malaya campus showing the locations of residential colleges, learning centres (faculties / academies) and administrative buildings. Special features shown are; PJ and KL gates (star), lake (blue) and forested hilly area (green).

Source: Universiti Malaya

The data for our study was collected using two methods, as described below.

1. **Opinion survey of students living on campus**. A total of 224 First Year students living in eleven residential colleges participated in this survey, which was conducted from 27 October 2014 until 12 November 2014. The participants in the survey were asked closed- and open-ended questions regarding the following topics:
   i. Five walkability indicators (Sidewalk width, Sidewalk Maintenance, Streetscape, Shading Devices, Vehicle-emitted pollution).
   ii. Walking experience from their colleges to the faculties based on a scale of 1 (best) to 5 (worst) in five different aspects: safety, security, comfort, convenience, and interestingness.
   iii. Their opinion on the University No-Car policy of prohibiting first year students to drive cars on campus. This policy was implemented in 2009 in order to promote a green campus.

2. **Ground truthing of street elements**. During our field work, we used the direct observation technique of measuring and recording the presence (or quantity) or lack of; and evaluated the conditions of the street elements that are important indicators of campus walkability. The direct observation and measurement technique follows the Malaysian Standard of MS 1184:2014 (Malaysian Standards, 2014). The existing conditions were also compared with best practices elsewhere for suggestions on improvement.

RESULTS AND DISCUSSION

1. Opinion survey of students living on campus

The questionnaire survey of students living on campus yielded the following findings. Firstly, based on a list of five walkability indicators, most respondents perceived the overall walkability environment in Universiti Malaya as being constituted of poor features and conditions (Table 1). Sidewalks, which are important walkability features, were not wide enough to allow for comfortable walking especially when one needs to pass each other and/or overtake another pedestrian. The lack of shaded areas along most of the sidewalks might have contributed to the streetscape being dull as well. The noise and fumes emitted by vehicles moving very close to the pedestrians would further negatively affect the walkability experience.

Table 1: Participants responses towards five walkability indicators.

i.	Sidewalk width	Sufficient 59 students (26%)	Insufficient 165 students (74%)
ii.	Sidewalk Maintenance	Well-maintained 42 (19%)	Less-maintained 182 (81%)
iii.	Streetscape	Interesting 64 (29%)	Dull 160 (71%)
iv.	Shading Devices	Provided 29 (13%)	None 195 (87%)
v.	Noises, Fumes, Vibrations	No 58 (26%)	Yes 166 (74%)

Secondly, when considering the factors of safety, security, comfort, convenience and interestingness, the students gave poor ratings as evidenced by the low total scores of 794 and above being far from the best score of 224 (Table 2).

Table 2: Total rating of five walkability aspects by 224 respondents

	Total Rating (224=Best; 672 = Moderate; 1120=Worst)
Safety	838
Security	794
Comfort	897
Convenience	820
Interestingness	923

(all five aspects received poor total rating). The rating for a respondent's walking experience is scored on a 1-5 scale (1 being best; 5 worst); all 224 respondents' scores for each walkability aspect were then pooled to obtain its total score.

Several examples of the students' expressed opinions on such poor walking experience are shared here. Student A cited long distance from the residential college to and from the faculty as being the primary hindrance of walking. On top of that, the poor bus transportation made using a private vehicle seemed a convenient alternative. The two negative aspects of distance and public transportation are indicative of the wider problem of planning, management and even finance. The problem of bus transportation in UM has been mentioned in other studies as well (Mohd Zulhanif et al., 2011; Rugayah et al., 2013). This also leads to questions relating to policy on walkability for the campus (see policy topic below).

> *"My college is located so far from my faculty and it is impossible for me to walk. The bus service is so poor. It is either buses are too few or they are not following the schedule. So I cannot just rely on my foot. Car is more convenient for me."* (Student A)

Student B cited the lack of covered walkway as their main walkability problem, especially during rainy days.

> *"During the afternoon, although the weather is hot, I still can use an umbrella because that umbrella still can protect me from the sunlight. But when it is raining, I will still get wet although I am using an umbrella. The sidewalk from my college to my faculty is not covered at all. So, sometimes I will choose to skip the class when it is raining or else I will go in a senior's car."* (Student B)

Student C, who considered jogging around the lake, likely had a more convenient way to travel to and from his college than walking. This student also shared their opinion about the National University of Singapore campus where the green landscape ('big trees') provided much needed shade from the sun for the pedestrians there. The comparison with another university campus could be suggestive of poor policy implementation at Universiti Malaya.

> *"I do not think it <walkability> works well on this campus. For exercising purpose, I will jog around the varsity lake but if want to walk from my college to faculty, I will say no. I went to NUS before for some academic program and I think the walkability idea works well there compared to here. I do not know why but I could see most of the students were walking. It may be the landscape, the shaded big trees help to create a more comfortable walking environment."* (Student C)

Finally, on the issue of Universiti Malaya's No-Car Policy for First Year students, we found that this policy was not well-accepted by the first year students. The majority (72%) of the participants said that they did not adhere to the policy. Only 12% of the participants agreed that the policy was positive and that they were adhering to it. On the extreme side, nearly 49% of the participants said that they did not adhere and thought that the policy was negative (Table 3).

Table 3: Responses of the respondents towards the University's policy.

	Adhere to policy	**Do not adhere to policy**	**Total**
Opinion: policy is positive	27 (12%)	51 (23%)	78 (35%)
Opinion: policy is negative	36 (16%)	110 (49%)	146 (65%)
Total	63 (28%)	161 (72%)	224 (100%)

2. Ground truthing of street elements

As mentioned earlier, the direct observation and measurement technique follows the Malaysian Standard of MS 1184:2014 (Malaysian Standards, 2014). Street

elements being considered here included curbs, walking surfaces, pathways, lighting, crossings, curb ramps, landscaping, street furniture, and stops (Table 4).

Pedestrian crossings

For the pedestrian crossings on campus, we found that there were three types of pedestrian crossings: crosswalk with pedestrian light signal, crosswalk with hatching and raised crosswalk (Figure 2). Crosswalks can be the most dangerous area for pedestrians because of the conflict with vehicular traffic, therefore, well-marked, mid-block and raised crosswalks would assist pedestrians to cross, while the placement of these crosswalks along with a well-planned traffic system and infrastructure will make for safer, secure and comfortable walking experience, with reduced conflicting points.

Table 4: Summary of findings via direct observation and measurements and suggestions for improvement.

Observed and Measured Findings	**Suggestions for Improvement**
Street Elements within Curb-to-Curb Roadways - Pedestrian Crossing - Number of Traffic Lanes - Width of Traffic Zone - Number of Traffic Calming Devices	With better design such as well-marked crosswalks, mid-block crosswalks, and raised crosswalks can create safe walkways on which pedestrian can cross the road with comfort. Mid-block crosswalks can improve the walkability by providing a better access to areas for pedestrian while limiting the number of pedestrians crossing without a crosswalk. Crosswalk to be placed every 30m. Median should be designed on the traffic zone, which exceeds 2 to 3 lanes so that the protection and resting point can be provided for the pedestrians.
Street Elements within Sidewalk - Width of Walking Zone - Width of Utility Zone - Width of Landscape Zone - Sidewalk Surface	Walking zone should be at least 1.8m - 3.0m wide or greater for higher pedestrian volumes. Trees planted along the edges of roadways and in medians would provide a barrier for pedestrians and also help in slowing down vehicle speeds. Trees would also help to create a more pleasant environment for pedestrians and create the image of the roadways as a part of a place or destination, not just a vehicular route.

Figure 2: Types of pedestrian crossings.

Traffic zones

The widths of the traffic zones on campus were found to be in the range of 7m to 14m. The widest traffic zone is at Lingkungan Budi (Figure 3) where the main bus station is located. Referring to Littlefield (2012), the maximum vehicle width permitted is 2.5m, and the minimum clearance between parallel vehicles is 0.5m, hence the minimum lane width is 3m. Our suggestion is to create narrower lanes so as to control vehicle speeds and to shorten crosswalk length.

Figure 3: Lingkungan Budi near UM main library (left) and the speed bump (right).

Additionally, traffic calming devices such as speed bumps, raised crosswalk, and textured paving treatments (Figure 3) can help to slow down traffic especially at the pedestrian crossing area. Pedestrian crossings need to be planned and designed together with the vehicular traffic system, where the design of the pathways, curb and road is based on behaviour of both pedestrians and drivers.

Types of pedestrian sidewalks

There are three types of pedestrian sidewalks that can be found on UM campus. Type A - landscaping zone in between walking zone and traffic zone, Type B - buffer zone in between walking zone and traffic zone, and Type C - walking zone in between landscaping zone and traffic zone (Figure 4).

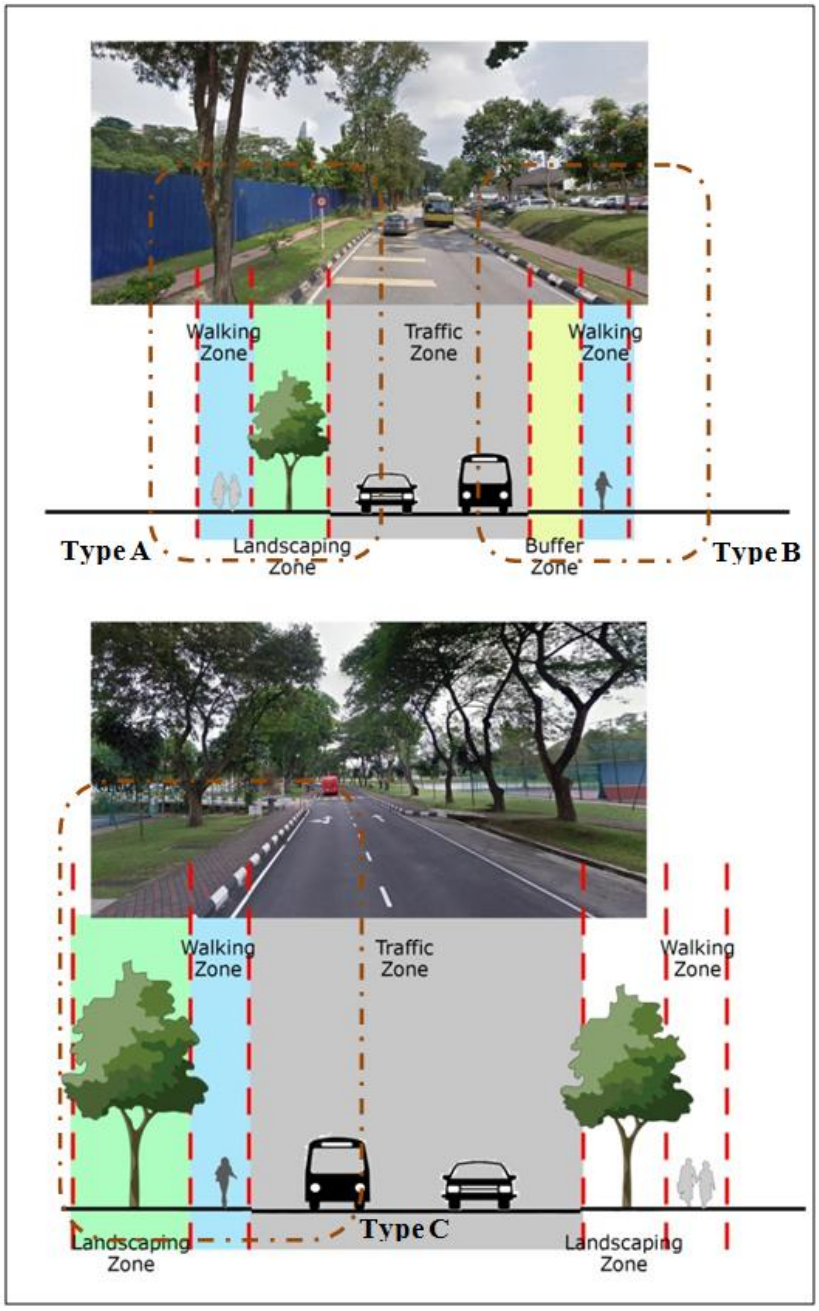

Figure 4: Types of pedestrian sidewalks.

As pedestrians spend most of their travel in an area called the walking zone (often located on both sides of a road / street), this zone should be free from all obstacles, protruding objects, and any vertical obstructions hazardous to pedestrians, particularly for individuals with vision impairments. The walking zone should be at least 1.8m - 3.0m wide or greater to meet the desired level of service in areas with higher pedestrian volumes, so as to allow pedestrians to walk side by side or for pedestrians going in the opposite direction to pass each other (Boodlal, 2003). Moreover, the walking zone should not be less than 1.2m, which is the minimum width required for people with disabilities (e.g. those using a guide dog, crutches, and walkers), and wheelchair users need about 1.5m to turn around and 1.8m to pass other wheelchairs (Boodlal, 2003). The width of the walking zone found on the campus is in the range of 1.5m to 3.6m but the average width is 1.6m.

Figure 5: The sidewalk in front of Faculty of Built Environment (left) and the sidewalk outside of Second Residential College (right).

According to Boodlal (2003), a utility zone provides a buffer from the traffic zone and allows for the consolidation of elements like utilities (poles, hydrants, telephone kiosks, etc.) and street furniture (benches, signs, etc.), and although there is no specific or minimum width of utility zone mentioned, 1.2m is preferred. During our survey, we found that in certain areas on campus, the

utility zone and the walking zone were combined as one and this had created the obstruction for the pedestrian travel (Figure 5).

A pedestrian walking experience can also be improved by the presence of shade and visual aesthetics as provided by vegetation (trees and shrubs), which can also act as auditory buffer between pedestrians and the traffic (Figure 6). However, vegetation causes sidewalk cracks and changes in level (i.e. the vertical rises between adjacent surfaces), which could pose difficulty for persons with disability to lift their feet or crutches. Moreover, it is difficult for wheelchair users to roll over large changes in elevation. Low hanging branches also pose a safety hazard, especially for pedestrians with vision impairments who may not detect them and other pedestrians with mobility impairments may have difficulty bending under them. Therefore, careful selections of tree type, their placement and maintenance will provide a comfortable and safe walking environment.

Figure 6: Landscape zone (in front of walking zone) near the Center of Foundation Studies in Science (left) and the concrete sidewalk with manhole (right).

At UM, a common feature of sidewalks built above drainage is the presence of manholes for maintenance purpose (Figure 6). These manholes are

a problem unto themselves if and when pedestrians dropped their keys and hand phones through the grating into the manholes, whilst manholes that are not properly covered / maintained pose hazards to especially pedestrians with walking aids or in wheelchairs. It is recommended that sidewalk pavements (made using concrete, tarmac etc.) need to be slip-resistant and visually contrasting. Surfaces that are not slip resistant are especially difficult for people who use wheelchairs or walking aids to travel across. For example, crutch users rely on being able to securely plant their crutch tip to travel effectively on the sidewalk. Besides that, surfaces that are not visually contrasting (all one colour and texture) can make it difficult for pedestrians with vision disabilities to distinguish the difference between a change in colour and pattern on the sidewalk.

