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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)

**CREATIVE CITIES RESEARCH IN PENANG, MALAYSIA: A
REVIEW OF CONCEPTUAL AND METHODOLOGICAL
FRAMEWORK**

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Abstract

A heightened interest in the notions of ‘creative cities, creative industries and creative economy’ has propelled research in these emerging areas of the New Economy. As an emerging area, some conceptual and methodological issues need to be addressed prior to adopting the creative city paradigm as part of the strategic and policy framework towards a creative economy. This paper presents a review of key conceptual and methodological issues that need to be considered when conducting research on creative cities in Malaysia. The conceptual and methodological issues relating to creative cities and creative industries should be addressed and dealt with in order to facilitate an enabling framework for contemporary research in this emerging area.

Keyword: Creative cities, creative industries, creative economy

INTRODUCTION

The discourse on creative cities is gaining much importance and increasingly pivotal in contemporary academic and political agenda. The discourse deliberates on the intrinsic link between creativity and urban development, and the contribution of creative activities towards territorial development and competitiveness (Costa, 2008). Creative cities are purported as the model cities of the 21st century, where cities of this nature would grow, thrive and progress as a result of an agglomeration of creative industries, which feature a clustering force of their skilled, innovative and creative urbane workforce (Florida, 2008, 2004, 2002; Lazzeretti, Boix & Capone, 2009; Cooke & Lazzeretti, 2008). The presence of such creative workers or popularly known as the ‘creative class’ (Florida, 2002), will be the key determinant towards a city’s liveability, attractiveness and future economic progress. Consequently, cities around the world strive to compete to be the location of choice in their quest to attract and retain the creative class.

Arguably, in the New Economy it is cities rather than countries or nations that compete against each other for economic dominance and wealth. In essence, a city needs to transform itself into a creative city in order to contest effectively since “...the concept of creative city can be seen as the newest place-marketing product, employed in the struggle between cities to attract investors and to promote competitiveness” (Hansel et al., 2001, cited in Costa, 2008). Statistics from advanced economies such as the United Kingdom, Canada and Singapore highlight the significance of creative industries clustering in cities and their contributions towards local and national development (DCMS, 2010; Cooke & Lazzeretti, 2008; AuthentiCity, 2008; Toh, Choo & Ho, 2003). Hence, many developing countries including Malaysia share the same aspiration to transform their primary or secondary cities to become creative cities (Lee, 2011; Khoo & Nurwati, 2011). Specifically, Malaysia’s National Creative Industry Policy aims to strengthen the local creative industries and leverage on the creative economy bandwagon to spur economic progress.

However, critiques have underlined some key issues regarding the conceptual and methodological comprehension of the notions of ‘creative cities/creative industries/creative economies’ and their usability. The current scenario depicts a “...rather confusing and unclear panorama around the correlated creative cities and creative/cultural activities concepts” (Costa, 2008: 188). Furthermore, “creative city notion has been particularly in the spotlight in the past decade, but it is not easy to identify a common conceptual ground covering the underlying diversity of interpretations and practices” (Costa, 2008: 191). Given the blurry boundaries between the notions of ‘creative activities’

and ‘cultural activities’, arguably, these conceptual issues are specific and peculiar to creative industries and the notion of ‘creativity’ per se.

Apart from the conceptual predicaments, a lack of understanding of the tangible dimensions and parameters of targeted economic performance poses another challenge to current research on creative cities and creative industries. The strength of a city’s creative economy is usually measured in terms of the number of creative businesses, total number of creative employees, and total wealth generated by the creative employees (CIE, 2009; Montgomery, 2005). Admittedly, creative inputs that can boost tangible economic outcomes provide vital statistics to operationalise and assess the “economic dimensions of creative industries as a driver of wealth creation, employment, competitiveness and prosperity” (CIE, 2009: 9). To date, however, most countries have yet to publish the tangible economic dimensions and quantifiable objective indicators that are related to their creative cities and creative industries (Costa, 2009). Data on Malaysia’s creative industries based on selected economic indicators (or proxies) is unavailable. This situation poses a real challenge given the dearth of creative cities research in Malaysia.

Against this background, this paper aims to fill the above research gap by reviewing the conceptual and methodological issues and challenges in creative cities and creative industries research. Essentially, the main objective of this paper is to disclose and unpack key conceptual issues and also latent methodological challenges that are hindering and obstructing research and practical developments in the field of creative cities and creative economies in Malaysia. Though several diverse and contentious concepts were highlighted, the convergent meaning found in the conceptual and methodological review adds on to the rigour and internal consistency of the working framework for this study. Issues and challenges discussed in this paper would provide some baseline data for future research on creative cities, creative industries and economic development especially in Malaysia. In addition, the Malaysian authorities and related statutory bodies may devise an appropriate taxonomy to document the contribution and development of creative industries as the city’s latest engine of growth in the New Economy.

REVIEW OF CONCEPTUAL FRAMEWORK

Creative industries have multiple definitions and meanings; and the debate continues on the inherent linkages that exist between creative industries and cultural industries (Costa, 2008). The literature highlights two distinct approaches in explaining the complex connections between creative industries and cultural industries. The first approach hinges on the dimension of culture and its supplementary contributions in the elements of politics, economics and environment in order to provide a holistic and sustainable condition for the birth of a creative city (Kern & Runge, n.d.; Landry, 2000). As the forces of

economic globalisation set in, advanced economies rapidly lose their manufacturing base and they progress into their next development phase with the birth of a new knowledge and informational economy. Artistic and technological creativity become the prime driver of the new knowledge economy, thus, placing creativity as a focal point of urban development policy (Sasaki, 2008). Interestingly, the link between culture and the arts is not novel; and can be traced back to the pioneers of cultural economists like John Ruskin and William Morris, who during England’s Victorian period championed the art economics that capitalise on creative human activities (Sasaki, 2008). A similar line of inquiry was later pursued by Lewis Mumford in *Culture of Cities* where he proposed cultural economics, which emphasises human life and environment over everything else, thus, placing much focus on “reconstitution of cities to fulfil human consumption and creative activities” (Mumford, 1938, cited in Sasaki, 2008: 78).

The second approach, on the other hand, hinges on economics and development. The concept of creative cities has evolved to encapsulate the dimensions of creativity and innovation of a city, as pioneered in Jane Jacobs’ work (1972). Extending from Jacobs’ work are proponents like Florida (2008, 2004, 2002) and Landry (2000) who define creativity as something beyond fantasy and imagination. They place creativity somewhere between intelligence and innovation, so that the concept acts as a “mediator” between art and culture and between industry and technology (Sasaki, 2008). A creative economy comprises creative industries fuelled by creative and innovative individuals (or creative class) who choose to congregate and agglomerate with other creative workers in urban areas in order to spur local economic development (Florida, 2008, 2006, 2002).

It is clear that the first approach leverages on elements that are linked to arts and culture; whilst the second approach is inclined towards capitalising creativity and innovation for economic development. These two differing conceptual definitions of the creative city as ‘culture-centric’ as opposed to ‘econo-centric’ orientations are compared and contrasted in Table 1. The contrasting orientation is posited by Smith and Warfield (2008: 288) as follows:

“According to what we call the culture-centric conception of the creative city, value is placed foremost on creative acts, which benefit the well-being and quality of life of citizens; the economic benefit and value is secondary. What we have termed the economic-centric orientation, on the other hand, sees local economic development and growth as primarily important, and artistic values are secondary”.

Table 1: Creative city orientations – ‘Culture-centric’ versus ‘Econo-centric’

Creative City Orientations	Culture-Centric	Econo-Centric
Creative city values	Central values = arts, culture,	Central values = urban economic

	community well-being, access and inclusion	sustainability and well-being through creative initiatives/industries
Definition of creative city	Place of diverse and inclusive arts and culture	Place of economic innovation, creative talent and creative industries

Source: Smith and Warfield (2008: 289)

Such delineated approaches of the “art-culture-creative-knowledge continuum” versus “cross-cultural interpretations” have caused major semantics and epistemology issues in this field (Mossberger and Stoker, 2001, cited in Evans, 2009). For instance, nebulous definition was an issue in assessing the creative industries in Liverpool (Liverpool City Council, 2009). Moreover, in articulating and validating the meta-themes on global culture and creative industries, tensions have emerged between city-regional authorities who champion creative and knowledge city status via economic-led cultural policy, against those local authorities and municipalities who are ingrained with cultural development and objectives for their arts and cultural policy and programmes (Evans, 2009). This dilemma has caused some Midwest American cities to define their creative economy in terms of cultural heritage, rather than creative class (Evans, 2009).

It is hardly surprising that some industries and occupations in the creative industries and cultural industries classifications are in fact overlapping. In Europe, there are efforts to consider indicators related to culture-based creativity to be incorporated into existing socio-economic indicators (Kern & Runge, n.d.). The Europeans have developed the term “culture-based creativity” to reflect ‘art and cultural production or activities which nurture innovation’ (Kern & Runge, n.d., p. 192) as follows:

Culture-based creativity is linked to the ability of people, notably artists, to think imaginatively or metaphorically, to challenge the conventional, and to call on the symbolic and effective to communicate. Culture-based creativity is a capacity to break the natural order, the usual way of thinking and to allow the development of a new vision, an idea or a product. Culture-based creativity is creativity that comes from artists, creative professionals and the cultural and creative industries.

It is generally agreed that creative industries are those that derive value from copyright and circulating creative content, whilst cultural industries produce creative content in a local cultural setting through literary, visual and performing arts (Evans, 2009). A widely accepted definition is that of the Creative Industries Task Force (CITF, 1998) of the United Kingdom, which defines creative industries as “activities which originated in individual creativity, skill and talent and which have the potential for wealth and job creation through the generation and exploitation of intellectual property.”

A later document entitled 2001 Creative Industries Mapping Document follows this definition and identifies 13 industries of specific classifications as creative industries. These industries are (1) advertising; (2) architecture; (3) art

and antiques; (4) crafts; (5) design; (6) designer fashion; (7) film and video; (8) interactive leisure software; (9) music; 10) the performing arts; 11) publishing; 12) software and computer services; and 13) television and radio. Table 2 illustrates the attempt by the British government to map out the 13 creative industries to the 2007 Standard Industrial Classification (SIC) for Annual Business Survey (ABS) data.

Table 2: Mapping of UK's Creative Industries to the 2007 Standard Industrial Classification (SIC) for Annual Business Survey (ABS) data

Mapping Document Chapter	Sector	Standard Industrial Classification (SIC)	
		Code	Description
1	Advertising	73.11	Advertising agencies
		73.12	Media representation
2	Architecture	71.11	Architectural activities
		74.10	Specialised design activities
3	Art & Antiques	47.78/1	Retail sale in commercial art galleries
		47.79/1	Retail sale of antiques including antique books, in stores
4	Crafts	Majority of businesses too small to be picked up in business surveys.	
5	Design	74.10	Specialised design activities
6	Designer Fashion	10 Codes	Clothing Manufacture
		74.10	Specialised design activities
7	Video, Film & Photography	18.20/2	Reproduction of video recording
		74.20	Photographic activities
		59.11/1 & 59.11/2	Motion picture and video production activities
		59.12	Motion picture, video & TV post-production activities
		59.13/1 & 59.13/2	Motion picture and video distribution activities
		59.14	Motion picture projection activities
		59.20	Sound recording and music publishing activities
9 & 10	Music, Visual & Performing Arts	18.20/1	Reproduction of sound recording
		90.01	Performing arts
		90.02	Support activities to performing arts
		90.03	Artistic creation
		90.04	Operation of arts facilities
		78.10/1	Motion picture, television and other theatrical casting
11	Publishing	58.11	Book publishing
		58.13	Publishing of newspapers
		58.14	Publishing of journals and periodicals
		58.19	Other publishing activities
		63.91	News agency activities
8 & 12	Software & Electronic Publishing	18.20/3	Reproduction of computer media
		62.01/2	Business and domestic software development
		62.02	Computer consultancy activities
		58.29	Other software publishing

8 & 12	Digital & Entertainment Media	58.21	Publishing of computer games
		62.01/1	Ready-made interactive leisure and entertainment software development
13	Radio & TV	60.10	Radio broadcasting
		60.20	Television programming and broadcasting activities
		59.11/3	TV programmes production activities
		59.12	Motion picture, video & TV post-production activities
		59.13/3	TV programme distribution activities

(Source: DCMS 2010: 18–19)

This original concept of creative industries has inevitably evolved and assimilated into different contexts. For instance, creative industries in Toronto, Canada are defined by industries and occupations as shown in Table 3. An Australian study mirrors this taxonomy in their cultural and creative industries in line with the UNESCO definition: “...the cultural and creative industries focused on both activities involved in the creation of cultural and creative goods and services as well as activities that subsequently add value to those products” (CIE, 2009: 18). The creative industries in the Australian study comprise (i) music and performing arts; (ii) film, television and radio; (iii) advertising and marketing; (iv) software development and interactive content; (v) writing, publishing and print media; and (vi) architecture, design and visual arts (CIE, 2009).

Table 3: Definition of creative industries in the city of Toronto, Canada (by industries and by occupations)

Creative Industries	Creative Occupations
<ul style="list-style-type: none"> • Independent Artists, Writers and Performers • Performing Arts Companies • Agents and Promoters of Performing Arts and Entertainers • Motion Picture and Video Production • Sound Recording • Radio and TV Broadcasting, Pay/Specialty TV, and Program Distribution • Architecture and Related Services • Specialised Design Services (Graphic, Industrial, Interior, Fashion, Other) • Advertising and Related Services • Newspaper, Periodical, Book and Database Publishing • Software and New Media Publishing 	<ul style="list-style-type: none"> • Architects & Landscape Architects • Industrial, Graphic & Interior Designers • Writers & Editors • Producers, Directors, Choreographers & Related Occupations • Conductors, Composers & Arrangers • Musicians, Singers & Dancers • Actors and Others Performers • Painters, Sculptors, Illustrating Artists & Other Visual Artists • Photographers • Announcers & Other Broadcasters • Theatre, Fashion, Exhibit & Other Creative Designers • Artisans, Craftspersons and Patternmakers

(Source: AuthentiCity 2008: 24)

ECONOMIC MEASURES OF CREATIVE INDUSTRIES

The economic dimensions or parameters of the creative industries are key determinants to ascertain whether a city qualifies to be branded as a creative

city. The number of current creative businesses and creative employees as well as the amount of wealth they create are vital statistics and indicators to assess and position the importance of creative industries in a particular city or nation (Montgomery 2005). Advanced economies such as the UK, Australia and Singapore have embarked on this endeavour to document and measure the importance of the creative industries in their respective economies. The British Government through the Department for Culture, Media and Sport (DCMS, 2010) has compiled these dimensions in a report entitled Creative Industries Economic Estimates released in December 2010, which reported that seven creative industries comprised 5.6% of the UK's Gross Value Added in 2008. On employment, the total creative employment contributes 7.8% as a proportion of all employment totalling to 2,278,500 jobs in November 2010 (DCMS, 2010).

Likewise in Australia, documenting the economic dimensions was undertaken by the Centre for International Economics (Canberra & Sydney) in a report entitled Creative Industries Economic Analysis (2009). The comprehensive Australian effort to capture and measure creative industries statistics based on time series and longitudinal approach is commendable. Multiple sources including the IBIS World Industry reports and ABS Census were consulted to construct the array of economics dimensions for the Australian creative industries. It was reported that the average contribution of the Australian creative industries to Gross Domestic Product (GDP) from 2004-05 to 2007-08 was about 2.8 per cent (CIE, 2009).

Malaysia's southern neighbour, Singapore, is also rapidly transforming itself into a creative city (Hing, 2008). Singapore is harnessing its creative industries as a primary engine of growth in the new knowledge-based economy. This national aspiration is documented in a blueprint entitled Economic Contributions of Singapore's Creative Industries which highlights how "the creative industries leverage on multi-dimensional creativity of individuals to create new economic values" (Toh, Choo & Ho, 2003: 51). In 2000, Singapore's Department of Statistics reported that the value of creative industries was around 3% of GDP. Singapore aims to develop the nation's creative industries to contribute 6% of GDP by 2012 and to employ 5-7% of the national workforce. These figures are comparable to other established creative cities such as London, New York, San Francisco and Venice. It is clear that the economic dimensions of the creative industries are vital determinants to indicate the strength of creative industries in a nation or a city, failing which would undermine the city's capacity to transform into a creative economy.

METHODOLOGY

Literature on creative industries and creative cities is mainly inclined towards the advanced economies; but research of this nature is scarce in the Malaysian context. As Malaysia's economy embarks on a structural transformation

towards services, this study on creative industries (which is predominantly service-based industries) is most timely. The inception of the National Creative Industries Policy in 2009 saw funds allocated to spur Malaysian creative industries such as film, music, animation, software development and other related creative activities. The availability of key statistics and data to illustrate the importance of these industries are, therefore, vital.

This study heeds this national call. Funded by the Universiti Sains Malaysia's Research University Grant, this study aims to explore the contribution of creative industries to economic growth in Malaysia. The following section explains the methodological challenges encountered in this pioneering study of creative industries in Malaysia.

Data Availability

Despite the existence of diverse taxonomy and classification of creative industries as reviewed earlier, this research opted for the classification used by the UK's DCMS (2010). Based on the United Kingdom DCMS's 13-sector classification, this study focused on obtaining secondary data on Malaysia's creative industries from existing Government blueprints such as the Five-Year Malaysia Plans, Malaysian Economic Reports and such. However, the attempt was futile since all these reports adopted the conventional method of displaying data and statistics. To date, all industries and sectors in the Malaysian economy are presented based on the Clark-Fisher's three sector model, namely, i) agriculture (First Sector); ii) industrial (Second Sector); and iii) services (Third Sector). No attempt has been made as yet to document and illustrate the contribution of Malaysia's creative industries to the economy.

The study then opted to source for primary data by contacting Malaysia's Department of Statistics (DOS). Correspondence between the researcher and DOS revealed another stumbling block. Apparently, Malaysia's existing classification does not support the creative industries classification as proposed in this study. DOS suggested the possibility to overlay and match UK's 13-sector of creative industries to the existing classification (i.e. Malaysia Standard Industrial Classification 2008, Version 1.0), which is currently used by DOS.

Malaysia Standard Industrial Classification 2008 (MSIC) Ver. 1.0

The Malaysia Standard Industrial Classification 2008 (MSIC) Ver. 1.0 is a classification of all economic activities in Malaysia. It adopts the International Standard Industrial Classification (ISIC) Revision 4 that was released in December 2006, incorporating all the necessary modifications to meet national requirements (MSIC, 2008). The main objective of the MSIC is to provide a set of activity categories that can be utilised for the collection and illustration of statistics according to such activities; of which industries are then established by grouping units with a common primary activity, based on specified similarity

criteria (MSIC, 2008). The structure provided by MSIC 2008 Ver. 1.0 is based on a ‘hierarchical levels of activities.’ The highest aggregation level known as “section” has 21 tabulation categories, and each is denoted by a single alphabetical letter as shown in Table 4.

Table 4: Hierarchical levels of activities based on Malaysia’s MSIC 2008 Ver. 1.0

Sections	Description	Divisions
A	Agriculture, forestry and fishing	01-03
B	Mining and quarrying	05-09
C	Manufacturing	10-33
D	Electricity, gas, steam and air conditioning supply	35
E	Water supply; sewerage, waste management and remediation activities	36-39
F	Construction	41-43
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	45-47
H	Transportation and storage	49-53
I	Accommodation and food service activities	55-56
J	Information and communication	58-63
K	Financial and insurance/takaful activities	64-66
L	Real estate activities	68
M	Professional, scientific and technical activities	69-75
N	Administrative and support service activities	77-82
O	Public administration and defence; compulsory social security	84
P	Education	85
Q	Human health and social work activities	86-88
R	Arts, entertainment and recreation	90-93
S	Other service activities	94-96
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	97-98
U	Activities of extraterritorial organizations and bodies	99

(Source: MSIC 2006, p. 4)

In MSIC, there are 88 two-digit divisions which constitute the highest numerical category. They are further broken down into more detailed categories encompassing 238 three-digit groups and 423 four-digit classes. In total, there are 1,197 five-digit items at the most detailed level. For instance, the formation of the five-digit code for items in Section A – ‘Agriculture, forestry and fishing’ is shown in Table 5. The summary of detailed levels used in MSIC is shown in Table 6.

Table 5: Example of formation of the five-digit code for each item

Level	Title and Description	Codes
Section	Agriculture, Forestry and Fishing	A
Division	Crop and animal production, hunting and related service activities	01
Group	Growing of non-perennial crops	011
Class	Growing of cereals (except paddy), leguminous crops and oil seeds	0111
Item	Growing of maize	01111
	Growing of leguminous crops	01112
	Growing of oil seeds	01113

(Source: MSIC 2006, p.5)

Table 6: Summary of detailed levels used in MSIC.

Sections	Divisions	Groups	Classes	Items
A	3	13	38	142
B	5	10	14	56
C	24	71	137	259
D	1	3	3	8
E	4	6	8	18
F	3	8	11	72
G	3	20	47	179
H	5	11	20	47
I	2	6	7	25

(Source: MSIC, 2006, p.5)

Subsequently, the study resorted to overlay and map the 13-sector creative industries based on the DCMS classification to the MSIC 2008. Although MSIC 2008 does not have specific classifications for creative industries in Malaysia, many of its detailed levels allow some forms of matching and identification with those of the established 13-sector creative industries. This feature may allow users to add more dimensions in future documentation and measurement work.

The process of mapping and matching the creative industries as identified in the DCMS taxonomy to the Malaysian context (via the MSIC document) was tedious at best. Meticulous effort was required to extract the coding of creative activities under MSIC that best reflect and coincide with those specified under DCMS. In this pioneering attempt, the exercise began with extracting data from existing classifications and then systematically reorganising them to separately account for the 13 sectors of creative industries as identified by the DCMS taxonomy. Generally speaking, the attributes of the creative industries are somewhat more difficult to identify and more tedious to measure than traditional industries, thus, requiring a certain degree of caution (CIE, 2009).

Nonetheless, the tedious process of searching and sieving through the items in the current MSIC 2008 and then match them to the UK's 13 sectors have yielded some positive outputs. This endeavour allowed us to gauge the extent of convergence or divergence in terms of matching the creative industries of both countries. Based on a simplistic and arbitrary assessment, indeed, the MSIC 2008 has items that match with the UK's 13-sector. Thus, the identified items from Malaysia's MSIC 2008 that coincide with the UK's classification can then be considered and classified as part of Malaysia's creative industry. The results of the matching process are illustrated in Table 7 below.

Table 7: Matching Malaysia's MSIC 2008 to UK's SIC

UNITED KINGDOM'S CREATIVE INDUSTRIES ACCORDING TO THE 2007 STANDARD INDUSTRIAL CLASSIFICATION (SIC) FOR ANNUAL BUSINESS SURVEY (ABS) DATA			MALAYSIA'S CREATIVE INDUSTRIES IDENTIFIED FROM THE MALAYSIA STANDARD INDUSTRIAL CLASSIFICATION (MSIC) 2008 VER. 1.0
Mapping Document Chapter	Sectors	STANDARD INDUSTRIAL CLASSIFICATION (SIC) (UNITED KINGDOM)	MALAYSIA STANDARD INDUSTRIAL CLASSIFICATION (MSIC) 2008 (MALAYSIA)
		Description	Description
1	Advertising	Advertising agencies Media representation	Item 73100 - Advertising
2	Architecture	Architectural activities Specialised design activities	Item 71101 – Architectural services
3	Art & Antiques	Retail sale in commercial art galleries Retail sale of antiques including antique books, in stores	<i>Unable to identify a closest match to its UK counterpart.</i>
4	Crafts	Majority of businesses too small to be picked up in business surveys.	<i>Unable to identify a closest match to its UK counterpart.</i>
5	Design	Specialised design activities	Item 74109 – Specialized design activities n.e.c.
6	Designer Fashion	Clothing Manufacture Specialised design activities	<i>Unable to identify a closest match to its UK counterpart.</i>
7	Video, Film & Photography	Reproduction of video recording Photographic activities Motion picture and video production activities Motion picture, video & TV post- production activities Motion picture and video distribution activities Motion picture projection activities	Item 47731 – Retail sale of photographic and precision equipment Item 59110 – Motion picture, video and television programme production activities Item 59120 – Motion picture, video and television programme post-production activities Item 59130 – Motion picture, video and television programme distribution activities Item 59140 – Motion picture projection activities Item 74200 – Photographic activities
9 & 10	Music, Visual & Performing Arts	Sound recording and music publishing activities Reproduction of sound recording Performing arts Support activities to performing arts Artistic creation Operation of arts facilities Motion picture, television and other theatrical casting	Item 18200 – Reproduction of recorded media Item 59200 – Sound recording and music publishing activities Item 85421 – Music and dancing school Item 90001 – Theatrical producer, singer group band and orchestra entertainment services Item 90002 – Operation of concert and theatre halls and other arts facilities Item 90007 – Activities of producers or entrepreneurs of arts live events, with or without facilities Item 90009 – Creative, arts and entertainment activities n.e.c.
11	Publishing	Book publishing Publishing of newspapers Publishing of journals and periodicals Other publishing activities News agency activities	Item 58110 – Publishing of books, brochures and other publications Item 58130 – Publishing of newspapers, journals, magazines and periodicals in print or electronic form Item 58190 – Publishing of catalogues, photos, engraving and postcards, greeting cards, forms, posters, reproduction of works of art, advertising material and other printer matter n.e.c. Item 82191– Document preparation, editing and/or proofreading Item 82192 – Typing, word processing or desktop publishing
8 & 12	Software & Electronic Publishing	Reproduction of computer media Business and domestic software development	<i>Unable to identify a closest match to its UK counterpart.</i>

		Computer consultancy activities	
		Other software publishing	
8 & 12	Digital & Entertainment Media	Publishing of computer games	Item 6210 – Computer programming activities
		Ready-made interactive leisure and entertainment software development	
13	Radio & TV	Radio broadcasting	Item 60100 – Radio broadcasting
		Television programming and broadcasting activities	Item 60200 – Television programming and broadcasting activities
		TV programmes production activities	
		Motion picture, video & TV post-production activities	
		TV programme distribution activities	

(Source: Compiled by the authors, 2015)

Although the current MSIC 2008 system cannot be regarded as the ultimate source for measuring Malaysia's creative industries, the MSIC 2008 does provide a basis or a platform for accounting and analysing the creative industries in Malaysia. The process of overlaying and matching the DCMS taxonomy with the MSIC 2008 was faced with many challenges given the inconsistencies and differences in economic activity categories adopted by these two documents. The following section discloses key methodological challenges and constraints encountered during the course of sourcing and collecting data on economic dimensions for Malaysia's creative industries.

METHODOLOGICAL CHALLENGES

Conventional methods (i.e. three-sector) still in use

Almost all of Malaysia's Economic Reports and Five-Year Malaysia Plans adopted the conventional standard classifications based on the three traditional sectors as identified in the Clark-Fisher's 3-Sector Model, namely, agriculture, manufacturing and services. However, creative industries which are predominantly service-based industries do not feature sufficiently under the umbrella of 'services industries' as shown in most recent Malaysian government blueprints. It is indeed a challenge to identify and extract data related to creative industries from these reports based on the DCMS classification.

Multiple and ever-evolving definition of creative industries

As elucidated in the Australian case, 'convergence' due to technological change and advancement is rapidly transforming definitions of industries and occupations (CIE, 2009). So much so that forces of economic globalisation such as technological innovation have invariably reorganised the way people work (Brown & Lauder, 2001). Specifically, digitisation and the 'almost universal access' to low cost telecommunication platform by the Internet has reorganised the nature of work by people, organisations and industries (CIE, 2009). Due to

the pervasiveness of advanced technology, industries that were once separated such as broadcasting, telecommunications and information technologies are now converged and overlapped. This situation resulted in changing work orientations involving a wide array of different types of businesses, occupations and skills. Oftentimes, these businesses, occupations and skills are not (yet) documented and listed as publishable statistical data for public consumption (Costa, 2008).

Absence of data from government agencies

Since research on creative industries is relatively new in the Malaysian scene, the Malaysian Department of Statistics does not (as yet) have up-to-date and publishable statistics and census data based on the creative industries taxonomy adopted in this study. There is a lack of panel or time series data on creative industries in Malaysia, or, for the individual states in Malaysia. This situation has posed another challenge in terms of comparing and contrasting the contribution of creative industries to other states in Malaysia, and to the wider national economy.

Inability to calculate Location Quotient

The absence of vital quantitative data such as ‘total contribution of creative industries to GDP’ and ‘total number of employees in creative industries’ further hampers efforts to tabulate the ‘location quotient’ for this study. Literature on creative industries and creative cities shows that the ‘location quotient’ is a useful indicator to show the spatial distribution and density analysis of the creative industries in a particular location, which is a prerequisite and determinant to brand a place as a creative city (Evans, 2009; Lazzeretti, Boix & Capone, 2009; Trullén & Boix, 2008). By definition, location quotient refers to the percentage of city employment relative to the percentage of national employment in the creative sectors (1 = national average) (Evans, 2009). In this study, the location quotient cannot be tabulated due to the lack of critical data. At this stage, the study is unable to identify which locality qualifies to brand itself as a creative epicenter in order to enhance its competitiveness and strategic positioning in Malaysia and globally.

