

JOURNAL OF THE MALAYSIAN INSTITUTE OF PLANNERS

CONTENTS	PAGE
1. Determinant Factors of Neighbourhood Quality <i>By: Norainah Abdul Rahman, Dasimah Omar & Abdul Ghani Salleh.....</i>	1
2. The Relationship Between Variations of Grid Layout and Burglary <i>By: Saniah Ahmad Zaki & Jamalunlaili Abdullah.....</i>	17
3. Analysis of Factors Influencing the Stated Preference of Academic Employees Towards Telecommuting in IIUM Campus, Gombak. <i>By: Farah Diyanah Ismail, Abdul Azeez Kadar Hamsa & Mansor Ibrahim....</i>	41
4. The Potential of Urban Forest Park for Sustainable City <i>By: Noralizawati Mohamed, Noriah Othman & Mohd Hisham Ariffin.....</i>	67
5. The Effectiveness of Provision of New Static Information Signage: A Case Study of International Islamic University Malaysia, Gombak Campus. <i>By: Syazwani Sahrir, Syahriah Bachok & Mariana Mohd. Osman.....</i>	81
6. The Construction and Demolition Wastes in Klang Valley, Malaysia <i>By: Muhammad Abu Eusuf, Mansor Ibrahim & Rafikul Islam.....</i>	99
7. The Future of Coastal Management Programme in Malaysia: Making the Coast Visible to Planners <i>By: M. Zainora Asmawi.....</i>	125
Notes to contributors and guidelines for manuscript submission.....	147
The past issues (articles).....	151

PLANNING MALAYSIA JOURNAL OF THE MALAYSIAN INSTITUTE OF PLANNERS

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



PLANNING MALAYSIA

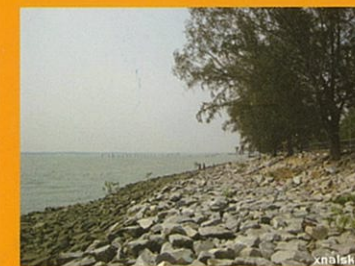
Journal of the Malaysian Institute of Planners

VOLUME 10 - 2012

PLANNING MALAYSIA

JOURNAL OF THE MALAYSIAN
INSTITUTE OF PLANNERS

MALAYSIAN INSTITUTE OF PLANNERS
VOLUME 10 - 2012 [ISSN 1675-6215]
www.mip.org.my



This title
is indexed
in Scopus

PLANNING MALAYSIA

Journal of the Malaysian Institute of Planners

Advisor

Professor Dato' Dr. Alias Abdullah

Editor-in-Chief

Professor Dato' Dr. Mansor Ibrahim

International Islamic University Malaysia (IIUM)

Local Editorial Board Members

Professor Dr. Muhammad Abdul Mohit - *International Islamic University Malaysia (IIUM)*

Professor Dr. Ismawi Hj. Zen - *International Islamic University Malaysia (IIUM)*

Professor Dr. Ho Chin Siong - *Universiti Teknologi Malaysia (UTM)*

Professor Dr. Jamilah Mohamad - *Universiti Malaya (UM)*

Professor Dr. Ghani Salleh - *Universiti Sains Malaysia (USM)*

Professor Dr. Badaruddin Mohamed - *Universiti Sains Malaysia (USM)*

Professor Dr. Ruslan Rainis - *Universiti Sains Malaysia (USM)*

Professor Dr. Dasimah bt. Omar - *Universiti Teknologi Mara (UITM)*

Assoc. Professor Dr. Jamalunlaili Abdullah - *Universiti Teknologi Mara (UITM)*

Datin Paduka Dr. Halimaton Saadiah Hashim - *Universiti Kebangsaan Malaysia (UKM)*

Assoc. Professor Dr. Ainul Jaria Maidin - *International Islamic University Malaysia (IIUM)*

Assoc. Professor Dr. Suhana Shamsuddin - *Universiti Teknologi Malaysia (UTM)*

Dr. M. Zainora Asmawi - *International Islamic University Malaysia (IIUM)*

Dr. Mohamed Thalha Hj. Alithamby - *Malaysia Institute of Planner (MIP)*

Khairiah Talha - *Malaysia Institute of Planner (MIP)*

Ishak Ariffin - *Malaysia Institute of Planner (MIP)*

Norliza Hashim - *Malaysia Institute of Planner (MIP)*

Dr. Alias Rameli - *Jabatan Perancang Bandar dan Desa (JPBD)*

Dr. Dahlia Rosly - *Jabatan Perancang Bandar dan Desa (JPBD)*

International Editorial Board

Professor Emeritus Dr. Richard E. Klosterman (*University of Akron / Whatif? Inc., USA*)

Professor Emeritus Dr. Stephen Hamnett (*University of South Australia, Adelaide, Australia*)

Dr. Tan Yigitcanlar (*Queensland University of Technology, Brisbane, Australia*)

Assoc. Professor Dr. Belinda Yuen (*University of Singapore / SIP*)

Dr. Davide Geneletti (*University of Trento, Italy*)

Professor Dr. Ali Abdul Raof (*University of Qatar, Qatar*)

Professor Dr. Kiyoshi Kobayashi (*University of Kyoto, Japan*)

Professor Ir. Dr. Boy Kombaitan (*Institut Teknologi Bandung*)

Editorial & Business Correspondence
PLANNING MALAYSIA
Journal of the Malaysian Institute of Planners
B-01-02, Jalan SS7/13B, Aman Seri, Kelana Jaya
47301, Petaling Jaya, Selangor Darul Ehsan, MALAYSIA
Tel: +603 78770637 Fax: +603 78779636 Email: mip@mip.org.my



Copyright © MIP, 2012

All rights reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, or otherwise without the prior permission of the publisher.

The views expressed in this publication are those of the author(s) and do not necessarily represent the views of MIP.

This journal is a refereed journal.

All articles were reviewed by two or three unanimous referees identified by the Institute (MIP).

Published By
Malaysian Institute of Planners

ISSN Number
1675-6215


**This title is
now indexed
in Scopus**

refine your research
SCOPUS™

CONTENTS

Journal of the Malaysian Institute of Planners

Message from The President	v
Articles:	
1. Determinant Factors of Neighbourhood Quality <i>By: Norainah Abdul Rahman, Dasimah Omar & Abdul Ghani Salleh</i>	1
2. The Relationship Between Variations of Grid Layout and Burglary <i>By: Saniah Ahmad Zaki & Jamalunlaili Abdullah</i>	17
3. Analysis of Factors Influencing the Stated Preference of Academic Employees Towards Telecommuting in IIUM Campus, Gombak <i>By: Farah Diyanah Ismail, Abdul Azeez Kadar Hamsa & Mansor Ibrahim</i>	41
4. The Potential of Urban Forest Park for Sustainable City <i>By: Noralizawati Mohamed, Noriah Othman & Mohd Hisham Ariffin</i>	67
5. The Effectiveness of Provision of New Static Information Signage: A Case Study of International Islamic University Malaysia, Gombak Campus <i>By: Syazwani Sahrir, Syahriah Bachok & Mariana Mohd. Osman</i>	81
6. The Construction and Demolition Wastes in Klang Valley, Malaysia <i>By: Muhammad Abu Eusuf, Mansor Ibrahim & Rafikul Islam</i>	99
7. The Future of Coastal Management Programme in Malaysia: Making the Coast Visible to Planners <i>By: M. Zainora Asmawi</i>	125
Notes to contributors and guidelines for manuscript submission	147
The past issues	151


“Whoever travels in search of knowledge is on Jihād until he returns”
(Transmitted by Tirmidhi & Darimi)



MIP Council Members
(2011-2013 Session)

President

Professor Dato' Dr. Alias Abdullah (194/88)

Vice President

Datuk Ismail B. Ibrahim (504/05)

Hon. Secretary

Lee Lih Shyan (267/92)

Hon. Treasury

Md. Nazri B. Mohd Noordin (301/94)

Council Members

Khairiah Mohd Talha (184/85)

Mohd Zamri Husin (430/01)

Mohamad Nazri Jaafar (168/86)

Mazrina Dato' Abdul Khalid (559/09)

Noraida Saludin (468/02)

Zahiruddin Zainal (495/05)

Mohammad Fahmi Alias (500/05)

Lokman Omar (211/88)

Associate Professor Dr. Jamalunlaili Abdullah (562/09)

Ishak Ariffin (239/90)

Co-opted Members

Tan Thean Siew (178/86)

Chairman of Sarawak/Sabah Chapter

Bartholomew Wong (477/03)

Chairman of Northern Region Chapter

Michael Ong Chin Kong (443/01)

Chairman of Southern Region Committee

Ahmad Abd Majid (290/94)

MESSAGE FROM THE PRESIDENT

Dear Readers,

This year MIP is celebrating its 40 years old. Although she was in existence for almost half a century with a lot of 'up and down' and 'bitter and sweet' recalls in championing the novel course of planning profession in the country, the consistency of publication of Planning Malaysia Journal only could be realized since 2003. Started with four editorial board members and difficulties in chasing the articles from the planning fraternities, now in its volume 10th the Journal is well-received by the members as well as the academic community. This is due to perhaps, the awareness for knowledge seeking and improvement among the members as the articles touch on wide spectrum of our daily planning issues. It is indeed a great achievement to the Institute as we strive to encourage more members and academics to write and share new ideas on planning and urban development.



The main objective of this journal is to offer a platform for town planners to share ideas and experiences on urban and regional planning stuffs. Ideas and thoughts may be generated from research, studies undertaken or actual hands-on experiences of planners and academics. MIP hopes the journal can offer a healthier insight to all planners so that their roles as town planners can be eloquently appreciated by the public.

We expect to outspread the circulation of this journal to non-planning related organizations and institutions that has indirect role in planning within and outside the country. We hope this issue will serve the purpose and welcome any comment for improvement in the future issue.

As a President, I would like to acknowledge and congratulate the authors and the Journal's Editorial Board Members for their dedication and continuous support to the Institute.

Thank you and happy reading.

Prof. Dato' Dr. Alias Abdullah
PRESIDENT
(2011-2013)



DETERMINANT FACTORS OF NEIGHBOURHOOD QUALITY

Norainah Abdul Rahman¹, Dasimah Omar² & Abdul Ghani Salleh³

¹*Faculty of Architecture Planning and Surveying*
UNIVERSITI TEKNOLOGI MARA, PERAK, MALAYSIA

²*Faculty of Architecture Planning and Surveying*
UNIVERSITI TEKNOLOGI MARA, SHAH ALAM, MALAYSIA

³*School of Housing Building and Planning*
UNIVERSITI SAINS MALAYSIA, PULAU PINANG, MALAYSIA

Abstract

The basic concept of neighbourhood refers to a physical boundary where people lead their private lives. Neighbourhood is about physical environment, economy and social which constitute the sense of community and place attachment. The development and neighbourhood changes for urban renewal, urban regeneration and redevelopment are to fulfil the people's needs and requirements. The neighbourhood changes are required to improve the neighbourhood conditions such as neighbourhood quality, liveable neighbourhood, healthy neighbourhood, sustainable neighbourhood, dynamic and self-stabilising neighbourhood, safe neighbourhood and better neighbourhood. All of these are shared towards people's well-being, health, safety and sustainable communities. This article looks into the multivariable influences in the provision of neighbourhood quality for the residents' needs in their housing and neighbourhood area. Previous research had explained three multivariable factors that influenced the quality of neighbourhood namely physical, social and economic aspects. The physical aspects were examined in four categories namely dwelling unit, facilities and services, accessibility and surrounding environment. The social aspects were classified as socio-demographic, social community and social interaction and place attachment. The economic aspect focused on the socio-economic of the residents.

Keyword: Neighbourhood, Neighbourhood Quality, Physical Factors, Social Factors, Economic factors.

¹ Senior Lecturer. Email: norai760@perak.uitm.edu.my

² Professor. Email: dasimah629@salam.uitm.edu.my

³ Professor. Email: sghani@usm.my

INTRODUCTION

The basic concept of neighbourhood is known as a delineated area within physical boundaries where people identify their home and where they live out and organise their private lives. There are both physical and psychological barriers between neighbourhoods such as a road or the tenure of the housing, or the social composition of residents (Power, 2004). Theodori (2001) mentions that a neighbourhood is the satisfaction and attachment of a community which have various social and demographic factors associated with ones' well-being. A neighbourhood is also known as a place-based community to support an argument that a neighbourhood is an appropriate spatial scale for understanding the operation of 'everyday life-worlds' (Meegan & Mitchell, 2001). According to Jones (2001) and Leby and Hashim (2010), a neighbourhood is a sense of community and quality of life. It is a promoted liveable neighbourhood by comparing the conventional suburban and traditional urban development. It also includes social embeddedness, sense of community, satisfaction with the neighbourhood, and sensed crime (Martinez, Black, & Starr, 2002). Urban neighbourhood is a place of attachment and has a community sentiment. The concept of place is conceptualised in terms of the setting in which social relations are constituted, the effects upon locales of social and economic processes and the creation of a sense of place (Corcoran, 2002). Neighbourhoods can be defined and created through social interactions and particular actions which often conflict and the ideal of neighbourhood asserts a role for the "local" in a world increasingly characterized by extra-local interactions and exchanges (Martin, 2003). The neighbourhood is an urban quality environment and human well-being where the specification of life concerns and determination of how reactions to them have to combine to predict people's sense of overall life quality (Pacione, 2003).

The improvement or upgrading in a neighbourhood is a continuous process for the need and requirement of its residents. People's perception is required to evaluate the urban quality environment elements in the neighbourhood change. The combination of elements of urban quality environment and people's perception will create the environment of a liveable city and for the people's well-being. The wide range of elements need to be satisfied such as social, economic and environment (Pacione, 2003). A neighbourhood has to be a settlement which is viewed holistically, being not simply the physical place but the people that live there, their activities, their social networks, the economy they depend on, and the broader base of environmental capital that supports them. It is the settlement as a living, breathing, changing thing as a local ecosystem within the global ecosystem

(Barton, 2005, 2009). According to Blum and Grant (2006), a neighbourhood is self-stabilising or dynamic in terms of economic and socio-economic measures including rates of tax delinquency, low-weight births, teenage births and home sales volumes. Other measurements used for self-stabilising neighbourhood are violent and property crime rates (Galster, Cutsinger, & Lim, 2007). The better neighbourhood will have reduced stress, greater feelings of safety and neighbourhood satisfaction, and employment, the increased of economic self-sufficiency and reduced dependence on social services (Goetz, 2010). A safe neighbourhood is safe from crime. There are two types of crime safety. First, objective safety pertains to victimization, that is, the measurable recorded experience of becoming a victim of a criminal act. Second, subjective safety concerns with the assessment by residents of the local crime and nuisance rate, and the extent to which they feel safe, particularly in their own neighbourhoods (Leerkes & Bernasco, 2010). The neighbourhood quality is about the adequacy of physical, social and economic aspects and satisfaction by the residents in the their residential and neighbourhood area (Kim, Nair, Knight, Roosa, & Updegraff, 2008; Scorbureanu & Scorbureanu, 2012).

As a conclusion, a neighbourhood is a place where the residents and community are associated with land uses and amenities. The sense of community is related to the sense of place and sense of attachment. The people, as a community in the neighbourhood, have different socio-economic and socio-demographic backgrounds that reflect the neighbourhood characteristics and preferences. Nowadays, the basic concept of neighbourhood has changed to become more practical in life. The neighbourhood regeneration, revitalisation, urban renewal and development are used in upgrading and improving the neighbourhood condition in terms of physical, social and economic. Recently, the most used neighbourhood terms are neighbourhood quality, liveable neighbourhood, better neighbourhood, sustainable settlement and neighbourhood, dynamic and self-stabilising neighbourhood and safe neighbourhood. All these terms are towards the residential and neighbourhood satisfaction which affects the individual quality of life, human well-being, health, safety and sustainable communities. Each neighbourhood term has its own definition and criteria to fulfil the residents' needs and requirements. This paper focuses on the neighbourhood quality to determine the criteria and characteristics of the neighbourhood quality.