CONCLUSION

It has long been known to the built environment professionals (architects, planners, surveyors etc.) that people's behaviours can be shaped by how the built environment is designed, planned and constructed. In the case of walking in UM, how the campus is designed, planned and then constructed over time (e.g. negotiating the topographic features, catering to increasing population size and needs as well as the academic and co-curricular activities) has either encouraged or discouraged people's (students, staff and visitors) from walking around the campus or in certain areas on campus. On UM campus, priority should be given to the pedestrians, especially if the No-Car Policy is to be successful. All road users should be made aware of such policy and the whole system should accommodate the policy. Furthermore, the campus management team should reconsider the issue of 'walking distance' between the students' hostels and faculties as some students perceive such distances are deterring them from walking to and from these places.

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PREVENTION OF AEDES BREEDING HABITATS FOR URBAN HIGH-RISE BUILDING IN MALAYSIA

Nurshuhada Zainon[1], Faizul Azli Mohd Rahim[2], Dalila Roslan[3] & Azlan Helmy Abd-Samat[4]

[1,2]*Department of Quantity Surveying, Faculty of Built Environment*
UNIVERSITY OF MALAYA

[3]*Department of Community Health Medicine, UKM Medical Center*
[4]*Department of Emergency, UKM Medical Center*
UNIVERSITI KEBANGSAAN MALAYSIA

Abstract

Dengue is endemic in Malaysia; it is found mainly in the urban and suburban areas. Aedes Aegypti and Aedes Albopictus have been incriminated in the transmission of dengue virus in many urban areas of South-East Asia, including Malaysia. Dengue cases that have been reported worldwide were related with high rise buildings especially in residential buildings such as apartments and condominiums. This study aims to identify the breeding habitats resulted from building designs in high-rise apartments in Kuala Lumpur, Malaysia. Inspections were conducted at three dengue-hotspots residential buildings located in Lembah Pantai, Kuala Lumpur. The selection criteria of the study sites were based on the most frequent reports on dengue cases from these three localities. The building elements that Aedes breeding were spotted created semi-permanent areas for Aedes breeding. Findings show the buildings were designed with unreachable rain gutters, making checking and cleaning for mosquito breeding in clogged gutters impossible for local residents. Poor drainage and piping system has found to be the Aedes habitats, too. Of these, surprisingly, uneven surface of the concrete rooftops and floors has also become one of the breeding spots, resulting to water stagnation and liveable areas for Aedes to breed. Correlating this findings not only helps target areas to be identified and focused in community search and destroy programs, but most importantly it contributes to high-rise building design and construction features in Malaysia by taking into considerations long-lasting measures for a holistic sustainable environment.

Keyword: Aedes, dengue, high-rise building, prevention, sustainable neighborhood.

[1] Senior Lecturer at University of Malaya. Email: zshuhada@um.edu.my

INTRODUCTION

Dengue endemic in Malaysia is alarming as reported dengue cases skyrocketed placing Malaysia third highest among the Western Pacific Region countries Mohd-Zaki, Brett, Ismail, L'Azour, 2014). Yearly comparison released by the Malaysian Ministry of Health (MOH) highlighted 250% increment of incidence rate in the year 2014 as compared to same period in year 2013 and claiming the lives of 101 people in 2015 as compared to only 59 people in 2014 (Astro Awani, March 31, 2015). Empirical findings of trend and pattern of dengue and the associated dengue virus serotypes alert us that dengue outbreaks is expected to occur continuously in Malaysia throughout the 21st century (AbuBakar & Shafee, 2002).

People infected by dengue fever will have high fever, and at least two of the following symptoms: severe headache, severe eye pain, joint pain, muscle and/or bone pain, rash, mild bleeding, and low white cell count, thrombocytopenia, and elevated liver enzymes (Bhave, Rajput & Bhave, 2015). Fatality of the dengue fever occurs when it progresses into dengue haemorrhagic fever, which if not controlled, leads to dengue shock syndrome causing multi organ damage and ultimately death (World Health Organization, 2015).

Aedes Aegypty and Aedes Albopicture mosquitoes are the transmitter of classical dengue fever and dengue haemorrhagic fever in many urban areas of South-east Asia, and both are present indoors and outdoors (Chen, et.al, 2005). Aedes Aegypty was found to be stronger than expected so far, where research indicates that they can live in dirty water, can fly farther and are active until evening (Hadi, 2011).

Increase of dengue cases are subjected to many factors. Barclay (2007) and Hii et.al (2009) identified that more rainfall in certain areas and warmer temperatures overall are providing optimal conditions for mosquitos to breed and expand into new territories. Significantly, Malaysia's equatorial climate which is hot and humid throughout the year with the average rainfall of 250 cm and average temperature 27°C is a perfect condition for Aedes mosquito to breed.

Evidently in Malaysia 70 to 80% of the reported dengue cases came from the high dense population and rapid development activities of the urban area (Ministry of Health, 2010). Nevertheless, a recent study highlighted that similar seroprevalence rates between urban and rural samples indicate that dengue no longer is confined to urban areas only and with the high dengue immunoglobin G (IgG) serpositivity found in the Malaysian population, dengue endemic is bound to remain longer (Azami et al 2011).

Cheong, Leitao, and Lakes (2014) found that human settlements and non-agricultural areas largely determined the occurrence of dengue cases.

Aedes mosquitoes were found indoors and outdoors in human settlements, especially in culverts, water compartments, metal drums, plastic drums, pails, gully traps, discarded containers, and solid-waste dumbs, open-spaces, construction sites, and factories. Flawed building structural designs are claimed to become one of the major contributing factors of dengue cases upsurge, as claimed and reported by many authorities such as Ministy of Health (Astro Awani December 10, 2014; Malaysian Insider December 9, 2014), Mesyuarat Jawatankuasa Peringkat Kebangsaan mengenai Denggi (Berita Harian November 4, 2014), World Health Organization (2014), as well as, few academic researchers; Yee (2014) and Omonikweinka & Iyagba (2005). However, the claim is yet to be empirically proven in the academic literature. This has become a research gap that seeks critical attention from academia, hence, drives this study with the aim to prove the claim through an empirical study by identifying Aedes breeding sites on building structures. Practically, it would be very useful and beneficial in guiding the policy makers in tackling the root causes of escalating dengue cases in Malaysia, and potentially to the other tropical climate regions with similar climate characteristics. Community empowerment in identifying breeding places is a key in dengue prevention activity and findings of this study helps in highlighting potential areas thus strengthening the overall dengue preventive framework.

METHODOLOGY

This study was conducted in three different sites in Lembah Pantai were selected for a building condition assessment in order to identify Aedes breeding spots on high rise residential buildings. These sites were identified by the Ministry of Health as dengue hotspots in 2014 based on the most frequent dengue cases reported.

The first site was a condominium that has 4 numbers of blocks, with 18 floors, and 316 of house units, with approximately 1,364 residents. The second site was a flat of People's Housing Program (*Program Perumahan Rakyat, PPR*) consists of 2 blocks of 4 floors, with a total of 64 house units, and populated by approximately 320 residents. The third site was also a PPR building of 4 blocks-apartments, with 13 floors on each block which consists of 320 house units for 1,280 residents.

Approvals from the local authorities and the residences' Joint Management Body (JMB) were received to assess the building from the ground level to the roof top. In a period of 3 months, 5 visits were conducted on separate occasions at each site with the aim to identify the building elements that has become Aedes breeding spots. Each visit was participated by 6 researchers. Inspection covered outdoor compound, which include potential building elements such as roof, gutter, drain, toilet, corridor and other parts that have been identified as areas that are prone to mosquitoes breeding. Assessment

of the findings of mosquito breeding spots to this building was done from top to bottom. Samples of larva found at the breeding spots were collected and tested to ensure the type of larva belongs to Aedes. The findings were tabulated in a table form to see the commonalities of the breeding spots.

RESULTS

Of the total 5 visits in the each selected sites, Aedes larva were detected in all sites which mainly found on gutter, flat roof surfaces, floor finishes, gully traps, cracked slab, trench, drainage, piping, and outlets. From Table 1, gutters were found to be the spot with highest occurrence where out of all the number of inspections, 100% of samples were found positive. Other commonest breeding habitats for Aedes in order of preference were in flat roof surfaces, piping and outlets, blocked drainage, uncovered drainage, and poor gradients of drainage. Additionally, gully-trap related conditions show frequent spots for Aedes. The flat roof surfaces showed a surprising habitat for Aedes, where it was found on all the inspected sites; this had never been reported before. The inspections result also revealed that a large proportion of the positive sites harboured mostly on the same building elements (Figure 2), though different number of occurrences. Frequencies below than 50% is associated with less risk of Aedes breeding, therefore it was not indicated as an ideal Aedes breeding spot.

Table 1: Aedes breeding spots found on each site in different visits

Site	Site #1						Site #2						Site #3						Total Freq.
No. of inspection	1	2	3	4	5	Freq	1	2	3	4	5	Freq	1	2	3	4	5	Freq	
Roof structure																			
Gutter	√	√	√	√	√	5/5	√	√	√	√	√	5/5	√	√	√	√	√	5/5	100%
Flat roof surfaces	√	√	√	√	√	5/5		√	√	√	√	4/5	√	√		√		3/5	80%
Floor finishes	√				√	2/5	√	√		√		3/5		√		√	√	3/5	53%
Corridor and walkway																			
Blocked gully traps	√	√		√	√	4/5	√			√	√	3/5	√					1/5	53%
Uncovered gully traps		√	√	√		3/5	√	√		√	√	4/5	√				√	2/5	60%
Insufficient numbers of gully traps	√			√		2/5	√	√	√	√	√	5/5				√		1/5	53%
Uneven/cracked concrete slab	√	√			√	3/5	√	√	√	√		4/5	√		√	√		3/5	67%
Shallow trench	√	√	√	√	√	4/5	√					1/5		√			√	2/5	53%
Drainage																			
Blocked drainage	√	√	√	√	√	5/5	√	√	√	√	√	5/5				√		1/5	73%
Piping and outlets	√	√		√	√	4/5		√	√	√		3/5	√	√	√	√	√	5/5	80%
Uncovered drainage	√	√	√	√	√	5/5		√		√	√	3/5	√			√	√	3/5	73%
Poor gradients	√	√		√		3/5	√		√	√	√	4/5	√	√	√		√	4/5	73%

Indicators:
√ = Aedes breeding spotted
Freq. = Frequency of occurrences

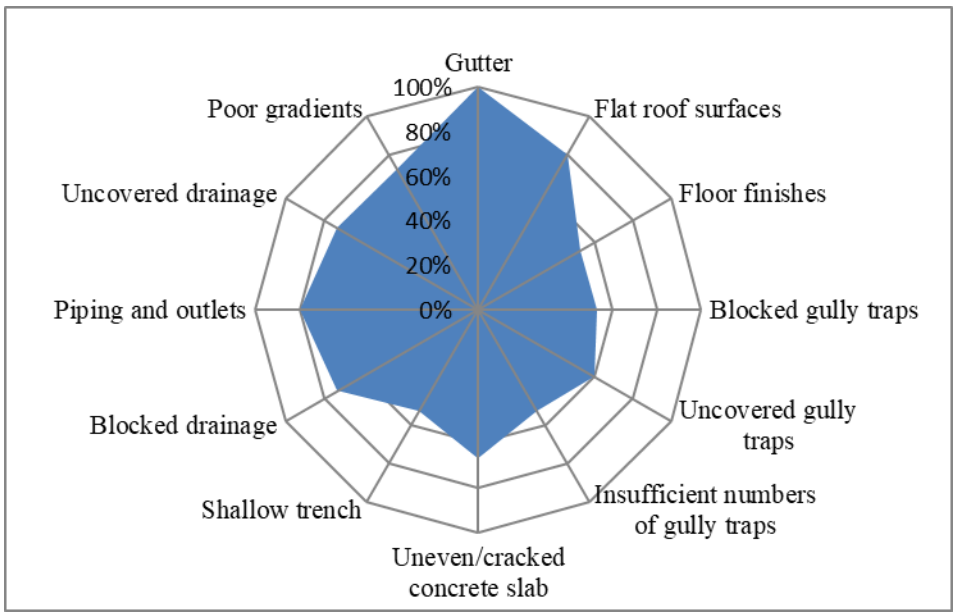

Figure 2: Commonalities of the Aedes breeding spots

Gutter

Roof has turned out the most common building element that contains Aedes breeding spot, especially on gutters (Figure 1(A)). Uncovered gutters were exposed to open space thus causing the rubbish, leaves, debris, and dust to fall into the gutter and block the movement of the water. This has resulted to blocked rainwater outlets, too. The gutter is made of iron, and they have rusted. Iron has comparatively low heat conductivity, means that it absorbs heat and dissipates heat at a slower rate. Thus, when the water is accumulated in the gutter, the slow rate of heat absorption by the gutter will cause the water to evaporate at a slower rate too. In other words, it has contributed to an ideal home for the mosquitoes to breed. In addition, the outlets size is too small which has encouraged algae growth and dirt deposition; these in return trapped the water flow. Another factor that contributes to the breeding spot is the lack of steep gradient level to channel the flow of water.

Flat roof structure

Uneven surfaces on the flat roof structure cause water stagnation (Figure 1(B)). Flat roofs should have constructed with a slight slope to allow rain water to drain off the roof. However, due to uneven surfaces, it causes water accumulation. Thus, it promotes the growth of green algae on concrete floor and this provides ideal water temperature for the mosquitos to breed, especially

on some covered surfaces. Furthermore, water tanks that were located on the rooftop were leaked due to low maintenance.

Floor trench

Insufficient gradient of floor trench causes the water to become stagnated. Furthermore, the trenches were blocked by debris and it causes water accumulation.

Gully trap

Uncovered gully traps allow debris into the gully traps and resulting to blockage of gully traps (Figure 1(C)). Blocked gully traps, restricts rain water from flowing into the designated drain and may overflow through the gully trap opening; this will result into having stagnant water on the building apron or floor. Some of the large open areas have no gully traps to channel the rainwater from upstairs to the drainage. This large open area is normal for having a drop of around 25mm to the normal ground floor level, which have enough capacity to create a high potential breeding spots. The water seal in the water traps becomes the house for mosquitos.

Floor finishes

At roof level, there are many empty spaces between the roof finishes which causes the rainwater unable to flow into a correct direction and discharge off from the building (Figure 1(D)). The rainwater will stagnant in gaps between the floor finishes or below the floor finishes. The arrangement fault of tiles encourages the growth of plant and increases the difficulties for water to flow out as the plant will act as a blockage for water movement.