Issues of data reconciliation

The process of charting the economics dimensions of Malaysia’s creative industries becomes more challenging when faced with data inconsistency and discrepancy such as references to different (raw) sources, reference to different time periods as well as issues on definitions, semantics and epistemology as mentioned earlier. Similar issues and challenges were encountered in Australian studies (CIE, 2009). Arguably, Malaysians working in creative industries can be elusive and ‘hidden’ in statistical terms. For instance, a Malaysian architecture

professor who is classified under the higher education industry should also be accounted as part of the creative industries (i.e. architecture). Interestingly, the Australian scenario also reported that some creative industries have a high percentage of volunteers and employees who are unpaid. Issues of data inconsistency and discrepancy make it more difficult to capture the actual contribution of the creative industries to the broader national economy.

Creative workers who hold more than one occupation

The flexibility of work in the creative industry enables some creative workers to hold more than one occupation at any given time (CIE, 2009). Research in Australia reveals that 63% of Australian artists are holding more than one job (Throsby & Hollister, 2003 cited in CIE, 2009). Malaysia has no empirical evidence as yet to support this statement; however, it is not surprising if some Malaysian creative workers also hold multiple jobs just like their Australian counterparts. Should this be the situation, it would pose another challenge in terms of documenting the actual employee headcount as well as tabulating the gross value added of creative industries to the overall Malaysian economy.

The Creative Trident approach – a compounded challenge?

Insofar most studies have viewed the creative economy from either the industry or the occupational perspective (DCMS, 2010; AuthentiCity, 2008; Toh, Choo & Ho, 2003). To reconcile the different orientations and to strengthen the creative economy analysis, a new approach to mapping the creative economy has been proposed. The creative trident approach identified by the ARC Centre of Excellence for Creative Industries and Innovation (CCI) is a ‘nexus between industry and occupation classification’ (CIE, 2009) which aims to provide a holistic and accurate estimate of the creative workforce. The creative trident approach proposes a cross-classification of employment by industry and occupation that permits the involvement and inclusion of three broad classes of employees, namely, i) specialist creatives; ii) support workers; and iii) embedded creatives as illustrated in Table 8. By definition, ‘specialist creatives’ are workers employed in creative occupations in creative industries; whilst ‘support workers’ are workers employed in creative industries but in non-creative occupations. The third category of ‘embedded creatives’ refers to workers hired in creative occupations, but in industries that do not produce creative products and services (CIE, 2009).

Table 8: The creative trident approach

Category of Employees	Employment with Creative Industries	Employment within other Industries	Total Employment
Employment in creative occupations	Specialist creatives	Embedded creatives	Total employment in creative occupations
Employment in other occupations	Support workers		

Total	Total employment in creative industries	Total creative workforce
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(Source: CIE 2009: 20)

Although the creative trident approach displays a wider and holistic view of the entire creative economy, the approach is not without its limitations. Firstly, since the trident approach is an employment-based measurement, there are no good and valid measures of output by occupation. As such, it is impossible to estimate the contribution by embedded creatives to the output of the industries that employed them. Secondly, the employment estimates in the creative trident approach are not comparable to conventional industries since this approach mixes the concepts of industries and occupations. Using a creative trident approach across industries may result in double counting at best (CIE, 2009).

CONCLUDING REMARKS

As contemporary literature and reality would affirm, many developed and developing nations as well as cities around the world are now gearing up to become creative cities, where the creative industries of these cities play a pivotal role towards economic development. Research on creative cities is perceived as most timely to chart the roadmap, milestones and key economic dimensions to illustrate the emergence of a creative economy as the new engine of growth. Malaysia is at this critical phase of national development trajectory where post-industrial sectors such as services and the creative industries are earmarked as the impetus for growth and progress. Malaysia is poised to capitalise on the dynamism of major cities such as Kuala Lumpur, Penang and Johor Bahru to spur economic development. The synergy between creativity and cities has inherently pointed to the importance and emergence of creative cities in Malaysia and ways to transform Malaysian cities to become a creative city in their own right.

As Malaysia's economy shifts towards services and the creative industries, it is hoped that the findings derived from this paper would generate more discussions on creative industries, creative cities and creative economy; and subsequently spur strategic initiatives and local interests to bring research in this area to greater heights.

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THE ROLE OF FABRIC BANNERS FOR COMMUNITY ENGAGEMENT IN DIGITAL ERA

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Abstract

This paper presents the role of fabric banners as a communication medium for community engagement, which would be the relevant communication medium for public participation in the development plan process. Discussions are based on findings from a study conducted in Subang Jaya-USJ, Selangor where the main objective was to evaluate the relevance of fabric banners as a communication medium in eliciting public participation in community engagements. The study was within a theoretical framework that links community engagement, urban way of life and the Media Richness Theory. Primary data were collected through self-administered survey under the purposive sampling method and in-depth interviews involving 100 local residents of Subang Jaya-USJ. Findings demonstrated that fabric banners are still relevant and functioning as an effective communication medium in community engagement, particularly in Subang Jaya-USJ. Thus, this type of communication medium should be seriously considered in town planning public participation process.

Keyword: community engagement, public participation, communication medium, media richness theory, urban way of life

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INTRODUCTION

The communication media used to disseminate information to urban communities in the digital age come in various forms such as the Internet, smartphones, mass printed media, fabric banners, billboards, buntings and pamphlets. With the objective of moving towards a paperless world, digital components have become a necessary communication tool for most people in their daily life. Concerns over global environmental issues, particularly on saving trees, have also seen an increased awareness where most people have resorted to the e-system such as e-newspaper, e-banking, e-government and emails in managing their day-to-day routines. Consequently, a study on the effectiveness of electronic media has been carried out to evaluate their impact on quality of life (Lee, Leung, Lo & Xiong, 2008; Lee, Leung, Lo, Xiong & Wu, 2011; Robinson and Martin, 2009; Liang, 2011; Chan & Huang, 2004; Boase, Horrigan, Wellman & Rainie, 2006). In this respect, the Internet and mobile phones have been found to be the two most important media in raising people's quality of life compared to television and other electronic media (Lee et al., 2008). However, Robinson and Martin (2009) claim that the Internet has resulted in fewer social visits by relatives and neighbours but higher visits by friends. Recently, Lee et al. (2011) has shown that internet communication is unable to predict quality of life as compared to face-to-face communication. In addition, Liang (2011) found out that the internet service usage has high positive influence on quality of life, but not in terms of e-Government services usage. Therefore, the effectiveness of electronic or conventional media in disseminating information still needs to be further examined even though some studies have been carried out (Levy & Banerjee, 2008; Wei, 2009; Soon & Kluver, 2007). Whether a medium is in digital or conventional form such as fabric banners, the effectiveness of the medium in information dissemination in urban environment is important in policy formulation and implementation (Srinivas, 1997), especially in the digital era.

The increasing number of urban population is followed by the increasing demand for optimum usage of urban resources. In Malaysia, the urban population has multiplied more than double in 40 years i.e. from 26.8% in 1970 to 71.4% in 2010, with the urbanisation rate recorded at 2.4% per year (The World Bank, 2011; Index mundi, 2011). The quality of urban life is monitored and planned by town planning authorities that indirectly shape the way people live and work. With the significant rate of urbanisation and the dynamic urban way of life, development planning in urban areas has faced greater challenges.

In creating sustainable living environment so as to attain Agenda 21 Rio-Summit declaration 1991, public participation is a pivotal factor. However, the planning process, which involves various stakeholders including the local

authority, the residents and non-governmental organisations (NGOs), is a time-consuming process and do not possibly address all affected parties even though it is a crucial factor to ensure the success of sustainable development. Therefore, a search for an effective method to increase participation in any community engagement is deemed necessary.

On the basis of the above findings, a study was conducted to evaluate the use of fabric banners as a communication medium to elicit public participation in community engagements. This paper reveals outcomes of the study, structured in eight sections. Section two deals with the urban way of life, followed by a section on fabric banners. In section four, community engagement is discussed. The fifth section describes the Media Richness Theory. Section six and seven discuss the methodology and results of the study, respectively. The paper ends with a discussion and concluding remarks in section eight.

LITERATURE REVIEW

Since urbanisation took place centuries ago, the urban way of life has evolved. There are two main perspectives in describing urban way of life (van der Veen, 2002; Gold, 2002), i.e. classical theory and contemporary. Karl Marx, Friedrich Engels, Ferdinand Tonnies, Georg Simmel, Emile Durkheim and Max Weber are among scholars who emerged from classical theory. Karl Marx and Friedrich Engels believe that the rise of a city is a transition from barbarism to civilisation. Ferdinand Tonnies, on the other hand, believes that there are two distinguished groups known as *gemeinschaft* (community) and *gesellschaft* (association). The former identifies three types of relationship in rural community, i.e. kinship, friendship and neighbourhood, while the latter associates the urban society with disunity, selfishness and individualism. Georg Simmel describes urban living as “in which individuals learn to discriminate, to use their head instead of heart, and to do something different in order to stand out in the city”; Max Weber believes that an ideal urban community requires market to serve as commercial relation, its own court and law, “partial political autonomy”, self-sufficient military and forms of social association (cited by van der Veen, 2002:4).

In addition, Robert Park, a contemporary scholar, argues that city is formed according to human way of life in a natural environment. He believes that human community is a product of four integrated factors, i.e. population, material and non-material cultural and natural resources that exist in a habitat (cited by van der Veen, 2002; Gold, 2002). Louise Wirth, whose work absorbs both Simmel’s and Park’s, believes that city produces a profound and distinctive mode of life. The shift from rural to urban life has affected every phase of

human life (Gold, 2002) and, thus, produces a distinctive urban personality. From the sociological approach, Wirth (1938:1) defines city as “relatively large, dense and permanent settlement of heterogeneous individuals”. Wirth (1938) claims that as the size, density and heterogeneity of a city increase, the social organisation and relationship would also increase. Besides being more socially tolerant, however, city people are more impersonal and less friendly; they can only be effective if they acted in organised groups (Wirth, 1938). Therefore, communication between individuals in the cities would be minimal unless they belong to a certain organisation. They spend most of their time at the work place, making them feel more associated with the organisation they are working with. This has led to disengagement with their neighbours and their neighbourhood, hence relying more on institutions such as the police force, rather than their neighbours, to look after their well-being. However, these institutions have greater tendency to cater for the masses instead of individual needs.

With such changes as observed in the urban way of life, face-to-face communication, which is perceived as the medium with the highest richness, between individuals within a neighbourhood does not take place as often as it would in an enclosed organisation. Furthermore, with the emergence of the Internet, urban society is currently more involved in virtual communication (Putnam, 2000). Even more now, social media has emerged as the new medium used in communication between organisations, communities and individuals (Kietzmann, Hermkens, McCarthy & Silvestre, 2011). It enables the construction of new connections between governments and citizens which could be difficult if it is done offline (Meijer, 2012). Moreover, Evan-Cowley and Griffin (2012) discover that microparticipation with social media could be effective in generating participation. It promotes multiple community memberships (Habibi, Laroche & Richard, 2014). However, it should not be used as a sole method since not everyone has access to the Internet (Chretien, 2013). Furthermore, it is also found that greater use of the Internet is associated with the decline in communication among family members and decrease of the size of social circle (Kraut et al., 1998). Urbanites only communicate with people whom they know (Boase et al., 2006). This study supports earlier work by Wirth (1938). Therefore, there is a need to identify an effective way of disseminating information to a wider urban society in order to reach a higher level of face-to-face communication.

Fabric banners

A fabric banner, also known as a cloth banner, is a piece of fabric that bears painted information on it (Merriam-Webster, 2011). Its size varies from one by

three metres to one by five metres. A fabric banner can be used for either indoor or outdoor signage and it comes in different shapes and colours. It is usually used for advertising purposes (GuestPoster, 2011). Normally, it is placed at the entrance of neighbourhood districts, school fences or entrance, or at road junctions. Words painted on a fabric banner are short and concise. Furthermore, its font type and size used is legible from a maximum distance of about fifty metres as shown in Figure 1.



Figure 1: Examples of banners found in Subang Jaya-USJ.

In Malaysia, fabric banners are usually used not only for marketing purposes but also as a communication medium to disseminate information by local authorities, neighbourhood associations and electoral parties. In Subang Jaya-USJ, the fabric banner is used as an important communication medium for neighbourhood associations to call residents to meetings or alert them on issues affecting their neighbourhood. It has also been used to invite residents to discussion sessions on matters pertaining to neighbourhood planning. Recently, the fabric banner has been used to call members of the public to attend a gathering. There are times when it is utilised in political campaigns containing messages that generate awareness on political issues by certain political parties in garnering support and denounce other parties. Thus, the fabric banner has been found to be a reliable means to invite residents for meetings and festival gatherings.

Community engagement

Community engagement plays a crucial role in policy formulation and decision making (Office of the Deputy Prime Minister, 2004). Defined as the process of building relationships between members to work together in a community, the main objective of community engagement is to achieve better living

environment (Gottlieb, 2006). It is a process of involvement and empowers communities to voice out their opinions on issues related to their livelihood (Purdam & Crisp, 2009). The causes of engagement can be due to community levels of satisfaction. If community members are satisfied with social offerings, their level of engagement will be higher (Grillo, Texeira & Wilson, 2010). The importance of community involvement can be learnt from the Warringah Council, for example, that designed a community engagement matrix in 2011. The matrix outlines the process of planning steps. One of the steps in the matrix is the 'inform' level of participation. 'Inform' refers to one way communication in providing balanced and objective information towards understanding something that is going or has happened (Warringah Council, 2011). The 'inform' may be disseminated via website, info session, media campaign, fact sheets, emails, letters or letterbox drop.

In Malaysia, community engagement is carried out in the public participation process, which is a mandatory requirement in the process of preparing development plans (structure and local plans) as stipulated under the Town and Country Planning Act 1976 (Act 172) and its amendments (Act 1129) under section 9 and 13 in 2003 (Law of Malaysia, 2006; Omar & Ling, 2009; Dola & Mijan, 2006). Commonly, in the public participation process the public exhibitions are used as the method to encourage the public to give feedback on draft local plans. For this purpose, announcements were made via advertisements in two main newspapers, one in the national language, Bahasa Malaysia, and the other in English language (Act 172). In contrast, Omar (2009) claims that series of workshops are more effective than public exhibitions in educating the public on public participation. Moreover, Omar and Ling (2009) and Rahman (2011) argue on other effective methods to increase public participation among Malaysians. They claim that television was the most important tool in educating and creating awareness among the public in Malaysia on public participation. Their arguments support the claim made by Lau and Lo (1991), Wijetunga (1996), and Taveesin and Brown (2006) that television was a powerful tool in educating the public about history, culture and politics. Television watchers were not distracted by the availability of personal computers (Suzuki, Hashimoto & Ishii, 1997).

Effective use of communication tool, therefore, will bridge the communication gap between government professionals and the community and, consequently, enhance public participation in urban settings (Lindquist, 2007). Nevertheless, in this respect, McLeod, Scheufele and Moy (1999) argue that the impact of different types of communication tools on community integration varies. In addition, the Media Richness Theory claims that face-to-face is the most effective medium in communication.

Media Richness Theory

The Media Richness Theory, developed by Daft and Lengel (1986), is the most widely known and used theory in explaining media effects (Daft & Lengel, 1986; Dennis & Kinney, 1998). It argues that performance increases as richer medium is used in communication, and that equivocality and uncertainty are two factors affecting communication in any organisation. Equivocality is ambiguity that arises when conflicting interpretations occur between groups on certain tasks or information, while uncertainty is a gap that exists between existing and required information. This theory considers face-to-face as the richest medium. Through this medium, information is conveyed not only verbally, but non-verbally as well in cues such as gestures, touch and vocal inflection (Daft & Lengel, 1986; Simon & Peppas, 2004). It claims that “communication media differ in their ability to facilitate understanding” (Daft, Lengel & Trovino, 1987:358). Communication that uses high richness medium will result in high and rapid understanding. The types of media can be hierarchically categorised according to their richness. Face-to-face medium of communication ranks top in this hierarchy, followed by telephone, addressed documents such as memo and, finally, unaddressed documents such as flyer and bulletin (Daft et al., 1987). They can also be hierarchically categorised according to their effects on quality of life in comparison to internet communication (Lee et al., 2011). According to Daft et al. (1987), the richness of a medium of communication is determined by four criteria: feedback, multiple cues, language variety and personal focus. The type of communication that is able to score high in these four criteria is ranked high in its richness, and there is a strong relationship between preference for medium and the type of communication used where rich medium is preferably used for unequivocal communication (Daft et al., 1987).

The Media Richness Theory has been tested by many scholars in various ways (Kahai and Cooper, 2003; Dennis & Kinney, 1998; Dennis, Kinney & Hung, 1999; Wright, Schwager & Donthu, 2008; Johnson & Keil, 1999; El-Shinnaway & Markus, 1992; El-Shinnawy & Markus, 1997; Simon & Peppas, 2004; Blau & Caspi, 2008; Sheer & Chen, 2004). When tested based on users’ gender, it is found that females perform better at their work place when medium with higher richness is used for communication (Dennis et al., 1999). In addition, audio conferencing can effectively perform as face-to-face communication (Blau & Caspi, 2008). It is discovered that visual anonymity results in reduction of fear of criticism and increase in participation. When tested with data collected using the traditional method such as pencil and paper, and the electronic method, it is found that adolescents are affected by the methods used (Wright et al., 2008). The use of mixed method does have an influence on the quality of data collected from adolescents as compared to

adults. In terms of website design richness evaluation, it is found that internet users are highly satisfied with rich sites as compared to lean sites (Simon & Peppas, 2004).

Not all scholars agree with the assumptions made in Media Richness Theory which appeared before the birth of the Internet. Currently, people rely not only on conventional media but also on new media such as email, voice mail and social network for communication purposes. Dennis and Kinney (1998:256) argue that “matching media richness to task equivocality did not improve performance” in terms of decision time and quality. Based on the four criteria in determining media richness, use of media with fewer cues such as email and voice mail, lead to higher performance but result in slower decision making or feedback (Dennis & Kinney, 1998). Furthermore, this theory does not consider the new functionalities and relationships of the new media (El-Shinnawy & Markus, 1997). New media such as email, voice mail, social network and video differ in their richness among users and between users and technologies.

Nevertheless, in terms of decision quality, the Media Richness Theory is still being upheld. According to Kahai and Cooper (2003), both richer and leaner media provide different levels of understanding that would affect decision quality. While richer media facilitate social perceptions and perceived ability, leaner media facilitate communication clarity. These outcomes depend on the knowledge and perception of the participants (Kahai & Cooper, 2003). Sheer and Chen (2004) suggest that decision on the type of media used to match up with message equivocality and media richness are based on four elements. First, when the message is positive, this theory is relevant. Secondly, however, when the message is negative, self-presentational goal will be the most powerful media choice predictor. Thirdly, choice of media is somehow affected by relational goals and, finally, complexity of a task. Most of the discussion above relates Media Richness Theory with managers within organisations. In this study, however, this theory is used to evaluate fabric banners as a communication medium in community engagement within the urban environment in the digital age.

METHOD OF DATA GATHERING

This study uses quantitative approach and in-depth interviews to further support its findings. Kruskal Wallis and Kolmogorov-Smirnov tests have been used to analyse the collected data. Secondary data were collected using the library search method while primary data, through a questionnaire survey using purposive sampling technique and interviews with local residents of Subang Jaya-USJ, Selangor in 2011. According to Oliver (2006), purposive sampling has an advantage in identifying participants that are likely to provide data.

Respondents that were chosen should be those who had seen the current banner/s as in Figure 1.

The study area

Subang Jaya-USJ, Selangor, Malaysia was chosen as the study area. It was the fastest growing community in the Petaling District (Figure 2) with a population increase of almost 20% in 10 years from 1991 to 2000. According to the Majlis Perbandaran Subang Jaya (2010) and Department of Statistics (2000), there were approximately 1,168,608 people living in Subang Jaya-USJ in 2000 and its population density was 66.4 people/hectare. Ranked as the 5th metropolitan in Malaysia, Subang Jaya-USJ offered 150,191 job opportunities and its job to population ratio was 34.4 (Jamaliah Jaafar, 2004; MPSJ, 2010).



Figure 2. The location of Subang Jaya-USJ in relation to Selangor and Malaysia.

In 1999, Subang Jaya was selected by the Malaysian Institute of Microelectronic Systems (MIMOS) to be transformed into a smart township by 2005 (Postill, 2006). The project aimed to transform the Subang Jaya community into a knowledge-based community which would later improve residents' quality of life in a sustainable manner. Among the objectives of the project was to increase ICT awareness and ease internet access with good infrastructures.

The Subang Jaya Municipal Council (MPSJ), nevertheless, often finds it difficult to elicit residents to participate in gatherings to prepare local plans. Although there is legal provision, public participation is not exercised to the fullest by both local authorities and residents due to either dissemination of inadequate information or ineffective use of communication medium (Srinivas, 1997). Through in-depth interviews with the residents, it was found that MPSJ had used the advertisement method to invite residents to attend a public gathering held at the Council's compound in 2007. However, the number of turn up was very small. Most residents were not aware of matters affecting their township until issues surfaced in a public hearing in 2007. An example was the issue of the development of Subang Ria Park, previously the green lung of Subang Jaya-USJ, into blocks of low density apartment (Rodzi, 2009).

Over the years, the Internet has gained its importance and seen an increase in the number of users in Malaysia (MCMC, 2011). The Subang Jaya community have been provided with excellent broadband infrastructures and web portals. Nevertheless, despite the privilege, since late 2008 fabric banners have been constantly used as a communication medium to inform urban communities of events, meetings and other activities, particularly in Subang Jaya-USJ. These banners are placed in various locations by state representatives and neighbourhood associations. Such use is considered unique because, in Malaysia, fabric banners are normally used for advertising purposes. Therefore, this study investigates the reasons for using and the effectiveness of fabric banners as a communication medium in Subang Jaya-USJ.

Survey

Out of 100 sets of questionnaires collected, only 90 could be used for analysis purposes. The remaining 10 sets contained incomplete and missing information. Non-parametric tests were used to analyse the data since the data have been found to be not under the 'normal distribution' curve.

Questions were divided into three parts: (1) respondents' background; (2) respondents' awareness of fabric banners and participation in activities; and, (3) respondents' suggestions. In Part One, questions include education level, gender, age and source of information. Part 2 or the 'awareness' component aimed to elicit respondents' opinion on the use of fabric banners as a communication medium, their placement location, satisfaction towards fabric

banner presentation and, respondents' participation in activities presented. Part 3 was intended to elicit suggestions on the use of fabric banners as a communication medium. The last two parts or components were measured using a Likert scale of 1 to 5, with 1 being 'most disagreed' and 5 being 'most agreed'. Respondents, who were the local residents, were approached at strategic points including shopping malls and restaurants where they spent most of their leisure time.

FINDINGS

53% of respondents were male. The majority of the respondents (78%) were within the working group aged 21 – 50 years old. In terms of education level, most respondents (27%) held *Sijil Pelajaran Malaysia*, a Malaysian high school certificate. This is followed by Bachelor's degree holders (21%) and post-graduate degree holders (20%). Although almost every home in Subang Jaya-USJ is equipped with internet access, most respondents still rely on printed materials such as newspapers and fabric banners, which scored a mean of 3.57 and 3.58 respectively, to obtain information (Table 1). Email and friends rank third and fourth, respectively, in their choice of information source.

Table 1: Media used and mean scores.

Media	Mean	Asymp. Sig. (2-tailed)
Fabric banner	3.58	.000
Newspaper	3.57	.000
Email	3.31	.091
Friends	3.19	.027
Pamphlet/brochure	2.84	.004
Forum	2.79	.004

When asked about the suitability of fabric banners as a communication medium, 81% of the respondents agreed to the idea. They were also asked about the suitable placement of banners. Most of them agreed that fabric banners should be erected on billboards and buildings, as well as hung on the MPSJ fence. The mean scores are 4.20, 3.80 and 3.62 (Table 2), respectively.

Table 2: Mean scores for suitable placement of fabric banners

Location	Mean	sd	Asymp. Sig. (2-tailed)
Billboard	4.10	1.050	.000
Building	3.80	.962	.000
MPSJ fence	3.62	1.087	.000
Pedestrian bridge	3.44	1.228	.000
Along the street	3.29	1.211	.002
Tree	2.72	1.112	.000

House fence	2.43	1.102	.004
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When asked about their satisfaction towards content features displayed on fabric banners, it was found that information richness and size scored a higher mean compared to other content features including colour, location and font. Furthermore, Kruskal Wallis was used to examine the significant difference between groups by gender and education level for this question. Results show that there is no significant difference between the groups (Table 3).

Table 3. Respondents' satisfaction towards fabric banner content features

Banner content features	Mean	Asymp. Sig. (2-tailed)
Information richness	3.74	.000
Size	3.67	.000
Colour	3.36	.000
Location	3.34	.001
Font	3.30	.000

Respondents were then asked whether they had attended any of the events published on fabric banners. Out of the 90 respondents, 66% attended. When asked whether their presence was affected by the information displayed on the banner, 93% of the respondents said that it somehow affected their decision to attend the event. This score presents a significant difference between the respondents' attendance and their decision to attend. Chi square test shows the significant difference ($X^2(2, n = 90) = 25.995, p < .005$).

In terms of attendance by gender, 58% of the respondents who attended events published on fabric banners were male. The score on chi square test shows there is no significant difference between gender groups ($X^2(2, n = 90) = 1.269, p > .05$). Similarly, there is no significant difference between groups when crosstab analysis was conducted to test between attendance and level of education ($X^2(8, n = 90) = 12.255, p > .05$). Respondents were asked if they were satisfied with the use of fabric banners as an effective communication medium. One sample Kolmogorov-Smirnov test shows a mean score of 3.92 ($n = 90, z = 2.941, p < .05$).

Finally, respondents were asked whether MPSJ should use fabric banners or its portal as the communication medium to invite residents to its events. Results show that respondents highly agreed to fabric banners.

Through in-depth interviews, respondents were asked whether the use of fabric banners is still relevant in this digital age. Respondent A who is 50 years old answered that fabric banners are still relevant. He said "it acts as a reminder", "it has all the information required", "it is clear and focus" and "it is easy to refer to". His opinion is echoed by Respondent B, 21 years old and Respondent C, 36 years old. They claimed that fabric banners are still relevant in this era. Respondent B said that although he spends most of his time on the computer and surfing the Internet, he still relies on fabric banners. He opined that "fabric banner acts as a source of information of activities happening in my neighbourhood". He added that it is very unlikely that young people would visit the local council's website. Therefore, they rely on the fabric banners. When asked about the best location to place fabric banners, both respondents chose billboards and buildings. Respondents A and C referred to a billboard located in front of a junction between commercial and housing areas. They considered the

billboard location as suitable due to the fact that the junction is a busy one. Respondent B, on the other hand, made reference to a billboard located at a junction in front of a row of shopping malls. He said that "it is suitable to put the banner here since it is visible not only to motorised vehicles, drivers and passengers, but also to the pedestrians who are passing by the shopping malls here". The font size and the banner size are quite big, hence visible from quite a distance. Information printed on the banner is short and concise. When asked to highlight which activities posted on fabric banners they had participated in, respondents A and C stated public exhibitions and residents association meetings, while respondent B, cycling events organised by MPSJ.

DISCUSSION AND CONCLUSION

Although the sample size used in this study might not be representative of the total population of Subang Jaya-USJ, results have shown the importance of using fabric banners as the medium of communication in eliciting residents to participate in community engagement regardless of their urban way of life. This is based on the following four reasons.

Firstly, the majority of residents still resort to public printed materials to obtain information on their surroundings. This finding is supported by the respondents' statements in in-depth interviews that they relied on fabric banners for information related to their neighbourhood activities. This shows that printed materials are still relevant although the Internet media seems to be more popular (MCMC, 2011). Therefore, fabric banners can be used as an effective medium in increasing public participation. This will add up to the list of media used in educating and creating awareness about public participation and inviting the public to engage in any neighbourhood events (Rahman, 2011; Omar & Ling, 2009). Although Omar (2009) claims that series of workshops are more effective than public exhibitions in educating the public on public participation, a medium is needed to play the role as a connector to link between the public and the events that are taking place. This study has shown that fabric banners are the said effective information tool as described by Waringgah Council (2011).

Secondly, the majority of respondents were affected by event information displayed on fabric banners. They attended the events and, thus, their attendance reflects that the fabric banners had elicited effective feedback. Through in-depth interviews it is also found that information displayed on fabric banners had somehow enticed residents who saw them to participate in events that were displayed. As such, it is consistent with one of the four criteria in determining richness of a communication medium i.e. effective feedback, as suggested by the Media Richness Theory (Daft et al., 1987).

Thirdly, contents and placement of fabric banners did have an effect on respondents' attendance. Respondents preferred that the banner be erected on billboards and hung on buildings for better visibility. Visual representation, clarity and placement are significant elements in determining the effectiveness of fabric banners as a communication medium. In addition, fabric banners have high level of multiple cues given their features. They allow residents to view detailed and specific information such as date, venue and purpose. Residents are able to make decisions on attending events or activities spontaneously.

Finally, fabric banners have the ability to attract people of various age groups, different genders and education levels. Results of analysis conducted earlier confirmed this statement. Although they are supplied with modern communication technology, the community still relies on fabric banners to organise community events and, at the same time, increase kinship and friendship among urban communities.