NEIGHBOURHOOD QUALITY

The literature reviews in determining the neighbourhood quality are taken from previous research on residential and neighbourhood environment. Most research on residential and neighbourhood environment deal with physical factors (Fornara, Bonaiuto, & Bonnes, 2010; Lovejoy, Handy, & Mokhtarian, 2010; Mohit, Ibrahim, & Rashid, 2010) social factors (Aiello, Ardone, & Scopelliti, 2010; Erkip, 2010; Rogers & Sukolratanamete, 2009) and economic factors (Lotfi & Koohsari, 2009; Serrano, 2009). Basically, the neighbourhood quality is influenced by neighbourhood attributes, home attributes and jurisdictional attributes (Greenberg & Crossney, 2007). The neighbourhood quality is also associated with social capital, security and adequacy of facilities (Yang, Yang, Shih, & See, 2002). The neighbourhood quality is about the environment condition and the residents' characteristics (Greenberg, 1998). As mentioned earlier, the neighbourhood quality is related to the physical, social and economy aspects in the residential and neighbourhood area (Kim, et al., 2008; Scorbureanu & Scorbureanu, 2012). Most previous research used multivariable elements in evaluating the neighbourhood quality. These aspects are important in the provision of adequate and sufficient facilities in the neighbourhood quality for the residents' necessities and requirements. There are three main factors that influence the neighbourhood quality. The factors are physical factors, social factors and economic factors. A detailed discussion of each multivariable factor used in the previous studies will be discussed further in the next section.

The Physical Factors

Most of the researchers use multivariable for physical factors. Aiello et al. (2010) use the functional and environment aspects such as architectural and town-planning features, services and facilities, crime and security as physical multivariable factors. Lovejoy et al. (2010) use attractiveness, quiet, liveliness, big yards, safety, mixed-use and good infrastructure in evaluating the physical attributes. Mohit et al. (2010) apply physical factors on the environment aspects such as noise level, accident situation, crime situation, security control and community relations as well as the public facilities and the distance of neighbourhood facilities provided. Whereas, Bonaiuto et al. (1999; 2003; 2006) utilize other physical elements related to architectural and urban planning space such as the organization of accessibility and roads, green areas, welfare services, recreational services, commercial services, transport services, environmental health and upkeep. Hur, Nasar and Chun (2010) develop other physical measures used in influencing the neighbourhood quality such as the

attributes of the surrounding environment, perceived attributes of the environment and evaluation of the attributes of the surrounding environment.

Serrano (2009) is concerned with the physical factors influencing the provision of neighbourhood quality such as noise, pollution, environmental problems and crime or vandalism. Lotfi and Koohsari (2009) evaluate the accessibility to public spaces such as to local parks, the stores and elementary schools. Rogers and Sukolratanamete (2009) take into account the physical factors that are well-defined centre and edge, mixed-use of household and land uses, density of neighbourhood and lot sizes, pedestrian walkways that are friendly in terms of distance and networking, and accessibility to public spaces and open spaces. Zhao (2009) considers the physical factors in spatial aspects such as architectural-planning space, organization and accessibility of space, green space. The physical factors measured in functional aspect are welfare, recreational, commercial, transport services. The physical factors used in contextual aspects are pace of life, environmental health and upkeep. Apparicio, Se'guin and Naud (2008) use the physical attributes like housing density, cultural facilities, educational facilities, health services and facilities, sport and recreational facilities, bank services and other facilities in their studies. Salleh (2008) evaluates other physical components that affect residents' satisfaction including services by the developers, neighbourhood facilities and environment. Karim (2008) quantifies the physical factors of community facilities with education, grocery shopping, eating, recreation, praying and medical services. Tu and Lin (2008) measure the physical attributes such as density, environmental health, greenness, and subjective attributes such as crowding, security and social relations. In addition, the behavioural perfectives include residential mobility, maintenance of house and neighbourhood, good relations with neighbours and participation in neighbourhood activities.

Gbakeji and Magnus (2007) evaluate the physical structure of the neighbourhood residence in terms of nature, mix and intensity of land use such as neighbourhood topography, drainage and microclimate, housing density, land use compatibility, neighbourhood flood level, vehicular traffic, open spaces and playgrounds. Greenberg and Crossney (2007) perceive physical neighbourhood attributes as crime, blight, odours, recreation, heavy traffic, parks and schools. The perceived jurisdictional attributes assessed are such as elected officials, schools and other services. Ge et al. (2006) and Ge & Hokao (2004) assess the physical attributes for the neighbourhood quality that include convenience with transportation and social services, amenity with natural environment, historical environment and living spaces, health with water environment, sound environment, air environment and other pollutions, safety from disaster, with

transportation and from crime and facilities in the community. Lee et al. (2006) and Ogu (2002) measure the environmental factors in the neighbourhood quality namely neighbourhood condition, access road, storm-water drains, maintenance of environmental facilities, collection of refuse and street lighting. H. Hashim (2005), Omar (2008), Westaway (2006) and Yang et al. (2002), consider the adequacy of public facilities and community facilities to persuade the neighbourhood quality in physical attributes. Chau et al.(2006) and Lee, Ellis, Kweon and Hong (2008) assess the landscaping element provided as a good quality environment of the housing and neighbourhood area in physical issues. Generally, multivariable features are used for the physical factors in evaluating and assessing the neighbourhood quality in most previous research. Based on previous research, the physical factors can be divided into four categories which are facilities and services, dwelling, surrounding environment and accessibility. The facilities and services involve the adequacy and maintenance of social, recreational and educational facilities such as sports, recreational and spare-time facilities; parks, play grounds, green areas, and elementary schools, greenery, naturalness and openness, trash collection and street lighting etc. The dwelling features are room size, bathroom size, kitchen size, total usable area of the dwelling etc. The surrounding environment would be noise, crowd, air pollution, safety etc. Lastly, accessibility is the convenience to the city centre, work place, health service and availability of shopping facilities and municipal services etc.

The Social Factors

Social factors that influence neighbourhood quality are the residents' demographic backgrounds, community interaction and place attachment. Many researchers use the socio-demographic variable to evaluate the residents' satisfaction perception on their housing and neighbourhood area. Different socio-demographic will give different individual data in the housing and neighbourhood area (Apparicio, et al., 2008). The socio-demographic backgrounds used by Aiello et al. (2010) and Erkip (2010) are gender, age, income, tenure, length of residence. Aiello et al. (2010) utilise socio-demographic indicators that involve persons living together, families composed of one member, families composed of four members or more, widows or widowers. Lovejoy et al. (2010) exercise the level of education as part of socio-demographic backgrounds. Lee (2008) uses variables such as age, education, health, and marriage status in the residents' satisfaction perception. Rogers and Sukolratnametee (2009) use socio-demographic factors like gender, age, number of children, household size, level of education and race. Tu and Lin (2008) use personal characteristics such as age and gender that are effective

'predictors' of residential satisfaction. Barton (2009) uses other socio-demographic variables namely culture and ethnicity.

Community interaction in housing and neighbourhood area is one of the social factors influencing the residents' satisfaction in neighbourhood quality. Aiello et al. (2010) use community interaction variables that are related to social relation features and context features. Social relation features involve psychology aspects. On the other hand, context features involve environment aspects. Mohit et al. (2010) use the relationship of the residents and the environment in their housing and neighbourhood area for the community interaction. Bonaiuto et al. (1999), Bonaiuto et al. (2003, 2006) and Fornara et al. (2010) use variables like social relational features and pace of life for the community interaction. Rogers and Sukolratanameteer (2009) use the length of residency and expected years to live in a neighbourhood to evaluate the community interaction in the housing and neighbourhood area. Zhao (2009) uses the social interaction in evaluating the human aspects that influence the neighbourhood quality. Gbakeji and Magnus (2007) include social relationship variables related to the nearness to friends and relations, suitability of neighbourhood for raising children, compatibility of neighbours, level of crime and other social vices to represent the social dimension of the residential environment. Ge and Hokao (2004, 2006) and Ge, et al. (2006) incorporate social with the convenience of daily life and community. Yang, et al. (2002) integrate social factors as participating in activities together and feeling happy with the neighbourhood. The final social factor influencing the neighbourhood quality is place attachment. Not many researchers evaluate place attachment in their studies. Zhao (2009) uses place attachment as a residential attachment. The residential attachment variables used in evaluating the neighbourhood quality are being away, fascination extend and compatibility. Bonaiuto et al. (1999), Bonaiuto et al. (2003, 2006) and Fornara et al. (2010) use variable such as neighbourhood attachment in measuring the neighbourhood quality.

The Economic Factors

The economic factors involved in the provision of neighbourhood quality are residents' socio-economic backgrounds and economic value in the neighbourhood. Socio-economic includes income and homeownership (Erkip, 2010). The socio-economic aspect also involves the residents' employment, dependence index and old age index (Aiello et al., 2010). The aspect also includes the annual household income and household size (Lovejoy, et al., 2010). It's also taking into consideration the individual characteristics such as health, migration, labour situation, income, and household characteristics which

are incorporated with the duration of residence, annual income, household size and housing costs artificial the condition of neighbourhood quality (Serrano, 2009). The socio-economic inequalities consist of level of income, unemployment rate, private car ownership and the quality of buildings (Lotfi & Koohsari, 2009). Additional socio-economic factors are home ownership, transport ownership, household income, work within community and full-time homemaker (Rogers & Sukolratanamettee, 2009).

EXPERIENCES IN MALAYSIA

A lot of research has been done in Malaysia on neighbourhood quality to ensure a good quality of life. A. H. Hashim (2003) uses physical, social and economic attributes to evaluate the residential satisfaction and social integration at low-cost housing in Selangor. The physical aspects included in the multivariable are the location of the residential, residential satisfaction, housing satisfaction and neighbourhood satisfaction. The social aspects are the residents' socio-demographic backgrounds and residential attachment. The economic aspects depend on the residents' socio-economic backgrounds. H. Hashim (2005) applies physical and social attributes to assess harmonious community living in an urban neighbourhood in Shah Alam. The physical aspects encompass secondary schools, primary schools, Islamic primary schools, public kindergartens, mosques, 'surau' (small mosque), community halls, fields and playgrounds, open spaces and recreational areas and community programs. Salleh (2008) utilises the physical features at low-cost housing in Penang and Terengganu. The physical features integrated in the study are the three main variables for the research namely dwelling features, services and facilities. The dwelling units involve the living area, kitchen area, dining room area, bedroom area, washing room area, room arrangement, air circulation, number of socket, level of socket, clothes line facilities, garbage line and noise. As for services, they include pipe repairs, electrical wiring, water supply, garbage disposal and safety. The facilities comprise preschool, primary school, secondary school, clinic or hospital, telephone, market, children's playground, public transport, parking lot, place of worship, community hall, and facilities for handicapped, police station, fire brigade and nursery. Karim (2008) evaluates the residents' satisfaction on community facilities at low-cost public housing in Shah Alam, Selangor. The physical attributes employed are kindergarten, primary school, secondary school, children playground, playing fields, grocery shops, mini markets, food stalls, restaurants, private clinics, government clinics, 'surau', mosque, community hall, public phone.

Omar (2008) measures communal living at low-cost housing in Malaysia by using physical elements. The physical elements are schools, playing fields, religious centres, community halls, recreation areas and libraries while the community facilities include secondary and primary schools, community hall, religious centre, business area, shop lots, terminal bus and open spaces. Omar (2009) assesses the residents' satisfaction at 10 new towns in Malaysia on physical, social and economic aspects. The physical aspects are religious centres, electricity supply, water supply telephone service, primary schools, secondary schools, open space facilities, children's playgrounds, commercial service, entertainment centres and public transport services. The economic aspect is based on the price of the house and rental value. The social aspects are their feeling about living in new towns, feeling safe and safety of property and the beauty of the surrounding area. Mohit et al. (2010) evaluate residential satisfaction in a newly designed public low-cost housing in Kuala Lumpur, Malaysia in terms of the physical features. The physical features focus on five main variables which are dwelling unit features, dwelling unit support services, public facilities, social environment and the distance to the neighbourhood facilities. The dwelling unit comprises living area, dining space, kitchen space, bedroom-1, bedroom-2, bedroom-3, toilet, bathroom, dry area, socket, and house ventilation. The dwelling unit support services include corridor, staircase, and lift, fire fighting, cleanliness of drain, street lighting, garbage collection and cleanliness of garbage house. The public facilities look into the open space or play area, car or motorcycle parking, prayer hall, multi-purpose hall, perimeter road, pedestrian walkways, public phone, local shops, and food stalls. The social environment stresses on noise level, accident situation, crime situation, security control and community relations. The neighbourhood facilities evaluate the distances to the nearest town centre, work place, school, police station, hospital, shopping centre, market, public library, worship building, Light Railway Transit (LRT) Station, bus station and fire station.

Leby and Hashim (2010) quantify the residents' perception on neighbourhood liveability attributes at Subang Jaya Municipal Council neighbourhood by making use of physical and social attributes. The Physical attributes are the maintenance of streets, rubbish collection service, ground vibration by traffic, noise by heavy traffic, maintenance of open spaces, and upkeep of neighbourhoods' lighting. The social attributes are the behaviour of neighbours, relationship with neighbours, sociability of people, sense of community, cordiality of people, and friendship with people and close distance to friends. Mohit and Nazyddah (2011) evaluate the residents' satisfaction on social housing programme in Malaysia by using the physical and social features.

The physical features are housing unit, housing unit support, public facilities, and social environment and neighbourhood facilities. The economic feature is the household characteristic of the residents. Karim (2012) examines the quality of life for the lower income residents in planned housing areas in Shah Alam Selangor on the physical and social components. The physical components are the community facilities environment and the neighbourhood physical environment. The social components are the family domain and the social environment. Tan (2012) evaluates the housing satisfaction in medium and high cost housing in Kuala Lumpur by utilizing the physical and economic elements. The physical elements are housing characteristic and housing delivery system. The economic elements are homeownership and socio-economic characteristic. Salleh (2012) assesses the residential satisfaction in Terengganu and Penang by concentrating on the physical features. The physical features are the dwelling unit, services by the developers and neighbourhood facilities. Another study of the household study in an urban area in Penang measures the residents' satisfaction on physical, social and economic features.

CONCLUSION

Many researchers have expended their research using the multivariable to suggest the criteria for a good neighbourhood quality. Previous research has shown that the neighbourhood quality can be influenced by physical, social and economic factors. Physical factors can be divided into four categories namely dwelling unit, facilities and services, accessibility and surrounding environment. The physical aspects are evaluated by the adequacy, amenity, attractive, convenience, defensible space, good infrastructure, homogeneity, immediate, maintenance, pedestrian friendly, quiet, upkeep, well-defined, accessibility, location, distance, nearness, safety, security, crowding, noise, odours, environmental health and natural environment. The social factors can be separated in terms of socio-demographic, social community and place attachment. The socio-demographic of the residents will influence social community and social interaction. Social community comprises community organization, human aspects and social relationship. While place attachment consists of neighbourhood and residential attachment, neighbourhood and residential context, neighbourhood and residential social setting, social image of neighbours, social environment, social formation, social welfare, pace of life, safety community and liveliness. The economic factors on the other hand, are related to the residents' socio-economic profile background.

REFERENCES

- Aiello, A., Ardone, R. G., & Scopelliti, M. (2010). Neighbourhood Planning Improvement: Physical Attributes, Cognitive and Affective Evaluation and Activities in Two Neighbourhoods in Rome. *Evaluation and Program Planning*(33), 264-275.
- Apparicio, P., Se'guin, A.-M., & Naud, D. (2008). The Quality of the Urban Environment Around Public Housing Buildings in Montre'al: An Objective Approach Based on GIS and Multivariate Statistical Analysis. *Social Indicators Research*, 86, 355-380.
- Barton, H. (2005). A Health Map for Urban Planners Towards a Conceptual Model for Healthy, Sustainable Settlements. *Built Environment*, 31(4).
- Barton, H. (2009). Land Use Planning and Health and Well-Being. *Land Use Policy*, (26S), S115-S123.
- Blum, A., & Grant, M. (2006). Sustainable Neighbourhoods: Assessment Tools for Renovation and Developmen. *Journal of International Research Publications: Ecology and Safety*, 1, 37-54.
- Bonaiuto, M., Aiello, A., Perugini, M., Bonnes, M., & Ercolani, A. P. (1999). Multidimensional Perception of Residential Environment Quality and Neighbourhood Attachment in the Urban Environment. *Journal of Environmental Psychology*(19), 331-352.
- Bonaiuto, M., Fornara, F., & Bonnes, M. (2003). Indexes of Perceived Residential Environment Quality and Neighbourhood Attachment in Urban Environments: A Confirmation Study on the City Of Rome. *Landscape and Urban Planning*(65), 41-52.
- Bonaiuto, M., Fornara, F., & Bonnes, M. (2003). Indexes of Perceived Residential Environment Quality and Neighbourhood Attachment in Urban Environments: A Confirmation Study on the City Of Rome. *Landscape and Urban Planning*, (65), 41-52.
- Bonaiuto, M., Fornara, F., & Bonnes, M. (2006). Perceived Residential Environment Quality in Middle and Low-Extension Italian Cities. *Revue Européenne De Psychologie Appliquée*(56), 23-34.
- Bonaiuto, M., Fornara, F., & Bonnes, M. (2006). Perceived Residential Environment Quality in Middle and Low-Extension Italian Cities. *Revue Européenne De Psychologie Appliquée*, (56), 23-34.
- Chau, C. K., Yung, H. K., Leung, T. M., & Law, M. Y. (2006). Evaluation of Relative Importance of Environmental Issues Associated With a Residential Estate in Hong Kong. *Landscape and Urban Planning*(77), 67-79.