Apron

Cracked apron creates a hole between the concrete of the apron and causes water stagnant (Figure 1(E)). The apron that was built with flat shaped design that has caused rainwater stagnant on the finishes, and there was no down water pipe at sides of the building to let stagnant water flows out from apron.

Piping and outlets

Piping outlets were not connected direct to the drainage system resulting to water overflow and accumulation on the uneven floor surfaces (Figure 1(F)). It also causes flash flood in the dwelling area because the water is pouring freely on the concrete bed of the pavement instead of directly discharge the water into the sewage. Lack of repair of leaky pipes causes' small water ponds everywhere, in addition to, lack of maintenance of corridors' floors encourages green algae growth which creates ideal water temperature for the mosquitos to breed. In addition, the limited number of outlets creates slow water flow, too.

The L-shaped rainwater down pipe used instead of the straight flow pipe also resulted in ideal breeding spots for Aedes. Reason being, the L-shaped pipe has poor gradient whereas the straight flow pipe could flow rainwater directly from the rooftop to the ground floor.

Drainage

Poor gradient of drainage prevents water from flowing smoothly resulting to blockage and stagnation of water. Drain covers, which are screwed to the ground, makes it impossible to be removed for cleaning. There were also some hips near the places which dirt can flow with the water to the drains and led to blockage to the flow of water**.** Cracked drainage causes the growth of trees and their continued growth made the drain cracked under the heavy load (Figure 1(G)). The cracked becomes location of water stagnation.

Open space

A huge water ponding in yard located at the centre and open area, surrounding by the residents' houses with total coverage is 8.68m x 4.75m (Figure 1(H)). The surface of yard is covered by a type of soil called sandy loam soil. Sandy loam soil contains some silt and a small amount of clay. This kind of soil has moderately high water retention and moderate drainage erosion.

Unwanted building element

Unwanted hollow metal were found in several locations and they keep stagnant water. The locations of the hole under the zinc roof protect the water pond from the sunlight, hence becomes an ideal home for mosquitos (Figure 1(I)),

Figure 1: Aedes larvae spotted areas

Label:

A: Gutter	G: Drainage
B: Flat roof structure	H: Open space
C: Gully trap	I: Unwanted building element
D: Floor finishes	J: Tiny holes on gutter
E: Apron	K: Two layers' trapper
F: Piping and outlets	L: Mosquito's flapper valve

DISCUSSION

Table 2 shows the summary of Aedes breeding areas that were spotted during the observations in three case studies. The breeding spots were spotted at the rooftop, as well as, on the ground floor. Beside suggestion of performing more frequent maintenance, there are some rectifications that could be done in order to avoid stagnation and accumulation of water in those areas. Gutters, gully traps, and flat roof surfaces were found most as Aedes habitats. Most of Aedes favourite spots require maintenance and having scheduled maintenance of building hinders the breeding of Aedes. Frequent cleaning of water ponding in any building elements should be conducted to ensure a healthy environment free from dengue. However, for some elements, enhanced method of constructions should be embarked to ensure buildings' contribution for sustainable living in urban environment.

Gutters

Gutters functions as a rainwater collector from the roof of a building and diverts the water away from the structure. It was found that it has become a key container for Aedes not just in Malaysia, but also in Australia (Montgomery & Ritchie 2002), especially due to blockage. Few mitigation measures could be undertaken. The surface of the gutter should be ensured smooth and flat without any pocket present so water can flow smoothly and this can prevent water stagnation. It should be constructed with gradient inclines minimum 12 millimetres for every 1 meter in the direction of the water flow (JKR, 2005). With this, the gutter should drain completely if the inclination is correctly set. The gutter can be installed with K-styled gutter due to its design properties that can hold more rainwater than other gutter despite having the same diameter. However, to prevent water blockage in gutter, drilling tiny holes in the gutter will allow the flowing water in the gutter to flow out of the gutter (Figure 1(J)). This will prevent the water from being accumulated in the gutter at any point and hence prevent the water in the gutter to become stagnated and causes the breeding of Aedes mosquitoes. Furthermore, gutter mesh screen could be installed to prevent leaves and debris and from falling into the gutter and impedes the flow of water. The gutter mesh screen can be found in three different types: those that screen and filter; those that block and fill; and those that separate water from debris by means of surface tension. Gutters should be installed with a solid, flexible drain tile that runs underground and extended downhill to safely exit via a pop-out outlet.

Roof top surfaces

Ponding on the low-lying parts of a flat roof has an implication in providing Aedes breeding area. To overcome this, concrete is added to one side of the roof which is away from nozzle outlet of the rain water down pipe to increase the sloping gradient of the roof so that water has higher chance to flow towards

the nozzle outlet of rain water down pipe. The concrete surface of flat roof is plastered so that the surface is much smoother and rainwater, sand, soil, dirt and debris can flow fast and smoothly towards the rain water down pipe. Alternatively, a French drain system could be installed and plants could be grown at the rooftop yard. The French drain consists of perforated drain pipe which lying at the bottom of trench to enable it vents water that seep down through the gravel or big rocks quickly (Mahan, Massa, White & Young 2002). It is a relatively simple and cost effective way of draining land, and it does not require specialist tools or complicated equipment.

Flat shaped apron

Designing a slope to the flat shaped apron would allow the flow of water and prevents stagnation. By having cement render with angle 15^0 and add gutter beside the apron can reduce the chance for Aedes breeding. Moreover, by increasing the numbers of rain water down pipes for the water to flow down can reduce the breeding spot for mosquitos in that particular place.

Gully trap

Trappers consist of two layers of grating could be very beneficial (Figure 1(K)). The first layer grating has larger holes and the second layer has finer holes. A rod is constructed to connect both layers of grating. The new design of trapper is believed that it can increase the efficiency of water flowing by trapping objects which cause blockage to occur.

Down pipe

The downpipe for the gutter at the rooftop level is not directly connected to the floor trap downstairs. The downpipe goes vertically down and stops on the floor, wherever the downpipe is placed. The floor trap may be on the opposite side of the space or on the same side but on different ends**.** To ensure that the flow of rainwater is safely channelled to the drain, the rainwater downpipe must be installed with extra rainwater downpipe connecting the pipe straight to the building. Mosquitoes swing valve is designed to prevent mosquitoes' penetration into the water trap. This could avoid mosquitoes from breeding in the trapped water. The way mosquito's flapper valve functions are similar to swing valve principle in preventing backflow of water in the drainage system and scupper flapper which installed in a boat (Figure 1(L)). Duckbill valve is among the devices that are widely utilized to prevent backflow or act as one-way valve. The simplest duckbill valve usually includes a collar and valve member which shaped like the beak of the duck. Duckbill valve is placed to prevent access of mosquitoes into the water seal.

Drainage

Permeable concrete act like porous medium rather than solid, impermeable block and this allows water to seep through the gap in the concrete (Gunderson, 2008). By using drain cover made from permeable concrete, only water will penetrate through the cover then to the drainage system leaving out substances like rubbish, leaves and debris from falling into the drain and cause drainage blockage. Permeable drain cover also can prevent mosquitoes from breeding in the drain if any stagnant water available.

Table 2: Summary of the Aedes breeding spots with high occurrences

Building element	Site #1	Site #2	Site #3
Roof structure			
Gutter	√	√	√
Flat roof surfaces	√	√	√
Floor finishes		√	√
Corridor and walkway			
Blocked gully traps	√	√	
Uncovered gully traps	√	√	
Insufficient numbers of gully traps		√	
Uneven/cracked concrete slab	√	√	√
Shallow trench	√		
Drainage			
Blocked drainage	√	√	
Piping and outlets	√	√	√
Uncovered drainage	√	√	√
Poor gradients	√	√	√

CONCLUSION

This study represents observed findings of common Aedes breeding spots on high-rise buildings. As presented in the Table 2, we found commonalities in building elements that act as catalysts for Aedes breeding, mainly on roof structure, corridor and walkway, and drainage. Interestingly, the emergence of new factors which are the uneven flat floors and rooftop; uniquely occurring in Malaysia and creates avenue for further research to comprehend and support this finding. This research has proved claims made by local authorities and researchers, especially the Malaysia Ministry of Health, where building elements are contributing to dengue cases upsurge by providing ideal conditions for Aedes to breed. However, it was not solely caused by the design of the buildings, but it was mainly related to the neatness and accuracy of a builder's works during construction. For instance, based on the Standard and Specifications for Building Works (JKR, 2005), gutters' gradient should be

built with an inclination of minimum 12 millimetres for every 1 meter in the direction of the flow. Nonetheless, research has shown that the gutter was built with poor gradient. Another example is the hollow metal that was found on the floor in several locations; this component has no purpose and could be eliminated to avoid water stagnation.

The findings demand for further research in investigating environmental and physical condition that make each component as an ideal breeding space for Aedes; follow-up researches can provide an understanding of micro elements of building design which contributes to the macro scale of human sustainable living environment. It will also impact on how designers design a building; consequently becomes one of considerations that need to be taken during planning stage.

There are two main potential implications of this research. Firstly, these findings elucidate a link between the importances of non-health factor which is the construct of a building, contributing to a life threatening disease which is dengue. In technical terms, building designs can be further improved, as it seeks the application of construction technologies. Preventing Aedes should start and involve the whole life cycle of planning, constructing and maintaining of any building project.

Secondly, these findings further reaffirms the importance of the findings to be considered as parts of the checklist items in building plan, as well as, to comprehend the Aedes Control Guideline in Construction Sites 2015. Collaboration between health aspect and technical sector provides a deeper understanding on the potential breeding points as highlighted in this study; the collaboration will help shape relevant primary prevention program across the community. This knowledge would only be useful once translated into the right attitude and action. With existing search and destroy programmes this useful information helps the community in tailoring their Aedes search towards relevant building features and in the long run also save cost and time in effectively combating dengue.

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ENERGY EFFICIENCY POLICY FOR EXISTING TYPICAL CAMPUS BUILDINGS IN THE UNIVERSITY OF MALAYA

Muhammad Azzam Ismail[1], Karam M. Al-Obaidi[2], & Raha Sulaiman[3]

[1,2,3]*Faculty of Built Environment*
UNIVERSITY OF MALAYA

Abstract

A very large component of the maintenance cost of any real estate property is the electricity consumption cost. The electricity consumption cost of a 700-acre university campus in Malaysia would reach an overall yearly operating expenditure of nearly RM 1 billion. Knowing this fact, the University of Malaya's (UM) top management has conducted many projects at various scales to address energy efficiency (EE), including the replacement of old and inefficient mechanical and electrical (M&E) equipment and the installation of new EE technologies around the campus. In enhancing the overall EE effort, an energy management system is required to ensure that a calculated EE plan can be implemented and audited after it is completed to improve the overall sustainability of UM. Therefore, this study presents the formulation of an Energy Management System (EMS) for UM based on the ASEAN Energy Management Scheme (AEMAS) methodology. Results show that with the full support of the top management of the university, the EMS can be implemented with at least a 5% electricity consumption reduction per year. The formalization of the EMS is the most important step in ensuring any marked reduction in electricity consumption campus-wide.

Keyword: Energy Management System, Energy Efficiency, University Campus

[1] Senior Lecturer at Dept. of Architecture, FBE, UM. Email: ma.ismail@um.edu.my

INTRODUCTION AND BACKGROUND

In many respects, university and college campuses are microcosms of environmental issues, concerns, and challenges. With a smaller scale and better structuring, universities are less complex than they are at the scale of the city. Universities with a potential site can implement sustainable development (Marans and Edelstein, 2010). According to Levy and Marans (2012), many universities in the United States have undertaken large-scale environmental sustainability efforts. However, only a few have advanced broad plans to address environmental sustainability in their campuses. Numerous studies showed that universities all over the world are confronted with increasing utility costs rising significantly faster than the rate of inflation (Marans and Edelstein, 2010). These issues are pushing university leaders to take serious decisions with long-term implications. As a result, many options are taken to overcome these concerns, such as cutbacks in building maintenance; curtailing the building of new classrooms, laboratories, and libraries; updating older facilities; reductions in faculty and staff salaries; increased student fees; and reduced student financial assistance (Marans and Edelstein, 2010). Therefore, many universities are developing new "sustainability" programs to address the problem of their rising energy costs (Hignite, 2008).

Electricity is a key energy source and is essential for economic development in every country. The actual scenario in Peninsular Malaysia shows that every 1 kilowatt-hour (kWh) of electricity releases about 0.681 kg of CO_2, which is equivalent to 35% electricity supply efficiency (PTM and DANIDA, 2006). Over the past few years, the electricity tariff for "Medium Voltage General Commercial" clients or Tenaga Nasional Berhad (TNB) tariff C1 has increased consistently. In 2007, the C1 tariff for every kilowatt of maximum demand was MYR19.50, and the general C1 tariff for all kilowatts of consumption was at MYR23.40. However, since January 2014, these demands have risen to MYR30.30 and MYR36.50, (TNB, 2014) putting significant pressure on the monthly utility bills for the University of Malaya (UM).

Therefore, in 2012, through the sustainability drive by the UMCARES, a small group of academicians were called upon to work with the Malaysian Green Technology Corporation (MGTC) through a UM Sustainability Science Cluster (SUSCI) flagship project to test and further develop a city-level carbon emission calculator called the "Low Carbon Cities Framework" or LCCF. Eventually, UM signed a Memorandum of Understanding with the MGTC at the IGEM 2013 as a pilot partner to further develop LCCF. In addition to the LCCF flagship project and with the support of the Vice Chancellor, SUSCI initiated the UM Energy Management Initiatives (UMEMI) and sent 20 individuals selected from various levels of the university service, including academicians

and technical and administrative staff, to the ASEAN Energy Management Scheme (AEMAS) energy management training in August 2013. At that point, the UM naturally created an energy efficiency policy, set up an energy management procedure, and allowed for existing buildings to be turned into living laboratories to test new technologies developed on campus that resulted in resource consumption efficiency.

However, the momentum stalled, and until now, only marquee energy efficiency projects were adopted such as LED streetlights fitted throughout almost the whole campus and all new buildings having energy efficient features without any systemic changes to the management of the university. The accounting of energy and water consumption continued as previously conducted, but the sharing of such information with the campus community has been inconsistent. Nevertheless, the foundations have been laid, and further action is needed especially a clear energy efficiency policy that has been outlined in this paper.

RESEARCH METHODOLOGY

As part of the efforts to achieve a marked reduction in the campus-wide electricity consumption to and formalize an effective EE policy, a set of objectives are needed:

- To implement the UM Sustainable Energy Management Program (SEMP) to increase the effectiveness of the UMEMI initiated by the UM SUSCI
- To strengthen the energy management procedure and organizational structure
- To implement appropriate measures of reducing energy consumption

To achieve the objectives stated, this study proposes that the AEMAS Energy Management Working Procedure (EM-WP) is adopted and adapted to suit the existing UM management structure. In this study, the plan for the EM-WP is presented in the next section, together with a simple case study of a faculty that includes a study on the return of investment (ROI) of the implemented measures. In demonstrating the applicability of the energy efficiency proposed in this study, the low cost measures outlined in this study can be implemented on the existing buildings in the university's campus. After one year of this initial implementation of this policy, the medium cost and high cost such as alternation to the building fabric and refreshment of cooling systems can be done to achieve a significantly high reduction of energy consumption. The flowchart (Fig. 1) below indicates the process of UM in formulating an attainable energy efficiency (EE) effort.