The Media Richness Theory claims that the effectiveness of a communication process depends on the richness of the medium used and, face-to-face ranked the highest. However, face-to-face communication might not be possible in an urban environment if the medium via which people are invited to participate in community engagements, is not available. Therefore, there is a need to utilise a communication medium for informing and inviting the targeted audience to gather, hence making face-to-face communication possible. In this study, fabric banners have proven to be an effective communication medium for such purpose. MPSJ should consider fabric banners as the alternative communication medium to elicit public participation in their event where they draft the next local plan for their township. This will then promote more sustainable urban living environment.

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THERMAL COMFORT AND ENERGY SOLUTIONS FOR A BETTER RESIDENTIAL ENVIRONMENT IN MALAYSIA

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Abstract

In hot-humid Malaysia, there are around five million units of housing. Among these, the medium-density terraced are the most built. However, little emphasis was given to designing for thermal comfort and energy efficiency. Consequently, air-conditioning is ubiquitous with ever-rising residential energy consumption. This paper studied passive design systems to improve living conditions and conserve energy through orientation and insulation parameters for terraced housing. Utilizing a triangulation of methods to correlate between thermal comfort and energy performance, findings from the questionnaire survey, data monitoring and computer simulation contended that with the passive design strategies minimum thermal comfort is attainable and energy savings predicted.

Keyword: terraced houses; passive design; thermal comfort; energy savings

INTRODUCTION

Malaysia has experienced rapid economic development and social transformation in the past four decades, characterized by rapid urbanization due to substantial population growth, which has in turn resulted in intensification in the demand for housing (Mohd Razali, 2002). Due to this phenomenon, many houses were urgently built, frequently being planned and designed without much forethought about the attributes of the local climate. As a consequence, these newly built houses are uncomfortable and hot (Davis, Shanmugavelu & Adam, 1997) and this has resulted in an increased use of energy for cooling (Byrd 2006), which has contributed to the effects of climate change.

Housing stock in Malaysia has increased and the latest residential property stock report for the first quarter (Q1) in 2014 puts the housing stock in Malaysia

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of all residential types at 4,746,184 units (NAPIC, 2014). Terraced house, consisting of single, double and even triple-storey houses, constitutes the largest type division at 41% or 1,923,802 units of the national existing housing stock and represents the most popular housing type (Phoon, 2004). With the rise of the housing stock the use of electrical energy in the residential sector inevitably increases as well. According to the national energy data available, energy consumption in the residential sector has increased from 17.5% in 2002 to 21% in 2006 (Energy Commission Malaysia, 2005). This increment is interlinked with the rise in the progressive efforts of the nation to develop which resulted in the emergence of the middle-class population in Malaysia (Torii, 2003), which is in turn, partly responsible for steering the trend toward an energy-intense lifestyle.

AIM AND OBJECTIVES

The aim of this study is to investigate the potential passive design strategies in typical medium density terraced houses in Malaysia in order to achieve thermal comfort for the occupants and be energy efficient as well. The paper seeks to ascertain the means by which energy consumption for cooling purposes in medium density terraced houses in Malaysia can be minimized. Given the nature of the climate, which is mostly hot and outside the comfort range throughout the year, it considers those design factors such as orientation and other design improvements to try to find alternate design strategies that will reduce residential energy consumption while maintaining thermal comfort. The information gathered will become the basis for all involved in the designing of the residential sector (especially for terraced houses) in Malaysia to rethink of a new design paradigm for the conventional approach of house building with particular attention to medium density construction.

BACKGROUND

Malaysia is situated in the hot and humid equatorial region, where daily temperatures between 24° - 34°C are common. It is slightly cooler when it rains. Coupled with high humidity (averaging more than 80% most of the year) and compounded by a lack of wind flow, thermal comfort is difficult to attain naturally. As a consequence, artificial ventilation is required almost all the time because internal conditions become hot and uncomfortable, not only during the day, but also well into the night. Studies have found that nighttime internal temperatures in terraced houses usually remain on the upper limit of the thermal comfort zone until the early hours of the morning. This necessitates some form of artificial cooling and of late the use of air conditioning has become ubiquitous. Due to this, the use of electrical energy in the residential sector has increased tremendously in recent years. On top of that, ownership of air conditioner units in 2005 had increased by 32% since 1999 and this is predicted

to increase to almost 60% by the year 2015 if the present trend persists (Saidur et. al., 2007). As a consequence, energy demand will increase as well. The availability of cheap and affordable air conditioner units due to the boom in the industry has made their purchase easier.

LITERATURE REVIEW

Housing Situation

Terraced house designs were introduced in Malaysia (then Malaya) around the beginning of the twentieth century during the early years of British colonial rule. Based on the British terraced home designs, the houses usually have only two elevations: the front and back. The living quarters and the main bedroom are located at the front of the house, and the kitchen and other bedrooms are at the back. Mass contemporary and intrinsic terraced houses have been built since the late 1960's, but the design of the buildings has not evolved much since its predecessor (Figure 1).



Figure 1: Contemporary terraced houses

Studies have established that the terraced houses designs are not climatically appropriate for hot humid climate of Malaysia. Davis et. al. (1997) and Noor Aziah (2008) established that most concrete terraced houses in Malaysia are comfortable for only a few hours a day, if at all, compared to the natural environment. The works of Al-Obaidi and Woods (2006) and Nugroho, Mohd Hamdan and Ossen (2007) also confirmed the poor thermal conditions of the present terraced house designs. One of the common design flaws being the inappropriate building orientation amplified the negative thermal effects even more. The use of passive design features, such as insulation in the roofs or walls or improvement in glazing, is seen as superfluous, costly and unnecessary.

Energy Situation

In Malaysia, buildings consume about 22 percent of total energy used with the residential sector using more than half that (Byrd, 2006). It also responsible for contributing about 7% greenhouse gas emissions. The trend is ever increasing and can be attributed to the country's projected high growth in economic activities and income. In reality, it may also be due to inefficiencies in the operation and the inherent design-related inefficiencies of the building sector (Balce & Soriano, 1999). Lack of regulations pertaining to energy efficiency of buildings in the earlier years can also be a factor. The re-introduction of the Malaysian Code of Practice on Energy Efficiency and Use of Renewable Energy for Non-Residential Buildings in 2001 (Department of Standards Malaysia, 2001) marked a major move by the country towards controlling energy use in commercial buildings. In 2009, a new Green Building Index (Green Building Index, 2009) – energy-rating tool was introduced to the residential sector in the tropical context to address the basic issues and problems of energy use in the residential sector.

Thermal Comfort Studies

Comfort zones delineated in ASHRAE Standard 55-2010 (2010) for summer conditions (similar to Malaysian climate) put it at having a neutrality value of 24.5°C with a comfort range between 23.0 – 26.0°C, airflow at 0.25 m/s and at 50 % humidity. The activity level is 0.5 met, for mainly sedentary work with Clo value of 0.5 (light slacks with short sleeves shirt or blouse). The standards based on theoretical analyses of human heat exchange in climate chambers using Fanger's (1972) predicted mean vote (PMV) formula, which predicts a numerical value for the mean subjective response to the thermal environment from a comfort scale. These standards however elicit a very narrow zone of occupant comfort; that is achieved through mechanical means with cost implications. However, researchers for the hot and humid conditions have debated these figures vigorously. Many studies have ascertained that these figures are not representative for naturally ventilated buildings and also for buildings with multi-variability controlled options. Nicol (2002) showed that ISO 7730 overestimates the occupant response on the ASHRAE PMV scale at high temperatures where subjects in field surveys in the tropics find higher temperatures as being comfortable than prescribed in the standard. Many researchers also argue that the standards “ignore importantly contextual differences that can attenuate responses to a given set of thermal conditions” (deDear, Brager & Cooper, 1997, pp: 7). The relevance of applying the standardized comfort zones for naturally ventilated buildings is questionable. Givoni (1994) acknowledged this matter by revising his work on the building bioclimatic chart by expanding the boundaries of the comfort zone with regards to people's' ability to acclimatize and adapt to a particular climatic condition under long exposure.

Sabarinah (2004), in reviewing thermal comfort zones for Malaysia based on local studies and other tropical countries in the region, summarises that comfort zones for Malaysia is between 25-30°C with 1.0 – 1.5 m/s of wind, for naturally ventilated buildings. However, Hui (1998) previously found that urban wind speed rarely exceeds 1.0 m/s, and indoor wind speed is less than half of that. Therefore, natural ventilation strategies are not as reliable and ideal for the urban and suburban context. Even when houses face optimum orientation for wind, studies by Noor Aziah (2008) found poor correlation between orientations with internal temperature; and consequently, energy consumption too. However, the houses do experience comfort ventilation from prevailing wind but this is an unreliable means of achieving comfort. This finding enhanced the idea that the natural ventilation is no longer a feasible means for achieving comfort for terraced houses within the urban context.

Building strategies

From the analysis of the hot-humid climate characteristics and thermal comfort requirements, the architectural means that can help in providing comfort in unconditioned buildings must be climate-responsive. Particularly for hot-humid climates, the design of the building should aim at lowering the indoor temperatures and enabling effective natural ventilation to achieve thermal comfort. In order to facilitate this, the main design consideration is the orientation of buildings, which can influence the solar and thermal conditions and ventilation potentials. Appropriately orientated buildings have the potential to exclude any unwanted direct solar radiation which can elevate indoor temperatures while admitting prevailing winds whenever possible. Shading devices, location and sizing of windows and other openings should also be dependent on the orientation.

Another important feature that can maximize the orientation impact is the selection of building envelope materials (roofs, walls, and glazing) along with the shape and form of the building. According to Givoni (1998), the thermal properties of the building materials govern the relationship between the indoor average temperature and swing, and the corresponding outdoor air temperature pattern; influenced to a great extent by orientation. In the urban and suburban context of terraced houses, the use of insulation is most advantageous to modify the internal temperature in order to achieve and maintain comfortable temperatures over a wide range of external conditions. Even when it is not possible to achieve comfortable conditions, insulated walls and roofs will minimize discomfort or reduce energy consumption where heating or air conditioning is used (Evans, 1980). Ibrahim (1987) emphasizes that the use of insulation on both walls and roofs can significantly reduce internal temperature and will protect the roof from extreme temperature cycling and will thus prolong building life. His findings also suggest that walls facing west and east

have a higher transmission value, and are, therefore, more critical and must be insulated to resist effects of solar radiation. Hence, the paper suggests investigating on both orientation and use of insulation parameters.

RESEARCH METHOD EMPLOYED

The method of research conducted sought to predict energy use and thermal comfort through computer simulation studies of hypothetical models. A model of an existing terraced house was simulated as the Base-Case (BC) study, and energy and thermal analyses undertaken to the performances. This was used as a benchmark for the Improvement (IMP) models: i.e. BC conditions with added passive design features. Comparative studies of the two models became basis for discussion and resulting recommendations for energy efficient design. The study uses the IES<VE> (Integrated Environmental Solutions <Virtual Environment>) program, which incorporated the validated powerful thermal analysis program ApacheSim. ApacheSim is linked with other suites of programs including SunCast, which analyses the shadowing impact of shading devices at different times of the day and year, and recalculates the energy output.

The aim of the investigation was to quantify the extent of energy and thermal performance due to varying orientation parameters on: firstly, a 'Base-Case' (BC) model using the conditions in an existing terraced house, and secondly on a series of Improvement (IMP) options where passive envelope features. The simulations were conducted for orientations from 0° - 350° at 10° intervals (36 orientations in all). The orientations were further divided into four different groups for reporting: NW-NE (316° -360° & 0°-45°); NE-SE (46°-135°); SE-SW (136°-225°) and SW-NW (226°-315°).

DATA ANALYSIS AND FINDINGS

This section presents the results of simulation studies conducted on terraced houses of varying orientations, utilizing passive design features for the envelope configurations. The results will report on the extent of energy savings and thermal performance on both the BC and IMP models along with a cost analysis of the IMP options as compared to the BC model. The simulation runs generated annual energy consumption (AEC) data in kWh per year (kWh/yr) and the thermal performances in terms of indoor temperature.

Base-Case (BC) Model Simulation

Results of the BC simulation revealed the annual electricity consumption (AEC) of the modeled house, which was assumed to have a typical roof with no insulation [R1], ½ brick thick walls with plaster on both sides [W1] and single clear float glazing [G1] for all windows and glazed doors. The abbreviation for the BC is [R1W1G1]. The findings revealed that the average energy

consumption over all the orientations was 7,789 kWh/yr. The highest energy consumption occurred with the orientation of 100° East at 7,948 kWh/yr, within the NE-SE (45° - 135°) zone. Meanwhile, the lowest consumption occurred at the orientation of 340° North at 7,606 kWh/yr, within the NW-NE (316° - 359° & 0° - 45°) zone. The difference in AEC savings between the worst case (NE-SE) and the best case (NW-NE) scenarios translated to approximately 4.3% difference or 342 kWh/yr savings.

Temperature Performance

In terms of the temperature performance, similar findings were also established where rooms facing easterly show the highest temperature during the day and night, while northerly facing rooms have had the lowest. The average indoor temperatures for all the orientations were much higher than the average outdoor temperature, as revealed in Table 1. The predicted temperatures in the BC model for all four orientations revealed that average temperatures during the day exceeded the upper limit of thermal comfort of 30°C established for the Malaysian climate with more uncomfortable conditions in the east orientation.

Table 1: Thermal performances of the living room in the BC model during the peak outdoor conditions

	Living		
	Max	Min	Ave
NORTH	33.4	28.5	30.7
EAST	35.1	29.5	32.6
SOUTH	33.3	28.7	31.0
WEST	34.0	28.5	30.9
Outdoor	35.6	24.1	28.3

Improvement (IMP) Model Studies

In order to improve the thermal comfort and reduce energy consumption of the BC model, the IMP model examined the effects of varying the improvements proposed on the BC model. The improvements used different thicknesses of insulation (25mm, 50mm, 75mm and 100mm) for the roof and wall, and different types of glazing (single and double). The IMP models were simulated in two steps: Step 1: INDV (individual) IMP investigated the energy performance of the different components individually – where one component was improved, and the two others remained, as shown in Table 2.

Table 2: Simulation components for INDV IMP options

STEP 1: INDV IMP					
Usage of insulation in 25mm thickness increment					
	BC (0mm)	25mm	50mm	75mm	100mm
ROOF	R1	R2	R3	R4	R5
WALL	W1	W2	W3	W4	
GLAZING	G1 (single)	G2 (double)			

The series of permutations for the individual combinations for the 36 orientations gives a total of 324 simulation runs. The results of AEC from Step 1 eliminated several of the individual improvements options deemed inappropriate, and the remaining IMP options were combined further. In Step 2 the best performances from Step 1 were examined and the combined improvement (COMB IMP) options of all three components with different variations (see Table 3) were investigated further.

Table 3: Simulation components for the COMB IMP options

STEP 2: COMB IMP					
	BC (0mm)	25mm	50mm	75mm	100mm
ROOF	R1	R2	R3	n.a	n.a
WALL	W1	W2	n.a		
GLAZING	G1 (single)	G2 (double)			

Table 4 shows the series of the COMB IMP options undertaken to elicit the findings of this study.

Table 4: COMB IMP options undertaken

ROOF1									ROOF2									ROOF3								
*R1	W1	G1	R2	W1	G1	R3	W1	G1	R1	W1	G2	R2	W1	G2	R3	W1	G2	R1	W2	G1	R2	W2	G1	R3	W2	G1
R1	W1	G2	R2	W1	G2	R3	W1	G2	R1	W2	G1	R2	W2	G1	R3	W2	G1	R1	W2	G2	R2	W2	G2	R3	W2	G2

The COMB IMP option gives a total of 12 variations, resulting in a final total of 288 simulation permutations. Findings of the simulation results are discussed below.

Energy Performance

Simulations of the AEC for the different COMB IMP revealed the option using [R3W2G2] or 50 mm insulation in the roof; 25 mm insulation in the walls and double-glazing presented the best AEC savings difference with the BC option. [R3W2G2] predicted an average AEC of 6,155 kWh/yr, which is 1,634 kWh/yr less than the BC scenario. The optimum orientation is between 270° and 320° (W - NW). Although East orientations still show the highest consumption, after subjecting the figures to statistical analysis, the results show no significant differences among the AECs of all orientations. Therefore, utilizing [R3W2G2], suggested that the orientation parameters have no influence on the house's annual energy consumption. From the results, due to the improved strategies of utilizing insulation in the roof and walls, and double-glazing for windows the energy consumption differences between the terraced houses from all orientations is slight. The inference is that when terraced houses are protected, energy usage can be optimized: even for houses facing both east and west, which usually have a higher energy use.

Temperature performance

Similar to findings from the energy performance, simulations of the thermal performance also indicated that lowest temperatures are predicted for the option utilizing [R3W2G2]. Figure 2 summarizes the differences in temperatures among the design options when applied to each of the four orientations.

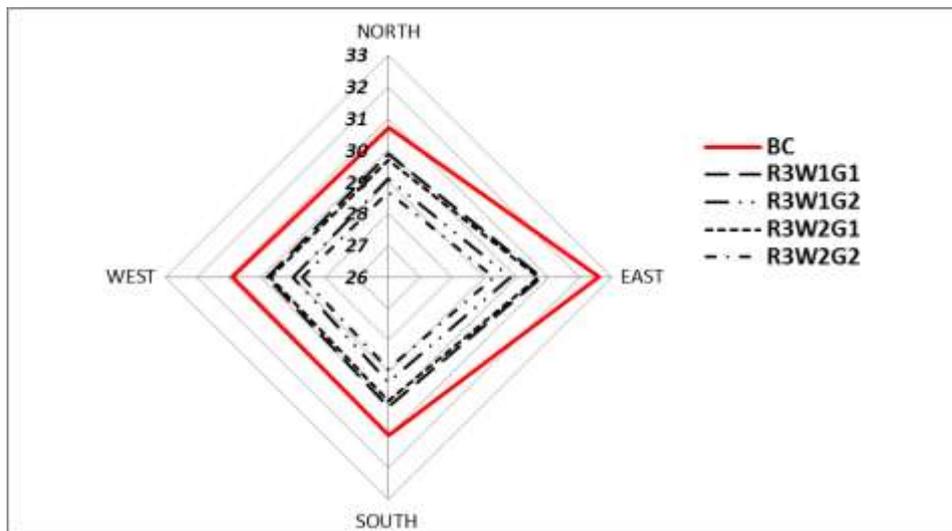


Figure 2: Differences in mean temperatures of the COMB IMP ROOF3 models at four different orientations with the BC

Figure 2 indicates that the highest temperatures occurred in the east orientation as in previous analyses, with option [R3W2G2] showing the lowest temperatures among the four options. The graph also shows a distinct difference in thermal performance between utilizing walls with insulation [W2] and without insulation [W1], with the former showing better results. Figure 2 also shows the BC temperature performance profile, where the highest temperature difference between BC and the best COMB IMP [R3W2G2] is 2 to 3 K, indicating better thermal performance for the improved options.

Regression analysis

Based on the simulations, the AEC data and optimum orientations were determined for the different IMP options. The next step was to provide a means for designers to use this data with simple mathematical calculation procedures to gauge the energy implications of orientation on their buildings.

A curvilinear regression analysis was performed to find the relationship between the AEC penalties as the dependent variable (y-axis) and the range of orientations from the optimum orientation as the independent variable (x-axis) for all the IMP options. From the analysis the best curve-fit regression line, is denoted by Equation 1. For this discussion, only the best results from the COMB IMP options will be used as examples, such as: [R1W2G2]; [R2W2G2] and [R3W2G2].

Equation 1: $Y = a + b_1 x_1 + b_2 x_1^2$

Where,

Y= predicted or dependent variable

a = constant (slope)

x = independent variable (explanatory variable)

b = intercept of x-axis on y-axis

From the regression analysis, the mathematical equations for the three COMB IMP options selected are as follows:

For [R1W2G2];

Equation 2: $y = 19.948 + .767(x) + .22(x^2)$

For [R2W2G2];

Equation 3: $y = 22.471 + 1.063(x) + .233(x^2)$

For [R3W2G2];

Equation 4: $y = 4.25 + .213(x) + .07(x^2)$

Where, (x) denotes each percentage of ranges (5%, 10%, 15% or 20%), either clockwise or anticlockwise from the optimum orientation.

The equations are used to calculate the AEC penalties for the different COMB IMP options. The equations can help designers to predict energy consumption for the houses should they stray from the optimum orientation.

Cost analysis

A cost analysis was conducted to find out whether these improvements or modifications to the building would increase the required capital expenditure. The reason was to examine the relationship between having more energy efficient house and the capital expenditure of the required improvements. Whether or not the investment is prudent will be determined by discovering the period required to recover expenditure and to compare it to the cost of energy consumption in the improved models. Table 5 summarizes the cumulative cost impact of all the COMB IMP strategies on the original cost of the BC, indicating the total capital expenditure and the recovery period in utilizing insulation and double-glazing in the COMB IMP options.

Table 5: Total investment costs and recovery period of investments of the COMB IMP options

Building Component	Ave. Running Cost/year		Actual savings			Capital expenditure (CP)		Total CP		Recovery Period* (year)
	MYR	USD**	MYR/yr	USD/yr	(%)	Insu.	Glaze	MYR	USD	
R1W1G1	1947	617	-	-	-	-	-	-	-	-
R3W1G1	1771	561	176	56	9.0	863.9	-	863.9	270	4.9
R3W1G2	1750	555	197	62	10.1	863.9	4076	4939.9	1566	25.1
R3W2G1	1676	531	271	86	13.9	1133.6	-	1133.6	359	4.2
R3W2G2	1539	488	408	129	21.0	1133.6	4076	5209.6	1652	12.8

* Recovery period is a ratio of total capital expenditure (CP) and actual savings in running cost.

** Current USD exchange rate at the writing of this paper .(Source: OANDA Currency Converter)

In the last column the recovery period of the capital investments is determined by the ratio between the total capital expenditure and the actual savings of the AEC, utilizing the different COMB IMP options. Generally, lower capital expenditures indicate a better internal rate of return (IRR) of investments in terms of the payback period (Gropelli & Nikbakht, 2006), as in the case for [R3W1G1] and [R3W2G1] denoting recovery periods of 4.9 and 4.2 years, respectively. According to Table 5, assuming a cut-off rate or rate of return of 10% as acceptable (Gropelli & Nikbakht, 2006), then the most profitable solution is option [R3W2G1] with a 14% IRR and a payback period of 4.2 years. In another scenario option [R3W2G2] shows the highest IRR (21%) and optimum thermal performance, but due to the higher capital investments where

the payback period is 12.8 years, this option is seen as being less viable because it is not the most economical. The cost of providing the improvements would offset the house buyer by more than MYR5,200.00 (USD1,652).

To emphasize the viability of option [R3W2G1], the statistical analysis ANOVA was conducted between the temperatures of [R3W2G1] and [R3W2G2]. Although the findings indicate that there is significant difference between temperatures from the different orientations in both COMB IMP options ($p = .032$ and $p = .026$, respectively), in actual fact, the difference in mean temperatures for both options is less than 1 K between the highest (East) and the lowest figures (North). This suggests that [R3W2G1] is the most appropriate strategy (based on this study) to increase thermal comfort, and yet reduce energy consumption in a terraced house with an acceptable payback period on investment.

CONCLUSION

This study was conceived and conducted addressing the main contention that housing can be made more energy-efficient and more comfortable with appropriate passive design features: orientation and passive building material improvements to the building envelope. The study investigated the impact of orientation on indoor thermal conditions and energy consumption of mass medium-density terraced houses in Malaysia. The key issue stressed on the impact of orientation and building design factors upon thermal comfort and energy savings. The main outcomes from the parametric studies were the predicted annual energy consumption (AEC) and thermal performance of the modeled terraced units. The findings show that lower energy consumption and better thermal comfort is attainable with some improvements made to the existing terraced houses. The passive design strategies applied in this study predicted energy savings of about 20% from the base case (BC) scenario and indicated good potentials for the improvement of the residential environment. The findings of this study is beneficial to building designers in residential planning and design in terms of AEC should their designs stray from the optimum orientation. This study is in line with the 11th Malaysia Plan, where Malaysia's bid is to reduce energy consumption and carbon emissions in all sectors. The residential sector was found to be one of the intensive energy consumer and all efforts to mitigate this problem is pertinent.

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**THE RELATIONSHIP OF HUMAN HAPPINESS AND
NEIGHBOURHOOD PLANNING: CASE STUDY PUCHONG INDAH
HOUSING ESTATE, SELANGOR, MALAYSIA**

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Abstract

People living in urban area are always linked to stressful life and less happiness. One of the symptoms is the increasing number of people experiencing depression. Besides, there is also the feeling of fear (unsafe) within the community. To overcome the problems, neighbourhood planning should take into consideration the elements of happiness. A study was carried out at Puchong Indah Housing Estate, with the objectives to examine the level of happiness of residents and to analyse the relationship between happiness and neighbourhood planning aspects. Questionnaire survey was conducted to identify the level of happiness and satisfaction among the residents. The Spearman correlation was applied for the relationship analysis. The main findings demonstrate that the people in Puchong Indah are happy. The residential area planning aspects, i.e. community relationship, accessibility to public areas, transportation and safety aspects were significantly related to happiness of respondents. Recommendations were constructed based on the findings.

Keyword: Happiness; neighbourhood; planning aspects; quality; satisfaction.

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INTRODUCTION

Happiness is a state of mind which is not straightforward in definition and is subjective. Thus, happiness brings many meanings. It is often related to an emotion state of well-being characterised by feelings ranging from contentment to intense joy. Barrow (1980) believes that happiness derives from a Latin word *felix* which sometimes translated as 'happy'. It implies fortune and the Greek word *eudaimon* which has a connotation of being favoured by the God. Happiness also appears to be originated from the archaic 'hap; meaning 'chance', 'luck' or 'good fortune'. As Argyle (1987) states, happiness relates to contentment, satisfaction, peace of mind, feeling fulfilled, enjoyment, pleasure and having fun. While Veenhoven (2001) identified the meaning of happiness as the meaning of the quality of life, in which social philosophy signifies a good living condition (happiness as the good society) and in moral philosophy as the sense of good performance (happiness as virtue). Meanwhile, in the context of social science, the word happiness is commonly used to denote subjective enjoyment of life. Subjective quality of life appraisals are referred to as 'aspect-satisfaction' and 'domain satisfaction'. Layard (2011) added that happiness is enjoying good life and wanting the feeling to be maintained. Furthermore, Fred (2008) agrees that happiness is not a static goal that individuals are able to attain by aspiring to it. Rather, happiness is a by-product of a "good life" (or civil happiness, as expounded by Aristotle) producing satisfaction over the long run. Happiness is therefore both an individual right, but seemingly important for societies' development (Greve, 2010).

Beyond doubt, everyone anticipates for happiness in life, especially people living in the city. Inhabitants around the cities and urban areas are always linked to problems which lead to unhappiness such as heavier work pressure, financial burden, the rise in goods prices and the cost of living, as well as low satisfaction of living conditions. Happiness is important to make our life worth for living. Apparently, there are many issues identified in relation to the study confirming the state of unhappiness of the Malaysian society, such as depressions, higher crime rates, child abuses, babies abandoned by teenage mothers and suicides. The former Malaysian Health Minister, Datuk Seri Liow Tiong Lai claimed that the ratio of suicides from 2007 to 2010 was 1.3 for every 100,000 people. However, Sipalan (2012) disagreed and commented that the statistics could be higher. Suicide is considered as rather a more valid measurement of happiness because it refers to revealed behaviour. The facts show that many people are not really happy and this situation might affect their mental health and the ability to face challenges in life.

In addition, Rosly (2014) discussed about some of the urban issues that had led to unhappy people in Malaysia. Generally, urbanisation is often

associated with the increasing crime rate in urban areas. Since the current rate of urbanisation in Malaysia is 63% and is projected to be 75% by the year 2020, crime is seemingly one of the main concerns of Malaysians. Crimes in residential areas has become a fact of life. The growing number of street crimes, crimes against humans and crime against properties have generated considerable fear within the community, making safety a greater issue. This results in the demand for critical attention at both local and national levels (Mohamad & Hanan, 2010).

According to Smith (2011), residential satisfaction is a degree to which the community meets a person's needs and aspirations. The degree to which these are met is dependent on a person's evaluation of the physical, social and personal elements of their community. Litman (2014) believes that well-designed and maintained city neighbourhoods have a significant impact on the happiness of city residents. Cities are important environment and these places can therefore facilitate human social connections and relationships because people are often connected to quality places that encompass of cultural value and distinctive. Hence, urban planners should design great places to live in, fostering health and happiness (Rosly & Rashid, 2012). The current Planning Guidelines published by the planning authorities in Malaysia have prescribed best practices in planning and design in creating a superior but affordable living environment that will ultimately promote happiness.

Happiness can be treated as a goal, also as an objective as it might come to be a target in specific urban or regional development project (Trkulja, 2007). As Layard (2011) suggested, in trying to achieve happiness, government should improves job security, reduce unemployment, provides more supports for parenting, creates better planning for the built environment, reduces mobility geographically (including immigration controls) and increases spending on mental health services. The Malaysian Government has decided that it is imperative to focus on the happiness of people as a yardstick to measure the country's development (Bernama, 2013). It will seek views on the role of Government as well as private and corporate organisations in creating a happy environment. This makes it even more central to investigate the relationship between happiness and urban planning, especially for neighbourhood areas.