- Corcoran, M. P. (2002). Place Attachment and Community Sentiment in Marginalised Neighbourhoods: A European Case Study. *Canadian Journal of Urban Research*, 11(1), 201-221.
- Erkip, F. (2010). Community and Neighborhood Relations in Ankara: An Urban-Suburban Contrast. *Cities*, (27), 96-102.
- Fornara, F., Bonaiuto, M., & Bonnes, M. (2010). Cross-Validation of Abbreviated Perceived Residential Environment Quality (PREQ) and Neighborhood Attachment (NA) Indicators. *Environment and Behavior*, 42(2), 171-196.
- Galster, G., Cutsinger, J., & Lim, U. (2007). Are Neighbourhoods Self-stabilising? Exploring Endogenous Dynamics. *Urban Studies*, 44(1), 167-185.
- Gbakeji, J. O., & Magnus, O. O. (2007). Aspects of Residential and Neighbourhood Preferences in the Warri Metropolis, Delta State, Nigeria. *Studies Home Communication Science*, 1(12), 121-126.
- Ge, J., Chen, F., Wang, J., & Hokao, K. (2006). *Residential Environment Evaluation Model Considering Residential Preference in Changjiang Delta Region of China*. Paper presented at the International Symposium of Lowland Technology.
- Ge, J., & Hokao, K. (2004). Residential Environment Index System and Evaluation Model Established by Subjective and Objective Methods. *Journal Of Zhejiang University Science*, 5(9), 1028-1034.
- Ge, J., & Hokao, K. (2006). Research on Residential Lifestyles in Japanese Cities from the Viewpoints of Residential Preference, Residential Choice and Residential Satisfaction. *Landscape and Urban Planning*, (78), 165-178.
- Goetz, E. G. (2010). Better Neighborhoods, Better Outcomes? Explaining Relocation Outcomes in HOPE VI. *A Journal of Policy Development and Research*, 12(1), 5-32.
- Greenberg, M. (1998). Age, Perceptions, and Neighborhood Quality: An Empirical Test. *Human Ecology Review*, 5(2), 10-18.
- Greenberg, M., & Crossney, K. (2007). Perceived Neighborhood Quality in the United States: Measuring Outdoor, Housing and Jurisdictional Influences. *Socio-Economic Planning Sciences*, (41), 181-194.
- Hashim, A. H. (2003). Residential Satisfaction and Social Integration in Public Low Cost Housing in Malaysia. *Pertanika Journal Social Science & Humanities*, 11(1), 1-10.
- Hashim, H. (2005). *Harmonious Community Living in Urban Neighbourhoods: A Case of Central Shah Alam*. Paper presented at the 8th International Conference of the Asian Planning Schools Association.

- Hur, M., Nasar, J. L., & Chun, B. (2010). Neighborhood Satisfaction, Physical and Perceived Naturalness and Openness. *Journal of Environmental Psychology*(30), 52-59.
- Jones, E. J. (2001). Liveable Neighbourhoods. *World Transport Policy & Practice*, 7(2), 38-43.
- Karim, H. A. (2008). The Satisfaction of Residents on Community Facilities in Shah Alam, Malaysia. *Asian Social Science*, 4(11), 131-137.
- Karim, H. A. (2012). Low Cost Housing Environment: Compromising Quality of Life? *Procedia - Social and Behavioral Sciences*, 35, 44-53.
- Kim, S. Y., Nair, R., Knight, G. P., Roosa, M. W., & Updegraff, K. A. (2008). Measurement Equivalence of Neighborhood Quality Measures for European American and Mexican American Families. *Journal Community Psychology*, 37(1), 1-20.
- Leby, J. L., & Hashim, A. H. (2010). Liveability Dimensions and Attributes: Their Relative Importance in the Eyes of Neighbourhood Residents. *Journal of Construction in Developing Countries*, 15(1), 67-91.
- Lee, L. M., Abdullah, A., Tan, S. F., Badruzaman, N., & Hassan, A. S. (2006). How We Failed to Plan for Habitability. *Journal of the Malaysian Institute of Planners*, 4, 1-21.
- Lee, S. W., Ellis, C. D., Kweon, B. S., & Hong, S. K. (2008). Relationship between Landscape Structure and Neighborhood Satisfaction in Urbanized Areas. *Landscape and Urban Planning*, 85, 60-70.
- Lee, Y. J. (2008). Subjective Quality of Life Measurement in Taipei. *Building and Environment*(43), 1205-1215.
- Leerkes, A., & Bernasco, W. (2010). The Spatial Concentration of Illegal Residence and Neighborhood Safety. *Journal of Urban Affairs*, 32(3), 367-392.
- Lotfi, S., & Koohsari, M. J. (2009). Measuring Objective Accessibility to Neighborhood Facilities in the City (A Case Study: Zone 6 in Tehran, Iran). *Cities*, 26, 133-140.
- Lovejoy, K., Handy, S., & Mokhtarian, P. (2010). Neighborhood Satisfaction in Suburban versus Traditional Environments: An Evaluation of Contributing Characteristics in Eight California Neighborhoods. *Landscape and Urban Planning*, 97, 37-48.
- Martin, D. G. (2003). Enacting Neighborhood. *Urban Geography*, 24(5), 361-385.
- Martinez, M. L., Black, M., & Starr, R. H. (2002). Factorial Structure of the Perceived Neighborhood Scale (PNS): A Test of Longitudinal Invariance. *Journal of Community Psychology*, 30(1), 23-43.

- Meegan, R., & Mitchell, A. (2001). 'It's Not Community Round Here, It's Neighbourhood': Neighbourhood Change and Cohesion in Urban Regeneration Policies. *Urban Studies*, 38(12), 2167-2194.
- Mohit, M. A., Ibrahim, M., & Rashid, Y. R. (2010). Assessment of Residential Satisfaction in Newly Designed Public Low-Cost Housing in Kuala Lumpur, Malaysia. *Habitat International*(34), 18-27.
- Mohit, M. A., & Nazyddah, N. (2011). Social Housing Programme of Selangor Zakat Board. *Journal Housing and the Built Environment*, 26, 143-164.
- Ogu, V. I. (2002). Urban Residential Satisfaction and the Planning Implications in a Developing World Context: The Example of Benin City, Nigeria. *International Planning Studies*, 7(1), 37-53.
- Omar, D. (2008). Communal Living Environment in Low Cost Housing Development in Malaysia. *Asian Social Science*, (10), 98-105.
- Omar, D. (2009). Assessing Residents' Quality of Life in Malaysian New Towns. *Asian Social Science*, 5(6), 94-201.
- Pacione, M. (2003). Urban Environmental Quality and Human Wellbeing - A Social Geographical Perspective. *Landscape and Urban Planning*, 65, 19-30.
- Power, A. (2004). *Neighbourhood Management and the Future of Urban Areas*. Houghton Street, London: Centre for Analysis of Social Exclusion London School of Economics.
- Rogers, G. O., & Sukolratanamete, S. (2009). Neighborhood Design and Sense of Community: Comparing Suburban Neighborhoods in Houston Texas. *Landscape and Urban Planning*(92), 325-334.
- Salleh, A. G. (2008). Neighbourhood Factors in Private Low-Cost Housing in Malaysia. *Habitat International*(32), 485-493.
- Salleh, A. G. (2012). Sustainable Urban Neighbourhoods: The Need to Consider Residents' Satisfaction *International Journal of Sustainable Development*, 3(10), 103-108.
- Scorbureanu, A. I., & Scorbureanu, I. (2012). Neighborhood Quality Determinants. Empirical Evidence from the American Housing Survey. *Review of Applied Socio- Economic Research*, 13, 153-161.
- Serrano, L. D. (2009). Disentangling the Housing Satisfaction Puzzle: Does Homeownership Really Matter? *Journal of Economic Psychology*(30), 645-755.
- Tan, T. H. (2012). Housing Satisfaction in Medium- and High-Cost Housing: The case of Greater Kuala Lumpur, Malaysia. *Habitat International*, 36, 108-116.
- Theodori, G. L. (2001). Examining the Effects of Community Satisfaction and Attachment on Individual Well-Being. *Rural Sociology*, 66(4), 618-628.

- Tu, K. J., & Lin, L. T. (2008). Evaluative Structure of Perceived Residential Environment Quality in High-Density and Mixed-Use Urban Settings: An Exploratory Study on Taipei City. *Landscape and Urban Planning*(87), 157-171.
- Westaway, M. S. (2006). A Longitudinal Investigation of Satisfaction with Personal and Environmental Quality Of Life in an Informal South African Housing Settlement, Doornkop, Soweto. *Habitat International*, (30), 175-189.
- Yang, M. J., Yang, M. S., Shih, C. H., & See, I. K. (2002). Development and Validation of an Instrument to Measure Perceived Neighbourhood Quality in Taiwan. *Journal of Epidemiology and Community Health*, 56(7), 492-496.
- Zhao, K. (2009). *The Relationships between Perceived Residential Environment Quality and Perceived Restoration in Urban Residents*. Paper presented at the The 1st International Conference on Information Science and Engineering (ICISE2009).



THE RELATIONSHIP BETWEEN VARIATIONS OF GRID LAYOUT AND BURGLARY

Saniah Ahmad Zaki¹ & Jamalunlaili Abdullah²

^{1&2} *Faculty of Architecture, Planning & Surveying*
UNIVERSITI TEKNOLOGI MARA, SHAH ALAM, MALAYSIA

Abstract

The study examined the relationship between urban spaces and burglary in Malaysian grid-like residential layouts located in a local authority area in the Klang Valley. It analysed first, the degree of grid in the layouts to understand how they could influence burglary rate, and, second, the spatial patterns of burglary in those layouts. The instrument used in this research was space syntax, a tool that analyse urban spaces. By comparing burglary rates to syntactical spatial attributes in six residential layouts, the findings showed how spatial attributes influenced burglary. It also attempted to relate how degree of permeability of grid-like layouts may have affected vulnerability. It concluded by suggesting for further studies in other residential layouts in this country.

Keywords: burglary, grid-like layout, space syntax, permeability

INTRODUCTION

Discussions on the relationship between environment and crime; and the spatial patterning of crime started way back in 1920s with the work by Shaw and McKay at the Chicago School when they found that juvenile delinquency is related to environment where they lived rather than to a particular group of people. Subsequently, Brantingham and Brantingham in 1975 investigated the spatial distribution of crime using urban form models they constructed which they geocoded burglaries to city blocks in locations burglary occurred, as well as mapping burglary rates. They identified locations in the neighbourhoods that are safe and those that may be vulnerable to burglary. Later, Brantingham and Brantingham and Beavon et al. (1994) suggested that criminals select targets

¹Associate Professor. Email: saniahzaki@salam.uitm.edu.my

²Associate Professor. Email: jamal858@salam.uitm.edu.my

based on their routine paths, which apparently are the highly accessible streets that are actively used by people. Beavon et al. also implied there are certain locations in which crime is likely to be concentrated.

Two other influential works were that of J. Jacobs (1961) and O. Newman (1972). Both identified characteristics of streets that are at risk to crime and streets that are safer, but with conflicting explanations. But, in a more recent study by Hillier and Shu (2000) using space syntax, they not only showed that crime is influenced by environment (spaces in residential areas) they also indicated the features in urban layouts that affected the uneven distribution of burglary. They found that the degree of integration of spaces in the layouts seems to correspond to the type of layout; the traditional layout has more integrated spaces, while the more broken-up layout has less integrated spaces. The traditional grid-iron layout was reported to start way back in the fifth century BC when Hippodamus drew up Miletus City plan thought to be the most practical urban planning scheme. Since then, grid-iron became a regular feature in the planned cities of the Greeks as well as the Romans and in Spain.

Various forms of grids from the rectangular block, the parallel grids and others were also reported to be introduced in cities way back in the 1900. Although these forms mainly contain linear and continuous street type, and allow through movement, they differ in length. In some, the streets are longer, more continuous and less breaks, in others they are shorter and as such more breaks. Later, when other forms of street pattern example cul-de-sacs and loops were introduced, residential layouts appear to have lesser continuous, linear and through streets. The difference in forms between the earlier and later layouts is its degree of permeability. In the former, the layout is more permeable and it encouraged through movement; whereas in the latter, it is less permeable or impermeable, and restricts through movement. Street pattern not only seems to determine the shape and type of an area particularly residential layout, but most importantly the movements within a layout.

Although there have been studies that investigated how far these street patterns influenced movement of people, there are others who looked at a broader dimension, the environment, and how it relates to crime distribution as mentioned earlier. Some have also examined the relationship of the street patterns (or street layouts) and crime. It appears from a study by Shu (2000) in a form of a PhD thesis that looked at the relationship between space and crime in various types of residential layouts, a safer layout would be one that have interconnected or integrated through streets, with dwellings facing out on to

both sides of the streets. Shu implicated that grid-like layouts appeared to be safer compared to tree-like layout that consists mainly cul-de-sacs and are more broken-up. The question is: If grid-like layout appeared safer would different variations of grid layout (i.e. from pure grid to the impure grid) still work to reduce vulnerability to burglary?

A research investigated the distribution of burglary in a Malaysian township that comprises mainly grid-like residential layout. By using space syntax, this study extended the past study into how each aspects of design interacted to influence burglary distribution in various grid-like layouts.

LITERATURE REVIEW

The most influential work in looking at the relationship between street patterns and crime has been that of Jane Jacobs (1961), who identified the characteristics of streets that are more at risk to crime and streets that are safer. Jacobs observed that streets in which there were more activities and more people, strangers and residents, crime was lower. The design of these streets as observed by Jacobs are more of a traditional, street-based (grid layout), in which the strangers (passers-by) acted as casual surveillance. She also noted the orientation of buildings along these streets was onto the streets. According to Jacobs, this allowed the owners of the buildings to set their 'eyes on the street'. By having the entrance of buildings onto streets, it indicated the importance of generating intervisibility amongst buildings along the streets. Whereas in parts where there were fewer people and lesser activities, such as those with a more suburban characteristic, she observed that crime was higher.

Contradictory to Jacobs is the work by Oscar Newman (1972) who also attempted to show the relationship between crime and environment but with conflicting explanations. Newman believed that in a neighbourhood where the streets are controlled and owned by residents, there is virtually very little crime. He also explained that because the streets are private, any strangers are considered as intruders and are as such they are to be under constant surveillance. Hillier and Sahbaz (2008) also reported that Newman finds too many people in spaces create anonymity and allows criminals to access their victims, which will weaken the possibility of residents to control their own environment. A more recent study by Hillier and Shu (2000) using space syntax, not only showed that crime is influenced by environment (spaces in residential areas) they also indicated the features in urban layouts that affected the uneven distribution of burglary. They looked at how different types of layouts and

streets have influenced burglary rate. They found that the degree of integration of spaces in the layouts seems to correspond to the type of layout; the traditional layout has more integrated spaces, while the more broken-up layout has less integrated spaces. These findings seem to agree with Jacobs' observation.

Hillier and Shu's study concluded with three main points: first, crime tends to seek the most vulnerable type of space within an area. Second, for an area to be safe, it depends on the co-presence of a group of factors, which are the positioning in the overall layout and the immediate surroundings of the dwelling. Finally, there are factors which can reduce crime in a layout but can increase it if other factors are present (Hillier and Shu, 2000). Having established the conclusions, they deduced that a safer layout would be one that have interconnected or integrated through streets, with dwellings facing out on to both sides of the streets.