Initially, one academic staff was approached by the researchers to solicit some energy policy information. Thereafter, the researchers referred to two technical staff members at the UM estate management department. Basing on these interviews, the researchers managed to plot the profile of the UM's

Energy Management Matrix (EMM), which is presented in the next section. Additional in-depth interviews were not conducted because of the saturated response from the interviewee stating that the energy policy in the UM campus has low implementation.

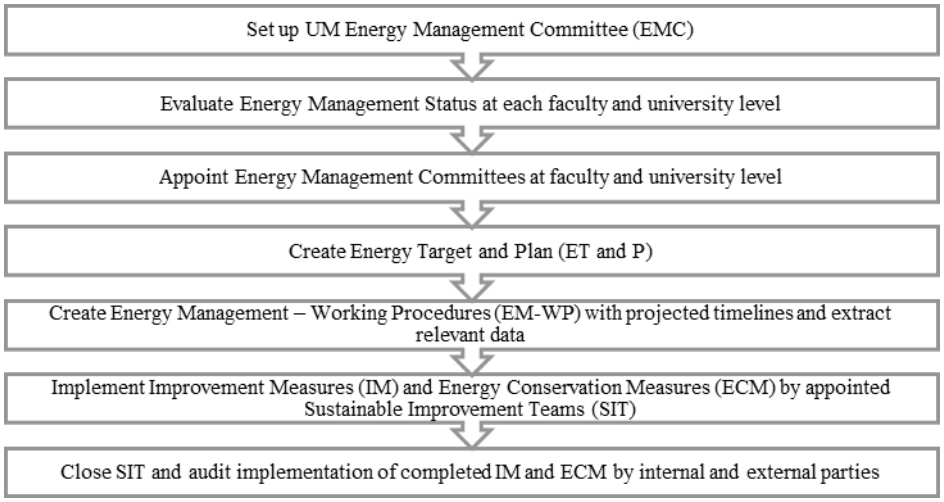


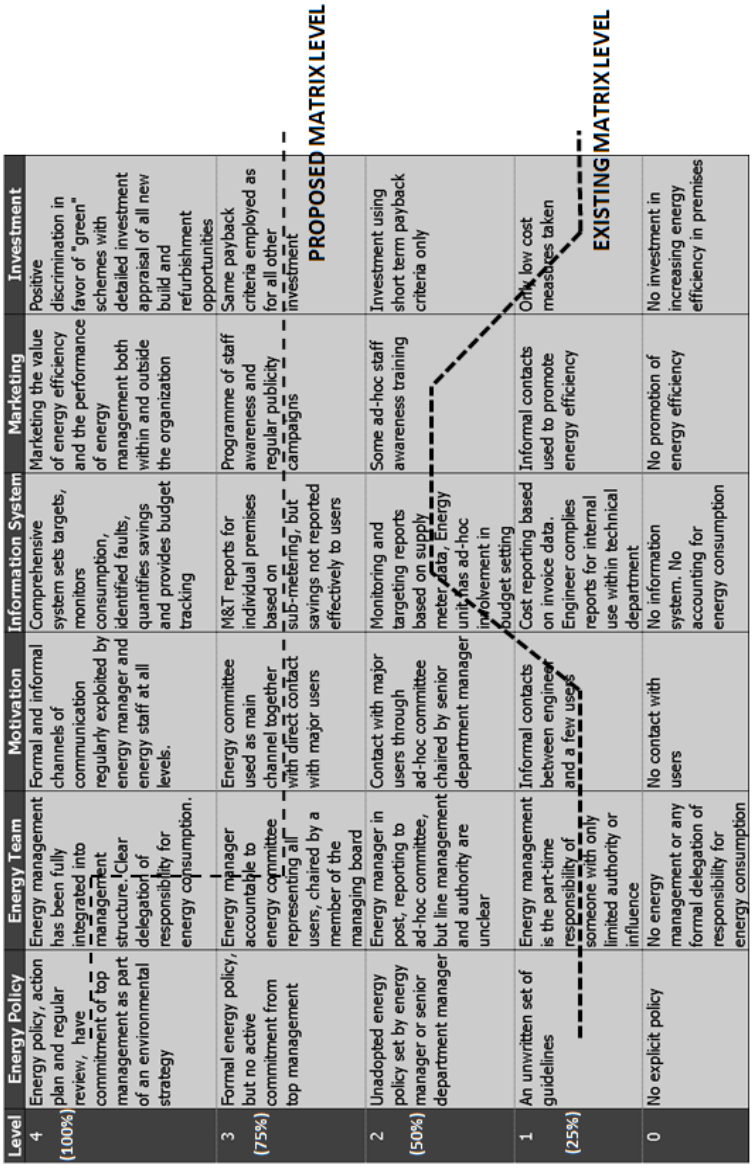
Figure 1: Implementation of Sustainable Energy Management Program (SEMP)

EVALUATION OF THE ENERGY MANAGEMENT STATUS

As mentioned earlier, through unstructured interviews, the researchers were able to plot the Energy Management Matrix as formulated by the AEMAS for UM. Initially, the foundation for UM's energy management was already established. However, according to all interviewees, it lacked clear direction and commitment from relevant parties. The existing matrix levels are indicated in Fig. 2.

Each EMM represents 25% out of 100% scores. For example, Level 1 in Energy Policy represents 25%, and an improvement up to Level 4 is calculated to an increase of 75%. In totality, the improvement percentage range would be from 25% to 75%. These points of improvement may help UM to execute meaningful improvement measures around the campus and to start to witness some electricity consumption reduction. In addition to the energy management matrix, establishing the baseline carbon emission rate for the whole campus is important to present an overall effect of the large electricity consumption that has taken place over the years at UM and as basis for the reduction of carbon emission to help mitigate climate change and related environmental issues. Although mitigation of climate change is intangible and the achievement is subjective, the reduction in carbon emission is finite and can

help to establish the baseline campus-wide yearly carbon emission as basis for an energy efficiency policy.



Level	Energy Policy	Energy Team	Motivation	Information System	Marketing	Investment
4 (100%)	Energy policy, action plan and regular review, have commitment of top management as part of an environmental strategy	Energy management has been fully integrated into management structure. Clear delegation of responsibility for energy consumption.	Formal and informal channels of communication regularly exploited by energy manager and energy staff at all levels.	Comprehensive system sets targets, monitors consumption, identified faults, quantifies savings and provides budget tracking	Marketing the value of energy efficiency and the performance of energy management both within and outside the organization	Positive discrimination in favor of "green" schemes with detailed investment appraisal of all new build and refurbishment opportunities
3 (75%)	Formal energy policy, but no active commitment from top management	Energy manager accountable to energy committee representing all users, chaired by a member of the managing board	Energy committee used as main channel together with direct contact with major users	M&T reports for individual premises based on sub-metering, but savings not reported effectively to users	Programme of staff awareness and regular publicity campaigns	Same payback criteria employed as for all other investment
2 (50%)	Unadopted energy policy set by energy manager or senior department manager	Energy manager in post, reporting to ad-hoc committee, but line management and authority are unclear	Contact with major users through ad-hoc committee chaired by senior department manager	Monitoring and targeting reports based on supply meter data. Energy unit has ad-hoc involvement in budget setting	Some ad-hoc staff awareness training	Investment using short term payback criteria only
1 (25%)	An unwritten set of guidelines	Energy management is the part-time responsibility of someone with only limited authority or influence	Informal contacts between engineer and a few users	Cost reporting based on invoice data. Engineer complies reports for internal use within technical department	Informal contacts used to promote energy efficiency	Only low cost measures taken
0	No explicit policy	No energy management or any formal delegation of responsibility for energy consumption	No contact with users	No information system. No accounting for energy consumption	No promotion of energy efficiency	No investment in increasing energy efficiency in premises

Figure 2: UM EMM adopted from AEMAS

Between 2007 and 2013, the amount of carbon emission (in kg CO_2) for the whole UM campus had increased by 9.7% on average per year (Table 1). Ongoing new-building developments on campus such as new faculty buildings

and research facilities will definitely increase the demand for electricity further and increase the overall carbon emission.

Table 1: UM electricity consumption 2007–2013

Year	Average monthly electricity consumption (kWh)	Average monthly maximum demand (kWh)	Yearly electricity consumption(kWh)	Yearly carbon emission ($kgCO_2$)	Yearly incremental increase in carbon emission (%)
2007	5,893,910.50	17,525.17	70,726,926	48,306,490	-
2008	6,015,536.17	17,715.33	72,186,434	49,303,334	9.8
2009	6,083,971.00	18,023.08	73,007,652	49,864,226	9.9
2010	6,313,539.25	18,565.92	75,762,471	51,745,768	9.6
2011	6,335,642.17	18,803.50	76,027,706	51,926,923	10.0
2012	6,680,434.33	19,713.67	80,165,212	54,752,840	9.5
2013	7,086,024.67	20,663.92	85,032,296	58,077,058	9.4

ENERGY MANAGEMENT COMMITTEE (EMC)

The best way to achieve the improved "Energy Policy" matrix level is to first set up an EMC at the university's top management level. This committee must have the mandate by the UM Board of Directors to implement a UM EE policy and to conduct various EE improvement measures around the campus with full administrative, financial, and technical supports.

At the faculty level, a similar EM Committee hierarchy can be adopted, where the Energy Action Centre (EAC) Chairman must be created to ensure that the chain of command is not broken and that the UM EE policy can be implemented effectively. The EAC Chairman must always be the Dean, and the Energy manager must always be the Deputy Dean (Research and Development), who has direct command of the faculty's amenities, as shown below in Fig. 3 and Table 2.

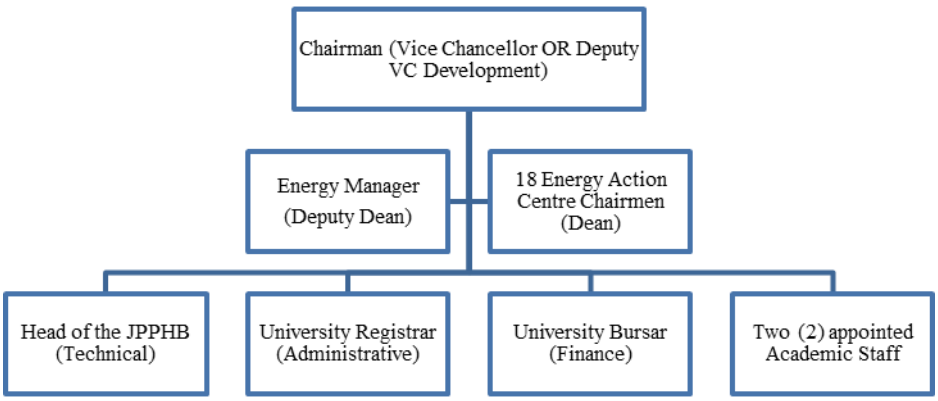


Figure 3: EMC at top level university management

Table 2. Roles and responsibilities of the EMC at top university/faculty level

EM COMMITTEE	ROLES AND RESPONSIBILITIES
Chairman (VC & Dean Level)	▪ Have full authority to make decisions to allocate resources including manpower, machine, and budget to implement energy management system to achieve the target stated in the energy policy
Energy Manager (Deputy Dean)	▪ Understands the energy consumption process of the whole department ▪ Coordinates with all sections to implement the energy management system
Technical Staff	▪ Have authority to control operations in their section ▪ Have good technical knowledge of equipment, utilities, and processes and energy efficiency technology ▪ Understand energy consumption of each area/process
Administrative and Finance Staff	▪ Have authority to control the operation for each area ▪ Develop guidelines of working manual and tools ▪ Monitor and implement plan ▪ Participate in assessment of energy management performance
Other Representatives	▪ Stakeholder representatives and EM Committee liaison officers

ENERGY SAVINGS TARGET AND PLAN

The university could start with an energy savings target of 5% per year. This target is significantly in line with the existing Malaysian government's own energy consumption reduction target of 5% per annum. Although this target seems low, with continuous and sustained effort over many years, it will result in substantial cost savings without major disruption to the existing university management system and maintenance budget.

In meeting the projected energy savings target, large-scale improvement measures (IM) must be planned and implemented campus-wide. IM projects at the university level can include the installation of electricity sub-meters at major buildings around the campus, organization of energy efficiency, campus-wide conservation awareness campaigns with the active participation of students and staff, and approval of specific improvement measures at the faculties.

Creation of Energy Management Working Procedures

EMCs at the top level university management and at various faculties must practice an energy management system similar to the quality management system or ISO system with various work processes, reviews, and other elements. The practice of such a system will inculcate a sense of responsibility showing that energy savings must be achieved consistently throughout the whole organization. For instance, achievements beyond the expected 5% yearly targets should be rewarded with financial incentives to implement further

improvement measures. Alternatively, yearly awards can be created for the best-performing faculties.

In ensuring the integrity and culpability of each improvement measure, audits similar to ISO audits of UM's curriculum and administrative processes should be conducted. Similar to the requirements of ISO, records are needed throughout the energy management process, especially at the faculties. At the top management level, committee members would deliberate over proposals for improvement measures from various faculties and yearly energy savings target, considering the finances and administrative abilities of the university. However, discussions in specific faculty-level EMCs should concentrate on planned improvement measures, the allowable budget, and outcomes or reviews of completed projects (Table 3).

Table 3: Documents needed for the operationalization of energy management at faculty level

No.	Document type	Description and contents of document
1	Operating guideline (OG)	▪ Objectives of the OG ▪ Scope of the OG ▪ Process mapping (electricity consumption analysis) ▪ List of standards and reference documents ▪ Normal working procedures to control energy consumption of faculty ▪ Working forms and documents
2	Work instruction (WI)	▪ Set of instructions to guide the implementation of individual improvement measures ▪ Troubleshooting guide ▪ List of available equipment for energy auditing and other processes
3	Log sheets (LS)	▪ Recording of daily electricity consumption according to areas in a building or major mechanical and electrical equipment

IMPLEMENTATION OF IMROVEMENT MEASURES: FACULTY AT UM

Part of the objectives of study was to simulate the implementation of improvement measures at a selected faculty to demonstrate the applicability and functionality of the whole EM-WP. The buildings selected were part of the same faculty, until very recently, the ownership of one of the blocks was transferred to a different faculty. This particular case study has two (2) blocks that can be labelled as EACs.