LITERATURE REVIEW

Happiness relates to social (including social equality), economic/financial, and physical condition aspects of the living environment, as well as mental (people's feeling). According to Helliwell et al. (2014), happiness is an aspiration of every human being, and it can also be used as a measure of social progress. While Rosly and Rashid (2013) stated that happiness had been increasingly recognized as a science, and is pre-requisite in individual, family, and community life and development. However, happiness, satisfaction, utility,

well-being and other words have often been used without acknowledging the fact that they have been defined differently or have had different connotation or understanding throughout the history of mankind (Greve, 2010).

In general, the most important elements of satisfaction in human lives are family, home life, money, living standards, social relationships, social values, housing, work and health. The level of happiness can be measured by the increased level of health and mental health with the presence of certain social relationships and reduce the stressful life events. It leads to happiness which indirectly makes people become healthier and live longer (Argyle, 1987; Greve 2010). On the other hand, Leyden, Goldberg and Michelbach (2011) see personal income and wealth as factors predicting individual happiness. Figure 1 shows the variables of family relationships, work, community and friends, health, personal freedom, and personal values that are related to people's happiness, and is called the "Big Seven".

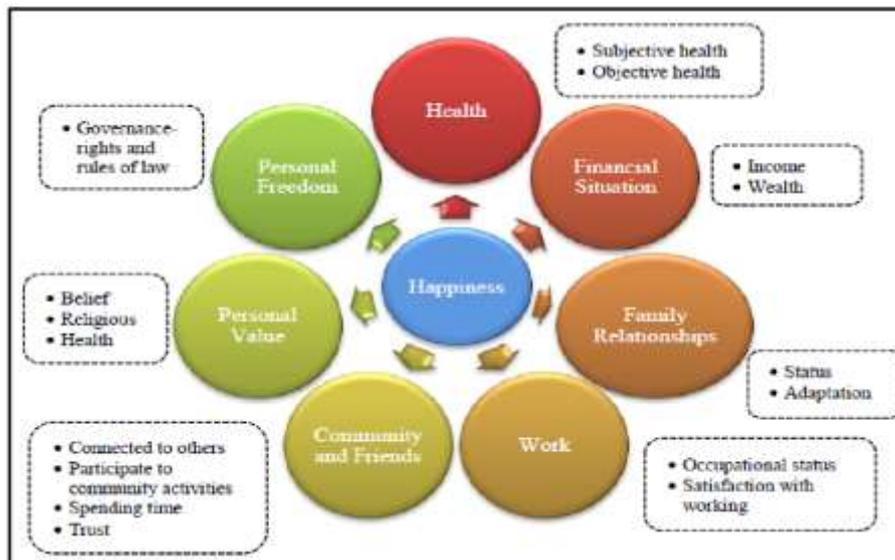


Figure 1: Factors affecting happiness
(Source: Adapted from Layard, 2011)

Happiness is a subjective matter as it is hard to be defined but it can be measured by questionnaire. Layard (2011) stated that people express about how they feel and it correspond closely to the actual levels of activity in different parts of the brain, which can be measured in standard specific ways. Some theorists linked a vibrant civil society to the built environment, urban places and, more specifically, to neighbourhoods. Table 1 informs a summary of the three examples of public efforts when measuring the happiness of people in the United Kingdom, Thailand and Bhutan.

Table 1: Summaries of happiness related measurement criteria in other countries

United Kingdom	Thailand	Bhutan
Gross Domestic Index (GDP)	Green Happiness Index (GHI)	Gross National Happiness Index (GNH)
Health	Health <ul style="list-style-type: none"> • Healthy Physical • Moral and ethnic mentality • Intelligence 	Economic Wellness <ul style="list-style-type: none"> • Economic metric • Example: consumer debt, average income to consumer price index ratio income distribution
Level of Satisfaction	Warm and Loving Family <ul style="list-style-type: none"> • Family role • Good relationship 	Environmental Wellness <ul style="list-style-type: none"> • Environmental metric • Example: Pollution, noise, traffic
Local Authority Services Inequality Income and Environment	Community Empowerment <ul style="list-style-type: none"> • Self-reliance community • Supportive community • Community participation <ul style="list-style-type: none"> • Economic Strength and Equity • Employment • Economic strength • Economic equity Surrounding and Ecological System <ul style="list-style-type: none"> • Basic needs • Safety in life and property • Good environment • Well balance of ecological system Democracy Society and Good Governance <ul style="list-style-type: none"> • Democratic awareness • Good governance • Harmonious society 	Physical Wellness <ul style="list-style-type: none"> • Physical Metric • Example: obesity or severe illness Mental Wellness <ul style="list-style-type: none"> • Mental Health metrics • Example: usage of anti-depression and rise or decline of physiotherapy patients Social Wellness <ul style="list-style-type: none"> • Social metrics • Example: discrimination, safety and divorce rates, complaints of domestic conflict and family lawsuits, crime rates Workplace Wellness <ul style="list-style-type: none"> • Labour metrics • Examples: jobless claims, job change, workplace complaints and lawsuits

Source: Adapted from Rosly and Rahid (2012) and Baramuechai (2007)

OBJECTIVES OF STUDY

The study had been carried out with the following objectives:

- i. To examine the level of happiness among the residents in study area; and
- ii. To analyse the relationship between the happiness of residents and the neighbourhood planning aspects.
- iii. To conclude and construct appropriate recommendation based on the findings.

RESEARCH METHOD

Scope of Research

This research was focused on the happiness of the residents and its relationship with the neighbourhood planning aspects, which covers the following scope:

- Psychological aspects of happiness level of residents including the feeling of happiness and satisfaction of life.
- Satisfaction of residents on the neighbourhood planning aspects that affect the people's emotion, which are social interaction in the area, accessibility to public area, transportation (accessibility of the area) and safety aspects.

Case Study

The study on human happiness and relation to the neighbourhood planning aspects was carried out at a neighbourhood area in Puchong Indah Housing Estate (Figure 2), located in Puchong Town, District of Petaling, in the State of Selangor.

The total size of the study area is 108.19 acres and the estimated population living in the boundary of study area is 4,025 people based on the calculation of household size in urban areas. The study area mostly covered by terrace houses and apartments. There are 632 units of terrace houses and 400 units of apartments consisting of eight (8) blocks.

Questionnaire Survey and Sampling of Respondents

The sample size of this research was 97 samples among estimated population of 4,025 people based on the calculation of the total number of houses with a 10 percent of a precision error. A questionnaire survey was designed comprising 36 questions and took an approximate 5 to 10 minutes for each person to complete the survey. The questionnaire which had been distributed to the residents was divided into two (2) sections which consisted of Section A (Profile of Respondent) that include questions about the characteristics of respondents through gender, age, employment, status, religious, income and type of property.

Meanwhile, Section B was on “Measuring the Happiness” which targets to obtain detail information about the respondents’ level of happiness, relationship with the community, their satisfaction level on accessibility to public area, accessibility (on transportation) and safety within their neighbourhood environment. Measuring the happiness referred to the average level of happiness within a particular month. According to Layard (2011), people normally accept the ups and downs, and care mainly because their average happiness is over a longer period of time. But the average is made up from a whole series of moments. The questions on happiness and satisfaction/happiness on neighbourhood aspects were designed in Likert Scale by rating their perception to indicate a degree of happiness or unhappiness by rating from 1 (not happy), 2 (less happy), 3 (moderate), 4 (happy) and 5 (very happy). Every single sub-topic in the questionnaire has an open ended question which requires the respondents to provide the reason why they have rated such answer to “1” or “2” (which are the lowest marks in describing happiness and satisfaction/happiness on the neighbourhood aspects).

The background characteristic of the respondents is summarised in Table 2. There were 53 percent of male respondents while 47 percent were females. Majority of the respondents were between 50 years and below, and mostly were married (69 percent). In terms of employment, majority of the respondents are in full-time employment. There were 30 percent of the respondents with an income below RM 840, which is categorized under poverty level. However, majority of the respondents (63 percent) were earning between RM 841 to RM 5,000. Additionally, 56.7 percent of respondents live in terrace houses, while the rest live in apartments.

Method of Analysis

The data were analysed by using the Spearman correlation method in the Statistical Package for Social Science (SPSS) software. The purpose of the

correlation was to establish the relationship between happiness and neighbourhood planning aspects/factors.

Table 2: Background of respondents

VARIABLES	PERCENTAGE OF RESPONDENTS (%)
Gender	
Male	52.6
Female	47.4
Age	
16-18 years old	16.5
19-22 years old	5.2
23-30 years old	21.6
31-50 years old	39.2
51-60 years old	9.3
> 60 years old	8.2
Employment	
Full-time working	47.4
Part-time working	9.3
Unemployed	4.1
Self-employed	5.2
Retired	8.2
Student	16.5
Housewife	9.3
Status	
Single	30.9
Married	69.1
Religious	
Religious	88.7
Non-religious	6.2
Income level	
RM 840 and below	29.9
RM 841 - 3,000	42.3
RM 3,001 - 5,000	20.6
RM 5,001 - 7,000	2.1
RM 7,000 – 13,000	0.0
RM 13,001 and above	1.0
Type of house	
Terrace house	56.7
Apartment	43.3

RESULTS AND FINDINGS

Happiness Level

Since happiness is a subjective matter, it is suitable to be measured through psychological perspective of the respondents. There were two variables (questions) that were directly measuring the happiness which are:

Variable 1: Consider themselves as happy people

Variable 2: Satisfied (happy) with life

For Variable 1 (V1), the survey asked the respondents to evaluate themselves whether they consider themselves happy or not. As shown in Table 3, majority of the respondents (70% from the total respondents), were happy or very happy. There were around 23 percent which felt that they were moderately happy. There were only 3 percent of the respondents that felt less happy. Variable 2 (V2) evaluates people's satisfaction on their life. This study shows that majority (around 60%) of them were satisfied (happy) or very satisfied (very happy) with their life. None of the respondents were not happy about their lives (Table 3). By averaging V1 and V2, results show that none of the respondents was less (or not) happy (Table 3). Instead, 47.4 percent of the respondents were happy, 21.8 percent were moderately happy and 16.4 percent were very happy.

Table 3: Happiness level of respondents

LEVEL OF HAPPINESS	V1: HAPPY PERSON		V2: SATISFIED WITH LIFE		AVERAGE OF HAPPINESS	
	No. of respondent	%	No. of respondent	%	No. of respondent	%
Not happy	0	0.0	0	0.0	0	0.0
Less happy	3	3.1	0	0.0	0	0.0
Moderate	22	22.7	29	29.9	21	21.8
Happy	51	52.6	46	47.4	46	47.4
Very happy	17	17.5	12	12.4	16	16.4
Refuse to answer	4	4.1	10	10.3	14	14.4
Total	97	100.0	97	100.0	83	100.0

From the cross tabulation analysis, it showed that most of the "happy person" (V1) were "satisfied with life" (V2). Meanwhile, most of the "very happy persons" were "very satisfied with life". For those who were "less happy" are moderate in term of the satisfaction of life (Table 4). The relationship between V 1 "happy person" and V 2 "satisfaction with life" was positively, strongly and significantly correlated at 0.01 level ($p= 0.000$; $r= 0.781$). It explains that if they are more satisfied with their life, they are happier. Happiness is achieved when respondents are satisfied with their life and consider themselves a happy person.

Table 4: Cross tabulation analysis between V1 and V2

V1:Happy Person	V2: Satisfied with Life (%)		
	Moderate	Happy	Very Happy
Not Happy	0.0	0.0	0.0
Less Happy	3.6	0.0	0.0

Moderate	21.7	4.8	0.0
Happy	4.8	45.8	4.8
Very Happy	0.0	4.8	9.6
Total	30.1	55.4	14.5

Happiness in Relation to Neighbourhood Planning Aspects

For the purpose of analysing the relationship between the happiness and the neighbourhood planning aspects, four (4) main aspects of neighbourhood planning had been studied, which were:

- Level of community relationship in the neighbourhood area, which covers two (2) sub-aspects: social interaction in community, and communicating with neighbours.
- Level of accessibility to public areas i.e. green spaces, educational facilities, religious facilities, social centre, and health facilities.
- Level of accessibility (transportation) of the area, which covers five (5) sub-aspects: satisfaction on overall transportation system, private transportation, public transportation, cycling, and walking.
- Safety aspect, which covers the safety level in the house, safe living in the neighbourhood area, and common crimes in the area.

The neighbourhood planning aspects had been measured based on the satisfaction or perception of respondents on the level of the neighbourhood aspects (Tables 5 to 18). Most of the respondents were moderately satisfied or satisfied with most of the aspects. However, the results of the level of satisfaction of respondents for every neighbourhood planning aspects are not being discussed in this paper. This chapter focuses on the output of relationship analysis (correlation) between the neighbourhood aspects and the average happiness of residents.

Table 5: Satisfaction or perception on neighbourhood aspects (Part A)

SATISFACTION OR PERCEPTION (PERCENTAGE OF RESPONDENTS)							
	Social interaction in community	Communicating with neighbours	Access to Public Green Spaces	Access to Educational Facilities	Access to Religious Facility	Access to Social Centre	Access to Health Facilities
Very weak	0.0	0.0	0.0	0.0	0.0	4.1	0.0
Weak	7.2	4.1	4.1	0.0	4.1	8.2	4.1
Moderate	46.4	42.3	51.5	47.4	22.7	50.5	24.7
Somewhat strong	38.1	49.5	39.2	48.5	64.9	28.9	66.0
Very strong	8.2	4.1	5.2	4.1	8.2	8.2	5.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean value	3.47	3.54	3.45	3.57	3.77	3.29	3.72

Table 6: Satisfaction or perception on neighbourhood aspects (Part B)

SATISFACTION OR PERCEPTION (PERCENTAGE OF RESPONDENTS)							
	Overall Transportation System	Private Transportation	Public Transportation	Accessibility by Cycling	Accessibility by Walking	Safe in their own house	Safe in neighbourhood
Very weak	0.0	0.0	0.0	8.2	4.1	4.1	4.1
Weak	8.2	8.2	8.2	5.2	10.3	4.1	0.0
Moderate	37.1	28.9	28.9	34.0	14.4	35.1	38.1
Somewhat strong	41.2	45.4	55.7	49.5	56.7	40.2	45.4
Very strong	9.3	9.3	1.0	0.0	8.2	16.5	12.4
n/a	4.1	8.2	6.2	3.1	93.8	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean value	3.54	3.61	3.53	3.29	3.58	3.61	3.62

Table 7: Perception on neighbourhood aspect - common crimes

% OF RESPONDENTS	
Never	9.3
Rarely	12.4
Moderate	39.2
Sometimes	39.2
Always	0.0
Total	100.0
Mean value	3.08

Relationship between residents' happiness and community relationship in the neighbourhood area

From the correlation tests, results show that sub-aspect of “social interactions in community” was positively, strongly and significantly correlated at 0.01 level ($r= 0.520$; $p= 0.000$) with an average happiness level of residents (average of V1 and V2). Besides, the sub-aspects of “communicating with neighbours” was also positively and significantly correlated (at 0.01 level) with an average happiness of residents ($r=0.505$; $p= 0.000$). This shows that stronger community relationship (social interaction and/or communicating with neighbours) is going to increase the happiness of residents.

In the study area, it can be seen that Puchong Indah residents have good social interaction with neighbours. They communicate with the people in their surrounding especially while they are waiting for their children to return from schools or when they are accompanying the children at the playgrounds.

Relationship between happiness of residents and accessibility to public areas

Correlation tests show a weak, positive and significant correlation (at 0.01 level) between average happiness of residents and satisfaction of residents on accessibility to green spaces e.g. parks ($r=0.383$; $p=0.000$); as well as the accessibility to health facility ($r=0.317$; $p=0.003$). This shows that an increase of accessibility to public areas (i.e. green spaces and health facility) will increase the happiness of residents of the neighbourhood (study area).

However, the relationship between happiness and satisfaction on accessibility to other public areas i.e. educational facilities ($r=0.166$; $p=0.134$), religious facility ($r=0.120$; $p=0.279$), and social centre ($r=0.194$; $p=0.80$) was very weak and insignificant even at the 0.05 level. This shows that accessibility to educational, religious and social facilities is not significantly affecting the level of happiness of residents. It might be due to the scenario that majority of the respondents are not students, and focus less on the facilities of religious and social centres in their neighbourhood area.

Relationship between happiness of residents and accessibility (transportation) of the area

Results of relationship analysis show significant correlation (but weak) between the average happiness of residents and satisfaction of residents on accessibility of the study area for the sub-aspects of public transportation ($r=0.225$; $p=0.049$), cycling ($r=0.356$; $p=0.001$) and walking ($r=0.342$; $p=0.02$). However, the results of correlation between average happiness of residents and their satisfaction on the other sub-aspects of accessibility show very weak and not significant even at the 0.05 level, i.e. overall transportation system ($r=0.048$; $p=0.677$), and private transportation ($r=0.118$; $p=0.301$). This shows that accessibility in terms of public transportation, cycling and walking do affect the happiness level of residents. Meanwhile, the accessibility of private transportation does not affect the happiness of residents.

Relationship between happiness of residents and safety of the area

Safety level (as measured based on the 3 sub-aspects) of the area was significantly correlated (at level of 0.01) with an average happiness of the residents (Table 19). It shows that safety perception of respondents on their properties, neighbourhood and crime are significantly related to the average happiness of residents. The increase of safety level for the house and neighbourhood were able to increase the happiness of residents. That means respondents are feeling happy when they felt safe in their house and neighbourhood. People who were anxious even inside the house were not happy

because they are living in fear. Among the most common crime in the study area is robbery, thefts, stolen vehicles (cars or motorbikes), and vandalism.

Table 8: Correlation between average happiness and Sub-aspects of safety

Correlation between average happiness and sub-aspects of safety	Correlation coefficient (r)	Significant level (p)
Feeling safe in their own house	0.437	0.000
Feeling safe in the neighbourhood	0.556	0.000
Perception on common crimes	0.405	0.000

SUMMARY AND CONCLUDING REMARKS

In general most of the respondents were happy and satisfied with their lives. In term of the relationship between happiness and neighbourhood planning aspects, analysis showed some neighbourhood aspects were weak and not significantly correlated while some of the aspects were strong and significantly correlated with happiness of residents.

The factors that are statistically less related to happiness are satisfaction on the accessibility to education, religious and social centre/facilities, and satisfaction on accessibility of overall transport system and private transportation. While for the strong and significant relationship between neighbourhood planning aspects and average happiness of respondents are community relationship, safety, accessibility to green spaces and health facilities, and accessibility of the area (in the aspects of public transportation, cycling and walking).

To conclude, the neighbourhood planning aspects are contributing to the happiness of residents. Thus, town planners and designers should properly plan a neighbourhood for the purpose to improve the happiness of the residents. However, not all of the aspects are significantly correlated to the happiness level. The result might be different if the study was to be carried out in a different study area due to the different perception of people. Thus, further studies should be carried out in different areas in the future to provide a more comprehensive understanding on the happiness of residents in different areas in relation to the neighbourhood planning aspects.

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ASSESSING THE URBAN AND RURAL STAGE BUS SERVICES DISPARITIES IN PENINSULA MALAYSIA

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Abstract

Disparities between services and goods provision have been the concerns of various regional development proponents. Among the gaps that needed to be addressed by regional policies and initiatives were accessibility and mobility levels between urbanites and the rural population. This study reports on the differences of the urban versus rural bus services. For this purpose, this study extends the exploration of approximately 48 routes within selected urban and regional settlements in Peninsula Malaysia, using a quantitative traffic engineering measure known as Level of Service standards or LOS. Three performance measures, namely fixed-route hour of service, fixed-route service frequency and passenger-load threshold were evaluated in determining the existence and extent of such disparities. The passengers' satisfaction and preference survey were conducted to complement some qualitative explanations left void by the LOS evaluation. Methods of on-board face to face intercept survey and adoption of Geographical Information System (GIS) /Global Positioning System (GPS) were deployed in the collection of primary data. More than 1600 survey forms were distributed, but after collection and data cleaning, only a total of 1130 were analysed. Findings of the study supported and confirmed the existence of such spatial imbalances of services provision. They also further accentuated that many developing nations' rural settlements were indeed stigmatised by a lower level of stage bus services (average at LOS D) compared to those enjoyed by the urbanites (average services at LOS C).

Keyword: transport planning; public transport; passenger's aspiration; onboard survey

INTRODUCTION

An issue greatly discussed by many regional stakeholders is the urban and rural divide of Malaysian mobility and accessibility levels (Nor & Nor, 2006; Roslan, 2001; Siong, 2008; Thompson, 2004). This divide hindered systematic and comprehensive growth of rural areas especially in network infrastructure

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upgrading and accessibility improvement. One of the main contributors of the disparity is inefficient public transport system, whereby the lack of such system would limit the choices, circumstances and fortunes of the population to reach amenities and facilities as well as access the employment opportunities (Kamba, Rahmat, & Ismail, 2007; Olsson, 2012; Pucher & Renne, 2013).

In some parts of the world, public transportation, such as buses in urban areas, is an optional mode to overcome many traffic issues including to reduce congestion, to increase the coverage of distances and to improve the mobility levels (Abdullah, 2006; Ismail, Hafezi, Nor, & Ambak, 2012; Jayaraman, Choong, Suan, & Lin, 2011; Ponnaluri, 2011; Suwardo, Napiah, & Kamaruddin, 2009; Yaakub & Napiah, 2011a, 2011b). However, for some rural populations who are captive to buses, these are the only access modes to destinations near and far. Whilst many services are provided to varying degrees in Malaysia, less have been prioritised on ensuring the buses' integration, coordination and monitoring to reach an efficient level of sustainability (Hayashi, Doi, Yagishita, & Kuwata, 2004).

This study engages with the current system of public bus services in four main conurbations and suburban areas of Malaysia. There existed some 62,672 buses registered in Malaysia (Ministry of Transport Malaysia, 2014), comprising five major systems namely stage bus (intra-city), minibus, express bus (interstate and intercity), school and factory workers' bus and feeder bus (Land Public Transport Commission (SPAD), 2012; Suruhanjaya Pengangkutan Awam Darat (SPAD), 2014a). Various subsystems such as fleets, management and operating, scheduling, routing, stops and termini, boarding and alighting facilities, fare and ticketing as well as passenger information support the vehicular services system (Land Public Transport Commission (SPAD), 2011; Suruhanjaya Pengangkutan Awam Darat (SPAD), 2014b). In Peninsula Malaysia, Acts of Parliament related to public buses including stage buses provide legislative backing of statutory roles and functions of the Suruhanjaya Pengangkutan Awam Darat (SPAD) or Land Public Transport Council (SPAD, 2014) to plan, develop, issue licenses, regulate and monitor, execute and upgrade these supply systems. Being one of the Prime Minister's departments, the Council is deemed to have credentials of ensuring that the delivery of bus services to be more effective, efficient and accountable (since it is partially subsidised by the government).

RURAL VERSUS URBAN BUS SERVICES

Issues of the urban-rural public bus in Malaysia received less than proportionate attention by the global literature (Abdullah, 2006; Ismail et al., 2012; Jayaraman et al., 2011; Ponnaluri, 2011; Suwardo et al., 2009; Yaakub & Napiah, 2011a, 2011b). Whilst many research highlighted the issues pertinent to countries, regions, cities and ruralities facing imbalance physical and socio-economic

growth, contemporary literature has focused more on cases of developed nations' urban-rural gaps (Hidding & Teunissen, 2002; Odeck & Alkadi, 2004; Odeck, 2006; Pucher & Renne, 2013). Limited literature can be cited for an in-depth discussion on quality and performance (operation) of urban-rural public transportation especially buses in Malaysia (Jayaraman et al., 2011; Kamaruddin, Osman, Anizaliana, & Pei, 2012; Napiyah, Farid, & Suwardo, 2010; Noor, Nasrudin, & Foo, 2014; Sham, Samsudin, & Rahman, 2013; Suwardo et al., 2009; Suwardo, Napiyah, & Kamaruddin, 2008a, 2008b). Most studies in public transportation were carried out in the specific areas of urban or rural localities distinctively, and these lack the comparative element in their discussion (Jayaraman et al., 2011; Kamaruddin et al., 2012; Napiyah et al., 2010; Noor et al., 2014; Sham et al., 2013; Suwardo et al., 2009, 2008a, 2008b). Previous studies have purposively concentrated on ridership and improvement of bus services in a case study manner, providing scarce literature sources for regional disparities assessment. Hence, in-depth regional comparison and rigorous evaluation of rural-urban bus services divide is made difficult, if not impossible. This particular research fills in this literature gap.

Often, bus operations are varied by types and features, where distinctive characteristics are found between those of urban and rural, such as route coverage, fare and fleet systems (Odeck & Alkadi, 2004). These systems and fleet characteristic variations have been attributable to the socio-economic, value-belief-culture and geo-spatial differences of the localised needs. As nations grow, Asian urban centres are faced with mobility issues and automobile dependency. In rural areas, this effect is compounded by the limited alternatives (Bailey, 1986; Bell & Cloke, 1991; Dandapat & Maitra, 2015; Santoso, Yajima, Sakamoto, & Kubota, 2012). Additionally, the existing public transport in both localities encountered problems of low and poor quality of service operation, infrastructure and facilities, the similar conditions faced by capital cities and rural settlements of Malaysia (Jayaraman et al., 2011).

Hook, (2006) suggested that costs and time are factors contributing towards the fewer trips made by the urban lower income groups in developing countries. In addressing this, it was argued that urban mass transit (public transport) provision would boost the efficiency of movement for lower income people. Examples of best practices can be found in Singapore's rail-based mass rapid transit (MRT). In many urban areas, due to barriers of high investments that rail is associated with, bus system such as Brazil's bus rapid transit (BRT) is considered a better and more functioning alternative to reduce automobile dependency, in pursuit of the preservation of the geo-cultural and sustenance of the regions (Currie & Delbosc, 2014; Jaramillo, Lizárraga, & Grindlay, 2012; Patrick & Roseland, 2005). However, this situation may not be a true reflection of the urban-rural public bus ridership reality in Malaysia. Whilst programmes of bus services transformation may be adopted for urban systems, different

treatments may be necessary in rural areas which have a lower density and diverse population activities within sparse geographical areas.

The Level of Service (LOS) and passengers' satisfaction are two viable measurement tools in assessing bus services performance (Chen, Yu, Zhang, & Guo, 2009). Target performance improvements are increased overall quality, reliability, efficiency and effectiveness of the system. Not only service quality is measured from the aspects of operation and management, the performance can also be evaluated against the perception and expectation of the passengers, who are the end users. Evaluating passengers' satisfaction level towards buses would help identify the service quality and areas of necessary improvements (Zakaria, Hussin, Batau, & Zakaria, 2010). Even though there exists no specific standard measurement tool or parameter that can be applied universally, the attributes in LOS and passengers' satisfaction study are considered by scholars as sufficient for service quality assessment (Samir, 2001; State of Florida Department of Transport, 2013). In short, LOS measures the service quality from the perspectives of existing passengers on the bus services, while providing insight to the aspiration of what matters the most for the current and future the users of buses.

The bus services and system provision may differ between urban and rural areas. Geo-spatial factors such as population density, weather and environmental conditions, economic and values/beliefs/cultural may influence the quality provided (Odeck & Alkadi, 2004). Similarly, route alignment and coverage, fare rates and fleet size provided may also depend on the local needs (Rohani, Wijeyesekera, & Karim, 2013; Sham et al., 2013; Sham, Soltani, Sham, & Mohamed, 2012). More often than not, urban and rural transportation face issues of service operation, infrastructure and facilities provision, scenarios often associated with those of Malaysian case study (Ariffin & Zahari, 2013). For example, rural European public buses compared to those of urban, are functional and practical as modes to reduce the private vehicle dependency for sustainability and to preserve the geo-culture (Patrick & Roseland, 2005). In rural Malaysia, bus services are provided as a social obligation rather than driven by the market or by income levels and trip patterns of the users (Ismail et al., 2012; Noor et al., 2014). Hence, addressing rural bus issues may require different treatment due to the population size, density and sparse locations of the trip attractions (Ariffin & Zahari, 2013).

Santoso, Yajima, Sakamoto, & Kubota, (2012) highlight that since rural areas rarely face traffic issues like congestion and insufficient parking spaces, dependency on private vehicles is inevitable. Any attempt to provide sustainable bus services or improve the existing system would be a challenge. Hence, an expected scenario most likely experienced by rural Malaysians is one where low ridership on older fleets, passengers riding the scanty services with minimum amount of complaints and inter-district or even door to door service to the

population. This study aims at confirming such scenario, by identifying differences and similarities between urban and rural public buses services in Malaysia, a gap clearly mooted by the literature. It is also the aim of the study to analyse the quality of services in the selected urban and rural settlements in Peninsula Malaysia for the purpose of generalizing the quantum and magnitude of public bus system issues.