RESEARCH METHODOLOGY

The question: would different variations of grid layout (i.e. from pure grid to the impure grid) still work to reduce vulnerability to burglary. To answer this question, a study was conducted which investigated the spatial distribution of burglary in grid-like layouts at two-levels: the area and the street. The first level examined why there were variations in the spatial distribution of burglary between grid-like residential layouts. The second level was at a finer scale, which were the street segments; individual dwelling and its immediate environments. At this second level analysis, the local factors that influence dwellings vulnerability were investigated. Nonetheless, in this paper only the findings of the first level analyses are presented.

Six residential areas were selected randomly within a Local Authority area located in the Petaling District of Selangor. These areas are of varying degrees of grid layouts, from the pure grid with mainly linear through streets to the impure grids with some cul-de-sacs. An inventory questionnaire used consisted of five sections was designed to address the question. The first section contains five questions capturing the house profile such as type of house, type of door, location of house entrance, location of house in a row, and number of sides of house exposed on to the space. The second section determining the availability of situational factors such as alarm outside the property, the presence of CCTV, occupancy of the house, grills on doors, grills on windows, and form of deterrents (e.g. dogs or membership of neighbourhood watch). The

third section, explores the visibility of house front, which includes the quality of visibility of the house front measured using a 5-point Likert scale from 1 = very poor to 5 = excellent. The assessment as to the degree of visibility of house front was further established by identifying availability of features that conceal the front, the form of features, fencing material, and fencing height. The fourth and final sections look at the side and back of the burgled house respectively. Each of the sections determines how the side and back of the house is exposed, its accessibility from the side and back lanes, as well as the availability and forms of climbing elements that could have provided easy entry to burglars.

A total of 1228 houses were recorded of which 380 (31%) were burgled houses and 848 (69%), non-burgled houses. The burgled houses were based on Police records between the years 2006 to 2008. Non-burgled houses situated on both sides of the burgled houses (and in some cases opposite of the burgled houses) were also selected for the inventory. The purpose was to compare and examined why some houses are more vulnerable and others safer. However, the comparison between burgled and non-burgled houses is not discussed in this paper. The study used space syntax as a tool that allows spaces in the grid-like layouts to be analysed quantitatively and compared with other quantitative variables. GIS (geographical information system) was also used to provide the database for spatial data and also to map the precise location of burglaries. Based on this map, the spatial concentration of burglaries was examined in relation to the streets in the areas. A simple statistics, regression plots and ANOVA were used to explore the relationship between burglary rate and spatial factors and syntactical variables using Statview statistical software.

Space syntax is a set of techniques for representing and analysing street networks of cities in such a way as to bring to light underlying patterns and structures which influence patterns of activity in space, most notably movement and land use (Hillier and Sahbaz, 2008). Before the case study areas could be analysed, an axial map (a space syntax line map) was first produced. The axial map of the six case study areas (Appendix 1), in which the streets or spaces (represented as lines) in an area, were drawn and then processed in a space syntax software (example Axman). Axial maps when processed will produce coloured lines from the warmer colours (red) through the cooler colours (blue). These coloured lines indicate the integration level of spaces based on its movement potentials. A red coloured line indicates that it is the most integrated space and a blue line, the least integrated. The global integration level (represented as radius n), measures each line in relation to the whole system, and the local integration level (represented as radius 3), measures the complexity of lines up to three steps away from the line. Besides the integration

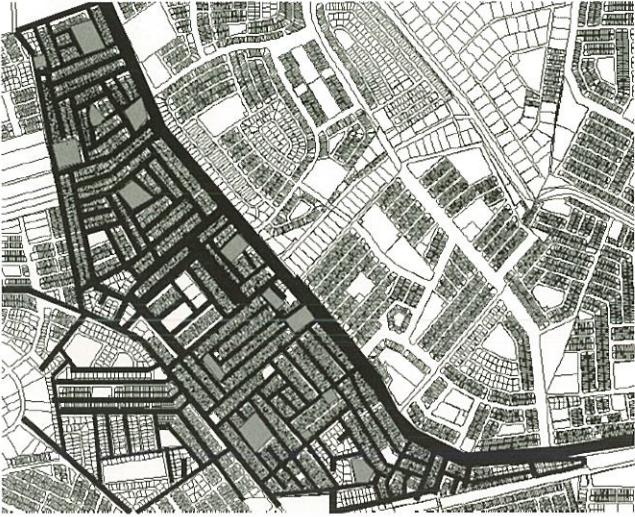

levels of spaces, other syntactical variables can also be obtained. These include: connectivity, intelligibility, and synergy. Connectivity refers to the degree of connections of each line to another; intelligibility is the relationship between the global integration and connectivity that shows how well residents and visitors are able to understand in moving in and out of an area; and synergy of a layout (local-to-global), is the measure of co-presence between residents and strangers in the area. Burglary data of three years (2006 – 2008) provided by the Malaysian Royal Police Force (PDRM), was mapped as dots onto axial map. But, in complying with the confidentiality of the burglary data, the study areas have been anonymised and named as Areas 1, 2, 3, 4, 5, and 6.

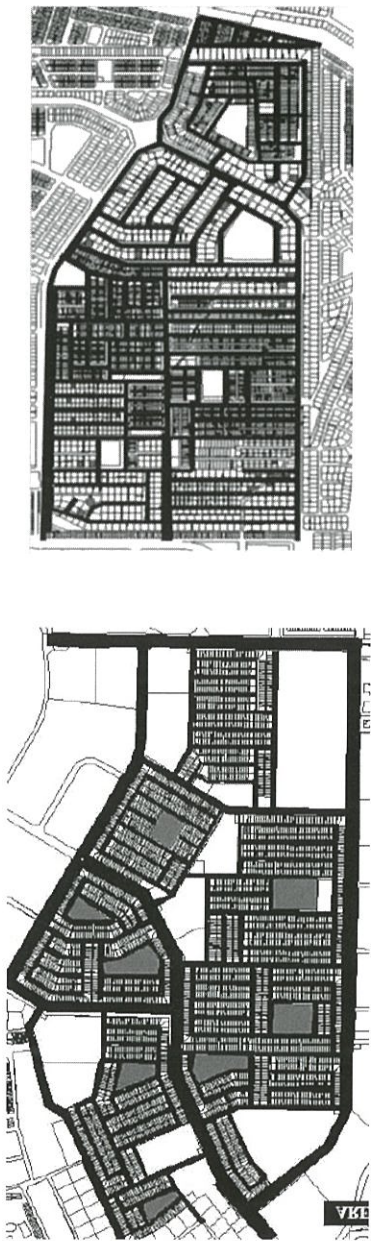
THE CASE STUDY AREAS


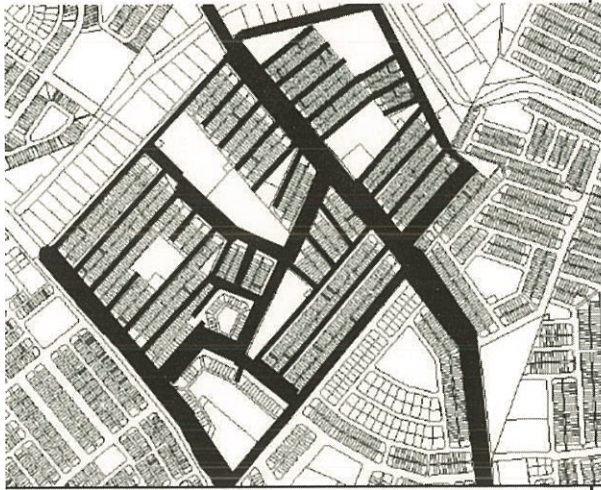
The case study areas are located within a local authority area in the Klang Valley. These areas, which are socio-economically homogenous, are all laid out in different variations of grid, that is from the more pure grid to the lesser pure or impure grid. The inherent features of the layouts are that they generally constitute through, linear streets and in some areas with very few cul-de-sacs. Houses that are mainly terraced tend to line up the streets with front of the houses facing onto the local roads and the back onto back lanes.

The roads are arranged hierarchically, linking the local roads to the main road. Although this arrangement may be common in Malaysian residential layouts, in some, the hierarchical layout are more prominent than others. Areas 5 and 6 are examples of areas with such layout compared to the other areas. These varied hierarchies relate to permeability of the layouts. Areas with more direct access to the main roads tend to be more permeable than those that have less direct access and are also more hierarchical.

In considering these features, the areas are indexed based on a 4-point scale as follows:

Characteristics of areas	Area	
<p>A layout, which is entirely based on long linear through streets with very regular sized blocks, is most permeable.</p> <p>Index: 1</p>	Area 1	
<p>A layout which is based on a mixed of long and short linear through streets, as well as a mixed sized blocks,</p> <p>Index: 2</p>	Area 2	

<p>A layout of regular blocks with linear streets that is arranged in a loop pattern.</p> <p>Index: 3</p>	<p>Area 3</p> <p>Area 5</p>	
---	--	--

	Area 6	
A layout that has very few linear through streets but mostly cul-de-sacs. Index: 4	Area 4	

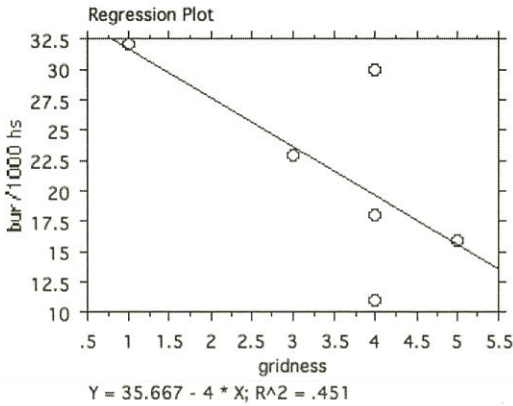
FINDINGS

i. At the area level

a. Relationship between characteristics of areas and burglary rate

At this level the variations in the spatial distribution of burglary in residential areas was first examined. This was done by comparing the relationship of burglary rate with spatial characteristics between areas. For this purpose burglary rate was calculated based on the number of burglary per one thousand (1000) houses. A data table of six case study areas was constructed, that include spatial pattern type, degree of connectivity, total number of houses, breakdown of house type, permeability index, and three-year period burglary data (Table 1).

The table shows that out of the six areas, three (Areas 1, 2 and 3) have more than 20 burglaries per 1000 houses and the other three (Areas 4, 5 and 6) have less than 20 burglaries per 1000 houses. Why are some areas safer with lower burglary rate but others higher? Although, it may initially appear that areas with spatial characteristics indexed on a scale of 1 and 2 (from very regular layout to less regular) has higher burglary rate, Area 3 that is indexed on a scale of 3 has also high burglary rate. Ironically, Areas 5 and 6 which are also spatially indexed on the scale of 3, have lower burglary rates. Similarly, the degree of grid when visually analysed does not appear to be related to burglary rate. Among three areas indexed as 4 (partially impure grid), Area 3 has high burglary rate, whereas the other two areas (Areas 4 and 6), lower rate. In a regression analysis, it is shown that the degree of grid is moderately related to burglary rate (Figure 1) with an r-squared of 0.451. Nonetheless the p-value in the ANOVA table indicates that the relationship is weakly significant.



Regression Summary
 bur/1000 hs vs. gridness

Count	6
Num. Missing	0
IRI	.671
R Squared	.451
Adjusted R Squared	.313
RMS Residual	6.807

ANOVA Table
 bur/1000 hs vs. gridness

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	152.000	152.000	3.281	.1443
Residual	4	185.333	46.333		
Total	5	337.333			

Regression Coefficients
 bur/1000 hs vs. gridness

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	35.667	8.214	35.667	4.342	.0122
gridness	-4.000	2.208	-.671	-1.811	.1443

Figure 1: Relationship between burglary rate and degree of gridness

When the type of houses in the areas was next compared to burglary rates, it appears to indicate that areas constituting of only terraced houses (100%) have lower burglary rates compared to those with mixed type of houses example in Areas 1, 2 and 3, where there are mixed of terraced and detached houses. The study then attempted to find if permeability index is calculated, which is the sum between the spatial pattern and scale of grid, could it be related to burglary rate. Hillier and Shu (2000) have suggested that the more open and permeable layout with through streets that facilitate continuous pedestrian and vehicle movements are less at risk to burglary than a layout which is more broken-up, closed and impermeable. Looking at the table it seems to implicate that only two areas (Areas 1 and 2) that have higher degree of permeability also have high burglary rate; and areas with lower degree of permeability lower burglary rate (Areas 4 and 5). However, in two other areas (Areas 3 and 6) their permeability indices do not seem to relate to burglary rate. It looks as if permeability of the case study areas (Malaysian residential layouts) affects burglary differently from that in a Western country.

Thus, it seems to suggest that at the area level, only housing type appears related to burglary rate. Areas appeared to be safer if the housing type is homogenous. In a study by Bowers, Johnson and Pease (2005), they found that areas with homogenous housing are less targeted by burglars compared to areas with heterogeneous housing. They further noted that terraced houses with two sides exposed (front and back of house) are less at risk compared to detached houses that have more windows and doors (more sides exposed). These findings seems consistent with the findings in a study by Hillier and Shu (2000), in which they described the terraced houses as having less exposure (at least two sides) onto the spaces provides less opportunity to burglars compared to detached houses that have four sides exposed allowing more opportunities to burglars to enter a property.

However, when regression analysis was performed, the result suggests a weak relationship between terraced houses and burglary rate with p-value that indicates weakly significant. As pointed by Hillier and Shu (2000), the co-presence of a group of factors would determine the safety of an area, which would prove difficult at the area level.

Table 1: The data table below illustrates a summary of the characteristics of the six case study areas

Area	Spatial Pattern	Scale of gridness	Total no. of houses	House Type		Spatial + Gridness	Bur	Bur Rate
				Terrace	Detach			
1	1	1	4439	4035 (90.9%)	404 (9.10%)	2	142	32
2	2	3	2728	1139 (41.75%)	1589 (58.25%)	5	64	23
3	3	4	2083	1647 (79.07%)	436 (20.93%)	7	62	30
4	4	4	1442	1442 (100%)	-	8	26	18
5	3	5	4057	4057 (100%)	-	8	66	16
6	3	4	1581	1581 (100%)	-	7	18	11

Note:

1. Area: six areas that are socially homogenous, selected within one Local Authority area.
2. Spatial pattern: street layout indexed from 1 to 4 indicating degree of through roads in an area; pattern 1 for most regular with mainly linear through street over pattern 2 that are less regular with mixed through roads, to pattern 4 that are mainly cul-de-sacs
3. Scale of gridness: degree of grid is indexed based on the mean connectivity of areas; from 1 for very pure grid through to 5 for impure grid
4. Total houses: number of houses in each areas
5. House type: number and percentage of each house type in each area: Terr (terraced); SD (demi-detached); Det (detached)
6. Spatial + gridness: sum of spatial type index and degree of grid with lowest value for highest degree of permeability and highest value for lowest degree of permeability
7. Bur: number of domestic burglary
8. Bur rate: number of burglary per 1000 houses based on three year period (2006 - 2008) for each area

b. Relationship between spatial syntactic properties and burglary rate

The study next examined the relationship between burglary rate and spatial syntactic variables of the six grid-like layouts. A visual analysis of these variables compared with the burglary rate appears to indicate that Area 1 is most vulnerable to burglary because: it is highly integrated to the whole system as well as to its surroundings; within the area its streets (or spaces) are also highly connected; and its high synergy value that suggests a high degree of co-presence between residents and strangers in the area (Table 2). The less vulnerable areas (with lower burglary rates) appear to be less integrated both globally and locally; the streets are less connected, and, thus, lower synergy value. This pattern also can be visually analysed in the axial map (Appendix 2), in which, Area 1 has darker or warmer coloured lines compared to the other areas. Apparently, the most integrated line (darkest line) in the system borders

north of Area 1. Similar dark colour lines border the sides (east and west) of this area.

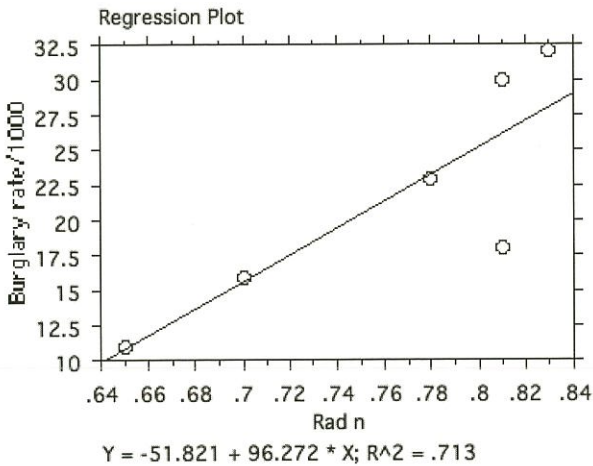
Regression analyses were then performed to determine the significance of syntactic variables, and the strength of relationship between burglary rate and the syntactic variables. Nevertheless, the results of the analyses showed only radius n (global integration) indicates a strong relationship with burglary rate with an r-squared of 0.713 and a p-value of 0.0346. The remaining syntactical variables were weakly related.