An EAC is a small part of the organization that can effectively control the overall energy consumption. The number of EACs will depend on the size and condition of the organization. The Faculty of Built Environment (FBE) has

two blocks with a total of four wings (Fig. 4). The main block at the faculty has been identified as EAC 1, whereas the surveyor's block is EAC 2. Existing available data and information of each EAC are tabulated in Table 2. After the ET & P in step G is set up, the EMC must allocate the responsibility to each EAC to identify the measures in their areas. The target allocation is based on their respective energy consumption.

To identify an effective energy management plan, both EACs will use the recommended internal WP or EAC-WP, as outlined in Fig. 5. This WP will help the EACs to identify improvement measures to control energy consumption in their respective areas. Through the EAC-WP, each improvement measure can be properly implemented, monitored, and audited. As part of the EAC-WP, the OG, Work Instruction (WI), and Log Sheet (LS), as in Table 3, must be created and used.

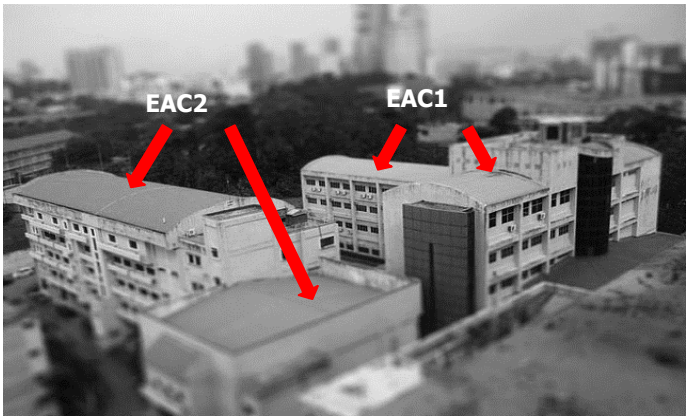


Figure 4: Blocks of FBE and the designated EAC

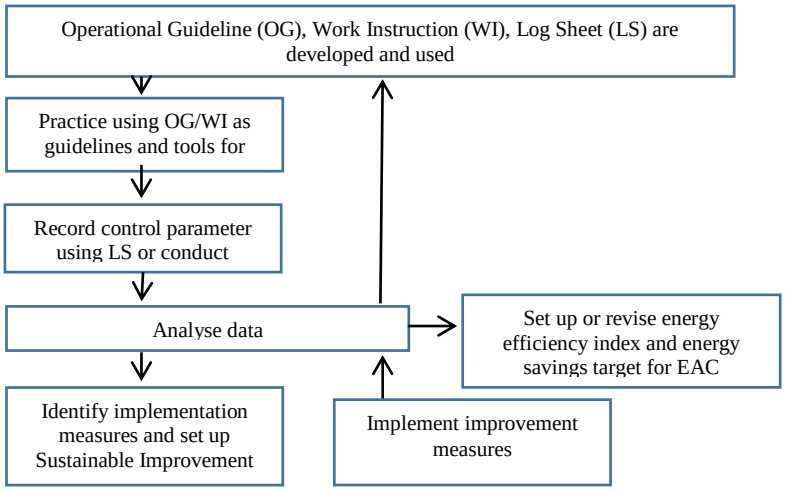


Figure 5: EAC energy management working procedure (EM-WP)

Energy savings can be achieved from three (3) levels of practical measures: zero/low cost (housekeeping), medium cost investments, and high cost investments. At the initial stage, the faculty could implement low cost and medium cost measures to improve the EEs of EAC1 and EAC2. This faculty targets to achieve at least 5% of energy savings, following UM's proposed yearly energy savings target. Low-cost measures represent a move toward technology solution but with substantial input from building occupants. Table 4 below shows proposed improvement measures that must be approved by the faculty's EMC and could be implemented over a set period of time.

Table 4: Proposed improvement measures with details for EAC1 and EAC2

	IM No.	Improvement Measure details	Budget

EAC 1 (SIT1)	IM1-1	Installation of weather strips
		• Providing glass doors with both horizontal and vertical weather stripping (3 units):
		  • RM 25.00/p
		• Providing timber doors with bottom door weather stripping (65 units):
		  • RM 1.50/m
			RM 250.00

	IM2-1	• Installation of timer to centralised a/c system • Timer (RM480.00 x 4 AHUs)	RM 1,920.00
	IM3-1	Replace T8 with T5 light fittings • 1 T5 bulb = RM22.24 • EAC1 = 9,395.45 m² For T8 (1 m^2 = +/- 3 bulbs) De-lamping of T5 (reduction about 50% of bulbs) • Total number of bulb = 1,600	RM 35,584.00

	IM4-1	Setting all split air-conditioning units at 24º and confiscating all remote controls. • Wiring and setting the air-conditioning units = RM80.00/unit • Number of split air-conditioning units = 94	RM 7,520.00
	IM5-1	Maintaining centralised a/c system	RM 5,000.00
EAC 2 (SIT2)	IM1-2	Installation of weather strips. • Providing glass doors with bottom, up and centre weather stripping (8 units) • RM 25.00/p • Providing timber doors with bottom door weather stripping (75 units): • RM 1.50/m	RM 450.00
	IM2-2	Replace T8 with T5 light fittings. • 1 T5 bulb = RM22.24 • EAC1 = 20,611.51m² For T8 (1 m^2 = +/- 3 bulbs) De-lamping of T5 (reduction about 50% of bulbs) • Total no. of bulb = 4800	RM 77,840.00
	IM3-2	Setting all split air-conditioning units at 24º and confiscating all remote controls. • Wiring and setting the air-conditioning units = RM80.00/unit • Number of split air-conditioning units = 81	RM 6,480.00
TOTAL			**RM 135,044.00**

IM1 - Installation of weather strip

Weather stripping is a material used to seal gaps around windows and exterior doors. Caulking seals the small gaps at doors; weather-stripping seals around them can help to make the building airtight.

IM2 - Installation of timer at AHU

Currently, the centralized air-conditioning system only supplies cool air to EAC 1, which is the main block. The air-conditioning system starts at 8:00 am and shuts down at 10:00 pm during the weekdays and 9:00 pm on Saturdays. This operation resulted in major energy wastage and increased energy bills. Four (4) AHUs are found in EAC1, distributing cool air to each floor. A timer can automatically switch air conditioners on and off, which means that an occupant can fall asleep with a unit turned on, but the unit can automatically shut down after an hour or so.

IM3 - Replace T8 with T5 lighting fixtures

In proposing an improvement toward energy efficient buildings, the lighting system must be changed to a more energy efficient lighting such as T5. The T5 adapter has its own extremely efficient built-in ballast. This component can produce more light, in particular more natural light, than before while saving

about 79% on lighting cost. Table 5 shows additional information about T5 and T8.

Table 5. Specifications of the T5 and T8 Fluorescent Light Bulb

Description	Light output (lumens)	Luminous efficacy (lm/W)	Energy Used (watts)	Rated life (hours)	Length (inch)	Diameter (inch)	Colour temperature	Price (approximately) RM
T8	1900	80	36	15, 000	36	1	4100	12.00
T5	2100	1001	21	20,000	34	0.625	3500	22.00

IM 4 - Setting all existing split air-conditioning units

In setting the temperature to be consistent at 24° C at all times, minor re-wiring works will be conducted at the indoor unit of the split system. The occupant/user will only have to turn on the air-conditioning system with the existing switch. All individual remote controls will be confiscated. This improvement measure is also in accordance with KETTHA's requirements to have 24° C in all government buildings (REF).

IM5 – Maintenance of centralized air-conditioning system

Regular and planned preventive maintenance management is the best solution to maintain the performance of the air-conditioning systems in any building. This maintenance avoids failures in the operation of the units. Failures include the following: outdoor fan does not run, compressor does not run, no cool air felt, excessive cooling, and others.

MONITORING AND ASSESSMENT OF IMPROVEMENT MEASURE RESULTS

As a guide in implementing all improvement measures, a Gantt chart shown in Fig. 6 must be created by the faculty EMC to ensure the delivery of planned projects.

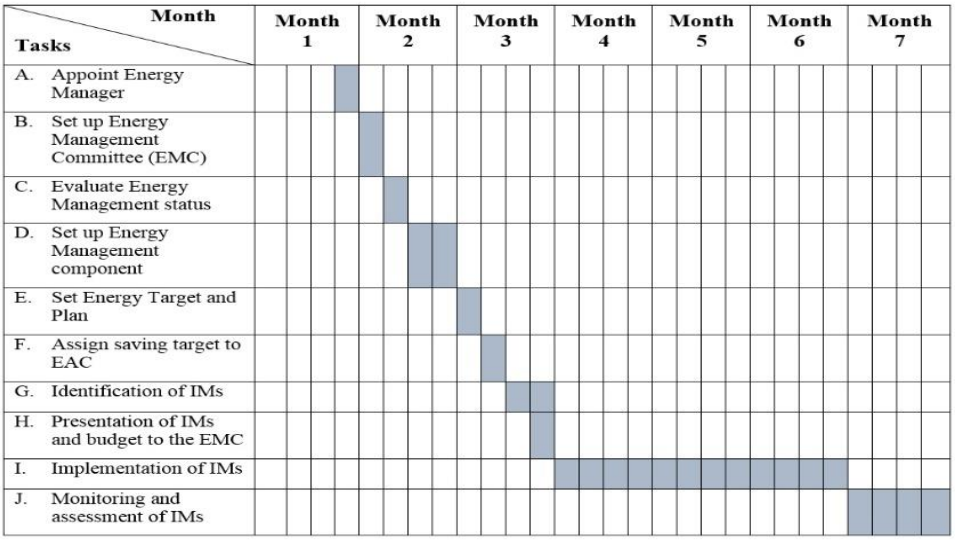


Figure 6: Gantt chart for the implementation of the EM-WP

After all improvement measures have been successfully implemented, the EMC will monitor and assess the implementation results. This monitoring will be done at two (2) levels:

- Level 1 –Faculty/Organization
  - To assess the performance of the implementation of the EM-WP
  - To assess the effect on the overall EEI
- Level 2 –EACs
  - To assess the performance of ECMs and the daily practice within each EAC. This assessment is to be conducted every month for six (6) months after the completion of the system preparation and the implementation of the ECMs.
- The monitoring and assessment at both levels can be conducted through the following:
  - Internal audit of IMs
  - External audit of IMs by EMC from other faculties (third party) and student representatives (second party)

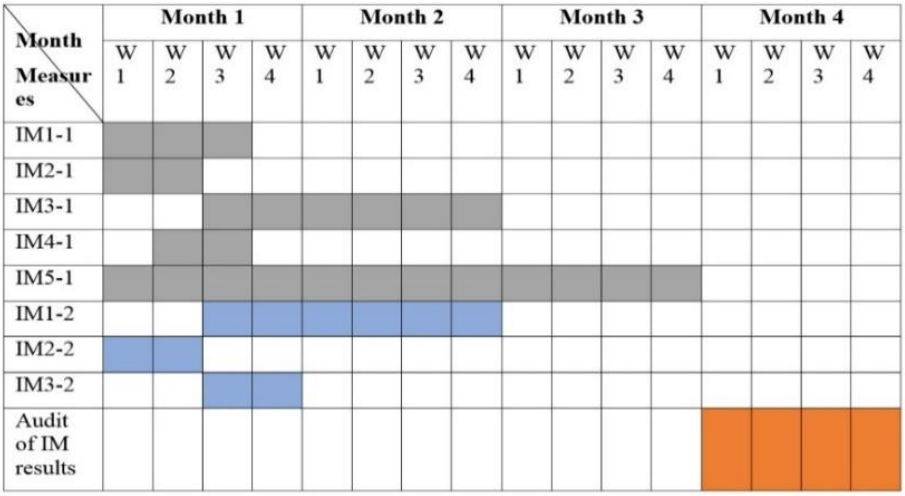


Figure 7: Gantt chart for the implementation of IMs

EXPECTED RESULTS

The EMC at the studied faculty could expect that within 3 years of the implementation of this simulated energy management plan, the faculty's Energy Matrix will be improved.

Expected cost requirements

The expected cost that the studied faculty needs to invest is based on the expenditures needed in IM. Table 6 below summarizes the expected cost of this implementation.

Table 6. Summary of expected cost requirement

No.	Task	Expected cost (RM)
1	Energy Conservation Measures (ECM)	135,044.00
2	Overhead (20% from item 1)	27, 008.80
	TOTAL	**162,052.80**

Net-cost benefits

The actual electricity bill is not known; therefore, the electricity bill is calculated through estimated figures from the technical staff of FBE, who is responsible for the maintenance and use of the building's facilities. Based on the estimated annual energy consumption of the studied faculty at 240,000 kWh/month and the electricity tariff at RM0.43 per kWh, the overall electricity bill for the whole studied faculty is RM 1,238,400 per year. To estimate the return on investment and the overall payback period, the EMC calculated the estimated benefit that this faculty can gain based on payback period and energy savings target.

Payback period

- Assume the annual electricity cost for the whole building = RM 1,238,400.00 (This value includes all mechanical and electrical equipment.)
- Electricity bill for air-conditioning system (estimated at 50% from total) = RM 619,200.00

Through installing a timer, performing weather stripping, and performing regular maintenance of the air-conditioning system, an estimated 10% reduction in energy consumption can be achieved. Therefore,

- 10% reduction from RM 619, 200.00
  = RM 61, 920.00 …… (1)
- Electricity bill for lighting system (estimated at 20% from total)
  = RM 247, 680.00

Through the de-lamping of the lighting fixtures, an estimated 50% reduction in energy consumption can be achieved. However, this implementation will be carried in stages and must be completed within three years. Therefore,

50% reduction from RM 247, 680.00	=	RM 123,840.00
1st year reduction	=	RM 41,280.00 …… (2)
2nd year reduction	=	RM 82,560.00
3rd year reduction	=	RM 123,840.00

- The expected cost requirement for the IM
  = RM 162,052.80 Total saving for electricity bill (based on 1st year reduction)
  = RM 103, 200.00……. (1+2)
- Overall payback period (based on 1st year reduction)

$$\text{Payback period} = \frac{\text{Installation cost (RM 162,052.80)}}{\text{Overall reduction/saving (RM 103,200.00)}} = 19 \text{ months}$$

Energy savings target (%)
In three years, the studied faculty could target to achieve a 5% of reduction in yearly energy consumption and electricity bills. Calculating its initial (1st year) energy saving target involves the following:
Estimated annual electricity bill = RM 1,238,400.00
Estimated reduction in electricity bill = RM 103,200.00

Energy savings target =
Estimated reduction (RM 103,200.00) x 100 = 8.333%
Estimated annual bill (RM 1,238,400.00)
The studied faculty will successfully achieve its 5% energy and cost saving target approximately within one (1) year of the implementation of the proposed improvement measures.