RESEARCH AIM AND OBJECTIVES

Having identified research gaps and problem statements, the following objectives are formulated:

1. To determine the existence and magnitude of LOS difference between services of selected urban and rural centres of Peninsula Malaysia
2. To analyze the bus passengers' preferences and aspirations

RESEARCH METHODOLOGY

Sampling Frame

Using purposive sampling technique, four states with generic and homogeneous public buses have been selected to represent the variation of services performance (Royce A. Singleton & Straits, 2010; Creswell, 2009; Sarantakos, 2005). First, Pahang, Perak, Pulau Pinang and Johor were selected because the bus services were provided in both the urban centres and settlements with rural characteristics. Second, these urban centres are Georgetown, Kuantan, Johor Bahru and Ipoh, selected based on the regional conurbation definitions and zones by National Physical Plan 2 (Federal Department of Town and Country Planning Ministry of Housing and Local Government of Malaysia, 2010). Third, settlements with rural characteristics were purposively identified to be on certain radius limit of geographical proximity or a satellite town or hinterland servicing the major conurbations. Finally, these rural case studies has a single bus service provider using conventional system, lower and older conditions of fleets and not supported by other public transport systems with the exception of informal paratransit such as informal car rental (kereta sapu). The four rural settlements are:

- i. Pekan, Batu Pahat and Kerian (Pekan District Office, Batu Pahat District Office and Kerian District Office), settlements that centered on small or intermediate towns.
- ii. Batu Pahat as included in the zone of Muar-Batu Pahat-Kluang District Growth Conurbation in National Physical Plan 2 (Federal Department of Town and Country Planning Ministry of Housing and Local Government of Malaysia, 2010).

- iii. Seberang Prai bus route coverage includes suburb and small villages in Penang.

The present population and recorded bus users as supplied by the operators of the selected settlements against the number of operators and routes registered are detailed in the Table below:

Table 1: Population, Number of Bus Operators and Bus Routes of the Selected Case Studies

Settlements	Population	No. of bus operation within the state, 2012	No. of bus routes registered within the state, 2012
Georgetown, Penang	708,127	9	108
Seberang Prai, Penang	818,197		
Ipoh, Perak	120,192	31	481
Kerian, Perak	657,892		
Kuantan, Pahang	427,515	16	229
Pekan, Pahang	103,839		
Johor Bahru, Johor	1,061,950	29	1067
Batu Pahat, Johor	262,684		

Sampling Unit

The unit of analysis for LOS evaluation was the bus services performance as quantitatively defined by the relevant authorities, whereas the unit of analysis for satisfaction survey was the bus rider selected as the respondent when encountered by the enumerators. As such, convenience sampling (Cinquina, 2006; Jayaraman et al., 2011) was deemed most suited for this kind of study due to the nature of moving vehicles within the specific distance, routes and speed driven by the drivers. Face to face intercept survey ensures the comfort of passengers without compromising the limitation experienced by the enumerators to ask questions, mobility and ease with which the enumerators to move on board the buses and approach the prospective riders. Thus, it is inevitable that sampling strategy may have a greater tendency to select passengers seated or standing near, next to, behind, in front or beside the enumerators when and if a crash load of passengers' boarding reached maximum level or beyond the tolerable threshold. Employing the 95 percent confidence level and confidence interval, the following algorithm by Yamane, (1967) is adopted to ascertain the minimum sample size for each of the case studies.

Given the confidence level = 95%, and P = 0.05

$$n = \frac{N}{1 + N(e)^2} = \frac{2,739,544}{1 + 2,739,544 (0.05)^2} = 399.9 \text{ people}$$

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$$n = \underline{400}$$

For each case study state (Perak, Pahang, Pulau Pinang and Johor) a minimum of 300 samples were targeted to be collected, thus 1200 samples for the overall study. In this study, to achieve the targeted samples, an optimal 140 survey forms were distributed to passengers of the bus as soon as the bus move from the terminal. Optimally, from the nine (9) terminals, it was aimed that some 1260 samples to be collected. However, enumerators were working on the basis of approved and permitted survey duration and survey routes allowable by the operators. As such, after data cleaning, only 1130 survey forms were analysed for generalisation purposes. Some terminals have higher and more than proportionate samples due to a higher number of riders and greater concentration of route coverage. Table 2 details out the distribution of respondents by urban-rural centres.

Table 2: Distribution of Sampling Unit for On-Board Survey

Centre	Terminal	Population	No of Respondent	Percentage (%) over population
Kerian, Perak	Parit Buntar	120,192	100	0.08
Ipoh, Perak	Medan Kidd	46,629	105	0.23
Seberang Prai, Penang	Penang Sentral	545,688	101	0.02
Georgetown, Penang	Jetty Terminal	518,478	100	0.02
Kuantan, Pahang	Hentian Bandar	347,204	130	0.04
Pekan, Pahang	Pekan	103,839	108	0.10
Johor Bahru, Johor	Larkin Terminal	424,648	60	0.06
	Johor Bahru Sentral		200	
Batu Pahat, Johor	Batu Pahat	209,461	226	0.11
TOTAL		2,316,139	1130	0.05

On-board public bus survey

Adopting face to face intercept survey has the greater advantage over other methods in capturing passengers' demographic and travel characteristics. This method provided greater reliability, validity, credibility and precision or accuracy of data since passengers can easily recall, reflect and approximate their journey experiences with the very trip they were making when they were interviewed on board (Yaakub & Napiiah, 2011a).

Procedure

Surveys were conducted were carried out on several bus trips during both weekdays and weekend. The on-board passengers' responses were capture according to the schedule below:

Error! Reference source not found.*Intercept face to face conducted during off peak

Figure 1: Onboard Survey Period Conducted

Questionnaire

The variables to be collected for purposes of bus performance evaluation and improvements aspired by passengers have been translated into questions in the survey forms. This questionnaire was divided into two sections namely sections A and B. Section A consisted of the socio-demographic and trip characteristics. Meanwhile, Section B evaluated the satisfaction level with the current services as well as respondents' preferences and aspirations. The quality of bus services in the selected case studies were assessed against three performance measuring standards or Level of Service LOS (Tables 3 through to 8):

First, the fixed-hour service LOS definitions were provided Transportation Research Board, (2003). This measured the bus services availability and the capacity of the fleet.

Table 3: Fixed-route Hour of Service LOS

LOS	Hours of service	Remarks
A	19-24	Night 'owl' service provided
B	17-18	Late evening service provided
C	14-16	Early evening service provided
D	12-13	Daytime service provided
E	4-11	Peak hour service only or limited midday service
F	0-3	Very limited or no service

Source: (Yaakub & Napiah, 2011a)

Second, the measurement was made on the average frequency of bus within the waiting time, which is also known as the fixed-route service frequency LOS. Meanwhile, headway is a derivation of frequency of services, whereby in a service of two buses per hour i.e. the frequency of two per hour, the headways between two buses were thirty minutes.

Table 4: Fixed-route Service Frequency LOS

LOS	Average Headway (min)	Vehicle per hour	Remarks
A	<10	>6	Passengers do not need schedules
B	10-14	5-6	Frequent service, passengers consult schedules
C	15-20	3-4	Maximum desirable time to wait if bus/train missed
D	21-30	2	Service unattractive to choice riders
E	31-60	1	Service available during the hour
F	>60	<1	Service unattractive to all riders

Source: Noorfakhriah and Madzlan, 2001, p.5

Another measurement is the degree with which maximum allowable seating and standing capacity of a vehicle fleet is reached. This is known as passenger loading LOS.

Table 5: Passengers Loading LOS Thresholds

LOS	Passengers /Seat	Remarks
A	0.00-0.50	No passenger needs to sit next to another
B	0.51-0.75	Passengers can choose where to sit
C	0.76-1.00	All passengers can sit
D	1.01-1.25*	Comfortable standee load for urban transit
E	1.26-1.50*	Maximum schedule load for urban transit
F	>1.50*	Crush load

*approximate values for comparison

Source: Transport Research Board of National Academics TCRP Report 100 (TCQSM 2003) as cited in M. Napiah et al., (2010)

Bus services performance is also possibly measured using the speed with which the buses travel. Bus speed LOS is a good measurement of how the buses deal with the traffic conditions.

Table 6: Bus Speed LOS

LOS	Speed (km/h)	Adapted from Ministry of Urban Development India, (n.d.)	Adapted from Cortés, Gibson, Gschwender, Munizaga, & Zúñiga, (2011)
A	> 30	Primarily free flow movement at average travel speeds usually about 70% of the free flow speed for the key corridors.	Excellent
B	< 25 to ≤ 30	Small increase in traffic causing substantial increase in approach delay and hence, decrease in arterial speed.	Good
C	< 21 to ≤ 25		Fair
D	< 19 to ≤ 21	Significant approach delays and average travel speed of 1/3 the free flow speed or lower. Such conditions causing combination of one or more reasons such as high signal density, extensive queuing at critical intersections and inappropriate signal timing.	Barely acceptable
E	< 15 to ≤ 19	Key corridors at extremely low speeds below 1/3 to 1/4 of the free flow speed.	Bad
F	≤ 15	Intersection congestion is likely at critical signalized locations, with high approach delays	Very Bad

Source: Adapted from Ministry of Urban Development India, (n.d.) and Cortés, Gibson, Gschwender, Munizaga, & Zúñiga, (2011)

Table 7 provides the threshold levels for each of the four measurements. Level D was determined as the minimum tolerable threshold for public transportation (State of Florida Department of Transport, 2013), whereas traffic engineers are familiar with Level C for private transportation systems (Clifton & Blohm, 2007; The City of San José, 2009).

Table 7: Acceptable Level of Service (LOS) Range

Determinant	Minimum Range of Acceptable Level of Service (LOS)
Fixed-route hour service	D : Daytime service provided
Fixed-route Service Frequency	D : Service unattractive to choice riders
Passengers Thresholds	D : Comfortable standee load for urban transit
Stage Bus Speed	D : Barely acceptable

*All LOS below than acceptable range as above were determined as low or poor level of service.

Other methods of scoring may also be applicable to determine the LOS of public buses in the case studies (Orth, Dorbritz, & Weidmann, 2011; Samir, 2001). Table 8 details out the scoring range of LOS performance measure to adapted by this study. It can be seen that the higher the LOS e.g. A or B, the more scores the performance would be associated with.

Table 8: Score Range of Level of Service (LOS) Performance Measure Adaptation

LOS Range	Score Range developed by Samir, (2001)	Score Range developed by Orth et al., (2011)	Score Range adapted for this study
A	5	6	6
B	4	5	5
C	3	4	4
D	2	3	3
E	1	2	2
F	0	1	1

Source: (Orth et al., 2011; Samir, 2001)

FINDINGS AND DISCUSSION

Several findings were derived from the secondary and field surveys. First, the majority of the case studies have the bus services operated by a main provider or a single company operator, with the exception of Johor where multiple operators were servicing both the conurbations and rural settlements. Table 9 outlines the various operators by number of routes against geographical locations. The surveys were conducted on a total of 48 routes, 30 in urban areas and the remaining 18 in rural settlements. Disparities are glaring whereby most urban areas with the exception of Pulau Pinang have higher number of routes compared to those of rural.

Table 9: Bus Service Provider and Routes Coverage (Observed and Surveyed)

State	Selected Case Studies		Number of Routes	
	Urban Settlement	Rural Settlement	Urban	Rural
Perak	<ul style="list-style-type: none"> Main provider of bus consortium; Perak Transit Bhd Multiple private operators 	Single Private Operator; The Red Omnibus Sdn. Bhd	6	3
Penang	Main provider; Operator A		6	11
Pahang	Main provider; RapidKuantan	Single Private Operator; Rahmat Alam Sdn. Bhd	12	2
Johor	Multiple Private Operators; Syarikat Maju Sdn. Bhd & CausewayLink Sdn. Bhd	Two Private Operator; CausewayLink Sdn. Bhd & Johore Motor Sdn. Bhd	6	2
TOTAL			30	18

Second, the study found that LOS were ascertained to be varied even among the four performance measurements namely fixed route hour, frequency, passenger load and speed. Disparities between urban and rural were clear as only one of five measurements in rural areas achieved the minimum tolerable level. Only bus speed in rural areas (LOS C) surpassed LOS D, the threshold. Other achievements were LOS D, E, E and F, respectively. Passenger loads during the

weekend were in the worst condition or LOS F. This reflected the lowest ridership of rural areas, especially during Sundays.

In contrast, two of the measurements applied on urban buses achieved better than the threshold at LOS C (for fixed route hour service and speed). The services of urban buses performed better than those of rural in passenger loads during the weekend. Performances in frequency and passenger loads during weekdays were comparable to those of rural areas.

Next, scoring measurement highlighted that there was a comparable scoring between services provided both in urban and rural areas. Nevertheless, scoring of rural areas (average 2.4 point) was lower than that of urban (2.8 points), indicating a mild disparity between urban and rural services.

Table 10: Summary of Mean Scores for LOS of Selected Urban-Rural Bus Services in Peninsula Malaysia

Performance Measure	Urban									Rural								
	Frequency of LOS (W)						LOS Score (Σ)	Mean LOS (X)	LOS	Frequency of LOS (W)						LOS Score (Σ)	Mean LOS (X)	LOS
	A	B	C	D	E	F				A	B	C	D	E	F			
Fixed-route hour service	0	16	8	5	1	0	129	4.30	C	0	0	11	4	2	0	60	3.53	D
Frequency	0	2	2	14	12	0	84	2.80	E	0	0	2	1	11	4	37	2.06	E
Passengers Load (Weekdays)	5	1	4	2	1	14	73	2.70	E	3	2	0	3	0	10	47	2.61	E
Passengers Load (Weekend)	1	2	0	2	0	6	28	2.55	E	0	0	0	1	1	3	8	1.60	F
Bus Speed	9	7	4	0	3	4	115	4.26	C	8	5	2	1	2	0	88	4.89	C

* Score Range: A = 6, B = 5, C = 4, D = 3, E = 2, and F = 1.

Where:

1. **W** = frequency of LOS obtained
2. **T** = score range (A = 6, B = 5, C = 4, D = 3, E = 2, and F = 1.)
3. **N** = total case studies (routes surveyed)
4. **X** = mean LOS
5. LOS Score: $\Sigma = W \times T$
6. Mean: $(X) = \Sigma / N$

The reflection of disparities between urban and rural bus services would inevitably influence the determination of route coverage, fare system and fleets provided by the operators (Rohani et al., 2013; Sham et al., 2013, 2012). As such, treatments of varying degrees should be initiated on performance of fixed routes hour services and passenger loads during weekends to bridge the services gaps experienced by the rural bus operations. More suitable operation hours and promotion of choice trips with higher bus frequency during weekends must be undertaken by operators of rural bus services.

From the average and disaggregated scoring measurement, it is confirmed that the overall bus services were still poor or low, be it in urban areas or rurality. The crush load situation (Level F, more than 1.5 capacity factor) has created uncomfortable and inconvenience riding experience for the passengers. It becomes worse during public holidays or special events/occasion when passenger volume was overloaded and severe traffic congestion occurred. Other contributing factors may include lower frequency of services on weekends as well as lower quality fleets were deployed in the rural areas.

It can also be discussed that in rural areas particularly, travel time became longer and the last bus trip was sometimes cancelled by the operators/drivers by choice or unintentionally because they already reached the maximum operation hours. In rural areas, more often than not, buses frequency was less desirable than those of urban. Furthermore, spiraling the effects of lower load, rural buses have less revenues and profit, thereby compromising the fleet quality and comfort/convenient (Transportation Research Board, 2013). The domino effects are less attractive services resulting in lower ridership levels and lower reliability of the services for the rural population. In the worst case scenario, this will result in the collapse and closure of certain routes, as have been deliberated by more than one of the operators.

Further discussion of the above three major findings is regarding the gaps of services between two geographical settings based on operating system (Ariffin & Zahari, 2013; Odeck & Alkadi, 2004; Patrick & Roseland, 2005; Rohani et al., 2013; Sham et al., 2013, 2012). In many rural areas and one or two urban bus services, delivery was by a single operator or a monopoly. This is a major factor that influences the lower and poorer quality of the service, leading towards less competitive or an imperfect market. In a market inequilibrium, passengers received less choices, limited exposure to higher quality services and normally being complacent or more receptive of the lower than appropriate levels of buses services quality. As such, morale and motivation to complaint about poor bus services were lower as propagated by many previous researchers (Aziz & Amin, 2012; Bachok, 2007; Ismail et al., 2012; Jayaraman et al., 2011; Kamba et al., 2007).

On the outset, the overall bus services (LOS E) in Malaysia was not comparable even to the minimum levels of those tolerable by the more developed countries i.e. LOS D (State of Florida Department of Transport, 2013). With greater disparities between urban and rural areas, it can be expected that the quality of the current or existing bus services left much to be desired. These facts could not be captured by the LOS performance evaluation. As such, passengers' satisfaction and aspiration surveys were needed to fill in the qualitative explanation that left void by the LOS evaluation.

Table 10: Final Mean Score and LOS categorization for LOS of Selected Urban-Rural Bus Services in Peninsula Malaysia

Performance Measure	Urban				Rural					
	Mean (X)	LOS	LOS Score (Σ)	Mean LOS (X)	Overall LOS	Mean (X)	LOS	LOS Score (Σ)	Mean Score (X)	Overall LOS
Fixed-route hour service	4.30	C	4	2.8	E	3.53	D	3	2.4	E
Frequency	2.80	E	2			2.06	E	2		
Passengers Load (Weekdays)	2.70	E	2			2.61	E	2		
Passengers Load (Weekend)	2.55	E	2			1.60	F	1		
Stage Bus Speed	4.26	C	4			4.89	C	4		
Total Score			14			Total Score		12		

* Score Range: A = 6, B = 5, C = 4, D = 3, E = 2, and F = 1.

Where:

1. **W** = frequency of LOS obtained
2. **T** = score range (A = 6, B = 5, C = 4, D = 3, E = 2, and F = 1.)
3. **N** = total case studies (routes surveyed)
4. **X** = mean LOS
5. LOS Score: $\Sigma = W \times T$
6. Mean: $(X) = \Sigma / N$

Table 11 depicts the satisfactory level disparities between urban and rural passengers. Passengers in the surveys have been asked to recall trips made using buses either previously or the ones that they were currently experiencing. From the Table, one of the many conclusions is that disparities between urban and rural were most dramatic in the bus conditions and punctuality. In rural areas, passengers were in the opinion that bus conditions were poor (67.4%) compared to 32.6% rating by the urban riders. Rural population were also not choosing to ride the bus due to factor of punctuality (only 24.7%) compared to those in urban areas (75.3%).

Secondly, from Table 11, satisfaction levels were less varied but still distinguishable between urban and rural passengers. Whilst more urbanites were more dissatisfied with the services (51%) than rural riders (49%), the former believed that safety (60.9%) was a positive factor to attract urban passengers towards buses compared to rural passengers (39.1%).

Thirdly, another gap between urban and rural users of buses can be found in their respective perception of reliability of the bus services. Urban users who could be more exposed to higher quality services elsewhere or prior to being surveyed, were less receptive of the reliability (32.7%) of the current bus system compared to rural people (67.3%).

Finally, rural people surveyed were also more complacent about the bus conditions, despite the lower quality of, comfort levels and convenience offered by the fleet by perceiving the conditions to be between poor and good (73.9%). Urban riders were very critical of this view, by recording only 26.1% response for this category.

Table 11: Bus Services Satisfactory Level between Urban and Rural Passengers

Opinion Towards Current Bus Services	Locality				Total (%)
	Urban		Rural		
	Frequency	%	Frequency	%	
a. Satisfaction Level					
Dissatisfied	348	51.0%	334	49.0%	682 (60.4%)
Between Satisfied and Dissatisfied	148	61.2%	94	38.8%	242 (21.4%)
Satisfied	99	48.1%	107	51.9%	206 (18.2%)
Total	595	52.7%	535	47.3%	1130 (100%)
b. Bus Condition (Comfort)					
Poor	92	32.6%	190	67.4%	282 (25%)
In Between Poor and Good	24	26.1%	68	73.9%	92 (8.1%)
Good	479	63.4%	277	36.6%	756 (66.9%)
Total	595	52.7%	535	47.3%	1130 (100%)
c. Factor Choosing the Service					
Efficient	64	47.4%	71	52.6%	135 (11.9%)
Safe	137	60.9%	88	39.1%	225 (19.9%)
Reliable	105	32.7%	216	67.3%	321 (28.4%)
Affordable	176	58.9%	123	41.1%	299 (26.5%)
Punctual	113	75.3%	37	24.7%	150 (13.3%)
Total	595	52.7%	535	47.3%	1130 (100%)

Table 12 shows further differences between urban and rural passengers by their disaggregated satisfaction levels.

Table 12: Passengers' Satisfaction Level

Satisfaction Level	Locality	Quality Issue			% Within Satisfaction Level According Locality
		Punctuality & Frequency	Comfort & Clean	Safety & Reliability	
Dissatisfied	Urban	141 (40.6%)	50 (14.4%)	156 (45%)	347 (30.7%)
	Rural	166 (49.6%)	75 (22.4%)	94 (28.1%)	335 (29.6%)
Between Satisfied & Dissatisfied	Urban	52 (45%)	27 (18.3%)	70 (36.7%)	149 (13.2%)
	Rural	47 (34.9%)	12 (18.1%)	34 (47%)	93 (8.2%)
Satisfied	Urban	32 (50.5%)	25 (12.9%)	42 (36.6%)	99 (8.8%)
	Rural	52 (48.6%)	21 (19.6%)	34 (31.8%)	107 (9.5%)
% within aspiration towards service improvement		490 (43.4%)	210 (18.6%)	430 (38%)	1130(100%)

One clear similarity that can be derived from the Table above is that urban and rural bus users put emphasis on punctuality and frequency (50.5% and 48.6% satisfied responses respectively). Safety and reliability are secondary to riders of both geographical locations (36.6% and 31.8% satisfied responses respectively) when choosing to utilise bus services.

Two glaring disparities between urban passengers compared to their rural counterparts are that the former were more dissatisfied with safety and reliability (45% compared to 28.1%) and while the latter were more dissatisfied with punctuality and frequency (49.6% compared with 40.6% agreeable responses respectively).

Table 12 provides further discussion on the differing treatments needed to improve the buses quality between the urban and rural services delivery. In rural areas, improvement aspired were more focused towards higher frequency and greater punctuality. Meanwhile, urban users were expecting more of safety assurance and reliability improvement with regards to the future bus services. Comfort and cleanliness were tertiary factors considered by passengers when evaluating the quality of the buses.

CONCLUSION

In summary, this study has identified Level of Service (LOS) as measurement tools for a quantitative assessment of bus services quality. The first objective of the study has been achieved by determining that the current services levels in Malaysia were LOS E which was lower than the threshold tolerated by many developed countries. Even more concerning is that there is a wide gap of services quality between urban and rural buses, namely the fixed hour service and passenger loads (weekend) i.e. LOS D and F respectively for urban areas compared to LOS C and E respectively for rural areas. The rural buses suffered from lower passenger's number and poorer fleet quality.

The second objective of the study was to ascertain the areas of improvements as aspired by the urban as oppose to rural passengers. It can be concluded that urbanites were more concerned about safety and reliability due to trips being made even during late hours while the rural passengers were emphasising on punctuality and frequency because services frequencies were lower and quality fleets have less capability to perform strictly adhering to published schedules.

These varied findings are consistent with several previous research in that there existed disparities between bus services in urban and rural areas (Abdullah, 2006; Ismail et al., 2012; Jayaraman et al., 2011; Ponnaluri, 2011; Suwardo et al., 2009; Yaakub & Napiah, 2011a, 2011b). The findings not only further accentuated the facts there are gaps between quantitatively evaluated performances in urban and rural buses (Aziz & Amin, 2012; Bachok, 2007; Ismail et al., 2012; Jayaraman et al., 2011; Kamba et al., 2007), but also proved

that the magnitude of such disparities are glaring especially in the improvements aspired by the passengers. Rural respondents were dissatisfied with buses frequency and punctuality but urbanites were more concerned with safety and reliability. This finding is coherent with the literature on regional disparities of buses services worldwide (Odeck & Alkadi, 2004; Pucher & Renne, 2013).

In conclusion, capital planning, infrastructure instalment and subsystem improvements are essential in the longer term planning of public transport system development. City region public transport operation, management and structure must be supported with a mature and more appropriate sustainable public transport provision guidelines and standards; through strict evaluation and proper use of indicators. Improving rural buses quality is of great importance because many services are facing dire issues, with more routes were susceptible to closure in the future should patronage continued to dwindle.

In short, the sustainability of public buses in Malaysia and the reduction of urban-rural gaps can be achieved first by implementing a comprehensive systems assessment through LOS identification and passengers' satisfaction surveys.

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THE ROLES OF URBAN HERITAGE IN DETERMINING THE IMAGE OF THE ROYAL TOWN OF SRI MENANTI, NEGERI SEMBILAN

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Abstract

Malaysia has many towns of historic and cultural significance that are worthy of preservation for sustainable development. For instance, a royal town, which is a town where the old palaces and the royal administrative district are located. This paper aims to discover the significance of the urban heritage of a royal town so as to ensure its preservation. Special attention is paid to the identification of townscape elements in forming the image of the town and the roles of the townscape elements as built heritage of the royal town. A case study was carried out in Sri Menanti, Negeri Sembilan, which is one of the royal towns in Malaysia. The study methodology involves a historical map overlay, non-participant observation and semi-structured interviews. The findings reveal that Sri Menanti has played a significant role in the history and development of Negeri Sembilan. Additionally, the contribution of 'Adat Perpatih' to the nation's history as one of the unique administrative components helps to signify the importance of the town's local culture and urban heritage. The town also represents a number of townscape elements that are intertwined as urban heritage, with rich cultural and architectural significance. The paper concludes that diversity in the character of the town is unique and worthy of preservation.

Keyword: *Urban heritage, townscape elements, preservation, royal town Sri Menanti*

INTRODUCTION

In Malaysia, historical and cultural significance plays an important role in shaping the identity, structure and meaning of towns. Royal towns, in particular, have high historical and cultural values that are worthy of preservation. Nevertheless, extensive urbanisation and rapid development have eroded the significance of these towns.

The primary aim of this paper is to discover the significance of urban heritage of a royal town to ensure its preservation. This preservation of the urban heritage should not only cover certain monuments and sites, but should also extend to the level of preservation of all properties of historic and cultural significance involving the tangible and intangible elements. Therefore, in this study, several objectives are set, the first of which is to identify the elements of the urban townscape that form the image of the town using historic map overlay, non-participant observation and semi-structured interviews. The resulting findings on elements of the urban townscape are categorized according to their physical and cultural significance in the royal town.

The second objective is to understand the roles of the townscape elements as urban heritage of the royal town. This is because the townscape elements identified in the royal town may have high potential to become part of the urban heritage. As the research focuses only on a single case study in Sri Menanti Royal Town, an overall picture of the characteristics of royal towns in Malaysia cannot be generalized. However, it is hoped that this study might help in signifying the importance of royal towns in the nation's history.

THE CHARACTER OF A ROYAL TOWN

A royal town is defined as a town that has high value in terms of historical and cultural significance, and shows a strong relationship between the growth of the community and the development of the urban landscape, especially in terms of the built elements (Royal City Comprehensive Plan, 2009). In addition, the identity of a royal town is based on the presence of old palaces and royal administrative districts, which are the key aspects that form the identity of the town.

Malaysia has a number of royal towns, such as Kuala Kangsar in Perak, Arau in Perlis, Klang in Selangor, Seri Menanti in Negeri Sembilan, Pekan in Pahang, Anak Bukit in Kedah and Muar in Johor (Utusan Online, 2009). Each of these royal towns has its own historical and cultural characteristics that help to distinguish between these towns through the alignment of minor or major building fabrics, forming the area into valuable urban masterpieces (Dalmas, Geronimi, Mengin, Noel & Patin, 2012). It is important to preserve these royal towns, as they are testament to the greatness of the monarchy system of the

Malay Royal Institution (Muslim, Wan Hassan & Umar, 2013). However, in order to preserve a royal town, it is important to firstly identify the significance of its urban heritage through the identification of its key townscape elements.

Types of Urban Townscape Element

When defining the visual image of a royal town, an in-depth understanding of its physical form is essential. Lynch (1990) has classified the elements of the physical form into five main categories, which are paths, edges, district, nodes and landmarks. Path can be understood as the most significant elements within the town's development, as they help in supporting human movement along the streets, walkways, transit lines, canals and railroads. They may be classified into several categories, such as primary, secondary and tertiary paths, or major and minor paths. Meanwhile, the line breaks or barriers that help in defining the region of the town are known as edges. The district is defined according to the elements that become guide points outside the town. Another type of urban townscape element, known as nodes, can be defined as the focal points or loci in the town or strategic places where people congregate. Finally, landmarks are defined as points of reference, either physical objects such as buildings, signs, stores or mountains. An understanding of the urban townscape elements may help the researcher to understand the physical pattern of the urban fabric in detail.

Urban Heritage

The physical pattern of the urban heritage in a royal town has been shaped over the centuries, portraying the reformation of the heritage landscape through the interaction of nature and culture. This interaction can be seen in terms of the elements of the urban heritage that symbolize the identity, structure and meaning of the royal town. This is because the urban heritage is based on a concept that requires a combination of historical, sociological and economic approaches by the society towards the local people of the urban area. However, industrialisation has caused the growth of urbanisation within the area of the royal town, affecting valuable elements of its urban heritage. Therefore, each individual, whether a local citizen or a government official, should have a deep understanding of the specific definition of the evolution of the historic structure and material elements of the urban heritage in a royal town in order to preserve its values.