The graph (Fig. 2) shows that burglary rate is high in areas in which the layout that is highly connected to the whole system. The more globally integrated an area, the more vulnerable it is to burglary.

Table 2: Burglary rate in six case study areas compared against spatial syntactic variables

Areas	Burg/1000 houses	Radius n (global integration)	Radius 3 (local integration)	Conn	Intell	Synergy
1	32	0.83	2.58	4.77	0.43	0.36
2	23	0.77	2.27	4.01	0.47	0.23
3	30	0.80	1.88	3.26	0.56	0.30
4	18	0.80	2.19	3.32	0.57	0.13
5	16	0.69	2.07	3.46	0.23	0.17
6	11	0.66	2.05	3.52	0.29	0.16

Note:
 Conn - connectivity
 Intell - intelligibility



Regression Summary

Burglary rate/1000 vs. Rad n

Count	6
Num. Missing	0
IRI	.844
R Squared	.713
Adjusted R Squared	.641
RMS Residual	4.924

ANOVA Table

Burglary rate/1000 vs. Rad n

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	240.360	240.360	9.915	.0346
Residual	4	96.973	24.243		
Total	5	337.333			

Regression Coefficients

Burglary rate/1000 vs. Rad n

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	-51.821	23.425	-51.821	-2.212	.0914
Rad n	96.272	30.575	.844	3.149	.0346

Figure 2: Relationship between burglary rate and radius *n*

c. Relationship between spatial categories and burglary rate

The study also compared the spatial categories of the layouts with burglary rate. The properties considered were: 1) constitutedness of the streets, in which the number of entrance of houses that open to both sides of a street. A street is recorded as constituted if there are more than 70% of houses lining both sides of a street with their entrance open onto the street; 2) categories of space, which includes through carriageway, cul-de-sac driveway, and cul-de-sac carriageway; and also, intervisibility.

In a previous syntax-based study by Hillier and Shu, it has been shown that a layout is safer if its streets are generally constituted, with high intervisibility and mainly through carriageways. Unlike the previous study, the case study areas are grid-like layouts and as such the streets are mainly made-up of through carriageways. Nevertheless, the degree of constitutedness of streets varies. Area 5 has the least proportion of streets that are constituted (46.2%) and Area 2, the most (more than 74%). But, the proportion of constituted streets in grid-like layouts does not seem to relate to burglary rate. Perhaps, the high intervisibility of houses (low proportion of poor visibility in all areas) could have an influence in the burglary rate. This visual analysis was confirmed when the variables compared with burglary rate in regression analyses, showed weak relationship (p-value of more than 0.05). It has been shown that analyses at the area scale have partially explained the proportion of burglary rate between areas. With the exception of the global integration (radius *n*), all the other variables do not explain the uneven distribution of burglary between grid-like areas. Thus, it was essential for the study to examine at a much finer scale of the street level.

Table 3: Comparison between burglary rate per 1000 houses and spatial categories

Area	Burglary rate per 1000	% Const	Categories of space			% poor visibility
			% thrc	% culdri	% culc	
1	32	59.10	99.41	0.00	0.5	21.8
2	23	74.10	98.30	1.50	0.2	20.4
3	30	52.60	99.40	0.30	0.2	19.4
4	18	66.80	85.70	0.00	14.3	0.0
5	16	46.20	100.00	0.00	0.0	10.6
6	11	70.20	97.20	2.80	0.0	27.8

Note: const: constitutedness, thrc: though carriageways, culdri: cul-de-sac driveway, culc: cul-de-sac carriageway

ii. At the street level

It has been illustrated that burglary rate is unevenly distributed between areas. Although, at the area level it has been shown that the *gridness* or the degree of grid and permeability do not appear to be related to burglary rate, areas with homogenous housing (terraced houses only) have lower burglary rate than areas with heterogeneous housing. Nonetheless, if burglary is mapped (Appendix 2), it can also be seen that within each areas burglary is also unevenly distributed. Some spaces are more at risk than others. The question is why burglary is unevenly distributed within an area. In answering this question, a micro analysis at the street level was considered. At this level, the local factors that make dwellings vulnerable in areas were investigated. But for the purpose of this paper, the results presented are of a comparison of burglary rate at the street scale using band as the unit of analysis.

Unlike most models that look at cities based on function-first approach, space syntax is a form-function based approach. According to Hillier and Stonor (2010), the space syntax approach measures are configurational, in which the relationship of each space in a system to all others are calculated. Thus, the spatial element, which is the street segment between junctions, was suggested as the main form of syntactic analysis of a city. In a residential layout, the number of houses lining street segments may vary from as little as 1 unit of house to more than 50 units. Looking at that range of houses in the study areas, the study then divided the street segments into bands as follows:

Band 1:	1 - 12 houses
Band 2:	13 - 24 houses
Band 3:	25 - 36 houses
Band 4:	37 - 48 houses
Band 5:	more than 49 house

a. Comparison between band and burglary rate

At this level the study attempted to find which band has higher burglary rate or is less safe and which is safer. In comparing at the street scale, burglary was calculated in each band as per 12 houses, in which the number of burglary for each band was multiplied with 12 (houses) and the actual number of houses in each band as the denominator (Table 4). When bands in all the areas were compared visually to determine which is most vulnerable to burglary, the study found burglary rate tend to be highest in band 1 (1 - 12 houses) in each of the areas with the exception for Area 1. A regression is performed to determine if the relationship between burglary and bands in the areas (except Area 1) is

significant. The results showed that the relationship in five areas is statistically significant with r-squared of 0.492 and a p-value of <0.0001. Although it appears to implicate that houses in band 1 are at risk, Table 4 also showed that in 2 areas (Areas 1 and 6), burglary is also high in band 3, in fact highest in band 3 for Area 1.

Why does the burglary distribution pattern differ in Area 1? The study tested if burglary rate in this area is related with syntactic, spatial or local factors of the area. When burglary rate in its entire band was correlated with all the variables, it looks like there was a strong relationship with connectivity ($r = 0.826$). Similarly in a regression analysis the r-squared was also strong with a value of 0.683. But, in the ANOVA table, the p-value was 0.0847, which is more than the significant value of 0.05. All the other variables do not indicate any relationship with burglary rate in Area 1.

Table 4: Burglary rate per 12 houses in each band

Band	Area 1		Area 2		Area 3		Area 4		Area 5		Area 6	
	Burg.	Rate	Burg.	Rate	Burg.	Rate	Burg.	Rate	Burg.	Rate	Burg.	Rate
1 (1-12)	39	1.78	13	1.95	20	1.68	2	2.67	22	1.64	2	1.09
2 (13-24)	14	0.38	14	0.92	18	0.87	5	0.71	7	0.81	3	0.69
3(23-36)	31	2.28	14	0.63	10	0.60	6	0.38	7	0.40	3	1.09
4(37-48)	7	0.75	16	0.45	3	0.30	2	0.27	5	0.45	3	0.43
5(49- >)	51	0.59	7	0.24	9	0.38	11	0.26	25	0.31	7	0.34
	142		64		60		26		66		18	

Regression Summary

burglary rate per 12 vs. band

Count	30
Num. Missing	0
R	.701
R Squared	.492
Adjusted R Squared	.474
RMS Residual	.474

ANOVA Table

burglary rate per 12 vs. band

	DF	Sum of Squares	Mean Square	F-Value	P-Value
Regression	1	6.087	6.087	27.111	<.0001
Residual	28	6.286	.225		
Total	29	12.373			

Regression Coefficients

burglary rate per 12 vs. band

	Coefficient	Std. Error	Std. Coeff.	t-Value	P-Value
Intercept	1.800	.203	1.800	8.873	<.0001
band	-.318	.061	-.701	-5.207	<.0001

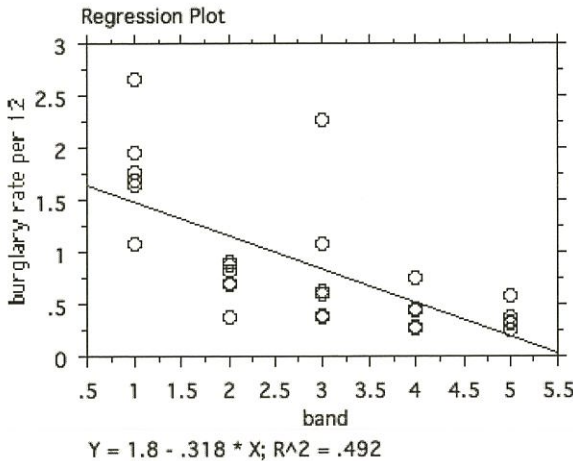


Figure 3: Relationship between burglary rate and band

CONCLUSION

Grid-like layout has been a common street layout in residential areas throughout this country. Although a previous study by Hillier and Shu (2000) has suggested that grid-like layout is generally safer compared to tree-like layout, their study has also indicated that there are spaces in the former layout that is vulnerable to burglary.

Following Hillier and Shu's study, this study has attempted to examine how various grid-like layouts in Malaysia can be vulnerable to burglary. Upon examination at the macro and micro scale, the findings of this study have shown that layouts that we planners draw and produce can influence burglary. When variables in a layout were considered independently (as shown in this study), not all factors relate strongly to burglary. Nonetheless, the findings of this study has shown that at the macro scale (area level), global integration (radius n), relates strongly to burglary rate, and at the micro scale (street level), houses in band 1 (street segments with less than 12 houses) are more vulnerable to burglary. It was also suggested that areas constituting of homogenous type of houses (e.g. terraced only) is safer than areas with heterogeneous type of houses (mix housing type). These findings seem to suggest that planners when drawing up residential layouts must reconsider the hierarchy and connectivity of streets. Although accessibility is essential for the convenience of its residents, too many (or a very permeable layout) will have negative impact on its safety. Similarly, having fewer houses along a street segment may also put houses at risk of being burgled.

This research has attempted to examine the relationship between burglary, urban spaces in grid-like layout and the local conditions of layouts in Malaysia. Although, this paper presents partial results of the study, suffice to say examining burglary at the macro and micro scales have provided a glimpse into how spaces interact with burglary. By using space syntax as a tool, it has allowed the comparison of spaces and burglary rate, which otherwise seem impossible. No doubt there are several crime studies that have been conducted in this country, very few have actually attempted to examine at the finer scale. In conclusion, it can be implied that the results of this study have to a certain extent agree with the findings of the study carried out by Hillier and Shu.

REFERENCES

- Beavon, D. J. K., P. L. Brantingham, et al. (1994). The influence of street networks on the patterning of property offenses. *Crime Prevention Studies* 2: 115-148.
- Bowers, K.J, Johnson, S.D, and Pease K. (2005). Victimization and re-victimisation risk, housing type and area: a study of interactions. *Crime prevention and community safety: An international journal*. 7 (1), pp 7 – 17.
- Brantingham, P. L. B., P.J (1975). Residential burglary and urban form. *Urban Studies*(12): 273-284.
- Hillier, B. (2008). Space and spatiality: what the built environment needs from social theory. *Building Research & Information* 36(3): 216-230.
- Hillier, B. and Sahbaz, O. (2007). Beyond hot spots; using space syntax to understand dispersed patterns of crime risk in the built environment. <http://eprints.ucl.ac.uk/18549/>. Retrieved 30/08/11
- Hillier, B. and Sahbaz, O. (2008). An evidence based approach to crime and urban design: Or, can we have vitality, sustainability and security all at once? http://www.spacesyntax.com/Files/MediaFiles/Hillier%20Sahbaz_An%20evidence%20based%20approach_010408.pdf. Retrieved 01/10
- Hillier, B and Shu, S. (2000). Crime and urban layout: the need for evidence. *Secure foundations*. London: IPPR
- Hillier, B. and Stonor, T. (2010). Space Syntax - Strategic Urban Design. *City Planning Review, The City Planning Institute of Japan*. 59/3 (285): 7-11.
- Jacobs, J. (1961). *The death and life of great American cities*. New York: Vintage Books.
- Johnson, S. D. and K. J. Bowers (2010). Permeability and burglary risk: are cul-de-sacs safer?. *Quantitative Criminology* 26: 89-111.
- Newman, O. (1972). *Defensible Space: Crime Prevention through Urban Design*. New York, MacMillan.

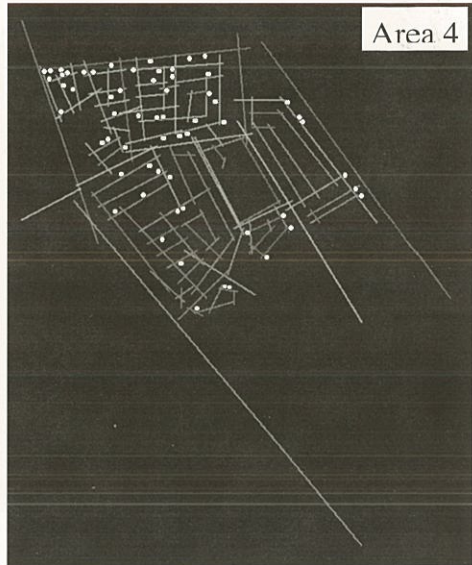
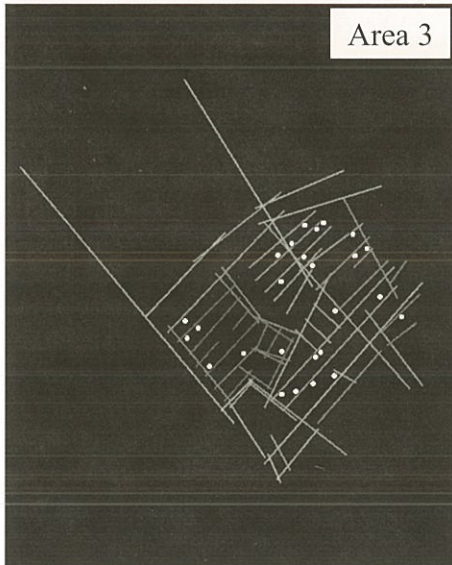
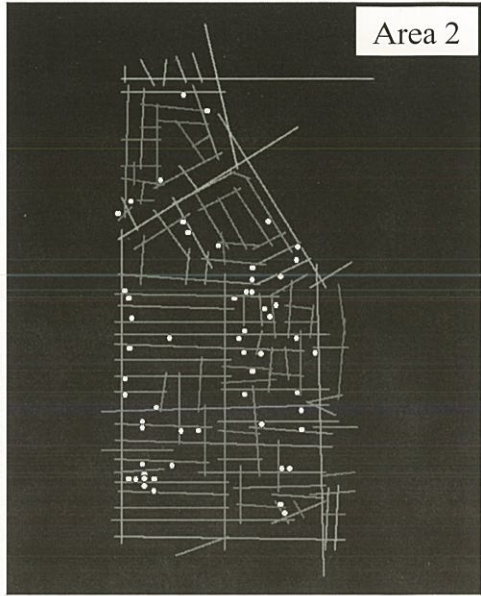
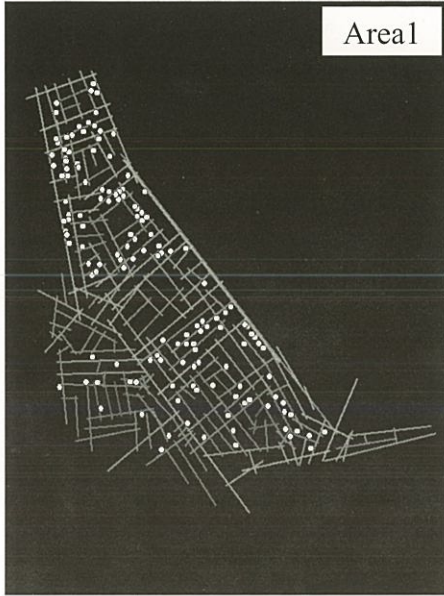
Appendix 1