CONCLUSION
This study has presented the chronological process of setting up a functional energy management system for a large university campus that can be implemented as soon as concrete confidence and commitment from the top management of the university is gained. This energy management system follows an established system created by AEMAS and is in line with the existing quality management system at UM. In other words, this new energy management system is a new dimension to the existing ISO system that the university has already practiced for many years in its curriculum and administrative processes. The presentation of a specific faculty's improvement measures, budget, and timeline indicated that with only the implementation of low-cost measures, a yearly energy savings target of 5% can be easily achieved with an ROI of one (1) year.

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PREFERENCES OF STUDENT RESIDENTS TOWARDS SUSTAINABILITY WITH THE CONCEPT OF BIOCLIMATIC DESIGN

Adi Ainurzaman Jamaludin[1], Hazreena Hussein[2], Nila Keumala[3] & Ati Rosemary Mohd Ariffin[4]

[1]*Institute of Biological Sciences, Faculty of Science*
[2,3,4]*Department of Architecture, Faulty of Built Environment*
UNIVERSITI OF MALAYA

Abstract

A satisfaction and perception survey was carried out at a residential college building in Kuala Lumpur. It was acknowledged as an energy efficient building due to the most considerate implementation of bioclimatic design concept. Currently, there is no specific preference studies were done in this type of building in the equatorial climate region. 266 respondents were received, relying on 95% confidence level and ±5% margin of error from the overall population. The satisfaction and perception levels of residents are found to be positive with the concept of bioclimatic design. A majority of them are at a comfort level in all performance indicators including the internal courtyard, thermal comfort and indoor air quality, daylighting and landscape features, which contributed to the increased work productivity. Indirectly, it shows that the bioclimatic design concept at an old residential building is still appropriate to meet the needs of contemporary life while increasing the efficiency of electricity usage. Nevertheless, the positions of the rooms should be highly considered in implementing the improvement measures for increasing the comfort level of the room when this aspect, rather than the gender aspect, considerably influences the satisfaction and perception levels of respondents.

Keyword: bioclimatic design, internal courtyard, Likert scale, post occupancy evaluation, residential, sustainable.

[1] Senior Lecturer at ISB, FS, UM. Email: adiainurzaman@um.edu.my

INTRODUCTION

Sustainable development has led to a number of concept and approaches to designing buildings that assist in reducing pollution and resource consumption (Hyde, 2008). In 1960s, a new concept of bioclimatic design was introduced as a process of design to ensure favourable microclimatic conditions for human comfort by considering the disciplines of human physiology, climatology and building physics (Olgyay, 1963; Bondars, 2013). This concept is using natural energy sources and sinks; without the use of any electromechanical devices or systems (Yeang, 2008; Hyde, 2000). Thus, it able to reduce the operating costs, enhance building marketability, reduce potential liability from indoor air quality problems and increase occupants' performance and productivity (Tiyok, 2009). In the long term, encourage sustainable development in the built environment by helping alleviate the problems concerning the depletion of energy resources and the deterioration of the environment (Li et al., 2013).

The effectiveness of bioclimatic design concept in providing comfortable living space can be evaluated by using the Post-Occupancy Evaluation (PoE) (Jamaludin et al., 2014a; Amole, 2009). PoE is defined as the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time to understand the mutual interactions between the building and users' needs (Preiser, 1995). The PoE integrates the occupants' behaviours, perceptions and opinions, and outlines the issues which will then be monitored (Khalil et al., 2008).

The PoE is widely acknowledged but rarely practiced as there is a lack of agreed-upon protocol, measures and procedures which make comparison difficult (Meir et al., 2009). The implementation of PoE is frustrated by ownership, liability, lack of knowledge and lack of progress (Hadjri & Crozier, 2009). Additionally, the culture was also highlighted as a barrier to the PoE process when the occupants may feel that moving into a new working environment is disruptive enough (Riley et al., 2010). In Malaysia, the term PoE is still new while the aspects of evaluating building performance are not widely emphasised (Zakaria & Hamzah, 2007). There are no systematically collected data for various types of building in Malaysia and most of the studies done previously tend to focus on office buildings (Khalil & Nawawi, 2008; Khalil and Husin, 2009). In other words, there are no specific studies were done on the residential building with the bioclimatic design concept in the equatorial climate region.

The aim of this study is to analyse the residents' satisfactions and perceptions of an old residential college focusing on four performance indicators. There are elements of internal courtyard, thermal comfort and indoor air quality, daylighting and landscape, with regard to gender, race and ethnicity,

as well as the location of the room according to the floor levels. This residential building is acknowledged as a residential college building with the efficient use of electricity due to the best implementation of bioclimatic design concept, particularly daylighting and natural ventilation (Jamaludin et al., 2013). Unfortunately, the efficient use of electricity is not the ultimate victory of the building design when the occupants are suffering with uncomfortable indoor surroundings, especially in terms of thermal comfort and visual comfort (Jamaludin, 2014). Therefore, the effects of the recent adoption of bioclimatic design concept in influencing the residents' comfort levels and the appropriateness of an old building to meet the needs of contemporary life will be revealed subjectively through this PoE. Indirectly, this will contribute to the establishment of PoE standard methods and pragmatic models for multi-residential buildings in Malaysia. Additionally, it will produce a set of results which is easy to compare with other studies in the future in order to provide indications of improvement towards sustainable transformation.

RESEARCH DESIGN AND APPROACHES

Building description

The residential college building is a multi-residential building, which provides accommodation for university students. This building is also referred as a hostel that contains leisure areas, lounges, meeting rooms and laundry facilities. Dayasari Residential College (Dayasari RC) established in 1966 with 18,212.51m^2 of total floor area. This residential college is low-rise, naturally ventilated building and able to accommodate 847 residents at one time. The location of this residential college is 3°07'39.0"N, 101°39'30.1"E and showed in Figure 1.

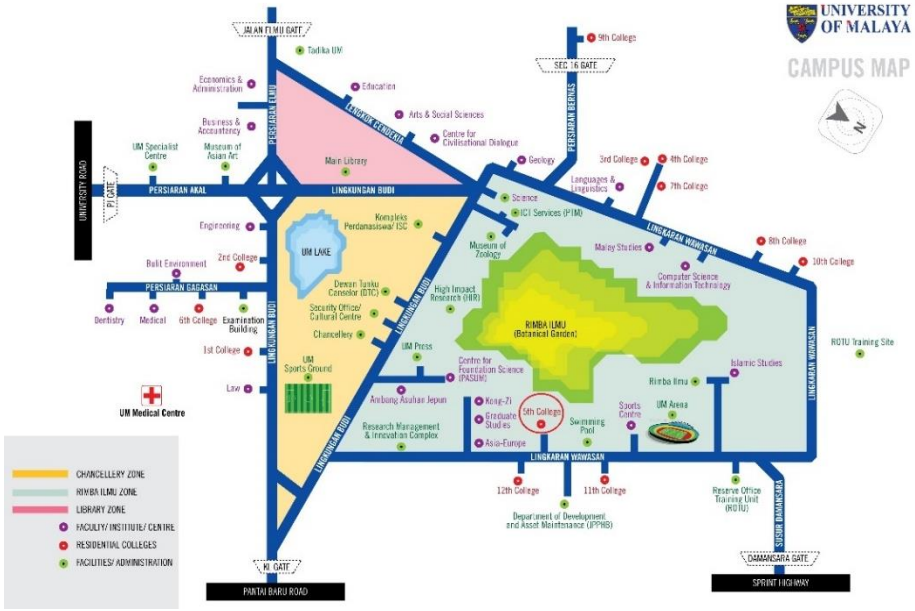
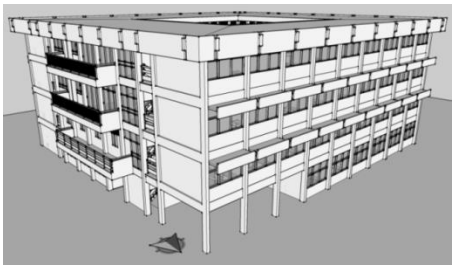
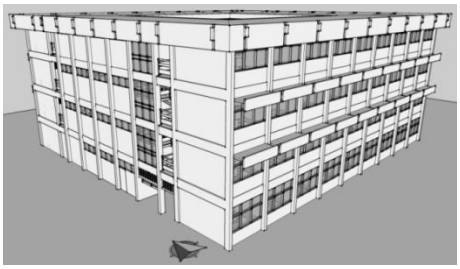


Figure 1: The location of Dayasari RC in UM campus (University of Malaya, 2015).

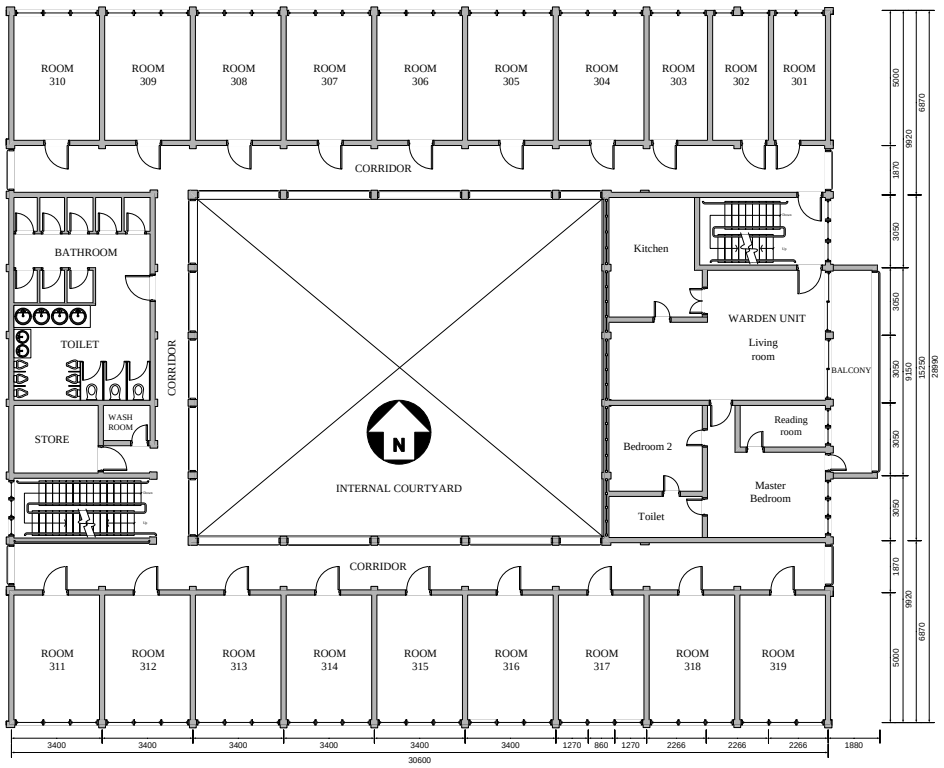
The building arrangement is based on the internal courtyard arrangement that encourages various implementations of bioclimatic design concept, especially under the daylighting and natural ventilation conditions (Jamaludin et al., 2011). The typical room's floor area and volume are 16.35m^2 and 45.78m^3, respectively. A typical elevation and floor plan of Dayasari RC is presented in Figure 2.



Front isometric elevation



Rear isometric elevation



Floor plan

Figure 2: Typical elevation and floor plan of the Dayasari RC building.

The building's orientation to the sun path is north-south that reduces the glare and the thermal effects inside the rooms. At the East-west orientation, there are only service areas, such as toilets, bathrooms, stores, staircases and balconies. The internal courtyard provides daylight and natural air in the corridor and staircase area whereas inside the room daylight and natural air can

be obtained through the transom on top of the entrance door and the wall. Thus, lessening the usage of the corridor lamp during daytime is difficult to achieve at other residential college buildings with a linear arrangement of building layout (Jamaludin et al., 2012). Consequently, Dayasari RC has among the lowest Energy Efficiency Index (34.52 kWh/m^2/year) compared to the other residential colleges; which are in the range of 40 to 125 kWh/m^2/year (Jamaludin et al., 2013).

Dayasari RC was designed with glare protection and adjustable/fixed opening options. There are two types of windows with tinted glasses, centre pivot and awning. The window to wall ratio (WWR) is quite big, 0.66, while the window area is 6.41m^2. Subsequently, the operable window area is only 4.20m^2 with 0.43 of operable WWR. The combination of operable window and transom on top of the entrance door and the wall forms cross-flow/two-sided ventilation, which encourages natural ventilation inside the room. In order to produce significant shadow effects to the rooms, there are large horizontal overhangs along the window in each room. These features are not available in the rooms on the ground floors. As located next to UM Rimba Ilmu Botanical Garden, this residential college is surrounded by a highly vegetated area with high plant diversity (Jamaludin et al., 2014b). Most of the plants are well matured with huge canopies that are capable of covering the ground. The plant composition also shields the building from maximum sunlight penetration especially in the mid-afternoon (Jamaludin et al., 2012; Al-Obaidi & Woods, 2006).

Post occupancy evaluation

The study by Jamaludin et al. (2014a) on satisfactions and perceptions of residents towards bioclimatic design concept at residential college building has been adapted to restructure the questionnaires. The questionnaires have been improved with the addition of several performance indicators. A number of questions were also added to obtain a clearer picture of their satisfaction, perception level of the residents and also the acceptance level towards the implemented bioclimatic design concepts.

The questionnaires use a Likert Scale format where each number generally responds to a specific scale as listed in below,

- -2: very poor/not at all/very uncomfortable/much decreased/too dark/ very dissatisfied,
- -1: poor/slightly/uncomfortable/decreased/dark/dissatisfied,
- 0: fair/moderate/neither/no changes,
- +1: good/very/comfortable/increased/bright/satisfied,
- +2: very good/extremely/very comfortable/much increased/too bright/ very satisfied.

For thermal comfort, ASHRAE 7 point of the thermal sensation scale has been adopted in the questionnaires (Singh et al., 2011). The scale ranges from -3 to +3 where, -3: cold, -2: cool, -1: slightly cool, 0: neutral, +1: slightly warm, +2: warm, and +3: hot.

To understand the living behaviour of residents for sustaining the comfort level of their room, a further survey was done by focusing on the usage pattern of the windows and ceiling fan. The questionnaires were distributed to all residents with the minimum number of feedbacks and with reliance on 95% of the confident level and ±5% margin of error from the overall population at each residential college. A simplified formula introduced by Yamane (1967) was used to calculate the sample sizes,

$$n = N / 1 + N (e)^2$$

where, n is sample size, N is the population size and e is the level of precision. In this study, the level of precision is 0.05.

The survey was carried out just before the academic session ended and the long semester break was about to begin. Thus, the results obtained were more accurate as residents have stayed for at least one semester or 14 weeks at the residential college.

There are no changing seasons, which would have significantly affected the result of the survey because Kuala Lumpur has a constant annual average of temperature and humidity, 26.7°C and 83% respectively (Ahmad, 2008). Kuala Lumpur is only affected by the northeast monsoon from October to March which brings more rainfall (Malaysian Meteorological Department, 2015).

The statistical analyses that include the descriptive analysis were done by using statistical computer software package. The analysis was extended by way of comparing the percentage of respondents with regard to gender, as well as the location of the room according to the floor levels.