Even though the historical structure and material elements have become the main physical elements embodying the spirit of the place, the value of urban heritage is on the relationship between humans and nature in order to create a strong sense of belonging within the town. The concept of the sense of belonging might be achieved through the preservation of the vividness of

cultural traditions over the development of the industrial sectors within the urban area.

Urban heritage may be simplified by classifying its components into three main categories, which are monumental heritage of exceptional cultural value, non-exceptional heritage elements that are present in a coherent way and in relative abundance, and new urban elements to be considered, such as the urban built form, the open space, streets, public open spaces, and urban infrastructures such as material networks and equipment.

In Malaysia, conservation of heritage items, including national heritage, natural heritage, tangible and intangible cultural heritage and related matters, are governed by the National Heritage Act 2005. The Act defines conservation of heritage items to include preservation, restoration, reconstruction, rehabilitation, adaptation or any combination of the said conservation methods. The aim of preservation, as stipulated in the Act, is to stop any deterioration, decay or state of dilapidation and provide structural safety and well-being.

METHODOLOGY

In order to identify the significant role of urban heritage of a royal town, historical map overlay, non-participant observation and semi-structured interviews were employed in data collection. The data were then analysed to determine results from all forms of data collection were later analysed in order to achieve a comprehensive understanding of the findings.

Study area

Sri Menanti, in Negeri Sembilan, was selected as the case study area because it has the characteristics of both historical and cultural significance that might help in distinguishing this royal town from other types of Malay Royal Institutional District. The town is selected due to the presence of its old palace, which acted as the former administrative centre of the state (Md Jani & Mohd Hussain, 2014).

Sri Menanti is located 6km off the Seremban-Kuala Pilah road and surrounded by green stretches of paddy fields and row of hills, forming the pattern of the physical landscape in Sri Menanti. The Minangkabau architectural influence is strongly visible in this area. The main economy of the area is agriculture.

Historical Map Overlay

This method was used in order to get a better understanding of the role of townscape in providing the image, identity and meaning of the town. According to Shamsuddin (2013), the pattern form of the development of the townscape is due to the accumulation of buildings from different periods, from the initial development of the town until the present time. Therefore, the layout and structure of Sri Menanti were studied based on the physical components,

comprising the characteristics of the natural landscape, urban structure and architectural features. Also studied were fundamental geographical reasons for settlement formation, dominant buildings of historical significance and the movement pattern of ancient origins based on changes to the seat of power, economic and functional patterns within the town. Then, a series of historical maps was analysed in order to determine all the factors that contributed to the formation of the townscape elements in the study area.

Non-participant Observation

In general, non-participant observation is defined as a technique of data collection that might help in gaining a better understanding of the role of the townscape elements applied by the local people in Sri Menanti. The observation aims firstly to identify the types of element that exist in the town in order to relate to its function in the daily routine activities conducted by the local people. The data collection specifically contributes to ideas on the physical and social background that form the identity of the whole town. Sketches and mapping were used to record the data from the observation.

Semi-Structured Interviews

In order to develop a deep understanding of the historical and cultural background of the Royal Town in Sri Menanti, semi-structured interview method was also used for data collection. The interview focussed on understanding the relationship between social characteristics and environmental, social and economic factors. Respondents were Encik Azhar, Head of *Jawatankuasa Kemajuan dan Keselamatan Kampung* (Village Development and Safety Committee), Dato' Bangsa Balang Mohamad Dahalan Alias, the Head of the *Luak* in Sri Menanti, Encik Nordin Jonid, Officer at *Muzium Diraja Istana Sri Menanti* (Sri Menanti Royal Palace Museum), Encik Afian Abd. Kadir, Officer of *Muzium Kebudayaan Negeri Sembilan (Negeri Sembilan Cultural Museum)*, and a few local people with knowledge on the history of the study area. The information gathered from the interviews were later screened, transcribed and analysed.

FINDINGS AND DISCUSSIONS

The results of the analyses indicate that the royal town image of Sri Menanti was defined by several elements. These can be categorised into physical and social components. The physical component comprises the characteristics of the natural landscape, the urban structure and architectural features. Meanwhile, the social component comprises the social background and cultural significance of human activities in the study area.

Landscape Characteristics of Sri Menanti

Geographically, Sri Menanti is a town specifically located within the area of the Kuala Pilah District. Developed within the valley and surrounded by hilly terrain that acts as a natural predominant line breaker that separate the Sri Menanti from other towns (see Figure 2). The physical pattern of the natural landscape has influenced the structure and function of the urban form of the town. This can be seen through the relationship between human behaviour and the environmental setting (Shamsuddin, 2011).

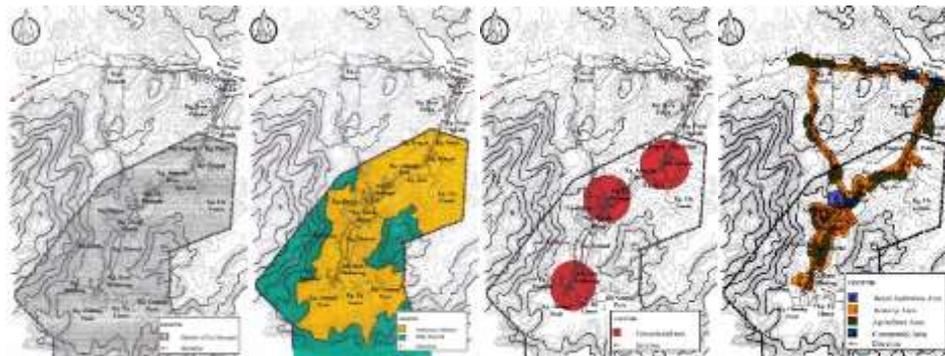


Figure 1: The historical map of Sri Menanti. a) District map; b) Settlement map; c) Concentrated settlement area map; d) Land use map. Reproduced from <https://www.google.com.my/maps>

According to Abd. Kadir (personal communication, February 28, 2015), before the arrival of the immigrant people of the Minangkabau from the Sumatera, Sri Menanti was a hilly virgin forest wherein lied the settlements of the Malay-proto group known as the Sakai, Semang and Jakun (see Figure 1a). They had their own unique identity and culture in which they lived as a group that occupied the lowland area, depending on the forest resources (Mohd Sam & Seow, 2013). The Malay-proto was a group ruled by a headman, known as '*Tok Batin*'. He was the person who controlled the use of the land before the arrival of the immigrant people. However, the function of the hilly virgin forest gradually changed once the Minangkabau people started to settle in Sri Menanti. As shown in Figure 1b on the concentrated settlement area map, it is identified that the settlers started to take advantage of the physical character of the hilly and valley area of Sri Menanti by turning the lower hilly area into rice fields that acted as their main food crop area, although the valley area remained as the settlement area for the community as it was common practice for settlers to build their houses next to a stream running into the main river area (Gullick, 2003). This study indicates that the Minangkabau people understood the physical pattern of the hilly and valley area as an area that might drain water, sediments and dissolved materials to a common receiving body, or in other

words, the functional characteristics of the land as the watershed area (O'Keefe et.al, 2015).

Due to the rising number of villages forming the Sri Menanti, the town became a liveable place that supported the community with rice cultivation became the main source of economy, which consequently led to the town becoming an administrative centre. Today, through observation, the valley area still remains as the main settlement area, while some of the lower hilly area remains as cultivation area, although cultivation is now predominantly through oil palm plantations rather than rice cultivation (see Figure 1d). In referring to the history of Sri Menanti, the oil palm plantation was introduced during the British colonialisation era in the late 19th century, during which time the British were focusing on the growth of commercial crops such as oil palm and rubber plantation. Therefore, it is demonstrated that the historical development of the Royal Town in Sri Menanti may have high significance for the physical characteristics of the urban pattern in the town (Shamsuddin, 2011).

Urban Structure in Sri Menanti

When looking at the natural features as the main structural characteristics of the town of Sri Menanti, the urban structure, in the form of the built elements, is the most dominant aspect of the town's identity. The town is basically a district with a single centre that allocates the commercial area, oriented by the administrative and residential area, which consists of a row of wooden shops and houses, a post office and police station and a health clinic (see Figure 2a). The profile of the town is best viewed from the hilly area, as the whole town can be easily recognised from afar due to the hilly terrain that appears as a backdrop and gives a distinctive view of the concentrated housing areas (see Figure 2b and 2c).



Figure 2: a) The map of the town centre; b) The illustration of the old view of Sri Menanti town; c) the current view of Sri Menanti.

The urban structure of Sri Menanti is upheld by the structure of its paths. The major paths in Sri Menanti are in the form of vehicular roads that spread perpendicular from the first road along the roads of Seremban-Kuala Pilah (see Figure 3a). The roads of Sri Menanti are characterised by the alignment of the traditional buildings along the side-roads, with modern buildings along the side-

road to Kampong Tanjung Ipoh. However, one element that shows the continuity of the roads is the alignment of the coconut and palm trees along the roadsides in front of the housing landscape compound. According to Gullick (2003), coconut is one of the alternative food crops in Sri Menanti. Therefore, it is not surprising that the roads are lined with coconut and palm trees. From the perspective of planting arrangements, the alignment of the coconut and palm trees helps in forming a physical barrier between the roads and the housing areas while creating a sense of direction (Walker, 1991).



Figure 3: a) The circulation map; b) alignment of palm tree along the road that shows a sense of direction; c) palm trees planted in front of the housing compound that act as natural physical barriers

In addition, through observation, it is recorded that the design of the facilities is somewhat influenced and enhanced by the character of the royal town in Sri Menanti. Some of the facilities that give a sense of welcoming are the entrance archway, which uses the colours black and yellow, symbolizing the royal institution of Minangkabau in Sri Menanti, and the legibility of the signage at Sri Menanti, which is used to help identify the direction of the pathway (see Figure 4). The signage is designed to reflect the culture of the Minangkabau people.



Figure 4: The signage in Sri Menanti, which shows the architectural characteristics of the Minangkabau

Therefore, through observation, it is clear that the characteristics of the urban structure in the Royal Town of Sri Menanti are upheld by the road

system, which reflects the identity and values of the Royal Institution. It is also important to preserve and highlight the road system within the town, as this might help in supporting the movement of people through creating a certain level of familiarity with the town.

Architectural Features in Sri Menanti

Another aspect of the built elements that show some significance in characterising the royal town in Sri Menanti is its architectural features. Through the observation conducted in Sri Menanti, it was identified that the major characteristics of the traditional houses and other buildings are influenced primarily by the Minangkabau architectural style (see Figure 5), with minor influence from the British architectural style.



Figure 5: The traditional buildings and house that follow the Minangkabau architectural style; the Old Palace of Sri Menanti (left), old mosque located next to Masjid Kariah Parit Istana (centre), half of the traditional house named as 'Rumah Ibu' located at Ladang Warisan (right).

The traditional buildings and houses were built mainly from wood using traditional construction skills that require no iron nails. Natural elements were adapted into the design of wood-carving in traditional buildings and houses in Sri Menanti, which help in characterising the cultural significance of the Minangkabau people. Some of the motifs used are believed by the villagers to have their own spiritual influences, such as the '*Sayap Layang-Layang*', '*Naga Bekaluk*', '*Itik Pulang Petang*' and '*Buku Bambam*' motifs (see Figure 6). Furthermore, some of the motifs also reflect the cultural belief of Islam. For example, the use of calligraphy as an aspect of the wood carving in the house.



Figure 6: The 'Awan Larat' wood carving motif, symbolizing harmony among the Minangkabau people (left); geometrical pattern symbolizing the Islamic culture (centre); calligraphy applied on the wall of a house showing the Islamic culture (right)

The most popular building in this town is the Old Palace of Sri Menanti, which is located next to Kampung Buyau. The Old Palace, reflects the Minangkabau architectural style, has become the main landmark within the town. The four-level building dominates the skyline of the town, in which the level of the traditional buildings and houses in Sri Menanti should not be more than the height of the Old Palace (see Figure 7). According to the Officer of *Muzium Istana Sri Menanti*, the palace was built by two famous wood carvers, *Tukang Kahar* and *Tukang Taib*, using only materials from the local woods, and has become the iconic building of the monarchical system of the Malay Royal institution in Sri Menanti.



Figure 7: The hierarchy of the urban buildings in Sri Menanti Royal Town

Before the Old Palace of Sri Menanti was built, three other palaces had been built for the rulers of Sri Menanti (refer Figure 8). The palaces were called Barong-Barong (Istana Rambal), Istana Baruh and Istana Pulih, and were built under the Raja Melewar monarchy (1773) until Yamtuan Antah (1872). The Old Palace of Sri Menanti was built during the Yam Tuan Muhammad era. The construction of the palaces was similar in terms of position, with the hilly view in the background. However, today the only palace remaining is the Old Palace of Sri Menanti, which has been turned into a Royal Museum (Raja Shahminan et al., 2009).

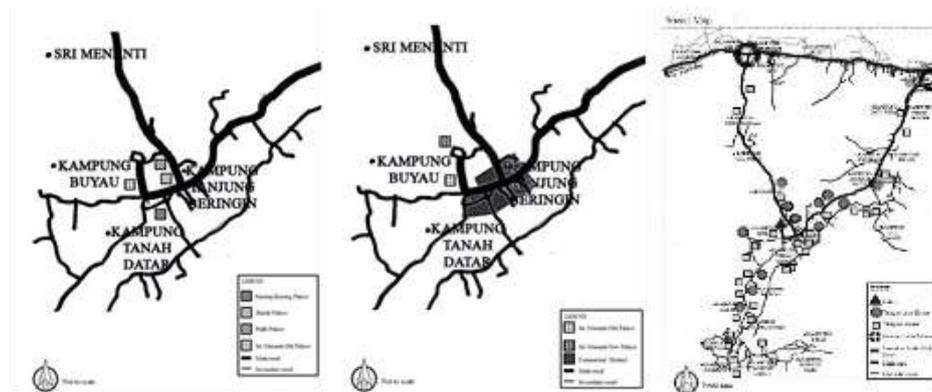


Figure 8: Map of the location of the four old palaces as written in history (left); map of current palace of Sri Menanti (centre); map showing the traditional houses of the Minangkabau people (right). Reproduced from Raja Shahminan et al., (2009)

The other type of building that exemplifies the great value of the traditional buildings in the Minangkabau architectural style are the old mosques located mostly in villages in Sri Menanti. As mentioned by Alias (2015), one of the ‘Ketua Luak’ in Sri Menanti, most of the people in the town follow Islam as their main religion. Therefore, the old mosques are considered to be among the dominant traditional buildings that might influence the development of the town of Sri Menanti.

Finally, another type of building that influenced the characteristics of the town was the traditional Minangkabau houses. Observation revealed that the traditional houses were built in different styles according to the Luak, reflecting the villages located in Sumatera. According to Abd. Kadir (2015), there are more than a hundred traditional houses that are over one hundred years old. Some of the houses are protected and preserved by the Museum but most are not, due to the problem of private ownership, which prevents the government or any other agencies from taking further action to preserve and protect these houses.

Hence, the results of this study reveal that the architectural features play an important role in shaping the built elements of the urban areas in the Royal Town of Sri Menanti. The preservation and conservation of the architectural elements is essential when developing and maintaining the unique image of the townscape elements in the royal town.

Social Background of Sri Menanti

Through the interviews, it was identified that in order to understand the social background of the local people in Sri Menanti, we first need to understand the town’s political system. The hierarchy of the political strata in Sri Menanti Royal Town started with ‘*Yang Dipertuan Besar*’ at the highest level, followed by ‘*Undang*’, ‘*Lembaga*’, ‘*Buapak*’ and ‘*Perut*’. During the interviews, Azhar (2015), the Head of *Jawatan Kuasa Ketua Kampung* (JKKK), stated that the setting of the urban fabric was influenced by the hierarchy of the political system. The design of the traditional buildings for the rulers was different from other villagers’ houses in terms of height, roof shape and pattern. It is thus clear that the architectural style of a building reflects its social character.

Cultural Significance of human activities in Sri Menanti

Human activity is one component of the identity of places in Sri Menanti Royal Town that helped in creating a thematic point of concentration (Shamsuddin, 2011a). Through observation, it was found that fewer outdoor activities are

conducted within the town area. However, most of the outdoor activities conducted in Sri Menanti take place in the centre of the town, specifically at the field located opposite the primary school and next to the library (see Figure 2). As it has an open field, this space has the ability to support gatherings in Sri Menanti. Most of these gatherings are conducted during the late evening, from 5pm until 7pm. People also come to the lake next to the open field, which is called ‘*Lembah Londah Naga*’, to enjoy the scenery and take part in recreational water-based activities such as fishing (see Figure 9).



Figure 9: Some of the activities conducted at the open field and surrounding the lakes of *Lembah Londah Naga*.

However, as mentioned above, in relation to the social background of Sri Menanti, the local people strongly uphold the culture of ‘*Adat Perpatih*’. This culture still strongly influence their daily activities (Saludin, 2007b). Referring to Figure 9, the open spaces are usually used by teenagers and young men. According to Azhar (2015), this is because of the cultural belief that the women should not waste their time socializing, but should instead focus on managing the household matters.

The ‘*warung kopi*’ (coffee shops) that exist adjacent to the road also create mini nodes to the town (see Figure 10). ‘*Warung kopi*’ activities are conducted during the early morning and late evening, until late night. These activities have an impact on the character of the townscape during this time, occurring at mini nodes in the town centre, and these sites also serve as an important space for supporting social gatherings among the local people.



Figure 10: The ‘*warung kopi*’ located adjacent to the road that form the mini nodes in Sri Menanti.

Other types of node that have been identified based on the observation made include the mosques, which are major nodes during the Muslim prayer

times: *fajr, dhuhur, asr, maghrib* and *isha*'. The mosques located within in the town are part of the street frontage and are places for peace and retreat for Muslims, supporting group gatherings. Historically, as mentioned by Abd. Kadir (2015), the mosques were used as meeting areas, and this was evident during the British colonisation of Sri Menanti, as the colonial powers burned a number of mosques in Sri Menanti to prevent meetings among the local people. Therefore, the results show that mosques were one of the important nodes that help in characterising the town of Sri Menanti.

DESIGN RECOMMENDATIONS

As part of the research efforts to facilitate the conservation of built and cultural heritage of the Royal Town of Sri Menanti, a set of design guideline recommendations has been put in place to inform and guide related parties and conservation advocates on future conservation efforts.

Table 1: Design Recommendations

SIGNIFICANCE ELEMENTS	DESIGN RECOMMENDATION
Architectural features	<ul style="list-style-type: none"> • Building with historic and architectural significance should be restored in which original structure and layout are to be retained. • All features and detailing should be replaced with the most similar design and pattern. • Any alteration of structural elements should be done in the most unobstructive way, if possible using original methods and materials.
Historical sites	<ul style="list-style-type: none"> • Clear demarcation of land use and zoning of activities in the historic area because some land uses and activities are sensitive and cannot be mixed with certain activities. There are also certain uses which are sensitive to new development due to its special character and aesthetical values. • In terms of the development control process, new guidelines may need to be formulated as different land uses or zones may require different guidelines based on their needs. • New development may be needed in some areas to generate new activities and for overall enhancement. However such redevelopment should be considered carefully in respect of the existing scale, bulk grain and architectural style of the physical fabric. • Entrance to these historic buildings and site can be charged at minimal fees. These fees can be used to cover part of the maintenance cost and improvement works of these buildings and sites.
Cultural activities	<ul style="list-style-type: none"> • To promote new commercial and other suitable uses that can complement the character of historic buildings, historic sites and cultural activities. These activities will help to generate income to the occupiers of these old buildings but also to

enhance the special attributes and environment of the area as a whole. This will not only revitalize the socioeconomic of the area, but also can improve the physical and visual characteristics of the buildings within the area.

- The cultural activities should be promoted as tourism products by the State Government. Part of the building, historical sites and cultural performances can be promoted within a tour package, historical trail or tours.
-

CONCLUSION

The urban heritage in Malaysia, often occupying an important and sometimes central location in present day towns, are localities of great cultural, architectural and historic significance. They derive their character, not only from the buildings and spaces of which they are comprised but also from the activities that occur there. The urban heritage has played a significant role in the history of Malaysia and its development. The site of the Seri Menanti Royal Town represents some of the special attributes which are rich in cultural and significance as it has been developed into the first administrative and early settlement in Negeri Sembilan. The special attributes which are important include the traditional features of the old buildings, special structures, traditional street patterns and its environment, traditional housing design and patterns and its daily activities. The diversity in character of the town together with its structural design, green space and cultural variety make the area unique and worthy of preservation. The research also concludes that conservation of physical and cultural heritage is an integral part of the urban conservation strategies of a royal town in Malaysia. The preservation and better maintenance of these heritage sites will add variety to the urban image while acting as a reminder and representation of the real identity of local culture and Malaysia.

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CARBON SEQUESTRATION THROUGH URBAN GREEN RESERVE AND OPEN SPACE

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Abstract

The world is experiencing rapid development and urbanisation of urban areas that cause an increase in the carbon emission which contributes to greenhouse gasses and global warming. The environment has been declining for the past few years while extreme weather has impacted some urban areas in Malaysia. In 2009, the Malaysian government pledged to achieve up to 40% voluntary reduction in carbon emission intensity by 2020. Now it is time to move forward by proposing the green and low-carbon way to offset carbon emission from both planning and landscaping perspectives. This research demonstrates how urban green reserves, being a vital land use component in the urban area, is effective in carbon sequestration to absorb and store carbon emission for an extended term. Through the natural process of photosynthesis, mature trees planted in urban green reserve and open space can act as a carbon sink. This research computes the volume of carbon sequestration of trees planted in urban green reserve and the open space within the study area. Through this study, the accurate allometric relationship for the total above-ground biomass with the tree diameter and height was developed to estimate the rate of carbon sequestration in Pasir Gudang. The results based on mature trees inventory revealed that the total amount of carbon sequestration contributed by both urban green reserve and open space were 2,238.183 tons of carbon per year. Within the design parameters of the case study area, the total contribution of carbon reduction was merely 3.15% per year compared to the target of 10% carbon reduction via carbon sequestration. The total balance of carbon reduction that needs to be offset via carbon sequestration is 6.85%. Therefore, there is a need to provide smart planning and consolidating of low carbon initiatives to increase the contribution of carbon sequestration for a healthier environment in the urban area.

Keywords: Carbon emission, carbon sequestration, urban green reserve, and open space.

INTRODUCTION

The world has been discussing low carbon technology since a long time ago, but only in 2009, most countries in the world have formally raised this issue comprehensively. The prime minister of Malaysia has mentioned in 15th United Nations Framework Convention on Climate Change in Copenhagen that "Malaysia has committed to reduce the carbon dioxide intensity to the GDP by 40% GDP per capita by 2020 as compared to 2005 levels; conditional upon transfer of technology and finance for developing nations" (COP15, 2009). This order has been strongly impacted by the decision-makers and stakeholders who are involved in the development. The impact of climate change is happening around the world including Malaysia. Therefore, we have been advised by the United Nation as well as a developed nation to move forward efficiently towards low carbon technology to minimize carbon emission and maximize carbon sequestration. The focus area is the urban area where the concentration of development is the most.

Global warming and climate change that contributed to carbon emission are the most crucial issue (EIA, 2006). For the past five years since the declaration of carbon footprint reduction in Malaysia, Malaysia has produced several methodologies to obtain carbon reduction (KeTTHA, 2014). However, this research will view from different angles of carbon reduction through carbon sequestration reserve between the existing urban areas to ensure the maximizing of carbon absorption and carbon reduction. This research will take part by concentrating the green reserve and open space in a developed area. As the urban area has been found to be the place of higher generation of carbon emission (Dhakal, 2009; Misni and Allan, 2010; Misni, 2012), therefore urban areas, particularly existing urban areas are the most significant area to be studied. Green reserve in an existing urban area is an important area and cannot be used by other usage or activities except for green purposes only (USDA, 2014). This reserve should be planned as a place that will contribute higher carbon sequestration and helps to reduce the carbon emission for the scenario of urbanization process in Malaysia. This study applies the National Green Technology Policy with the release of greenhouse gas (GHG) low or zero in any development area in Malaysia (KeTTHA, 2014). In addition, this study provides the insights into the role of urban green areas for decision-makers and the public to make a better management plans to protect and maintain these areas.

GREENHOUSE GASES

Atmospheric carbon is the most abundant anthropogenic gases among other gases in the air. According to the greenhouse gas theory, other gases contain in the atmosphere are methane, nitrous oxide, and fluorinated gases. All these gases that trap heat in the atmosphere are called greenhouse gases in which it contributes pollution to the atmosphere and causes global warming. The greenhouse effect is not a bad thing by itself because it allows Earth to stay

warm enough for living things to survive. The greenhouse effect is a complicated heat circle and process. When the sunrays hit the surface of earth and earth's atmosphere, approximately 70% of the energy or heat stays on the planet which is absorbed by several components of earth such as land, oceans, and plants (NASA, 2014). The other 30% is reflected into space by clouds, snow fields, and other reflective surfaces. However, even the 70% of the energy that gets through does not stay on earth forever due to ecological and biological process. The Earth's oceans and land masses eventually radiate the heat back out and some of the heat make it into space (EPA, 2014).

The rest of it ends up getting absorbed when it hits certain things in the atmosphere such as carbon dioxide and water vapour. After these earthy components in our atmosphere absorb the heat radiated from the sun, they emit energy that also in the form of heat. The heat that does not make it out of the earth's atmosphere keeps the planet warmer than the outer space because more energy is coming in through the atmosphere than the energy that goes out. This is the right part of the greenhouse effect that keeps the Earth warm. However, the greenhouse effect has increased continuously due to the contribution from other heat agents such as industry activities, transportation system, urban development, tree cutting, deforestation, and other activities. Through the process of greenhouse effect, the atmosphere traps some of the solar radiation as a greenhouse, thus increases the planet's temperature, and eventually causes global warming.

CLIMATE CHANGE

The Earth's climate has changed throughout history. Most of these climate changes are attributed to subtle variations in the Earth's orbit and the change in the amount of solar energy that the planet receives. The heat-trapping, nature of carbon dioxide, and other gases have been demonstrated in the mid-19th century (NASA, 2014). Globally, the average surface air temperature has increased 0.5°C in the 20th century. It is estimated that the global average air temperature would further increase by 1.5-4.5°C by the year 2100 (Houghton et al., 1996; Misni, 2012). The increase in the level of greenhouse gases will cause the Earth to warm in response. The increased of atmospheric carbon dioxide is attributed mostly to fossil fuel combustion (about 80–85%) (Hamburg et al., 1997). According to Olivier et al. (2005), carbon dioxide is dominant in greenhouse gases, which accounts approximately three-quarters of the total emissions of greenhouse gases. Atmospheric carbon is estimated to increase approximately 2,600 million metric tons annually (Sedjo, 1989). Urban areas are already warmer than surrounding rural environments due to high proportion of impervious surfaces and high level of fossil fuel combustion (Weng and Yang, 2006). Thus, the impacts of climate change on saturated and developed urban areas in the city centre are worst.

CARBON SEQUESTRATION

The main purpose of carbon sequestration is to absorb and store the carbon from the atmosphere in trees for a very long time. Atmospheric carbon is the most abundant anthropogenic gases among other gases in the air. Carbon sequestration is simply a process of keeping the carbon out of the atmosphere, in which according to the most scientific theory, it contributes to the greenhouse effect. Terrestrial carbon sequestration is the most significant method to keep the carbon out of the atmosphere. Storing the carbon at the earth's surface is considered as a direct intervention in the natural environment (EPA, 2014). Terrestrial sequestration occurs in forests, crops, soils, subsoil, and bedrock in which it naturally stores carbon but release it again as carbon when people cut down forests, harvest crops, and disturb soils. This method can be defined as the permanent storage of greenhouse gases, therefore they do not contribute to the greenhouse effect.

Urban green areas including urban forests, open spaces, and urban green reserves can play an important role in mitigating the impacts of climate change as a sink for carbon dioxide in urban areas. Urban trees can transform the carbon dioxide into above and below-ground biomass through photosynthesis (Nowak et al., 2013). The process called carbon sequestration stores carbon in the form of stems, branches, or roots (Nowak and Crane, 2002). Urban green area's soils also store a large amount of organic carbon before it releases it into the atmosphere. Quantification of carbon sequestration by urban green areas can be used to assess the actual and potential role of urban trees in reducing atmospheric carbon dioxide (Nowak and Crane, 2002).

CARBON SEQUESTRATION BY TREES

This study will focus on carbon sequestration by trees. One of the methods is terrestrial carbon sequestration which is performed in order to achieve some target of carbon reduction in urban areas. Unwin and Kriedemann (2000) have generated the model of tree maturity that can be adapted for preliminary accounting of carbon content by a tree. Generally, the maximum growth rate is usually gained early in the life of newly planted trees which soon after the canopy closure. The maximum carbon sequestration gained by every tree is 250 tons per year. This is referring to the national sequestration of carbon stored in a continuous cycle of 1 hectare of annual crop establishment with a 35-year rotation. Trees are capable of efficient sequestration and storage of atmospheric carbon in above-ground and below-ground biomass through photosynthesis process and tree growth.