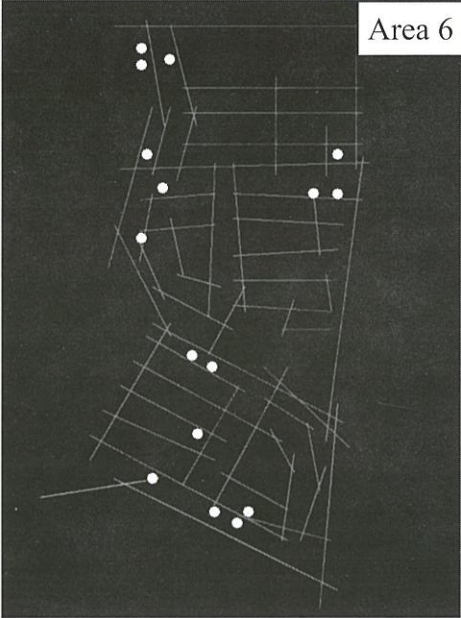
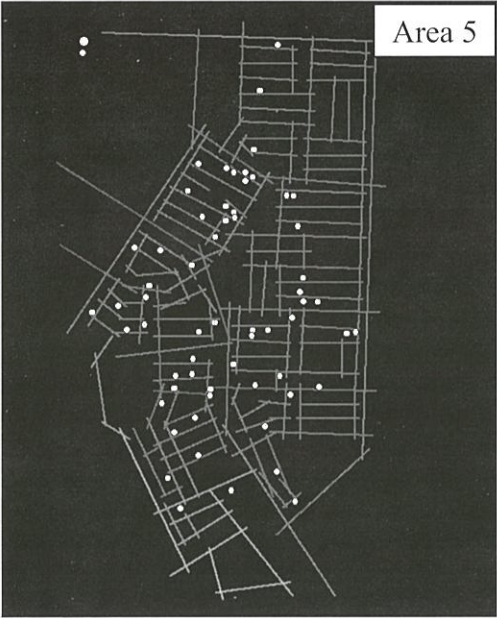
Axial map of the study area in relation to the whole system



Appendix 2

Axial maps of case study areas with burglary mapped as white dots







ANALYSIS OF FACTORS INFLUENCING THE STATED PREFERENCE OF ACADEMIC EMPLOYEES TOWARDS TELECOMMUTING IN IIUM CAMPUS, GOMBAK

Farah Diyanah Ismail¹, Abdul Azeez Kadar Hamsa², Mansor Ibrahim³

1, 2&3 Kulliyah of Architecture and Environmental Design
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Abstract

Telecommuting acts as one of the Transportation Demand Management (TDM) measures that aimed to reduce peak hour traffic congestion by allowing commuters to work from home or a nearby telecommuting centre on certain days of the week. The increasing private vehicle usage by IIUM community (staffs and students) is posing a strain on the ability of the existing road and the related infrastructure on-campus. The purpose of this paper is to investigate factors influencing the stated preference of the academic staffs of IIUM towards various aspects of telecommuting. About 100 respondents had participated in this study through a self-administered questionnaire survey. Four research hypotheses highlighting the relationship between the preference to telecommute and commute distance, commute time, marital status having children as well as amount of time spent on research were formulated. Among the hypotheses, only the hypothesis highlighting the preference to telecommute and married female staff with children was tested statistically significant at 95% confidence interval. On the preference to telecommute, about 68% of the respondents expressed willingness to telecommute, even though, the University does not have an official policy on telecommuting arrangement. Some of the recommendations to increase the penetration of telecommuting in IIUM are: establishing telecommuting arrangement; promoting awareness of telecommuting; implementing telecommuting pilot project and conducting further study on various other aspects of telecommuting.

Keywords: telecommuting, teleworking, academic employees, travel demand, peak-hour traffic.

¹ Postgraduate Student (Master of Science Built Environment). Email: farahd.ismail@gmail.com

² Associate Professor, Department of Urban and Regional Planning. Email: azeez@iium.edu.my

³ Professor, Department of Urban and Regional Planning. Email: profmansor@iium.edu.my.

INTRODUCTION

Malaysia is a rapidly growing country with high private vehicle ownership. The number of cars in the Klang Valley is expected to reach seven million by 2020, unless there is a marked shift to public transport (BERNAMA, 2011). This number of vehicle ownership has been growing at an exceedingly fast rate with an average of 30,000 cars per month. Recently in the Klang Valley, 83% or six million trips were made using private transport, mostly single occupancy vehicles (SOVs). This explains the huge traffic jams and constant gridlock conditions even though the Klang Valley has one of the highest concentrations of roadways and tolled highways in the world (Sabariah, 2011). The growth of private vehicle trips has been exerting tremendous pressure on the capacity of the existing road network that cannot be subdued by only physical extension of the network, which often proved to be costly. The rapid increase in the use of private transport has resulted in increased traffic congestion, accidents, inadequate parking space and air pollution among other negative effects (Abdalla Nurdeen et al., 2007). In view of the above problems, telecommuting could be seen as one of the measures in reducing the number of private vehicles on the road especially during peak hour and thus reducing the associated negative impact.

The increase in private vehicle use also affects road, parking and related infrastructure in higher learning institutions in Malaysia. International Islamic University Malaysia (IIUM), being located in Gombak, Kuala Lumpur, is one of the public Universities in Malaysia. The University has been subjected to an increasing number of staff and student population every year. The University statistics showed that the number of employees in IIUM has increased at an average rate of 6.6% per year between 2001 and 2010 (IIUM Management Services Division, 2011). The increasing number of employees has contributed to the high number of registered vehicles in IIUM. According to IIUM Security Management Unit Office (2011), the number of registered vehicles among the staffs has reached almost 3000 registered cars in 2010. The statistics also showed that the number of registered private motorized vehicles has exceeded the total number of employees by 10.4%. As a result of the increasing number of private vehicles, IIUM has been facing insufficient parking spaces to accommodate both staffs and students' vehicles. The statistics of IIUM Security Management Unit Office (2011) showed that the number of registered vehicles, among the staffs, to the number of available parking spaces on-campus has exceeded by 9.2%. It clearly showed that the available parking supply is far less

than the parking demand. The increasing private vehicle usage by staffs as well as students has been imposing an enormous pressure on the ability of the existing infrastructure to cope with the increasing traffic volume and parking demand on-campus. As a result, the major circular road has seen congested with long queues of vehicles, which cause slow moving of traffic especially during morning and evening peak hours. The purpose of this paper is to investigate factors influencing the stated preference of the academic staffs of International Islamic University Malaysia (IIUM) towards telecommuting and also analyze their perceptions on various aspects of telecommuting. As such, there is no policy on the telecommuting phenomenon being introduced in the University. However, some of the academic staffs were found to be practicing telecommuting as informal work arrangement. Hence, the views of the academic staff, especially due to their involvement on telecommuting compatible work arrangement such as research and consultancy, on the facets of telecommuting is very crucial and pertinent. Self-administered questionnaires were administered on the selected respondents to ascertain academic staffs' views on the practice of telecommuting as an alternate work arrangement in IIUM. The findings of the questionnaire survey are discussed in the following sections. Recommendations to increase the penetration of telecommuting phenomenon as an alternate work arrangement in IIUM are also drawn.

LITERATURE REVIEW

Various authors have pointed out the diverse meanings assigned to the term "telecommuting". Additionally, several other researchers had tried to establish their own definition. To exemplify, Joice (1999) defines telecommuting as a "work arrangement in which employees work at alternate worksites to conduct some of their officially assigned work during paid hours". According to Fairweather (1999), telecommuting uses information and communication technologies to bring work to the worker. Telecommuting is sometimes equated with the use of telecommunications-related technology to conduct work. Ellison (1999) defined telecommuting as a "periodic work out of the principal office, one or more days per week either at home, at a client's site, or in a telework centre". Due to such an inconsistency in shaping the definition of the term, one could argue that the definitions applied to telecommuting can be grouped in three main blocks; some emphasize on where the work has taken place, some agreed that telecommuting is usually connected with the use of telecommunication tools and others defined in terms of how often it has taken place.

The literature on telecommuting has grown significantly, especially in western countries, over the last two decades. Research on telecommuting in developing countries is still considered unsurprisingly new (Mohamed and Abdallah, 2009). On empirical part of telecommuting research, some researchers had presented results from the investigation and analyze of the preference towards performing telecommuting among the employees. Wan Rozaini and Haitham (2005), for example, had used a sample of 70 lecturers from “Fakulti Teknologi Maklumat (faculty of information technology)” to investigate the possibilities of implementing telecommuting as a first mode of working at all faculties at Universiti Utara Malaysia (one of the public Universities) by ascertaining their views on willingness to telecommute. Similarly, Abdul Azeez and Wan Nurul Mardiah (2009) had conducted a study to unravel travel, work and socioeconomic characteristics of the stated preferred telecommuters and factors associated with preference to telecommute in the private and public sectors in Johor Bahru and Kuala Lumpur city by targeting 391 employees.

Based on earlier studies, Yen and Mahmassani (1994), Sullivan (1993) and Peters et al. (2004) had agreed that the decision to telecommute is governed by socioeconomic variables. In terms of gender, Popuri and Bhat (2003), Yap and Tng (1990) and Wells et al. (2001) had suggested that telecommuting would be of particular interest to women employees. Earlier studies had identified that age is also one of the factors that contribute to preference to adopt telecommuting (Mokhtarian and Meenakshisundaram, 2002 and Walls et al., 2007). Thériault et al., (2005) had suggested that older workers are more likely to telecommute than younger ones. Several studies have suggested that telecommuting would be of particular interest to employees who have children (Popuri and Bhat, 2003; Yap and Tng, 1990 and Wells et al., 2001). Furthermore, Peters et al. (2004) had assumed that the likelihood on the preference to telecommute is positively influenced by the number of children especially children in the youngest age group. The employees with a child under the age of four more often prefer to telecommute than employees with a child over 12 years of age. On other aspects, Walls *et al.* (2007) claimed that both the choice and frequency decisions of telecommuting were found to be substantial influences of workplace-related factors. According to Brown (2010), job position plays an important role in the selection process or in some non-telecommuters’ decision to opt out of telecommuting. Moreover, the length of service also found to be one of the important influential factors for the decision to telecommute (Bagley and Mokhtarian, 1997). Safirova and Walls (2004)

confirmed that having more professional experiences, in general, and a longer tenure with one's current company and one's current supervisor will boost the probability of telecommuting. Popuri and Bhat (2003) also suggested that employees with a long period of service with the current employer tend to be more inclined to telecommute.

According to Mokhtarian and Salomon (1996c), commute stress is expected to be positively related with the choice to telecommute, assuming that stressful commuting conditions can be avoided by telecommuting. Employees who have to spend long unproductive time on the road for work trip thereby subjected to stress and fatigue. Employees commuting to work who are facing traffic congestion and commute stress may encourage them to telecommute more frequently (Mokhtarian and Salomon, 1996b, 1997). In a study of emotional impact of telecommuting, Mann (2000) found that respondents of two service industries in the UK had perceived telecommuting advantages as follows: less travel (57%); more freedom/flexibility (57%); better working environment (50%); fewer distractions (43%); cheaper (29%); freedom to choose comfortable clothes (14%); freedom from office politics (7%); and easier to complete domestic chores (7%). On the other hand, Tremblay (2003) found the perceived disadvantages of telecommuting that are most often mentioned include: lack of co-workers and isolation (15.4% and 10% of respondents respectively), risk of working more (9%), difficulty of motivating themselves (6%) and work-family conflict (5%).

OBJECTIVES, HYPOTHESIS AND RESEARCH APPROACH

The objectives, research hypothesis and research approach are highlighted in this section.

Study objectives

The formulated objectives of this study are:

- (1) To analyse number of academic and administrative employees and their patterns of registered vehicles on-campus
- (2) To describe the existing traffic and road characteristics on-campus
- (3) To identify factors contributing towards the practice of telecommuting among the academic staffs
- (4) To formulate recommendations to increase the penetration level of telecommuting among staff members on-campus

Research hypothesis

Jiang (2008) and Mokhtarian and Salomon (1996a) explained that workers who have longer commute distances might be more likely to telecommute. In many studies commuting time is indeed found to have a large positive effect on telecommuting adoption (Mokhtarian and Salomon, 1997). Peters et al. (2004) mentioned the likelihood of preferring to telecommute is for individuals who have long commuting times. For some motivation and constraint variables, the presence or absence of children might have an important impact towards the choice of decision on telecommuting. Mannering and Mokhtarian (1995); Popuri and Bhat (2003) explored some of the most important variables in explaining the choice of telecommuting were the presence of small children in the household and gender of respondents. In response to that, Wells et al. (2001) found that telecommuters are more likely to be women, married, and have children. Thus, the following hypotheses were formulated based on the above literature study:

- H1 Further the commute distance from home to workplace, greater the inclination toward preference to adopt telecommuting by academic employees.
- H2 Longer the commute time experienced on the road, higher the inclination of the academic employees to telecommute.
- H3 Married female academic employees with children at home are more likely to state preference towards telecommuting.
- H4 Longer the time being spent on research, more likely the academic employees would prefer to telecommute

Research approach

The selection of appropriate research approach is imperative to achieve the stated objectives of the study. Both primary and secondary data were collected based on the stated objectives and research hypotheses. Field observational and questionnaire survey were applied in this study to collect data for this study.

Background of study area

The main campus of International Islamic University Malaysia (IIUM) is nestled in a valley in the district of Gombak, a suburb of the capital city of Kuala Lumpur. It is situated around 10 kilometers at the northeast direction

from Kuala Lumpur at the foot of the Gombak hillside. The campus occupies an area of 700 acres and it can be accessed by using the Middle Ring Road 2 (MRR2), Karak Highway or the Gombak road. The University was established in 23 May 1983 being founded based on Islamic principles with the aim to become a premier Islamic University in the world (The Star, 2007b). IIUM Gombak Campus comprises of 8 faculties, also known as Kulliyyahs, specialized in Architecture and Environmental Design, Economics and Management Sciences, Engineering, Islamic Revealed Knowledge and Human Sciences, Education, Laws, Information and Communication Technology and Language Centre. Presently, the University accommodates about 2708 employees including both academic and administrative staffs and a total number of 20,000 students (IIUM Management Services Division, 2011).

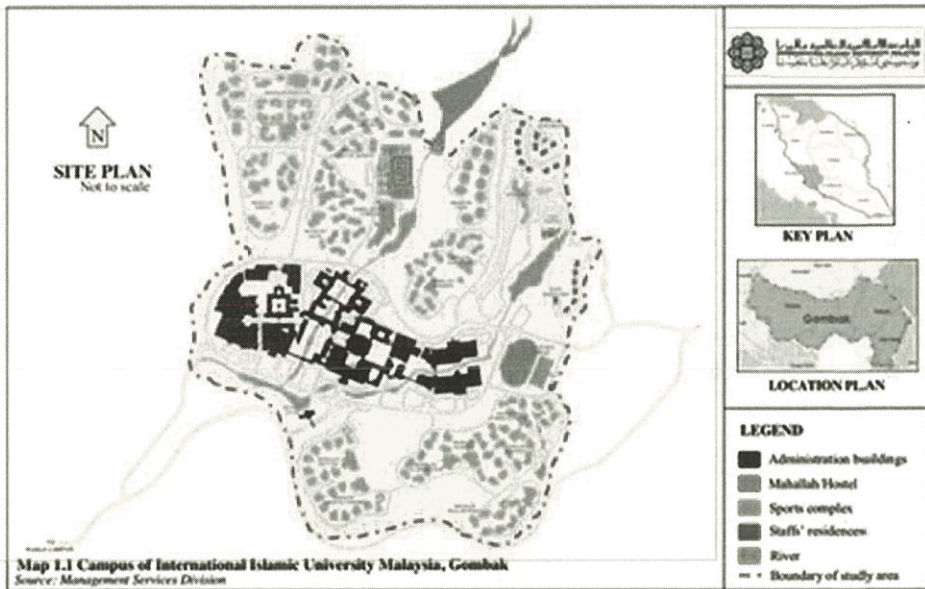


Figure 1: Campus of International Islamic University Malaysia, Gombak

Field observational survey

This survey was used to collect data related to traffic and road characteristics, parking demand and traffic circulation especially along major road on-campus. This is mainly to determine the rationale for the study. Field measurement on the road dimensions along the major road was administered. The road dimension at four different stretches along major roads in IIUM was measured because of different dimensions at these stretches. The measurement of road dimensions includes: carriageway width, width of pedestrian walkways, and width of landscape and drainage. Similarly, data on parking demand and traffic flow with the campus were also collected.