RESULTS AND DISCUSSION

The results of the satisfaction and perception survey of residents at Dayasari RC are presented in Table 1.

Table 1: The result of satisfaction and perception survey

The performance indicators		**Likert scale / *Residents' responses (%)***				
		-2	**-1**	**0**	**+1**	**+2**
Internal courtyard	1.The general room layout	*1.5*	*7.5*	*27.2*	*50.2*	*13.6*
	2.The residential building layout	*0.4*	*8.7*	*28.7*	*50.2*	*12.1*
	3.The adequacy of room in fulfil the needs	*1.1*	*11.4*	*25.5*	*49.8*	*12.2*
	4.The overall quality of the residential building	*1.1*	*6.0*	*28.7*	*52.1*	*12.1*
	5.The overall comfort level of the room	*0.8*	*4.5*	*29.1*	*53.6*	*12.1*

Thermal comfort and indoor air quality	6.The influence of overall room conditions on the degree of work productivity	*0.8*	*4.5*	*26.8*	*49.4*	*18.5*
	7.The thermal comfort of the room	*3.4*	*11.7*	*29.7*	*43.6*	*11.7*
	8.The ventilation & indoor air quality of the room	*1.9*	*13.4*	*29.8*	*46.2*	*8.8*
	9.The ventilation control in the room	*1.1*	*14.2*	*37.5*	*39.8*	*7.3*
	10.The provision of air movement in the room	*3.1*	*17.6*	*39.3*	*31.7*	*8.4*
Daylighting	11.The adequacy of daylighting in the room	*4.2*	*12.0*	*34.4*	*40.9*	*8.5*
	12.The daylighting control in the room	*1.5*	*9.5*	*37.4*	*42.4*	*9.2*
	13.The overall quality of daylighting in the room	*1.5*	*7.7*	*28.8*	*48.5*	*13.5*
	14.The view out of the room from the inside	*0.4*	*11.1*	*30.3*	*39.8*	*18.4*
	15.The windows/opening area of the room	*0.4*	*8.0*	*30.5*	*45.8*	*15.3*
Landscape features	16.The landscape quality at Dayasari RC areas	*1.5*	*8.0*	*33.7*	*48.7*	*8.0*
	17.The landscape quality in the internal courtyard	*1.5*	*6.1*	*35.9*	*48.9*	*7.6*
	18.The influence of landscape on the quality life	*0.8*	*7.3*	*30.2*	*47.7*	*14.1*

According to the percentages, the majority of respondents were experiencing a satisfactory level of comfort in all performance indicators, except for the provision of air movement under the thermal comfort and indoor air quality elements. About 50.2% of respondents claimed that the general room and residential building layout which is the internal courtyard with open corridor were 'good'. Meanwhile, 49.8% agreed that the rooms 'had fulfilled their needs very much. The majority of the residents, which were represented by 52.1% felt 'good' about the overall quality of the residential building and 53.6% of them were 'comfortable' with the overall condition of the room. Consequently, 49.4% claimed that the degree of work productivity had 'increased' considerably.

Under the thermal comfort and indoor air quality elements, the majority of respondents felt 'good' with all indicators, which are the thermal comfort in the room (43.6%) and the ventilation and air quality in the room (46.2%). A smaller number of people or only around 39.8% had given good words about the control of the ventilation in the room. For the provision of air movement in the room, about 39.3% representing the majority voted for 'neither'. Hence, we noted that 59.7% of respondents were highly reliant on the ceiling fan at the highest speed of five (50.2%), rather than natural ventilation through the opening of windows in order to promote air circulation and movement inside the room, as presented in Table 2.

Table 2: The usage pattern of windows and ceiling fan

	Residents' responses (%)				
The frequency of ceiling fan usage in a day	Never	Rarely	Sometimes	Frequently	Every time
	0.4	*3.1*	*10.9*	*26.0*	*59.7*
The fan speed is often used	One	Two	Three	Four	Five
	0.4	*2.7*	*17.1*	*29.6*	*50.2*
The frequency of the	Never	Rarely	Sometimes	Frequently	Every

windows is kept open in a day							time
	18.3		*14.8*	*21.0*		*30.4*	*15.6*
The time of windows has been always open in a day	Never		Morning	Afternoon		Evening	Night
	25.4		*27.6*	*16.8*		*19.0*	*11.2*
The reason for not opening the windows	Insect	Safety	Rain	Dust	Privacy	Monkey	Others
	3.4	*16.1*	*6.3*	*9.8*	*20.5*	*38.0*	*5.9*

Further survey on the usage pattern of windows and ceiling fans at Dayasari RC revealed that the 'monkey' (38%) became the main reason for the residents to not open the windows, which was then followed by 'privacy' (20.5%), 'safety' (16.1%), 'dust' (9.8%), 'rain' (6.3%), 'others' (5.9%) and 'insect' (3.4%). However, some of the residents are still keeping the windows 'frequently' open (30.4%) especially in the 'morning' (27.6%). Comparatively, the insects were the main reason why residents did not open the windows of residential buildings in the hot-humid climate of Malaysia (Kubota et al., 2009).

Regarding the daylighting aspects, the majority of respondents (48.5%) were 'satisfied' with the overall quality of daylighting in the room. They claimed that the adequacy of daylighting in the room was 'bright' (40.9%) with a 'good' control (42.4%). The existing windows/opening area of the room was 'good' (45.8%) which was indirectly able to give a 'good' view (39.8%) out of the room from the inside.

The quality of landscape setting at both residential college area and the internal courtyard area was 'good' with 48.7% and 48.9% of total respondents, respectively. About 47.7% of respondents claimed that the landscape setting in both areas was 'very' influential to the life quality. The advantage of the internal courtyard in promoting daylighting and natural ventilation would not be denied as the presence of a landscape with green trees provides better environment than the open sky (Monteiro & Alucci, 2009) and they improve the room and building conditions even when receiving direct heat radiation and penetration from the worst orientations for the equatorial region; east and west (Jughans, 2008). The tree canopies have significant filtration capabilities which contribute to the reduction of terrestrial radiation, cooling the ground surfaces by capturing more latent heat, reducing air temperature by promoting more evapotranspiration, and effectively improve the outdoor thermal comfort, especially in open spaces of the tropical climate region (Shahidan et al., 2010). It also indirectly affects the indoor temperature and the cooling load of the building through shading and insulation effects (Yeang, 2008). Moreover, the vegetation-integrated buildings are more liked, aesthetically pleasing, and restorative than the houses without vegetation (White & Gatersleben, 2011).

Regarding thermal comfort elements, a detailed survey has been done by adopting thermal sensation votes on ASHRAE 7 point sensation scale, which

ranges from -3 to +3. The majority of the respondents, 39.3% claimed to have been feeling 'neutral', as presented in Table 3.

Table 3: Thermal sensation votes

ASHRAE 7 point sensation scale / *Residents' responses (%)*						
-3	-2	-1	0	+1	+2	+3
Cold	Cool	Slightly cool	Neutral	Slightly warm	Warm	Hot
0.4	*7.0*	*8.7*	*39.3*	*25.2*	*16.5*	*2.9*

Further statistical analysis was done by comparing the percentage of respondents with regard to gender. There were not many different responses between genders when comparing all elements simultaneously, except for their responses on the landscape elements. The majority of female respondents rated the internal courtyard as 'very' influential on their quality of life, while the male rated it as 'moderate'. This is in the line with Karjalainen (2007) and Parsons (2002), who claimed that the differences in the responses of male and female; especially in terms of thermal comfort, were generally small.

CONCLUSIONS

The majority of the respondents are at a comfort level in all performance indicators of internal courtyard, thermal comfort and indoor air quality, daylighting and landscape features, which indirectly increase the degree of work productivity. Therefore, the bioclimatic design concept at an old residential building is still appropriate to meet the needs of contemporary life. Furthermore, the concept can increase the efficiency of electricity usage without suffering the occupants with uncomfortable indoor surroundings, especially concerning thermal comfort and visual comfort. However, there is still room for improvement, especially on the provision of air movement in the room when the majority of the residents rated one notch lower as compared to the other indicators.

The location of the room, rather than the gender aspect considerably influences the satisfaction and the perception level of respondents. Different responses gave by the residents according to the floor levels. These aspects should be highly considered in implementing the improvement measures to ensure the comfort standards of the room towards sustainable transformation, especially in urban area. The internal courtyard should be fully optimised while trees in the landscape; either in the internal courtyard or surrounding residential buildings, must appropriately be designed to meet sufficient daylight and ventilation requirements.

In future research, it is necessary to combine both subjective and objective evaluations through field measurement with specific equipment to

have an accurate result in the survey. The combination of these assessments will be able to provide more comprehensive results for the issues investigated.

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SYNTHESISING AN EFFECTIVE INCENTIVES SYSTEM IN SAFEGUARDING THE HERITAGE VILLAGE OF MELAKA AND GEORGE TOWN

Indera Syahrul Mat Radzuan[1] & Yahaya Ahmad[2]

[1]*Faculty of Technology Management & Business*
UNIVERSITI TUN HUSSEIN ONN MALAYSIA

[2]*Faculty of Built Environment*
UNIVERSITY OF MALAYA

Abstract

This paper summarizes the main findings derived from the field study held in three heritage villages located in the proximity of Melaka and George Town city. This study has employed a mixed method approach by using a questionnaire survey on the residents and interviews involving officials and local village leaders of the Morten Village and the Chitty Village in Melaka as well as the Clan Jetty Village in George Town. This study was conducted to address an overarching question, which is whether incentives programme that have been formulated for the community are suitable for their aspirations and needs. This paper analyses the residents' perception on the effectiveness of the current incentives policy by using Bennett's programme evaluation method. It evaluates the findings in relation to the present policy framework for understanding and managing the cultural heritage incentives programme in order to establish the sustainable community in the heritage village. As observed, this study has identified some constraints such as low quality of the conservation works and lack of incentives provision from the viewpoints of the local residents. In dealing with the efficiency of the current incentives programme, this study has taken the stance that a policy formulation for the incentives programme should visually reflect the 'real' needs of the local communities.

Keyword: cultural heritage, incentives system, heritage village, case study.

[1] Lecturer at Universiti Tun Hussein Onn Malaysia. Email: syahrul@uthm.edu.my

INTRODUCTION

In Malaysia, the cities of Melaka and George Town have played a major role in enhancing the living multicultural heritage, as depicted by its various religious and cultural practices of the society. The living cultural heritage in these cities were reinforced by the existence of the early urban settlements that have come to symbolise the unique multi-ethnic vestiges of the formation of the nation and which need to be continuously conserved and preserved. However, in recent decades the historic settlements in Malaysia were found to face adverse influences of modernization (Kamarul S. Kamal et al., 2007; and Amran Hamzah & Rosli Noor, 2006). The major changes in the historic settlements can be traced back from the last three decades due to industrialization, rapid urbanisation and economic growth of the country. The rapid economic development has caused the future demolitions of some historic districts in order to make way for new development and this has resulted in an alteration of the socio-economic landscape and unsettling communities imbalances. This paper syntheses the main findings derived from the field study held in three heritage villages located in the proximity of Melaka and George Town city that have been able to reflect the essence of the multi-cultures of the Malaysian society.

SAFEGUARDING SYSTEM AND POLICY

Malaysia is a federal constitutional elective monarchy with three-tier system of government. In managing the heritage properties, there are the Federal Government, the State Government and the Local Authorities, with the different roles and approaches on the preservation and conservation work for the identified monuments and buildings. A number of ministries and agencies at the federal, state and local levels are involved in the promotion, management and conservation of heritage buildings and areas.

At the federal level, under the Ministry of Tourism and Culture, is the Department of National Heritage which operates under the provisions of the National Heritage Act (2005) enacted in order to preserve the national heritages of the country (Malaysian Government, 2006). Other related ministries in the federal level are the Ministry of Housing & Local Government, the Ministry of Works, the Ministry of Education and the non-government agencies or organisations such as the Badan Warisan Malaysia. The State Executive Council (Exco), Municipal Council, State Tourism Action Council, State Town & Country Planning Department and Heritage Trust are the state agencies which were tasked to administer and manage the conservation of heritage sites at the state level. The local governments including the local authorities such as the George Town World Heritage Incorporated (GTWHI), Melaka World

Heritage Office (MWHO), the Think City Sdn. Bhd and the Melaka Museums Corporation (PERZIM) play a role by executing the by-laws, standards and practices for the management and promotion of the heritage buildings and sites.

METHODOLOGY

Following the case study approach by Yin (2003) and Stake (1995), this research study represents an appropriate method for inquiry into the emergent and diverse components of the community development in Melaka. In this regard, a mixed methods approach of concurrent triangulation designs was employed by performing document reviews, observations, structured interviews and a questionnaire survey involving residents in the two heritage villages in Melaka. These methods consisted of two distinct approaches: quantitative and qualitative (Creswell, Clark, Clark, Gutmann, & Hanson, 2003). In their design, the researcher would collect both quantitative and qualitative data concurrently and would then compare the two databases to determine if there could be a convergence, differences, or some combination (Creswell, 2009). Thus, with this quantitative data and their qualitative analysis, a study could refine and explain those statistical results by exploring the participants' views in more depth (Creswell, 2003; Rossman & Wilson, 1985; and Tashakkori & Teddlie, 1998).

In order to fully understand the dynamics of the incentives system, this study has employed a mixed method approach by using a questionnaire survey on the residents and interviews involving officials and local village leaders of the Morten Village and the Chitty Village in Melaka as well as the Clan Jetty Village in George Town. A two-stage cluster sampling was selected to filter the optimal respondents, who had found to be benefited from the incentives provided by the authorities. The survey data were collected from March to April 2014. Survey questionnaires were held with 103 households, including 45 from Morten Village, 18 from Chitty Village and 40 from Clan Jetty Village (Table 1).

Table 1: Demographic profile of the Morten, Chitty and Clan Jetty Villages

Demographic Profile	Morten	Chitty	Clan Jetty
Population	630	255	950
Number of households	98	23	150
Total area	12 acre	4 acres	16.8 acre
Number of incentive recipients	80	None	None
Number of samples	45	18	40

For the survey, the researcher visited the selected homes of the respondents and explained the purpose of the study. Each interview lasted approximately 30 minutes to 1.5 hours. Respondents were asked about the types

of incentives they had received, their perceptions on the effectiveness of the current incentives policy and their real needs for the cultural heritage conservation. Mean and ANOVA test were used to identify the different perceptions of the incentives programmes' evaluation by the residents and their real needs in the study areas.

The selection of the respondents was based on the following criteria: (i) residents who had benefited from the heritage incentives from the authorities, and (ii) residents who were residing permanently at the settlements. The samples were filtered based on the screening questions, whether or not they have had ever received any incentives or financial support from the authorities with regards to the conservation of their cultural heritage. To attain a holistic view, 35 interviews were carried out with groups of specialists (including academicians and conservators), cultural reference groups (including community leaders, heritage managers, cultural groups, the private sector and NGOs).