Carbon sequestration analysis in this study is emphasized on the tree biomass and the carbon content estimation which are significant for carbon reduction in urban areas. From a planning point of view, the estimation of tree biomass is necessary to estimate the percentage of carbon reduction in the

atmosphere in order to reduce the urban heat due to the higher carbon content contributed by human activities and urban development. The rate of carbon sequestration depends on the growth characteristics of the tree species, the conditions for growth (i.e. where the tree is planted), and the density of the tree's wood/trunk/stem (i.e. its biomass). The greatest rate is during the younger stages of tree growth, between 20 and 50 years (DOE, 1998). Researchers can roughly estimate the amount of carbon sequestered in a tree, and divided by the tree's age, a yearly sequestration rate will be obtained. In line with Kyoto Protocol (UNFCCC, 2011), as an Intergovernmental Panel on Climate Change, the strategic planning shall be oriented to the renewable energy that can reduce carbon generation and tree biomass that absorbs carbon through zero energy. There are several studies showed the contribution of carbon capture through carbon sequestration. Most of the research concluded that the percentage of carbon that can be absorbed via tree planting is between 5% and 10% (Bellassen and Sebastiaan, 2014; UNEP, 2014). For the purpose of this research and looking at the existing and developed urban area of Pasir Gudang as a case study, the targeted percentage is 10% based on Low Carbon Society (LCS) Blueprint by Iskandar Regional Development Authority (IRDA, 2012). The tree biomass of urban green reserve for the case study area is estimated using an equation developed by Kato et al. (1978).

However, for the purpose of this study, concentration will be given to the above-ground biomass with supporting information from tree inventory and land use survey. The ideal rate of carbon sequestration usually occurs in mature trees and continues to store carbon in a significant amount. It will be based on the tree diameter, tree height, tree healthiness, and other relevant factors. Carbon is absorbed by tree foliage and is stored as carbon organic compounds in woody tissues in a tree trunk, branches, as well as foliage. This absorption by carbon sequestration offers a significant carbon offset in the atmosphere.

METHODOLOGY

Primary data were collected via tree inventory, observation, and land use survey. The analysis involved identifying the existing land use pattern, the trend of current activity, committed built-up analysis, the tree species planted in the urban green spaces and open space, tree characteristics, and other relevant analysis. The calculation of carbon sequestration can be executed due to some limitations and availability of basic data required to represent the local situation. The analysis process was continued with benchmarking analysis. The benchmarking included the figures of the average amount of tree planted in one hectare land of open space in urban areas and carbon footprint for every single person per year. Another important benchmark was to determine the target of carbon sequestration in Malaysian practice. The benchmarking analysis was done to identify the best practise figure and situation to be adopted in the

calculation for current carbon sequestration.

Case Study Area

Pasir Gudang has a significant role in carbon emission due to the heavy and special industrial activities such as petrochemical and oleochemical, electrical and electronic, metal, plastic, chemical, and food. Pasir Gudang is an industrial and a port town located 35km east of Johor Bahru in Malaysia with 110,000 populations. Pasir Gudang is the biggest industrial zone in the southern part of Johor and located in the fastest growing economic region of Iskandar Malaysia. The industry is the main land use pattern, containing almost 50% of the overall land use of the whole central business district (CBD) in Pasir Gudang district (Figure 1). Currently, the urban forests and open spaces located in Pasir Gudang are being reduced gradually to become developed areas, and the environmental effects of reducing trees in the industrial city's environment of Pasir Gudang have not been studied.

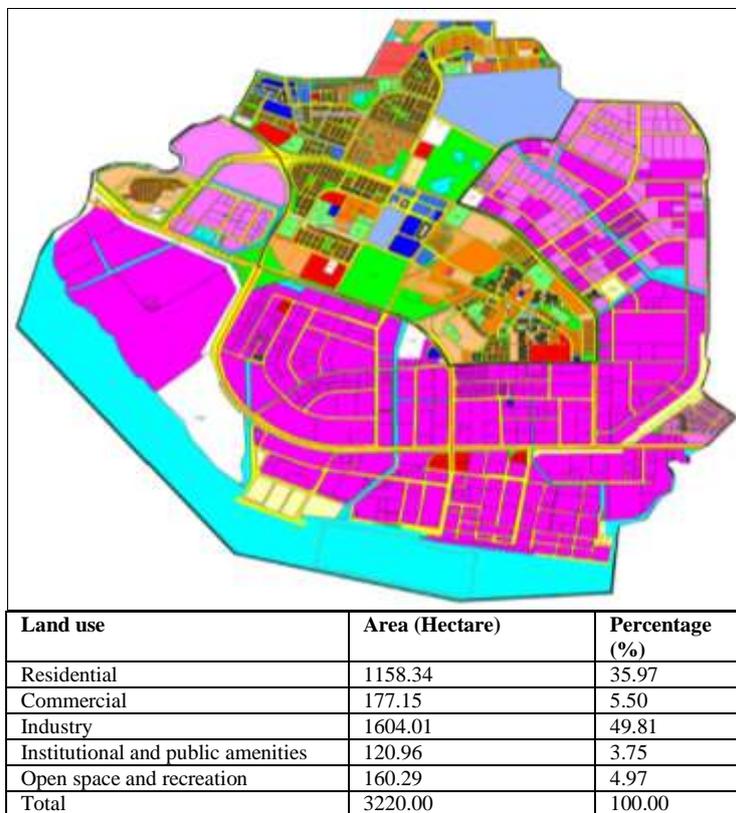


Figure 1. Land use map of Central Business District (CBD) in Pasir Gudang.
(Source: Pasir Gudang Local Authority, 2008)

Actions need to be planned to reduce the carbon emission and greenhouse gases in order to gain low carbon development and to support the sustainability of the area. Thus, to explore the carbon sequestration potential of trees in the green reserves in an open space, this study chose the open space located within the CBD with a 500m radius of green reserve. This open space has been there since 1990 and is one of the popular open spaces in Pasir Gudang. The surrounding land use of the open space within the stated radius consists of industrial lots, a proposed sports complex, and several residential areas with an estimated population of 10,000.

Carbon Sequestration Calculation

Urban Green Reserve

The urban green reserve is a space for tree planting for the purpose of greening the urban area and generates the corridor of carbon sequestration and carbon sink in the development area. The urban green reserve includes a buffer zone between the road and other land use, a reserve for utility activity, a reserve for maintenance, and buffer zones for industrial activities (Figure 2). This reserve is the limited space in the urban areas and needs to be utilized as an agent of carbon sequestration for the urban areas. For an individual tree located in an urban green reserve, carbon sequestered was quantified using Kato's (1978) formula (Kato, 2011). The total biomass of a tree including the above-ground components (Kueh et al., 2013; EPA, 2014) was determined as follows:

- i. The stem biomass was related to the product of the square of diameter breast height (dbh) and tree height.
- ii. The branch biomass was the weight of branch estimated from the equation.
- iii. The leaf biomass was related to the stem weight estimated from the equation.
- iv. The total biomass was the summation of the stem, branch, and leaf biomasses.
- v. The amount of carbon sequestration per tree per year.

The calculation was only counted for healthy tree species that can be identified through tree inventory. By using Kato's (1978) formula, there were five criteria needed to generate the amount of carbon sequestration for every tree in the case study area. The tree criteria were species, age, trunk diameter, height, and general condition.

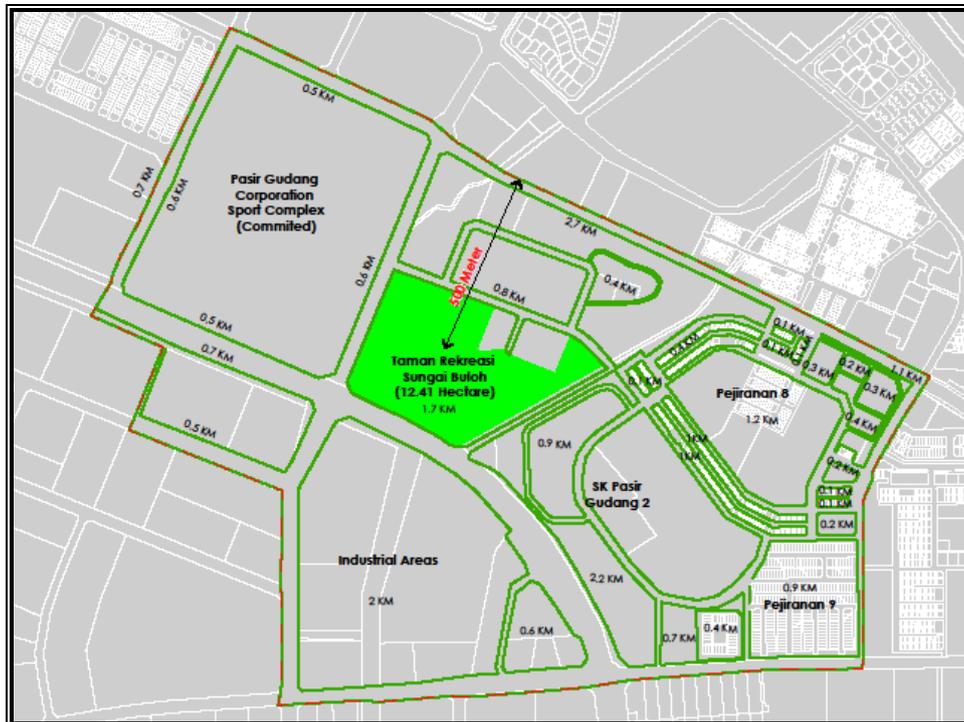


Figure 2. Location of urban green reserve and open space in the case study area in Pasir Gudang (1°N Latitude, 103° Longitude, and average elevation of 30m)

Open Space

Open space is a place designed to be an area for recreational, sports activities, social activities, and other activities relevant to community recreation. Based on the Act 172, Act Town and Country Planning Act 1976, open space means “any land, whether enclosed or not which is laid out or reserved for setting out wholly or partly as a public garden, park, sports and recreation ground, pleasure ground, walk or as a public place”. Open space needs to be provided by every planned urban area based on the hierarchy of open spaces. The requirement of an open space is 10% of the development area and it shall be handed to the local authority upon completion of the development with completed tree planting and beautification as stated in the planning approval.

For the calculation of carbon sequestration in an open space, another method was used and it was not as detailed as the urban green reserve. According to Myers and Goreau (1991), the formula of carbon sequestration in an open space can be defined by the sum of overall number of biomass per plot or per hectare. Basically, the total carbon sequestration (per ton per year) is the area of the open space (hectare) times the benchmark of how many tons

sequestered per hectare per year (250 tons carbon per hectare per year). Then, the amount is divided by the above-ground mass per hectare per year. The figure obtained through this calculation was the final amount of carbon sequestration per year for the whole area of the open space. The location of centralized 10% of the open space in urban areas of Pasir Gudang is mapped in Figure 1.

Tree Characteristic

Tree inventory of tree species was one of the vital methods in data collection process in this research. The key factor of conducting tree inventory was to identify the characteristics of current trees that have been planted in the urban areas of Pasir Gudang. The tree characteristics included tree trunk diameter, tree height, tree species, the healthiness of the tree, and estimated tree age. All these data play a significant role in calculating the carbon sequestration per year for every tree species to portray the actual contribution of carbon absorption through tree planting, especially for existing and old urban area like Pasir Gudang which has limited space to plant new trees.

Referring to the data tabulated in Table 1, the overall diameter of the tree species in Pasir Gudang was between 8 Dbh and 38 Dbh. This can be measured by a special measurement tape called DBH tape, and this tape was used to identify the diameter of the tree trunk. The height of the trees was measured from the bottom of the tree or at the ground surface level to the highest point of the tree, it can be the leaf or the tree branch. It was measured by using the instruments or tools called clinometer and measurement tape. The data collected showed a huge range of tree trunk diameter and the main reason for this situation is the gradual tree replacement for unhealthy or dead trees. Generally, most of the trees were planted about 10 to 20 years ago during the construction stage of development and continuously replaced during maintenance process by the local authority. Among all tree species planted in Pasir Gudang, three biggest tree species were found in Pasir Gudang during the inventory. These were *Khaya senegalensis*, *Alstonia angustiloba* and *Pterocarpus indicus* which have been planted along the road reserve (Figure 3).

Generally, most of the tree species that have been planted in the urban area of Pasir Gudang were from urban tree species and only a few were from forest tree species. Most probably, during the plantation of trees along the urban green reserve in the early 80s and 90s, urban tree species were promoted due to the fast growing and beauty factors. However, in line with low carbon lifestyle, forest tree is currently the most significant tree species due to the low maintenance, fast growing in cluster planting, easy to maintain after maturing, high survival rate, and greater carbon sequestration. Theoretically, forest tree contributes high carbon sequestration due to the high number of branches, higher stem, and the taproot character possessed (a straight tapering root

growing vertically downward and forming the centre from which subsidiary rootlets spring).



Khaya senegalensis (Khaya)



Alstonia angustiloba (Pulai)



Pterocarpus indicus (Angsana)



Sandoricum koetjape (Sentul)



Mimusops elengi (Tanjung)



Samanea saman (Hujan-hujan)

Figure 3: Tree species that have highest carbon sequestration in Pasir Gudang

Table 1: Tree characteristic at urban green reserve

Tree Species	Diameter Class (cm)	Height (m)	Numbers of Tree
<i>Hevea brasiliensis</i> (Getah)	9–17.5	12–22	35
<i>Dyera costulata</i> (Jelutong)	10	15	1
<i>Khaya senegalensis</i> (Khaya)	14–38	18–21	16
<i>Syzygium grande</i> (Jambu Laut)	8–14	9–13	29
<i>Alstonia angustiloba</i> (Pulai)	11–26	11–22	47
<i>Peltophorum pterocarpum</i> (Yellow Flame)	8–15	7–14	22
<i>Pongamia pinnata</i> (Mempari)	8.5–12.5	9–12.5	10
<i>Mimusops elengi</i> (Tanjung)	9–22	7–11	7
<i>Garcinia mangostana</i> (Manggis)	8.5–9	7–12	2
<i>Forest Species</i> (Kandis)	12.5	13	1
<i>Dalbergia oliveri</i> (Tamalan Tree)	8.5	6	1
<i>Fagraea fragrans</i> (Tembusu)	9–13.5	9–10	2
<i>Hopea odorata</i> (Merawan Siput Jantan)	8–10	9–17.5	17
<i>Sandoricum koetjape</i> (Sentul)	11–21	13–16	2
<i>Samanea saman</i> (Hujan-hujan)	12–20	8–11	16
<i>Syzygium polyanthum</i> (Salam)	8–11	9–15	9
<i>Delonix regia</i> (Semarak Api)	13	7	1
<i>Cinnamomum iners</i> (Kayu Manis)	11–17	8–10	4
<i>Pterocarpus indicus</i> (Angsana)	16–24	9–14	28
Total			250

RESULTS AND DISCUSSION

Carbon Sequestration of Urban Green Reserve

Generally, the types of tree in the urban green reserve of Pasir Gudang were dominated by local trees that have been planted more than 10 years and this morphology is in line with the maturity of the urban area which started more than 20 years ago. Several tree species synonym to Pasir Gudang can be found mostly at the urban green reserve for instance *Pterocarpus indicus*, *Alstonia angustiloba*, *Syzygium grande*, and *Hevea brasiliensis*. All these tree species have similar characteristics including low maintenance, high survival rate, and sustainable in various types of weather condition. This is also the main reason for the local authority to choose this tree species for landscaping purposes at the urban green reserve.

Based on the tree inventory, 250 units of main tree have been planted along the urban green reserve in the case study area. *Alstonia angustiloba* or

known as Pulai is the type of tree that is mostly planted along the urban green reserve, and there are 47 units. This species has sequestered 161,329 carbons per year, an average of 3,433kg carbon per tree per year. Based on the calculation, this tree recorded the highest carbon sequestration compared to other tree species. The main reason for this finding is due to the structure of the tree recorded during the tree inventory which can be considered as one of the significant main tree species with a diameter of 11–26 Dbh and a height of 11–22m. These two factors (diameter and height) technically contribute to the higher rates of carbon sink. Table 1 lists the tree characteristics and Table 2 shows the total above-ground biomass of the tree based on the types of tree species, diameter, and height of the tree.

However, from the data tabulated and the analysis done, the tree species that contributed the highest carbon sequestration in the case study area was *Khaya senegalensis* with the local name of Khaya. The average carbon sequester rate of this tree was 4,507kg carbon per tree per year which was slightly higher than *Alstonia angustiloba* with a difference of 1,074kg carbon per tree per year. 16 units of *Khaya senegalensis* species have been planted at the urban green reserve and contributed about 72,119kg carbons per year. Other tree species that have contributed higher carbon sequestration based on the number of trees in the case study area were *Pterocarpus indicus* (Angsana) with 78,538kg carbon per year, *Hevea brasiliensis* (Getah) with 55,850kg carbon per year, *Syzygium grande* (Jambu Laut) with 32,740kg carbon per tree, *Peltophorum pterocarpum* (Yellow Flame) with 18,823kg carbon per year, and *Samanea saman* (Hujan-hujan) with 18,004kg carbon per year.

250 number of trees have been identified as mature trees and to be calculated the carbon sequestration in Pasir Gudang urban area. Basically, every tree generates a different amount of carbon sequestration based on the tree characteristics including tree diameter, tree height, and tree health. Based on the tree inventory, the total amount of carbon sequestration for 250 number of trees was 488,183kg carbon, which was equal to 488.183 tons carbon. Due to this volume, the analysis was extended to define the contribution of carbon reduction to a person via urban green reserve compared to the average carbon footprint for estimating the populations of a case study area. Table 3 shows the analysis and findings of carbon sequestration via urban green space in the case study area in Pasir Gudang.

Table 2. Numbers of tree and sequestration estimation at urban green reserve

Tree Species	Numbers of tree	Estimated Carbon Sequestration Per Tree (kg)
<i>Hevea brasiliensis</i> (Getah)	35	55,850
<i>Dyera costulata</i> (Jelutong)	1	895
<i>Khaya senegalensis</i> (Khaya)	16	72,119
<i>Syzygium grande</i> (Jambu Laut)	29	32,740
<i>Alstonia angustiloba</i> (Pulai)	47	161,329
<i>Peltophorum pterocarpum</i> (Yellow Flame)	22	18,823
<i>Pongamia pinnata</i> (Mempari)	10	8,990
<i>Mimusops elengi</i> (Tanjung)	7	8,289
<i>Garcinia mangostana</i> (Manggis)	2	877
<i>Forest Species</i> (Kandis)	1	1,211
<i>Dalbergia oliveri</i> (Tamalan Tree)	1	272
<i>Fagraea fragrans</i> (Tembusu)	2	1,488
<i>Hopea odorata</i> (Merawan Siput Jantan)	17	11,878
<i>Sandoricum koetjape</i> (Sentul)	2	5,060
<i>Samanea saman</i> (Hujan-hujan)	16	18,004
<i>Syzygium polyanthum</i> (Salam)	9	6,748
<i>Delonix regia</i> (Semarak Api)	1	729
<i>Cinnamomum iners</i> (Kayu Manis)	4	4,343
<i>Pterocarpus indicus</i> (Angsana)	28	78,538
Total	250	488,183

Table 3. Carbon sequestration via urban green space

Analysis	Finding
a. Carbon sequestration via urban green reserve	488.183 tons
b. Estimated population within 5 meter radius of open space	10,000
c. Contribution of carbon reduction per person per year via urban green reserve (kg or ton carbon)	0.049 tons (48.818kg)
d. Average carbon footprint per person per year	7.100 tons
e. Carbon sequestration for 10,000 populations	71,000.000 tons
F. Contribution of carbon reduction per person per year via urban green reserve compared to the average carbon footprint for 10,000 estimated populations	0.690 %

The information and calculation in Table 3 and the Kato's (1978) formula applied showed that the average of carbon sequestration per person per year via urban green reserve in the case study area in Pasir Gudang was 0.049 tons or 48.818kg. It means every single person in Pasir Gudang emits only 0.049 tons of carbon per year through the trees planted in the urban green reserve.

According to the Ministry of Natural Resources and Environment (MNRE) during the National Conference on Green Technology on 9th and 10th of June 2014, the average of carbon footprint per person per year in Malaysia in

2014 was 7.1 tons. Malaysian annual carbon footprint was smaller compared to the annual carbon footprint of average Britons (British) at 10.92 tons of carbon produced each year (Ian & Jonathan, 2006). For the purpose of this research, 7.1 tons was used as the benchmark in the calculation of carbon sequestration in the case study area. Using this parameter, this study found that the contribution of carbon reduction per person per year through carbon sequestration for estimated of 10,000 populations was only 0.69%.

The findings from the quantifications remind us that this limited space has not been fully utilized for the purpose of carbon emission reduction in Pasir Gudang. Therefore, the findings can assist responsible individuals and stakeholders in justifying and recommending more programmes such as tree planting activities. In addition, the responsible authorities can recommend stronger strategies and smarter planning by consolidating low carbon initiatives to increase the contribution of carbon sequestration within this urban area. With appropriate planning, an urban green reserve will be an asset for future generations in Pasir Gudang to gain a quality environment and a healthy lifestyle.

Carbon Sequestration of Open Space

The 'Sungai Buluh' recreation site is an open space area located in the middle of the case study area and it is covered by 8.00 hectare. The primary function of this open space is to act as a sport and recreational area for the surrounding community, as well as a social interactive area, and other summit activities by the local community. This open space has been there since 1990 and has become one of the popular open spaces in Pasir Gudang area. The types of trees in the urban green reserve of Pasir Gudang have been dominated by native species and is in line with the maturity of the urban area which has started more than 20 years ago (Refer to Figure 4).

Several tree species that are quite a synonym to Pasir Gudang and can be found mostly at the urban green reserve, for instance, *Pterocarpus indicus*, *Alstonia angustiloba*, *Syzygium grande*, and *Hevea brasiliensis*. All these tree species have similar characteristics including low maintenance, high survival rate, and sustainable in various types of weather condition. This is also the main reason for the local authority to choose these tree species for landscaping purposes at the urban green reserve. The total acreage of the open space in the case study area was 8.0 hectares. For the purpose of this research, land use of open space was divided into two categories; tree planting area and non-tree planting area (Table 4). Tree planting area consisted of all areas that are covered with trees of any types regardless of the age of trees and its characteristics.



Figure 4: Current condition, and tree species planted in the park

Table 4. Estimated carbon sequestration at open space, Pasir Gudang

Type of Open Space	Area (hectare)	Percent (%)	Estimated Carbon Sequestration Per Hectare
Tree Planting Area	7.0	88.0	7.0 hectares x 250 tons = 1,750 tons
Non-tree planting area	1.0	12.0	-
Total	8.0	100	1,750 tons

The acreage of the tree planting area was 7.0 hectares that covered 88.0% of the open space. However, the non-tree planting area consists of several land use activities including infrastructure (road), utility (sub-station) public facilities (toilet and praying building), playground, building, concrete structure, and a green surface planted with grass or shrub. The non-tree planting area of this open space covered 12.0% of the area, equal to 1.0 hectares. Through Kato's formula, carbon sequestration can only be counted in the area that is covered by primary trees. Other than that, it will not contribute to carbon reduction including the green surface that theoretically can only provide less than 1% of carbon sequestration.

Therefore, the exact boundary of the tree planting area is crucial to be identified because it will determine the rate of carbon sequestered by open space. Technically, based on the data tabulated, the estimated carbon sequestration for an open space of 7.0-hectare tree planting area is 1,750 tons per year. This figure means that every hectare of open space in Pasir Gudang has contributed 250 tons of above-ground biomass per year to offset carbon emission for the surrounding development. Compared to the estimated number of populations within 500 m radius of the open space which is 10,000 populations, the carbon sequestration of the open space absorbed 0.175-tonne carbon per person per year or 175 kg (1 tonne = 1,000 kg) per person per year.

This figure is higher than the urban green reserve because the area of open space is much bigger and the tree density is compact because clustering planting makes tree growth faster. However, through the calculation shown in Table 5, the findings indicated that the contribution of carbon sequestration from open space was 2.46%. The figure considered the carbon footprint of 7.1 tons per person per year for the estimated population in the case study area of 10,000. The tabulation showed unexpected results of actual carbon sequestration scenario in an urban area which tells us that 10% of the open space in planning requirement is in line with the requirement of carbon sequestration. The figure 2.46% (Table 5) is considered very low and it is far away from the national target of 10% carbon sequestration via tree planting. Therefore, actions need to be taken to utilize the contribution by generating high carbon sequestration in open spaces in urban areas even though we might face the biggest challenge of retrofitting the existing development.

Table 5. Carbon sequestration via open space

Analysis	Finding
a. Carbon sequestration via open space	1,750 tons
b. Estimated population within 5 meter radius of open space	10,000
c. Contribution of carbon reduction per person per year via open space (kg/ton carbon)	0.175 tons (175kg)
d. Carbon footprint per person per year	Average 7.1 tons
e. Carbon sequestration for 10,000 populations	71,000 tons
f. Contribution of carbon reduction per person per year via open space compared to average of carbon footprint for 10,000 estimated populations	2.46 %

Total of Carbon Sequestration

According to the analysis and findings in urban green reserve and the open space of Pasir Gudang urban area, the total of carbon sequestration was determined to portray the current scenario. Table 6 reveals that the total of carbon sequestration contributed by both urban green reserve and open space was 2,238.183 tons carbon per year. With the 10,000 estimated populations within 5-meter radius and the carbon footprint per person per year which is 7.1 tons per person per year, the total contribution of carbon reduction is 3.15% per year.

Based on the calculation, technically urban green reserve and open space in Pasir Gudang urban area generated only 3.15% of carbon sequestration, and this is very low compared to the target of 10%. It means, another 6.85% carbon sequestration needs to be generated to achieve the national target of 10% carbon reduction through carbon sequestration. Considering Pasir Gudang is an old town surrounded by mature trees with a minimum age of 10 years old, a conclusion can be made that 10% of open space and urban green reserve for

every development area will only contribute to 1/3 of the carbon sequestration target of 10%. Therefore, in order to achieve the 10% target, the size of the open space and urban green reserve shall increase three times the current scenario or the size of open space is 30% of the development area which have been practiced in other urban areas like Putrajaya (37.6%) (PJCorp., 2012).

Table 6: Total carbon sequestration via urban green reserve and open space in urban area of Pasir Gudang

Analysis	Carbon Sequestration
Carbon sequestration via urban green reserve	488.183 tons
Carbon sequestration via open space	1,750.000 tons
Total carbon sequestration	2,238.183 tons
Estimated population within 5m radius of open space	10,000
Carbon sequestration per person per year	0.224 tons
Carbon footprint per person per year	7.100 tons
Contribution of carbon reduction per person per year via urban green reserve compared to the average carbon footprint for 10,000 estimated populations	0.690 %
Contribution of carbon reduction per person per year via open space compared to average of carbon footprint for 10,000 estimated populations	2.460 %
Contribution of carbon reduction per person per year via urban green reserve and open space compared to carbon footprint for 10,000 populations	3.150 %
Carbon reduction targets via carbon sequestration	10.00 %
The total balance of carbon reduction needs to be offset via carbon sequestration	6.85%

Average Carbon Sequestration by Tree Species

A tree inventory for all tree species planted along the urban green reserve has been carried out not only for the identification of total carbon sequestration but also to determine the average of carbon sequestration for every tree species per year. The average carbon sequestration for every tree species can be obtained by combining all the carbon sequestration for every mature tree species and divided by the number of trees of the same species or as shown as follows:

$$\text{Average carbon sequestration per tree species per year (for mature trees)} = \frac{\text{Total carbon sequestration for a particular tree}}{\text{Numbers of tree (same tree species)}}$$

This data is vital for this research because it will be used as a benchmark for the rate of carbon sequestration for every particular species. In addition, it can also be used to calculate and identify the future projection number of trees needed to be planted until 2025. This is done in order to achieve the 10% target of carbon sequestration via urban green reserve and open space. According to data tabulated in Table 7, currently five tree species generate the highest carbon sequestration in the urban area in Pasir Gudang. All tree species counted in this tabulation were based on the mature trees that cover the age of 10 years and above.

Table 7. Average carbon sequestration per tree per year in urban green reserve

Tree Species	Numbers of Tree	Estimated Carbon Sequestration Tree (kg)	Average Carbon Sequestration Per Tree (kg)
<i>Hevea brasiliensis</i> (Getah)	35	55,850	1,596
<i>Dyera costulata</i> (Jelutong)	1	895	895
<i>Khaya senegalensis</i> (Khaya)	16	72,119	4,507
<i>Syzygium grande</i> (Jambu Laut)	29	32,740	1,129
<i>Alstonia angustiloba</i> (Pulai)	47	161,329	3,433
<i>Peltophorum pterocarpum</i> (Yellow Flame)	22	18,823	856
<i>Pongamia pinnata</i> (Mempari)	10	8,990	899
<i>Mimusops elengi</i> (Tanjung)	7	8,289	1,184
<i>Garcinia mangostana</i> (Manggis)	2	877	438
<i>Garcinia griffithii</i> (Kandis)	1	1,211	1,211
<i>Dalbergia oliveri</i> (Tamalan Tree)	1	272	272
<i>Fagraea fragrans</i> (Tembusu)	2	1,488	744
<i>Hopea odorata</i> (Merawan Siput Jantan)	17	11,878	699
<i>Sandoricum koetjape</i> (Sentul)	2	5,060	2,530
<i>Samanea saman</i> (Hujan-hujan)	16	18,004	1,125
<i>Syzygium polyanthum</i> (Salam)	9	6,748	750
<i>Delonix regia</i> (Semarak Api)	1	729	729
<i>Cinnamomum iners</i> (Kayu Manis)	4	4,343	1,111
<i>Pterocarpus indicus</i> (Angsana)	28	78,538	2,895
Average			1,421

These five tree species as listed below as well as other tree species that have contributed the highest carbon sequestration can be promoted in urban green reserve and open space for future planning.