Questionnaire survey

The perceptions of academic staff on the various facets of telecommuting were determined by using a questionnaire survey approach. The questions were carefully drafted not only for the purpose of avoiding irrelevant and inappropriate questions but also reducing the length of the questionnaire. Academic employees of IIUM were selected as the target population for this study because of their involvement in telecommuting-compatible jobs such as research, and consultancy besides teaching and flexibility in working hours. Samples were selected because of high number of academic staff in IIUM, as it is extremely difficult to include the entire academic staff population. The total sample size for this research was estimated by using Yamane (1967) formula. Refer to Equation (1).

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

Where: n = sample size, N = population size, e = the level of precision (assumed 10%). The total number of academic staff population in IIUM Gombak campus was 1335 as given by Management Services Division, the main administrative wing of the University. The total sample size was calculated to be 93 and rounded off to 100. The total population of the academic staff was stratified according to Kulliyah (faculties) and proportional samples were selected from each Kulliyah (stratum). The proportional allocation of samples is determined by the following expression (Anderson, 1989). Refer to Equation (2).

$$n_i = N_i \times \frac{n}{N} \quad (2)$$

Where: n_i = sample units of i th stratum, N_i = population members of i th stratum, n = sample size, N = population size.

Table 1: Proportional allocation of sample according to Kulliyah/Department

Kulliyah/Department	Number of academic employees	Proportional Allocation	
		Sample units	Percentage
KAED	116	9	9%
KENMS	143	11	11%
KOE	225	17	17%
KIRHS	258	19	19%
INSTED	31	2	2%
AIKOL	135	10	10%
KICT	54	4	4%
CELPAD	373	28	28%
Total	1335	100	100%

Source: Management Services Division of IIUM, 2011 & Primary Calculation, 2011

Self-administered questionnaire survey forms were distributed to the academic employees by applying convenience sampling method. It is mainly to decrease the expected high response rate. Sufficient time was given to the respondents to respond the questionnaire. One hundred and sixty nine (169) questionnaire survey forms were distributed but only 100 participants had actually responded, a response rate of 57% (Table 2). The questionnaire form was divided into three main parts consisting of travel characteristics, perceptions of telecommuting and background profile of the respondents.

Table 2: Distribution of Questionnaires

Kulliyah/Department	Questionnaires distributed	Questionnaires received	Response rate
KAED	11	9	81.8%
KENMS	21	11	52.4%
KOE	29	17	58.6%
KIRKHS	34	19	55.9%
INSTED	5	2	40.0%
AIKOL	20	10	50.0%
KICT	8	4	50.0%
CELPAD	41	28	68.3%
Total	169	100	Average 57.1%

Source: Primary Survey, 2011

Method of analysis

Relative Importance Index (RII) method was applied on the ordinal ranking data to determine the ranking of the identified factors/determinants on the various aspects of telecommuting according to respondents' preferences. RII formula is shown in Equation (3).

$$RII = \frac{\sum a_i x_i}{A \times N} \quad (3)$$

Where:

- a_i = constant expressing the weight of the i th response
- x_i = frequency of the i th response of the total responses for each cause
- i = response category index (where $i = 1, 2, 3, 4$ and 5 respectively)
- A = highest weight (5) if 5 (if 7, then $A = 7$)
- N = total number of respondents

Each of the ordinal variables was categorized by using Likert scale. Cross-tabulation technique was used to determine the relationship between variables (preference of academic employees towards telecommuting and background profiles as well as travel characteristics of the respondents). Chi-square method was also used to test the statistical significance of each identified hypothesis.

ANALYSIS AND FINDINGS

The findings showed that the total number of employees in IIUM has been increasing at the rate of 6.6% per year from 2001 to 2010. The number of registered cars on-campus has been increasing at 1.8% per year from 2007 to 2010. Analysis on traffic volume in IIUM showed highest traffic volume in the evening peak hours (5.00 pm-6.00 pm). The demand for parking has also exceeded the parking supply in almost all the Kulliyahs/faculties in IIUM. The total number of parking spaces for both cars and motorcycle are 2567 and 1273 respectively. The study reveals that the parking spaces provided at the Kulliyah/faculties is highly utilized with the average of 83.55%. This indicates that the demand for parking is high. The traffic conditions in IIUM have been exerting tremendous pressure on the limited road and supporting infrastructure. Thus, this study is considered important in highlighting the perceptions of employees on telecommuting as an alternative form of work arrangement which would help to reduce impact on road infrastructure. The following sections discuss on the background profile of the respondents and their perceptions on telecommuting as an alternative work arrangement.

Background profile

The gender composition of respondents showed 57% female and 43% male. The majority (25%) of the respondents fall under the age structure of 41-45 years old with an average age of 42 years. Refer to (Table 3). A high number of “teachers” (27%) attached to the Centre for Language studies has participated in the questionnaire survey. Among the respondents, 7% hold the position as Professor, 18% as Associate Professor, 21% as Assistant Professor, 24% as lecturer 3% as academic fellow. A large proportion of the academic staffs (30%) have been working in IIUM for 6-10 years with an average tenure being 11 years. Generally, the academic staffs were involved in administration tasks, attending meetings, paper markings, lecture preparation, research and publications besides teaching.

Table 3: Summary of background profile of the respondents (n=100)

Background Profile	Frequency	Percentage	Mean	Median	Std. Deviation
Gender					
Male	43	43.0%	-	-	-
Female	57	57.0%			
Age Group					
26-30 years	9	9.0%	42.13 years	41.5 years	8.643 years
31-35 years	13	13.0%			
36-40 years	23	23.0%			
41-45 years	25	25.0%			
46-50 years	13	13.0%			
51-55 years	9	9.0%			
56-60 years	4	4.0%			
> 60 years	4	4.0%			
Marital Status					
Single	15	15.0%	-	-	-
Married	83	83.0%			
Divorced/Widowed	2	2.0%			
Children Status*					
0-5 years old	37	21.8%	11.15 years	10.6 years	6.587 years
6-10 years old	47	27.6%			
11-15 years old	44	25.9%			
16-20 years old	25	14.7%			
21-25 years old	14	8.2%			
> 25 years old	3	1.8%			
Job Position					
Professor	7	7.0%	-	-	-
Assoc. Prof	18	18.0%			
Assist. Prof	21	21.0%			
Lecturer	24	24.0%			
Teacher	27	27.0%			
Academic Fellow	3	3.0%			
Duration of Service					
0-5 years	28	28.0%	10.5 years	9.2 years	7.136 years
6-10 years	30	30.0%			

11-15 years	19	19.0%			
16-20 years	9	9.0%			
21-25 years	12	12.0%			
26-30 years	2	2.0%			
Time spend on job scopes					
a) Teaching					
1-8 hours/week	12	12.0%	18.42 hour per week	17.44 hour per week	9.071 hours per week
9-16 hours/week	34	34.0%			
17-24 hours/week	34	34.0%			
25-32 hours/week	13	13.0%			
> 32 hours/week	7	7.0%			
b) Consultancy					
None	7	7.0%	9.49 hours per week	6.70 hours per	7.774 hours per week
1-8 hours/week	60	60.0%			
9-16 hours/week	15	15.0%			
17-24 hours/week	12	12.0%			
25-32 hours/week	5	5.0%			
> 32 hours/week	1	1.0%			
c) Research					
None	4	4.0%	15 hours per week	11.55 hours per week	10.913 hours per week
1-8 hours/week	36	36.0%			
9-16 hours/week	21	21.0%			
17-24 hours/week	23	23.0%			
25-32 hours/week	9	9.0%			
> 32 hours/week	7	7.0%			
d) Others					
None	76	76.0%	19.5 hours per week	19.16 hours per week	11.618 hours per week
1-8 hours/week	6	6.0%			
9-16 hours/week	5	5.0%			
17-24 hours/week	3	3.0%			
25-32 hours/week	6	6.0%			
> 32 hours/week	4	4.0%			
Registered Vehicles*					
a) Car					
1	52	47.3%	1.55 cars	1 car	0.745 cars
2	34	30.9%			
3	9	8.1%			
4	2	1.8%			
b) Motorcycle					
1	12	10.9%	1.08 cars	1 car	0.227 motor- cycle
2	1	0.9%			

Source: Primary Survey, 2011

*Respondents may response to more than one answer choices

Travel characteristics

The average number of registered cars and motorcycles by an academic staff were found to be 1.55 and 1.08 respectively. "Driving alone" (single occupancy) to the campus (64%) was found to be very common among

academic staffs. Surprisingly, none of the academic staff were using public transport to the campus. Refer to (Table 4). The average commute distance of the respondents was 16.75 km. Most of the respondents (53%) spent commuting time of 15 to 30 minutes to the campus with 51% have experienced less than 15 minutes delay time.

Table 4: Summary of travel characteristics of the respondents (n=100)

Travel Characteristics	Frequency	Percentage	Mean	Median	Std. Deviation
Mode of Transportation					
Car – (single occupancy)	64	64.0%	-	-	-
Car – (more than single occupancy)	22	22.0%			
Car – as passenger	10	10.0%			
Motorcycle	4	4.0%			
Commute Distance (one-way trip)					
5 km or less	19	19.0%	16.75 km	11.5 km	17.54 km
6 -10 km	29	29.0%			
11-15 km	10	10.0%			
16-20 km	17	17.0%			
21-25 km	8	8.0%			
26-30 km	5	5.0%			
31 km or more	12	12.0%			
Average Commute Time					
a) To workplace					
15 minutes or less	18	18.0%	29.5 minutes	24.16 minutes	20.074 minutes
15-30 minutes	53	53.0%			
30-45 minutes	10	10.0%			
45-60 minutes	10	10.0%			
1 hour-1h 15mins	4	4.0%			
1 h 15mins-1h 30mins	3	3.0%			
More than 1h 30mins	2	2.0%			
b) From workplace					
15 minutes or less	14	14.0%	32.7 minutes	27.59 minutes	19.454 minutes
15-30 minutes	44	44.0%			
30-45 minutes	16	16.0%			
45-60 minutes	17	17.0%			
1 hour-1h 15mins	5	5.0%			
1 h 15mins-1h 30mins	3	3.0%			
More than 1h 30mins	1	1.0%			
Average Delay Time					
a) To workplace					
Not experienced any delay	17	17.0%	14.67 minutes	6.68 minutes	9.177 minutes
15 minutes or less	51	51.0%			
15-30 minutes	26	26.0%			
30-45 minutes	6	6.0%			
b) From workplace					
Not experienced any delay	24	24.0%	17.80 minutes	15.50 minutes	11.307 minutes
15 minutes or less	36	36.0%			
15-30 minutes	32	32.0%			

30-45 minutes	5	5.0%			
45-60 minutes	3	3.0%			
Experience of stress					
Yes	35	35.0%	-	-	-
No	65	65.0%			

Source: Primary Survey, 2011

Perceptions of respondents on telecommuting as an alternative work arrangement

The concept of telecommuting was widely accepted by the respondents. The findings showed that 68% of the respondents were preferred to adopt telecommuting while only 32% were against. The preferred frequency of telecommuting (about 34%) was 2 days per week followed by 3 days per week (28%) and 1 day per week (21%). This study also shows that some of the respondents preferred to telecommute for 3 days per week (27.9%) followed by 20.6% preferred only 1 day per week. Nearly 78% of the academic staffs were aware about telecommuting and 48% of the respondents were performed telecommuting informally. The views of respondents on telecommuting were asked based on their likely preference to practice telecommuting during and after office hours. Peters et al. (2004) mentioned that informal telecommuting is more widespread than formal telecommuting.

Hypotheses testing

Each hypothesis was tested for statistical significance by using Chi-square method. The following shows results of the hypothesis testing.

H1 Further the commute distance from home to workplace, greater the employees show preference to practice telecommuting

Jiang (2008) and Mokhtarian and Salomon (1996a) explained workers who have longer commute distances may be more likely to telecommute. The findings showed that this hypothesis was tested to be statistically insignificant at 95% confidence level. This finding is similar to that of Abdul Azeez and Wan Nurul Mardiah (2009) and Drucker and Khattak (2000) which indicated that distance to work is negatively correlated with telecommuting—that is, the farther the individual lives from his/her job, the less likely he/she to telecommute. (Table 5) shows the cross-tabulation between those two variables.

Table 5: Preference towards telecommuting according to commute distance

Likely to practice telecommuting		Commute distance					Total
		10 km or less	11-20 km	21-30 km	31-40 km	41 km or more	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of commute distance</i>	32 47.0%	19 27.9%	8 11.8%	4 5.9%	5 7.4%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of commute distance</i>	16 50.0%	8 25.0%	5 15.6%	2 6.3%	1 3.1%	32 100.0%

Source: Primary Survey, 2011

H2 Longer the commute time between home and workplace, the higher the inclination of academic employees to telecommute.

In many studies commuting time is indeed found to have a large positive effect on telecommuting adoption (Mokhtarian and Salomon, 1997). Peters et al. (2004) mentioned that the likelihood towards preference to telecommute is related with long commuting time. Results of chi-square test had revealed that there exists no significant association between the propensity towards telecommuting and commute time (for both to workplace and from workplace). The chi-square results showed insignificant relationship between inclination to practice telecommuting and commute time. (Table 6) shows the relationship between commute time and preference to telecommute.

Table 6: Preference towards telecommuting according to travel time

Likely to practice telecommuting		Average commute time to workplace				Total
		< 30 minutes	30 minutes - 1 hour	1 hour - 1 hour 30 minutes	> 1 hour 30 minutes	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of average commute time to workplace</i>	47 69.1%	13 19.1%	6 8.8%	2 2.9%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of average commute time to workplace</i>	24 75.0%	7 21.9%	1 3.1%	0 .0%	32 100.0%

Likely to practice telecommuting		Average commute time from workplace				Total
		< 30 minutes	30 minutes - 1 hour	1 hour - 1 hour 30 minutes	> 1 hour 30 minutes	
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of average commute time from workplace</i>	38 55.9%	22 32.4%	7 10.3%	1 1.5%	68 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of average commute time from workplace</i>	20 62.5%	11 34.4%	1 3.1%	0 .0%	32 100.0%

Source: Primary Survey, 2011

H3 Married female academic employees with children at home are more likely to state preference towards telecommuting

The presence of children at home may have an important impact towards the choice on the decision to telecommute. Mannering and Mokhtarian (1995); Popuri and Bhat (2003) explored that the most important variables in explaining the choice of telecommuting were the presence of small children in the household and gender of respondents. In response to that, Wells et al. (2001) found that telecommuters are more likely to be women, married, and have children. Among the respondents who expressed interest to practice telecommuting, 57.6% were married female with children. The third hypothesis, which states that married female academic employees with children at home are more likely to state preference towards telecommuting was tested for statistical significance. Mokhtarian and Salomon (1996b), on the other hand, showed different findings on this relationship. Their findings revealed that the presence of children were not significantly different between preferers and non-preferers. This research however has come out with a contrary result. The findings of this hypothesis showed that the association between preference towards telecommuting and married female with children status was statistically significant at 95% confidence level. (Table 7) shows the cross-tabulation between those two variables.

Table 7: Preference towards telecommuting according to married female with children status

Likely to practice telecommuting		Married female with children status		
		Married female with children	Married female without children	Total
Yes	<i>Count</i> <i>Percentage of respondents who likely to practice telecommuting in terms of married female with children status</i>	19 57.6%	14 42.4%	33 100.0%
No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of married female with children status</i>	2 15.4%	11 23.9%	13 100.0%

Source: Primary Survey, 2011

H4 Greater the time spent on research, more likely the academic employees to show their willingness to telecommute

The main work tasks of academic staffs are teaching, consultancy and research activities. Based on Yen and Mahmassani (1997) stated-preference approach survey, in which respondents are asked about their preferences towards telecommuting adoption, the authors find that the more face-to-face communication with the coworkers that the employee says he needs, the lower the probability of telecommuting. Since research activities mainly involve spending time independently and require less face-to-face interaction, it is presume that those who spend more time on research and publication would more preferably express willingness to telecommute. Chi-square test, however, has revealed that the association between propensity towards telecommuting and more time spent on research was statistically insignificant. It is because among those who preferred to telecommute were mostly spent their time on research for 1 to 8 hours per week (least frequent) whereas only few of the respondents who were willing to telecommute spent time on research for more than 32 hours per week (most frequent). (Table 8) describes the relationship between the time spent on research and the employees’ preference towards telecommuting. A summary of hypotheses is shown on (Table 9).