It is also important to note that these traditional villages are located in a vicinity of the core and buffer zones of Malaysia's historic towns of Melaka and George Town which were inscribed by UNESCO under serial nomination as the cultural sites known as the Historic Cities of the Straits of Malacca in 2008. The selection of these three villages was based on a fact that the Morten, Clan Jetty and Chitty Villages represent the unique traditional settlements of the three major races of the country which is the Malay, Chinese and Indian respectively (Figure 1).

Figure 1: Typical traditional houses in Morten Village, Chitty Village and Clan Jetty Village
Source: Author (2014)

THE INCENTIVES SYSTEM AND ITS ROLE

In the context of the cultural heritage conservation, policy-makers in developed and developing nations are becoming more aware of the importance of identifying the best incentives mechanism or tool for the preservation of their cultural heritage in the historic areas. Incentive of cultural heritage protection has made reference to funding pattern, resource allocation, financial control mechanisms, the quality of financial information, performance management and prioritization (Klein, 2000). However, as yet, there has been little or no research

into the nature and impact of these incentives and how they might be integrated into the heritage management strategies. Much literatures have encompassed the incentives provision in diverse disciplines such as researched in finance by Read (2005), wildlife conservation by Hadlock and Beckwith (2002), forest management by Kumar (2007), business by Goetz (2010) but very few researchers have touches on heritage areas.

Roddewig (1987), has been one of the few commentators who has written explicitly about the use of incentives in the preservation of historic areas. He pointed out how some of the ways in which incentives can assist the conservation of historical areas. In his view, incentives have two specific roles in the conservation process: (1) to generate more rehabilitation of historic structures than would be possible, presumably, through other forms of government action, and (2) to provide a reasonable economic return to owners of buildings protected and restricted by laws.

RESULTS AND ANALYSIS

In this study, numerous incentives programmes have been created with either financial or non-financial means by the Malaysian government to help in preserving the heritage villages. At the three selected sites, 97% of the respondents in Morten have reported that the house received financial incentives from the authorities. However, respondents in the Chitty and Clan Jetty Villages received incentives in the form of infrastructure development.

Morten Village

Situated in the heart of Melaka city, the Morten Village has over 600 residents and was named after the British Land Commisioner, F. J. Morten (Wee, 1999). In the Morten Village, about RM2 million has since been allocated by the Federal Government, via the Ministry of Culture, Arts and Tourism (recently known as the Ministry of Tourism and Culture) in order for them to standardise the roofings of more than 80 houses in 2000. Besides that, the beautification programmes had been carried out so as to enhance its aesthetic appeal. The most significant aid was for house renovation where selected old Malay houses have undergone renovation mainly to its main structure, walls, windows, roofs and stairs. This allocation was administered by the Melaka Museums Corporation using the funding allocated by the Conservation and Restoration Trust Fund from 2001 to 2010.

Obviously, the restoration project benefitted the recipient house owners. A majority of them received financial support, RM10,000 each with total allocations approximately RM100,000 in 2001. The highest sum distributed in 2010 and 2008 amounted to RM64,550.00 and RM46,500.00 respectively. Other aesthetic efforts provided by the Government consisted of the improvements of the pedestrians walkways beautification, tree planting along

the river and streets, outdoor street lamps, installation of roof lamp, landscape, signages, the arch gate and other public utilities. As part of revitalizing the landscape efforts by the Melaka Historic City Council (MBMB), steel railings with attractive designs were erected along the facade facing the Melaka River for the safety of the villagers and visitors.

Chitty Village

On the other hand, the Chitty Village is a home for over 200 residents who call themselves the 'Chitty' or *Hindu Peranakan*. According to Moorthy (2009) 'Chitty' means merchant in the Tamil language. This village has also received funds from the government to upgrade their tourist's facilities in 2009 (Table 2). The total value of the financial support was RM499,350.00. The grants were used particularly to upgrade the performance hall, outdoor street lamp installations, village road maintenance and drainage repairs and they were completed in 2010. In order to ensure the sustainability of the intangible heritage, in 2011 Melaka Museums Corporation (PERZIM) has also allocated RM20,000 to the Chitty communities to set up and train cultural troupes comprising the local youths (UNESCO, 2011).

Table 2: Supporting funds for upgrading tourist's facilities in the Chitty Village in 2009

Project	Total cost (RM)
To upgrade the performance hall, outdoor street lamp installations, village road maintenance and drainage repairs	449,350.00

Clan Jetty Village

The Clan Jetty Village that spreads along the waterfront of Weld Quay in George Town city, represents a unique settlement by Chinese immigrants who share common historical, geographical and lineage origin (Hockston & Tan, 2011). The Clan Jetty Village is the timber jetty housing numbering over 800 populations which remains as the George Towns's waterfront communities mainly the Chinese community.

Clan Jetties are built with wood on wooden stilts. Consequently, many structures are now weak and require regular repairs and maintenance. Recently, it was reported that RM300,000 had been spent by the state authority on repairing the walkways in the Chew Jetty and RM150,00 for the Lee Jetty (Table 3). As observed by the researcher, the basic utilities such as water supply and electricity were supplied to them with fire hose reels and street lamps installed in the common areas.

Table 3. Total allocations for the repairs of planked walkways by the Penang State Government

Type of repairs	Total cost (RM)
Replacement of half of the total walkways in Chew Jetty	300,000.00

Repairs on the damaged walkways in Lee Jetty	150,000.00

Source: Author (2014)

The data of the survey were analysed using the Statistical Package for the Social Sciences (SPSS) Version 20.0. Its analyses the residents' perception on the effectiveness of the current incentives policy by using Bennett's programme evaluation method (Bennett & Rockwell, 2004). Bennett's has came up with the hierarchy that could show the causal links between the steps from inputs to outcomes and where along the continuum of change an extension programme has reached its delivery. It evaluates the findings in relation to the present policy framework for understanding and managing the cultural heritage incentives programme in order to establish the sustainable community in the heritage village. By using the five-point Likert scale, respondents were asked whether they agreed or disagreed with the statements pertaining to their satisfaction or dissatisfaction towards the incentives programme's inputs (how participants perceive the resources of the programme), programme's activities (how participants react to the events or activities conducted), programme's participation (the extent to which participants were involved), programme's reactions (how participants react to the programme's interest), programme's learning (the extent to which participants acquired knowledge), programme's actions (how participants react to the decision taken) and programme's impact (the overall benefits).

Table 4 shows a summary of the mean scores of the incentives programme evaluation by the residents of the three heritage villages. For the Morten Village, the mean scores ranged from 2.73 to 3.95, with an overall mean of 3.53. Among the seven factors of the incentives programme's evaluations, programme's participation and programme's inputs had the highest mean score with a value of 3.95 and 3.89 respectively, followed by the programme's actions (3.66) the programme's reactions (3.51), the programme's learning (3.50), the programme's activities (3.44), and the programme's impact (2.73).

Table 4: Mean scores for the incentives programme evaluation of Morten, Chetty and Clan Jetty

Incentives Programmes Evaluation	**Case Study**		
	Morten (Mean)	**Chetty (Mean)**	**Clan Jetty (Mean)**
Inputs	3.8889	3.4444	2.9083
Activities	3.4356	3.2000	2.8550
Participation	3.9481	3.5926	3.0333
Reactions	3.5111	3.3889	2.8000
Learning	3.4963	3.2037	2.9500
Actions	3.6593	3.3704	2.9250
Impacts	2.7333	2.8056	2.9000
Total Mean	3.5247	3.2865	2.9102

Source: Author (2014)

For the Chitty Village, the mean score value ranged from 2.81 to 3.59, with an overall mean score at a moderate 3.29. The highest mean score for the incentives programme's evaluation in the Chitty Village was for the programme's participation with an average of 3.59, followed closely by the programme's inputs (3.44), the programme's reactions (3.39), the programme's actions (3.37), the programme's learning (3.20), the programme's activities (3.20), and the programme's impact (2.81). The results have demonstrated that the incentives programme in these two villages had been accorded some degrees of commitment. However, continuous improvement by the authorities should be focused more on the programme's impact which scored the lowest.

As for the Clan Jetty Village, the overall mean score was the lowest as compared to the mean scores of the Morten and Chitty villages with the mean value at 2.91. Of this village, the highest mean score for the incentives programme evaluation was for the programme's participation with an average of 3.03, followed by the others with an average mean score below 3.00 point for example the programme's learning (2.95), the programme's actions (2.93), the programme's inputs (2.91), the programme's impacts (2.90), the programme's activities (2.86), and the programme's reactions (2.80). The next part of the analysis of this study involved the ANOVA test analysis for the entire incentives programme evaluation by the residents of the three villages (Table 5).

The ANOVA test was carried out in order to identify the differences in perception towards the programme's inputs, programme's activities, programme's participation, programme's reactions, programme's learning, programme's actions, programme's impact, and the overall perception towards the incentives programme amongst residents in the Morten, Chitty and Clan Jetty Villages. It is apparent from Table 6 that there was a statitically significant difference in their perception of the programme's inputs, programme's activities, programme's participation, programme's reactions and programme's actions and the overall perception towards the incentives programme amongst residents in the Morten, Chitty and Clan Jetty Villages. However, the ANOVA showed that the programme's learning and programme's impacts results were not statistically significantly different.

Table 5: Summary of Levene's Test and ANOVA of the Morten, Chetty and Clan Jetty

Program's Evaluation	***p*-value (Levene's Test)**	**Assumption of Homogeneity of Variances**	***p*-value (ANOVA)**	**Significant Difference**
Programme's Inputs	0.572	Yes	0.000	Yes
Programme's Activities	0.040 (Welch)	No	0.031	Yes
Programme's Participation	0.080	Yes	0.000	Yes
Programme's Reactions	0.225	Yes	0.010	Yes

Programme's Learning	0.058 (Welch)	Yes	0.054	No
Programme's Actions	0.213	Yes	0.004	Yes
Programme's Impacts	0.783 (Welch)	Yes	0.798	No
Overall	0.216	Yes	0.006	Yes

Post-hoc comparisons using the Tukey HSD test have indicated that only the Morten and Clan Jetty Villages were significantly different from one another at the $p < 0.05$ level. The study found apparent differences for the programme evaluation with the programme's inputs, activities, participation, reactions and actions. The residents' perception towards the five significantly different variables in Morten was found to be greater than that from the Clan Jetty Village. The actual difference found in the perception towards the *programme's inputs, actvities* and *participation* between the two study areas (Morten and Clan Jetty) was small, based on Eta squared (below 0.01). Meanwhile, the magnitude of the difference in the means of perception towards the *programme's reactions* and *actions* were found to be moderate with Eta squared value of 0.09 and 0.11 respectively.

DISCUSSIONS

This study was undertaken in order to evaluate how the incentives programme has worked and what were the impacts and challenges faced by the concerned communities in the current scenario. The following evidences have been recorded by the researcher after listening to the authorities and villagers' voices. With rapid urbanization, one respondent from the Morten Village stated that: *"The government has undertaken conservation measures since 2000 in order to preserve the traditional houses. Initially, many of the houses have been repaired and the new roofs were installed with the help of the government budget for restoration projects. But it was centrally controlled. Yet we had no say in it. And after fifteen years have passed, why now there are no more proactive actions taken by the government to support and maintain our heritage village?"* (Personal communication, March 12, 2014).

Furthermore, one respondent has pointed out that: *"Appointed contractors installed the new roofs, timber walls and windows for our properties. However, the quality of the workmanship is found to be poor. For instance, after they had finished the renovation, we again faced other problems such as some roofs were leaking; there were gaps in between the timber wall arrangement, the windows they installed did not fit and could not be closed easily. The poor workmanship is really unacceptable and we are not truly satisfied because they did everything in a hurry. The contractors ignored our feedback about their workmanship"* (Personal communication, March 17, 2014). Another respondent commented that: *"The materials that they used were of a low quality. Some of the timber planks used were recycled and had been*

used before. They just fitted them for the sake of the repairs. Even for the floors, the planks they used were not planed and not smooth. I've to cover them up with mats" (Personal communication, March 18, 2014). These results are likely to be related to the residents' concerns on the lack of monitoring system led by the authorities in the implementation phase.

However, responses from the officers in local authority thus revealed a lack of creativities among the locals in promoting their own cultural heritage programme. R3, an officer in Melaka commented: *"State government have conducted numerous workshop and programmes to educate the local communities for the past few years. However, the communities need to be more self-reliance and proactive to establish their own heritage programme rather than heavily rely on the government funds and support. The communities itself must be creative enough to promote their own uniqueness"* (Personal communication, March 21, 2014). For R2, an officer in the Federal department suggested that there is a need for the local communities in the heritage village to establish their own heritage programme due to lack of financial resources from the government. He added that: *"Government can't afford to conserve and protect all houses within the heritage village. We have to consider the cultural and architectural significance in order to provide the support"* (Personal communication, March 17, 2014).

Moreover, one of the residents in the Chitty Village has pointed out that: *"[…] what concerns me most is that the government is not doing enough to protect our land from the urbanization pressure. Our land here used to be a playground for children enjoying our traditional games such as 'congkak', 'galah panjang', 'ketenteng', 'gasing', 'layang-layang', 'guli' and 'batu seremban'. This is the place where we grew up with laughter and joy. What has happened now is really disappointing. Our village is surrounded by 'urban jungles'. Nature is disappearing fast"* (Personal communication, March 15, 2014). The reason for this was clear and perhaps may have something to do with their disappointment on fragility of their custom and traditional lifestyles which seems to be threatened.

The researcher also recorded the Clan Jetty Village residents' views on the incentive programme in their village. As pointed out in the previous section, this village has been given some allocations by the state government in order to improve the walkaways, installation of the fire extinguishers and the street lamps. Despite these improvements, one respondent in Clan Jetty Village has expressed his disappointment: *"No improvement in our quality of life. Government only provides us with walkaways, no incentives were given to repair our houses. I think it's about time for the government to help us preserve this historic village"* (Personal communication, April 6, 2014). It can thus be suggested that the authorities should provide adequate financial supports to

safeguard the dilapidated houses so as to maintain its significance value of intangible heritage of the communities.

CONCLUSION

The researcher had discovered and learnt from this first insightful study of the three heritage villages the importance of the effectiveness of the incentives programme in guiding the conservation efforts for the local community. As observed, this study has identified some constraints on the current incentives policy implementation from the viewpoints of the local residents. Further studies regarding the role and impacts of incentives provision would be interesting to explore particularly in the case of community-based research. In dealing with the efficiency of the current incentives programme, this study has taken the stance that a policy formulation for the incentives programme should visually reflect the 'real' needs of the local communities.

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47301, Petaling Jaya, Selangor Darul Ehsan, MALAYSIA
Tel: +603 78770637 Fax: +603 78779636
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