- i. *Khaya senegalensis* (Khaya) – average sequester 4,507kg carbon per year.
- ii. *Alstonia angustiloba* (Pulai) – average sequester 3,433 kg carbon per year.
- iii. *Pterocarpus indicus* (Angsana) – average sequester 2,895kg carbon per year.

- iv. *Sandoricum koetjape* (Sentul) – average sequester 2,530kg carbon per year.
- v. *Hevea brasiliensis* (Getah) – average sequester 1,596kg carbon per year.

Estimated Number of Trees Required to Offset Carbon Footprint

It is difficult to offset all carbon footprints per person per year through tree planting in urban green reserve and open space. However, it is good to give some indication to the local authority and public on how many number of trees needed for every single person to offset their own carbon footprint per year. With this information, every single person will feel responsible for reducing their own carbon footprint by planting trees. Below is the formula to calculate the estimated number of trees needed to offset carbon footprint per person per year.

$$\text{Estimated number of tree needed to offset carbon footprint per person per year} = \frac{\text{Average carbon footprint per person per year}}{\text{Average carbon sequestration per tree per year}}$$

Table 8 shows that technically, every single person living in urban areas of Pasir Gudang needs five number of trees to offset or to absorb and store their individual carbon footprint generated through daily activity. On the other hand, every household needs to plant five number of trees in order to reduce the carbon emission to zero.

Table 8. Estimated numbers of trees needed to offset carbon footprint per person per year

Analysis	Findings
Average carbon footprint per person per year	7.100 tons
Average carbon sequestration per tree per year	1.421 tons
Estimated numbers of tree needed to offset carbon footprint per person per year	5 trees

In a case study in Pasir Gudang, the carbon sequestration via urban green reserve and open space only contributed less than 5% and is still far from achieving the 10% target of carbon reduction through carbon sequestration (IRDA 2012). However, this not the reason to stop implementing green and low carbon initiatives in planning and developing green space, but it is a challenge to improve the ordinary approach to a better urban green reserve and open space towards high carbon sequestration. Through smart planning of urban green reserve and open space, the utilization of the function of these two limited areas will be more efficient to act as a carbon sink of the urban area. The most important factor is to plan an appropriate and implementable method of carbon sequestration for the local authority. Therefore, we have to identify the best

practice of integrated urban development towards green and low carbon development by adopting related and significant initiative for every type of development.

CONCLUSION

The results revealed that technically, carbon sequestration generated by trees at the urban green reserve and open space in Pasir Gudang urban area was only 3.15%, and this figure is small compared to the 10% national target. Therefore, to achieve the 10% carbon sequestration, the size of open space and the number of trees in urban green reserve must be three times the current size. In other words, the area of open space and urban green reserve must be more than 30% of the development area. However, for existing urban area like Pasir Gudang, there is not enough space to add another open space unless some existing development is converted to become a carbon sink. Therefore, retrofitting the existing urban green reserve and open space is the most significant way to create a carbon sink through smart planning and choosing the appropriate tree species that contribute to high carbon sequestration. In line with the green development and low carbon development, carbon sequestration baseline study must be conducted in every urban area in order determine the current amount of carbon sequestered. This is a very important factor because the current contribution will help to prepare the appropriate planning and landscaping design for generating and managing carbon sequestration in an urban area, so that the 10% target of carbon sequestration can be achieved. This research attempted to orient the way forward regarding the intervention between planning and landscape perspective for enhancing a better quality of life.

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ERRATUM

Due to technical glitch in the publication of the following article entitled 'SUSTAINABLE GOVERNANCE IN RELATION TO THE FINANCIAL ASPECT IN MANAGING COASTAL AREAS: MALAYSIAN EXPERIENCE' in the previous issue of Planning Malaysia Journal, Special Issue III – 2014 (Urban Planning and Governance), therefore, the article is reprinted in this issue of the Journal in full.

SUSTAINABLE GOVERNANCE IN RELATION TO THE FINANCIAL ASPECT IN MANAGING COASTAL AREAS: MALAYSIAN EXPERIENCE

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Abstract

Managing natural resources sustainably is essential in this contemporary era of land use planning system. This includes managing and planning the invaluable of coastal areas. In this regards, coastal management programmes have been regarded as a key approach in delivering the coastal strategies and objectives towards achieving a sustainable coastal development worldwide. This is supported by the good governance to ensure that the implementation of coastal development is successful. As such, this paper suggests that the aspect of good governance as one essential element of coastal management that can and should make a substantial contribution to planning and managing coastal land uses in Malaysia. It has many positive implications to the environmental, social and economic sectors. The experience of Lembaga Urus Air Selangor (LUAS) in managing the coastal areas via the implementation of good governance indicates the requirement of good governance in ensuring a successful coastal management. In addition, financial element has become a significant attribute in implementing coastal management initiatives. This study offers input in planning literatures by addressing the integration of coastal management, good local governance, land use planning and financial elements which are very relevant with today's current global changes on environment as a whole.

Keyword: Governance, coastal management; financial; town planning; land use; sustainable.

INTRODUCTION

Coastal management (CM) programmes have been acknowledged as an essential approach in delivering the coastal strategies and objectives towards achieving a sustainable coastal development. Globally, it is increasingly seen as an effective management tool working across sectoral, disciplinary and institutional boundaries to manage coastal resources (Asmawi, 2010). It has many positive implications to the environmental, social and economic sectors. Its universal framework is applicable to any desired country to fulfil the nation aspiration to moving ahead in physical and socio-economic development and growth. In this regards, the financial factor has become a significant attribute in implementing CM initiatives. Many literatures demonstrate the influence and importance of financial in the practice of CM (refer Milne and Christie, 2005; Salamanca, 2003; Pomeroy, Oracion, Pollnac and Caballes, 2005; and Chua, 2001). Of the particular concern nowadays, the implementation of governance for sustainable coastal development is considered as a key driven factor in managing coastal areas as a whole. As such, this paper discusses the relationship established between CM and financial aspects from the perspective of good governance which is considered as the field that has the 'power' to control and regulate land use changes within the land-side areas. The aim of this paper is to illustrate a review that could move the management of coastal areas towards a sustainable outcome by looking at what driven by the question: what institutional arrangement and governance mechanisms could facilitate the delivery of a sustainable coastal development? Evidence is presented through reviewing the status quo of coastal management in relation to financial aspect and governance aspect based on the collection of series of secondary data pertaining to the subject matter. The approach used in this study refers to the pertinent lessons learnt from the discussion on case studies in relation to the aspect of good governance and financial aspect.

REVIEWING THE COASTAL MANAGEMENT IN MALAYSIA

Coastal Resources and their Management

The coastal environment is a unique system where land meets the sea and oceans. It is also characterised as dynamic and diverse which makes it vulnerable to changes. The coast contains a variety of renewable and non-renewable natural resources associated with its land, air and water. It has ecologically complex structures and extremely active environments. In contrast to the natural system, coastal areas also house human populations and provide the base for all human activities related to the use of marine resources. The intervention of human activities creates conflicts in CM. This is where the challenges and complexity emerge in CM. The complexity of resource use arises from the interaction between numerous users of coastal areas who often use the coast in multi-dimensional ways. According to Klee (1999), the constant

change in the coastal zone is due to three natural factors: terrestrial factors; marine factors; and biological factors.

Coastal Management in Malaysia

Malaysia is considered to be a maritime country as it is virtually surrounded by sea with abundant environmental resources for economic development. Together, Peninsular Malaysia, Sabah and Sarawak on the island of Borneo have a coastline of total length 4,810km. There is no state within the country that does not have a coastal area. The coasts of Malaysia experience enormous and numerous environmental and ecological problems due to massive development. The main problems are: beach erosion; resource depletion; environmental degradation; and destruction of natural habitat (Abdul Salam, 1998; Basiron, 1998; Cicin-Sain & Knecht, 1998); multiple use conflicts and multiple stakeholders with differing interests (Basiron, 2000); population expansion and rapid urbanisation (Chong A., 2001); massive tourism and recreational development (Che Omar, 1992); and agricultural development, transportation and navigation (Mokhtar & Aziz, 2003). Abdullah (1999) includes other problems such as uncontrolled sand mining activities and over-exploitation of fishery resources. Recognising the importance of CM, the government has taken preliminary initiatives by providing many development guidelines about how to protect coastal areas although a sectoral approach is currently applied. The evolution of CM initiatives in Malaysia is generally driven by a problem-based and reactive approach to resource degradation and international commitments (Basiron, 2000; Mokhtar & Aziz, 2003; Siry, 2006).



Figure 1: Pantai Remis in Kuala Selangor district is facing erosion problem that requires coastal defence work to curb it.

Presently, there is no specific comprehensive national coastal legislation, administration system or a single coastal development authority to deal with coastal area in Peninsular Malaysia (Syed Abdullah, 1992; Che Omar, 1992; Siry, 2006). Malaysian CM is complicated by the involvement of a

variety of agencies that operate by sectors (Saharuddin, 2001). Abdul Salam (1998) states that the involvement of many sectors creates conflict of interest, overlapping and duplication. The main government departments which have a sectoral interest in coastal issues are the Department of Irrigation and Drainage (DID), the Department of Environment (DOE), the Town and Country Planning Department (TCPD) and the Department of Fisheries (DOF).

In Malaysian experience, the first pilot CM project was undertaken at State level in South Johore (Chua & Scura, 1992; Ministry of Science, Technology and the Environment, 1992). Three pilot projects were undertaken in Sabah, Sarawak and Penang (1996), with assistance from the Danish Co-operation for Environment and Development (DANCED) and the Economic Planning Unit (EPU) (Cho, 2002; Pedersen *et al.*, 2005; Siry, 2006). The overall objective of the pilot projects was to understand the processes and mechanisms that were needed in the formulation and implementation of CM policy at State level. The national objective was to develop the process for formulating a national policy for CM that will provide clear principles and guidelines (Ibrahim, 1999) and to strengthen interstate and Federal-State co-operation in relation to CM (Pedersen *et al.*, 2005). Port Klang CM programme was undertaken in 2001 which operated at a local level. It was launched as a smart partnership under the 'Partnership in Environmental Management in South East Asia' (PEMSEA) initiative with the International Maritime Organisation (IMO) (Mohd Sharif, 2003). Sabak Bernam and Kuala Selangor CM plans were recently (2011) launched under the same arrangement of partnership, undertaken by Lembaga Urus Air Selangor (LUAS). However, the success of these CM plans still has to be evaluated.



Figure 2: Example in Klang District: A factory plant located within coastal area creates conflict use.

Institutional Arrangements for Coastal Management in Peninsular Malaysia

Malaysia currently practises a three-tier system of government: Federal; State; and Local Authorities. This system has major influence on the development and management of land, water and natural resources. It is important to understand the constitutional arrangements about the executive, administrative and legislative boundaries between the Federal and State Governments. The distribution of legislative competence can be found under Part VI of the Federal Constitution 1957 (Government of Malaysia, 1999). Article 73 of Part VI and the Ninth Schedule divide the subject matter of the Federal and State legislative power into three parts in which the coastal matters are listed in 1.

Table 1: The division of power between levels of Malaysian Government on coastal matters

List	Subjects that have a coastal significance
List I: The Federal List (those matters enumerated on which Parliament may enact laws)	<ul style="list-style-type: none"> • shipping and navigation on the high seas and in tidal and inland waters; • ports and harbours; • lighthouses and other provisions for the safety of navigation; maritime and estuarine fishing and fisheries (excluding turtles); • light dues; • wreck and salvage; • federal works on water supplies, rivers and canals (except those wholly within one State); • scientific and technical research; • tourism; and • industry.
List II: The State List (those matters enumerated on which State legislatures may enact laws)	<ul style="list-style-type: none"> • all land matters; • agriculture and forestry; • Local Government; • state work and water (water supplies, rivers and canals); and • turtles and riverine fishing.
List III: The Concurrent List (the common subject-matter on which both the Parliament and the state legislatures have competence)	<ul style="list-style-type: none"> • protection of wild animals and wild birds; • national parks; • animal husbandry; • town and country planning; • public health; • drainage and irrigation; • rehabilitation of mining land; and • housing.

Source: *Government of Malaysia (1999); Usuluddin (1999)*

The existence of the Concurrent List, which gives powers to the Federal and State legislatures, offers opportunity for conflict. LPAs are the lowest level of government that control development in their areas and they are often assigned particular functions and resources to oversee. Where coastal resources are concerned, it can be briefly said that water and land matters fall within the jurisdiction of the State Government and entails development planning and zoning, as well as other activities. In relation to biological resources, work is shared between the Federal and State Governments. In this case, the LPAs, together with relevant government agencies, act as a channel of communication for both the Federal and State Governments (Mokhtar & Aziz, 2003). Abdul Salam (1998) says that each State Government has constitutional rights and authority over land, minerals and the marine environment up to three nautical miles from the coastline. The Federal Government has jurisdiction beyond three nautical miles offshore (Abdullah, 1999; Syed Abdullah, 1992).

Malaysia has continuing 5-year national development plans, called Malaysia Plans. They set out the macroeconomic growth targets to achieve Outline Perspective Plans (OPPs) which provide the broad thrusts and strategies in the development agenda for Malaysia in the long-term (30 years) (Economic Planning Unit, 2004). Currently, the Tenth Malaysia Plan (2011-2015) is being implemented. However, coastal issues were not included in Malaysia Plans until the Third Malaysia Plan (1977-1980) (Table 2). This introduced policy on oil spills. Later, the Seventh Malaysia Plan (1996-2000) stated that a National Coastal Zone Policy (NCZP) would be produced for the country. The study for the NCZP was commenced during the Eighth Malaysia Plan (2001-2005).

Table 2: The coverage of coastal issues in Malaysia Plans

Period	Issues	Actions
Third Malaysia Plan (1977-1980)	Oil spill	Produced Straits of Malacca Contingency Plan
Fourth Malaysia Plan (1981-1985)	Oil spill	Continued developing Straits of Malacca Contingency Plan
Fifth Malaysia Plan (1986-1990)	Oil spill	Formulated National Oil Spills Contingency Plan: Incorporated the plans for the Straits of Malacca and the South China Sea
Sixth Malaysia Plan (1991-1995)	Oil spill	Continued efforts on the National Oil Spills Contingency Plan
Seventh Malaysia Plan (1996-2000)	Overall concept of coastal management	Planned to produce a National Coastal Zone Policy (NCZP) to provide clear principles and guidelines for resolving the conflicting interests between different types of development in coastal areas.
Eighth Malaysia Plan (2001-2005)	Overall concept of ICM	Continued efforts on the ICM initiatives based on the NCZP.
Ninth Malaysia Plan	Strengthening the	Proposes adoption of the NCZP to promote

(2006-2010)	concept of ICM	conservation and preservation of marine and coastal resources.
Tenth Malaysia Plan (2011-2015)	Implementing some initiatives on coastal management	Preparation of National Physical Plan-Coastal Areas by the Federal Town and Country Planning Department and other initiatives.

Source: Economic Planning Unit, 1977; 1981; 1986; 1991; 1996; 2001; 2006; 2010.

FINANCIAL ASPECT IN COASTAL MANAGEMENT PROGRAMMES

Integrating the financial aspect in CM approach is important especially in understanding the cost of undertaking one and ascertaining whether the outcomes are worth the money spent (Salamanca, 2003). In addition, Pollnac and Pomeroy (2005) state that financial investment is the backbone of successful CM. Without the essential financial support, CM will not be initiated and implemented. In Malaysia, research on the incorporation of costing impact factor in CM initiatives is currently unavailable. Though several programmes on CM have started and are on-going stages, no studies have tried to account the total level of investment. Case studies from other countries in the regional setting, e.g. the Philippines, also indicate that there is lacking of research on the relationship between financial and CM. Literature shows that the success of most CM programmes depends, largely, on the ability of municipalities to secure adequate financial for CM initiatives (Milne & Christie, 2005). The financial element can be especially important in future planning of coastal areas, particularly if the sources of fund are limited. Knowing the costing aspect in coastal management approach is important especially in understanding the cost of undertaking one and ascertaining whether the outcomes are worth the money spent (Salamanca, 2003). In addition, Pollnac and Pomeroy (2005) state that financial investment is the backbone of coastal management. Without the essential financial support, coastal management will not be initiated and implemented.

Local Planning Authority (LPA) is responsible for the implementation of CM programmes in which they need to decide on the measures to be implemented in the maintenance and up-keep of the shoreline. These decisions have to be appropriate for the sustainability of the habitats. Persson (2010) states that coastal habitats are valuable for the biodiversity of their fauna and flora while the dunes and wetlands provide flood control, drinking water, and waste assimilation, and beaches are valuable assets for tourism and recreation. He addresses that tools for taking account of costs and benefits are necessary for the establishment of priorities in CM:

- i. between different areas in need of help because of the shoreline being threatened; and
- ii. between different actions that could be taken that vary in their efficiency and effectiveness.

For instance, there are three levels of response in efforts to combat coastal erosion and its negative impacts on society can be distinguished in the appraisal of projects in this area. Figure 1 shows the associated aspects, i.e. planning or policy, engineering or implementation, and financial aspect used in order to handle the coastal issue. The appraisal for measures includes identifying problems, risk assessment of the alternative solutions, implementing the chosen programme and evaluating the impact to the environment and society. It is crucial to assess the effect as sustainability is the main goal of any CM programme. “Qualifying the effects” means assigning a qualitative value to each of the identified effects. The values can be monetary or non-monetary where monetary values can be represented by investment costs, production losses, and costs of restoring damage. Non-monetary values include classification and ordinal or interval scales that describe the effects of different alternatives. Nonetheless, the problem with monetary qualification lies in the actual appropriateness of making trade-offs between different costs and benefits and the transfer of wealth that can occur. In Malaysia scenario, studies on the inter-relationship between CM, TP and financial aspect are very limited either in academic literatures or practice. It is hoped that this paper could contribute to increasing the value of life by addressing the important linkage of various disciplines.

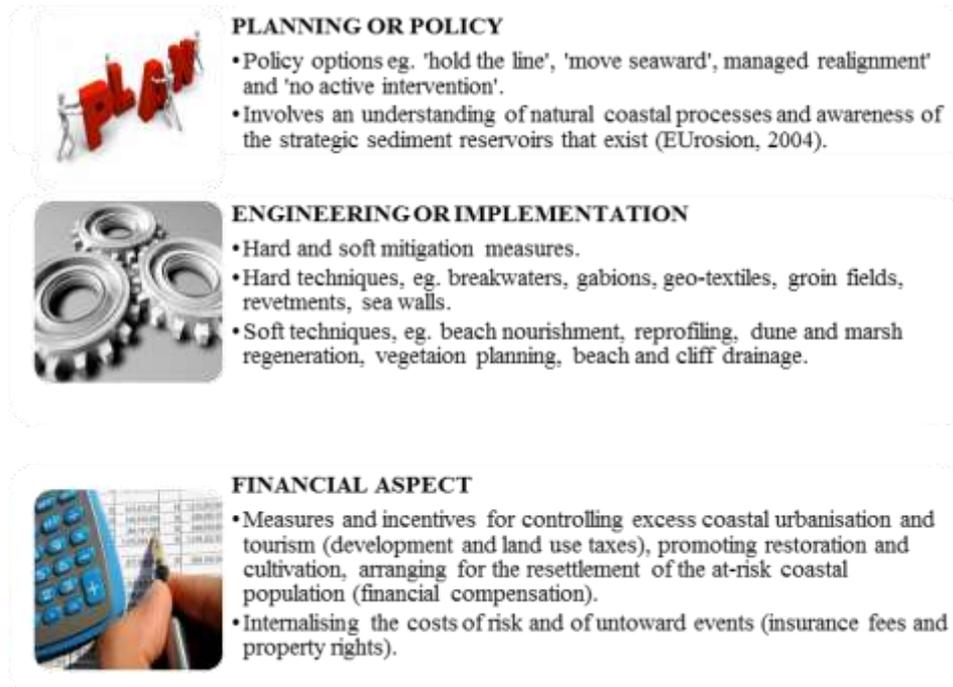


Figure 3: Level of Response Involved in Combating Coastal Erosion
 Source: Modified from Persson (2010)

THE RELEVANCE OF TOWN PLANNING TO COASTAL MANAGEMENT

It is observed that CM has some objectives that can only be achieved by curtailing development. Only TP has the power that lies in a statutory regime. Therefore, CM must be able to communicate, co-ordinate, co-operate and collaborate in partnership efforts within the scope of TP. At a local level, the TP system can make a contribution to CM by using its development plan and development control systems as shown in Figure 2. Coastal policies could be incorporated into development plans and development control decisions made based on development plans.

The TP system is seen as one of the elements of a broader spectrum of CM. This is a positive statement suggesting that TP has a role to play in CM. The planning system can be an instrument to achieve CM objectives through the shaping and guiding of development and land use, through policies and proposals in development plans or similar documents and development control decisions. It can definitely provide a statutory framework for coastal policy in a wider context of general planning and development process. It can also bring together spatial aspects of multi-sectoral inputs into a single development planning system. Development plans can implement CM policy. It can also

contribute by supplying information about development to other CM activities. The TP system is designed to control development through its application system, and decisions are made in accordance with the planning authority's development plan (Asmawi, 2010). Development within the boundaries of local authorities will normally be subject to development control. It is also important to recognise that the aspect of governance received good support from the players in managing the coastal areas (Moss, 2004). As such, the building capacity of the related government agencies in handling the issues related to coastal development is essential for them to move forward (Van de Kerkhof, 2006; Stojanovic and Barker, 2008). However, in real world circumstances, the true involvement of those agencies is hardly to achieve in operation due to many institutional procedures.

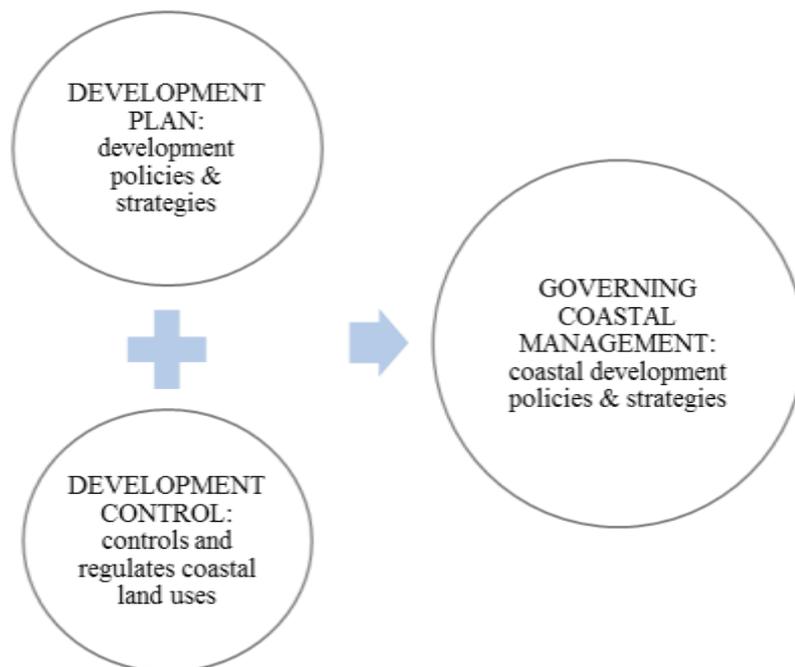


Figure 4: A Generic Relationship between Town Planning and Coastal Management

LUAS EXPERIENCE IN GOVERNING PORT KLANG INTEGRATED COASTAL MANAGEMENT (ICM) PROGRAMME

The ICM initiative in Port Klang was set up as part of various efforts, involving several coastal nations in south-east Asian region. The

International Maritime Organisation (IMO) established a Regional Programme office in Manila, Philippines, under the ‘Partnership in Environmental Management for the Seas of East Asia’ (PEMSEA) programme. Port Klang was chosen as ‘pioneer area and National Demonstration site’ under the PEMSEA programme. The programme was known as Port Klang Coastal Strategy.

The project area covers 7,960 kilometres square and comprises the Klang District, the Hulu Langat District and all the islands that fall under the jurisdiction of these districts (Figure 3). There are two local authorities involved: Klang Municipal Council; and Kuala Langat District Council. This project area is sufficiently close to Kuala Lumpur to experience its direct influence and impacts on the eastern part of the area.

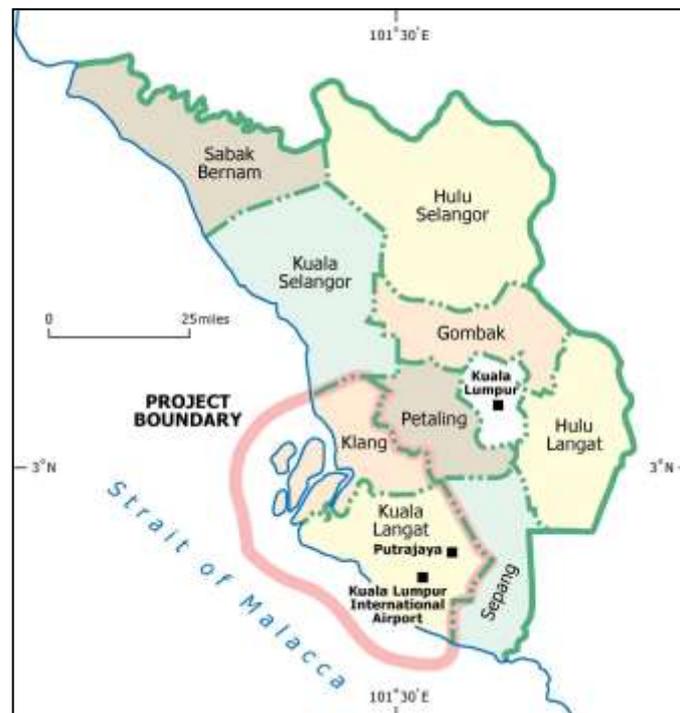


Figure 5: Location of Port Klang ICM programme

Source: Based on Port Klang ICM Project, 2004a

The coastal of Port Klang are important for many reasons: as a source of livelihood; for its natural beauty; for its ecological functions; for its historical and cultural heritage; and for its economic activities. This area has experienced both the positive and negative impacts of development within its catchment,

including generating employment in tourism and beach erosion. Thus, there is a need to harmonise economic development and environmental conservation.

Port Klang Coastal Strategy is the main plan for the Port Klang ICM programme. Other supporting plans are: Port Klang Initial Risk Assessment; Sea-use Zonation Plan; Information, Education and Communication Plan; and Integrated Environmental Management Plan. A web home page of the project (<http://luas.gov.my/icm/index.htm>) has been dedicated to information on the Port Klang ICM plan. The objective of the Port Klang Coastal Strategy is to provide stakeholders with a common vision and framework for their actions in using, managing and developing the coastal area. The objective is drawn from the principles of ICM and modified to the particular circumstances of the Port Klang coast. It is an important document that clearly defines a common vision, the mission, action plans and a programme.

Figure 6, which is taken directly from Port Klang ICM Project (2004b) demonstrates the process by which the strategy was prepared. It indicates the two-way communication between policy makers and stakeholders with support from other relevant parties such as research institutions and academics. The policy making components in the Port Klang ICM programme consist of various elements including political support, policy changes, manpower, funding and institutional arrangements.



Figure 6: Relationship between policy makers and stakeholders in Port Klang ICM programme

Source: Port Klang ICM Project, 2004b

The programme demonstrates that funding is one of key elements in implementing coastal strategies in the study area. However, the current practice indicates that there is lacking of coordination among the stakeholders in which it is done in a disintegrated manner. As a result, the element of funding does not involve properly in the programme which it leads to several issues, as follows:

- i. no emphasis was given to funding element when plan and manage coastal areas;
- ii. record on itemised budgeting and spending expenditure is hardly available to see the priority sector of coastal management; and
- iii. the importance of funding element in supporting the success of coastal management programme is not recognised in the study area.

Some lessons could be learnt from the case of LUAS. Firstly, the experience of LUAS in governing the implementation of its coastal management offers opportunities for improvement in order to establish a good governance of funding element in supporting coastal management initiatives. Secondly, from the planning perspective, financial aspect is regarded as an important factor that can boost the implementation activities involved in planning coastal land use to ensure that a sustainable coastal development can be attained in the longer term. Thirdly, the support from good governance will ensure the sustainability of managing coastal areas.

CONCLUDING REMARKS

This short paper highlights that CM generally needs strong support from various aspects for its operation and implementation run smoothly. The aspect of good governance seems to be the essential key factor in determining the successful of a coastal management programme. As such, the present governance framework for implementing coastal management works has to be improved for better results. If CM is to succeed in Malaysia, it demands serious attention to resolve many planning and development issues in its present practice. Since town planning has a more firm foundation in Malaysia, it could be the key to the successful implementation of the development related aspects of CM. In line with that, this short paper also urges the importance of financial aspect to be incorporated in the practice of CM to ensure the possibility of any CM programme to be successfully implemented is high. Though current scenario indicates that the inclusion of financial aspect in CM is very rare, there are rooms for improvement in the future. It is hoped that the exercise of CM can be

implemented within the umbrella of TP which takes into account the financial aspect in order to achieve sustainable coastal land use planning in Malaysia.

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