Table 8: Preference towards telecommuting according to the time spent on research

Likely to practice telecommuting		Allocation of time spent on research					Total
		Least frequent*	Less frequent*	Frequent*	More frequent*	Most frequent*	
Yes	<i>Count</i> <i>Percentage of respondents who are likely to practice telecommuting in terms of time spent on research</i>	23 35.3%	19 29.2%	11 16.9%	6 9.3%	6 9.3%	65 100.0 %

No	<i>Count</i> <i>Percentage of respondents who are not likely to practice telecommuting in terms of time spent on research</i>	13 41.9%	2 6.5%	12 38.7%	3 9.7%	1 3.2%	31 100.0%
----	--	-------------	-----------	-------------	-----------	-----------	--------------

Source: Primary Survey, 2011

* Least frequent = (1-8 hours per week), Less frequent = (9-16 hours per week), Frequent = (17-24 hours per week), More frequent = (25-32 hours per week), Most frequent = (More than 32 hours per week)

Table 9: Summary of Research Hypotheses

	Research Hypothesis Statement	Variables	Chi-square Value	df	Asymp. Sig. (2-sided)	Interpretation
H1	Further the commute distance from home to workplace, greater the academic employees show preference to practice telecommute	1. Commute distance from home to workplace 2. Willingness to tele-commute	.109	2	.947	Insignificant relationship
H2	Longer the commute time experienced to workplace, higher the inclination of the academic employees to telecommute	1. Commute time between home and workplace 2. Preference towards tele-commuting	Average travel time to workplace			Insignificant relationship
			.210	2	.647	
			Average travel time from workplace			
			.391	2	.532	
H3	Married female academic employees with children at home are more likely to state preference towards telecommuting	1. Gender 2. Marital status 3. Children status 4. Preference to perform tele-commuting	6.691	1	.010	Statistically significant
H4	Greater the time spent on research, more likely the academic employees to show their willingness to telecommute	1. Frequency of time spent on research 2. Willingness towards tele-commuting	4.151	2	.126	Insignificant relationship

Source: Primary Survey, 2011

The results of the hypothesis showed whether or not there exist relationship between preference to telecommute and the chosen variables. The results showed that as many as three hypotheses were tested statistically insignificant at 95% confidence interval. However, these results should be applied with caution because of the limitation in the selection of total sample size.

Perceived advantages on the preference towards telecommuting

This study also analyzed on the motivational factors that influenced the preferences towards telecommuting by using Relative Importance Index (RII) method. The results showed that “increase flexibility to work at own pace” was the most important factor (RII=0.84). Previous studies also mentioned that the importance of individual’s freedom is one of the key telecommuting facilitators as perceived by employees (Feldman and Gainey, 1997; Pulido and Lopez, 2005). “Proper management of time” was the second most important factor (RII=0.81) followed by “having more time with family” (RII=0.80), “ability to reduce travel time” (RII=0.78) and “ability to contribute in reducing traffic congestion” (RII=0.78). Furthermore, “increase comfort of workspace (i.e. at home)” (RII=0.76) and “ability to contribute in reducing pollution” (RII=0.75) were the other important factors, according to ranking index, as perceived by the academic staffs on the factors towards telecommuting. Findings from earlier studies showed that increasing productivity is considered as a key factor for employees to adopt telecommuting (Kurland and Bailey, 1999; Lim et al., 2003; Mills et al., 2001; Tung and Turban, 1996). However, this study has found that “increase productivity” (RII=0.74) and “increase job performance” (RII=0.74) were scored low ranking values by the respondents. The other factors which scored low ranking values are: “ability to reduce stress of traveling to work” (RII=0.74), “ability to reduce travel cost” (RII=0.73), “need to travel less” (RII=0.72), “control over physical environment (i.e. at home)” (RII=0.71) and “ability to avoid long commute distance” (RII=0.70). Refer to (Table 10). The ranking of these factors indicates what actually perceived as the important contributing factors towards willingness to practice telecommuting by the academic staffs.

Table 10: Factors influencing the motivation towards telecommuting

Factors influencing the preference to telecommute	Frequency of respondents					R.I.I.*	Rank
	(1)*	(2)*	(3)*	(4)*	(5)*		
Increase flexibility to work at own pace	0	3	13	20	32	0.84	1
Proper management of time	1	6	9	26	26	0.81	2
Having more time with the family	3	7	10	15	33	0.80	3
Ability to reduce travel time	4	7	11	15	31	0.78	4
Ability to contribute in reducing traffic congestion	2	7	15	17	27	0.78	5
Increase comfort of workspace (i.e. at home)	3	5	18	19	23	0.76	6
Ability to contribute in reducing pollution	3	6	19	16	24	0.75	7
Increase job performance	3	9	11	27	18	0.74	8
Increase productivity	2	10	13	24	19	0.74	8

Ability to reduce stress of travelling to work	4	11	14	13	26	0.74	9
Ability to reduce travel cost	6	9	15	12	26	0.73	10
The need to travel less	5	6	23	10	24	0.72	11
Control over physical environment (i.e. at home)	2	9	26	12	19	0.71	12
Ability to avoid long commute distance	7	10	15	13	23	0.70	13

Source: Primary Survey, 2011

* (1)= Least Important, (2)= Less Important, (3)= Important, (4)= More Important, (5)= Most Important **
 R.I.I.= Relative Importance Index

Perceived disadvantages on the preference towards telecommuting

This study also investigated perceived disadvantages on the preference towards telecommuting by the academic staff. The findings showed that “lack of resources to accomplish the tasks” as the most important inhibiting factor (RII=0.71) to adopt telecommuting. This finding is in concurrence with Mokhtarian and Salomon (1996b) which also states the similar trend. The results also showed that “low career advancement”, “decrease job productivity”, “inadequate work environment at home” and “increase level of overwork (due to lack of separation between work and family domain)” were scoring a RII value of 0.68. “Decrease job performance” (RII=0.67), “lack of social interaction with colleagues” (RII=0.66), “increase family-work role conflicts” (RII=0.61) and lastly “emotional stress (feeling of seclusion)” (RII=0.60) was the other inhibiting factors, as perceived by the respondents, to adopt telecommuting. Refer to (Table 11). Recent research indicates that isolation is perceived as one of the key factors that may hinder the implementation of telecommuting (Kurland and Cooper, 2002; Rognes, 2002).

Table 11: Factors influencing the demotivation towards telecommuting

Factors influencing the demotivation towards telecommuting	Frequency of respondents					R.I.I.*	Rank
	(1)*	(2)*	(3)*	(4)*	(5)*		
Lack of resources to accomplish the task remotely	1	7	7	8	9	0.71	1
Lower career advancement	2	4	12	8	6	0.68	2
Decrease job productivity	3	3	11	9	6	0.68	2
Inadequate work environment at home	3	5	9	7	8	0.68	2
Increase level of overwork	2	5	11	7	7	0.68	2
Decrease job performance	3	4	10	9	6	0.67	3
Lack of social interaction with colleagues	1	9	7	9	6	0.66	4
Increase family-work role conflicts	4	8	8	7	5	0.61	5

Emotional stress – feeling of loneliness	3	11	5	9	4	0.60	6
--	---	----	---	---	---	------	---

Source: Primary Survey, 2011

* (1)= Least Important, (2)= Less Important, (3)= Important, (4)= More Important, (5)= Most Important **
R.I.I= Relative Importance Index

DISCUSSION AND RECOMMENDATIONS

The implementation of telecommuting in higher learning institution will provide benefits in many aspects such as job flexibility to the academic staffs, travel and related benefits and reduction in the road and related infrastructure requirements on-campus. Nevertheless, the idea of introducing telecommuting in the University poses few challenges, which require careful close consideration before implementation. The level of achievement of job productivity, continuous inspiration to work away from main office especially at home, need to separate work and family time at home, desired frequency of working at home, possible long term benefits to road infrastructure and finally actual level of acceptance by academic staffs to work at home are few among them. The findings of this study showed that 68% of the respondents preferred to adopt telecommuting as an alternate work arrangement with an average frequency 2.51 days a week. Among the respondents who preferred to adopt telecommuting, female academic staffs (66.2%) were having greater inclination to practice telecommuting than male counterparts. Moreover, those who are expressed willingness to adopt telecommuting, 57.6% were married female academic staffs with children. However, the University does not have an official policy to allow its employees to perform telecommuting.

Few recommendations to increase the penetration level of telecommuting among academic staffs are:

- (1) Formulation of telecommuting policy and clearly established procedures on matters such as frequency of telecommuting, eligible staff members, work schedule, equipments and supplies, security and liability, worksite criteria, injury compensation and performance evaluation is highly required.
- (2) Wan Rozaini and Haitham (2005) stated that telecommuting work arrangement is relatively new among the Universities in Malaysia. Therefore, initiation of awareness to promote telecommuting at the Universities is highly recommended. An earlier study has stated that the intensity of promotion could lead to reduction in car commute trips by 3% to 12% in ten years (Cairns et al, 2004). Moreover, a pilot project on telecommuting should be initiated to ascertain the feedback on the practice

of telecommuting from both supervisors and employees of the organization.

- (3) Further studies covering other compatible workforce among administrative staff members of the University should be undertaken. Additionally, the views of top management of the University in introducing telecommuting should also need to be considered. This will provide much better insights on the compelling issues facing adoption of telecommuting by the University population.

CONCLUSIONS

Telecommuting is considered as one of the travel demand management measures in reducing the amount of travel and road infrastructure requirements. The amount of travel by private cars has been increasing in IIUM over the years because of increase in population and car ownership level. The increase in travel in and out of the campus has induced enormous pressure on the limited road, parking and related infrastructure on-campus. Formation of long queue of vehicles entering and leaving the campus in the morning and evening hours has become a normal phenomenon over the recent years, thereby increasing delay time. Thus, it has given an indication and immediate attention to address the increasing traffic problems on-campus. The suitability of adopting telecommuting in a University setting looks promising because of the greater flexibility involved, especially among academic staffs, in conducting research and consultancy projects. The findings showed that a high number of academic staffs (68%) were willing to adopt telecommuting for at least few days in a week. It is more prevalent especially among married female academic staffs with children. A formal telecommuting policy is required to further increase the number of preferred telecommuters. The formulation of policy on matters such as frequency of telecommuting, eligible staff members, work schedule, equipments and supplies, security and liability, worksite criteria, injury compensation and performance evaluation is required to provide a clear overview of the various aspects involved in practicing telecommuting as an alternate work arrangement. However, even with all the policy and procedures in place, the actual number of telecommuters and the associated benefits it may bring over an extended period of time is what actually need to be seen.

ACKNOWLEDGEMENTS

The authors are grateful to International Islamic University Malaysia (IIUM) for providing facilities and support for this research.

REFERENCES

- Abdalla Nurdeen, Riza Atiq O.K. Rahmat & Amirudin Ismail. (2007). Why Do People Use Their Car: A Case Study in Malaysia. *Journal of Social Science*, 3(3): 117 – 122, ISSN 1549-3652.
- Abdul Azeez Kadar Hamsa & Wan Nurul Mardiah Wan Mohd Rani. (2009). *Telecommuting and transportation: relationship and implications*. Kuala Lumpur: IIUM Press
- Anderson, Alan J. B. (1989). *Interpreting data: A first course in statistics*. Great Britain: J. W. Arrowsmith Ltd. Bristol.
- Bagley, M.N., & P.L. Mokhtarian. (1997). Analyzing the preference for non exclusive forms of telecommuting: modeling and policy implications, *Transportation*, Vol. 24, pp. 203-226.
- BERNAMA. (2011). *Number of cars in Klang Valley to reach 7 million by 2020*. Retrieved from <http://www.bernama.com/bernama/v5/newsbudget2012.php?id=618416>.
- Brown, J. M. O. (2010). *Telecommuting: the affects and effects on no telecommuters*. Faculty of the Virginia Polytechnic Institute and State University.
- Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A. & Goodwin, P. (2004). *Smarter Choices Changing the Way We Travel*, Department for Transport, London.
- Coyle, J. J., Novack, R. A., Gibson, B. J. & Bardi, E. J. (2011). *Transportation: supply chain perspective (7th ed.)*. United States: South –Western Cengage Learning.
- Drucker, J., & Khattak, A.J. (2000). Propensity to work from home – modeling results from the 1995 nationwide personal transportation survey. *Transportation Research Record*, Vol. 1706, pp. 108-117.
- Ellison, N. B. (1999). Social impacts: New perspectives on telework. *Social Science Computer Review*, 17(3), pp. 39-49.
- Fairweather, N. B. (1999). Surveillance in employment: The case of teleworking. *Journal of Business Ethics*, 22(1), pp. 39-49.
- Feldman, D. & Gainey, T. (1997). Patterns of telecommuting and their consequences: framing the research agenda. *Human Resource Management Review*, Vol. 7 No. 4, pp. 369-88.

- Jiang, Yi. (2008). The impact of telecommuting on the journey to work: A two sample instrumental variables approach. *Two empirical essays in environmental and urban economics*. University of Maryland: ProQuest LLC.
- Joice, W. (1999). *Workshop 1: Getting educated*. International Telework Association & Council. Retrieved from <http://www.telecommute.org/twa/workshop1>.
- Kitamura, R., Nilles, J. M., Conroy, P. & Fleming, D. M. (1990). Telecommuting as a transport planning measure: Initial results of California pilot project. *UC Transportation Center, No.58*, pp. 98-104.
- Kurland, N. & Bailey, D. (1999). When workers are here, there, and everywhere: a discussion of the advantages and challenges of telework. *Organizational Dynamics*, pp. 53–68.
- Kurland, N. & Cooper, C. (2002). Manager control and employee isolation in telecommuting environments. *Journal of High Technolog Management Research, Vol.13*, pp. 107–126.
- Lim, H., Van der Hoorn, A. & Marchau, V. (2003). *The effects of telework on organization and business travel*. Paper submitted for Symposium on Teleworking, 4th Interbalkan Forum International IT conference, Sofia, Bulgaria, 6-7 October 2003.
- Mann, S. (2000). An exploration of the emotional impact of teleworking via computer mediated communication. *Journal of Managerial Psychology, Vol. 15 No. 7*, pp. 668-690.
- Mannering, J. S. & Mokhtarian, P. (1995). Modeling the choice of telecommuting Frequency in California: An exploratory analysis. *Technological Forecasting and Social Change 49*, pp. 49–73.
- Mills, J., Wong-Ellison, C., Werner, W., & Clay, J. (2001). Employer liability for telecommuting employees. *Cornell Hotel and Restaurant Administration Quarterly, Vol. Oct-Nov.*, pp. 48 – 59.
- Mohamed G. Aboelmaged & Abdallah M. Elamin. (2009). Teleworking in United Arab Emirates (UAE): An empirical study of influencing factors, facilitators, and inhibitors. *Int. Journal of Business Science and Applied Management, Volume 4, Issue 1*.
- Mokhtarian, P.L. & Meenakshisundaram, R. (2002). Patterns of telecommuting engagement and frequency. *Prometheus, Vol. 20, No. 1*, pp. 21-37.
- Mokhtarian, P.L. & Salomon, I. (1997). Modeling the desire to telecommute: the importance of attitudinal factors in behavioral models. *Transportation Research Part A 31 (1)*, pp. 35-50.

- Mokhtarian, P. L. & Salomon, I. (1996a). Modeling the choice of telecommuting: the importance of attitudinal factors in behavioral models. *Environment and Planning, Vol. 28*, pp. 1877-1894.
- Mokhtarian, P. L. & Salomon, I. (1996b). Modeling the choice of telecommuting 2: A case of the preferred impossible alternative. *Environment and Planning A. Vol. 28*, pp. 1859-1876.
- Mokhtarian, P. L. & Salomon, I. (1996c). Modeling the choice of telecommuting 3: Identifying the choice set and estimating binary choice models for technology-based alternatives. *Forthcoming Environment and Planning A. Vol. 28*, pp. 1877-1894.
- Peters, P., Tijdens, K. & Wetzels, C. (2004). Employees' opportunities, preferences, and practices in telecommuting adoption. *Information & Management, Vol. 41 No. 4*, pp. 469-82.
- Popuri, Y. & Bhat, C.R. (2003). On modeling choice and frequency of home based telecommuting. *Transportation Research Record, Vol.1858*, pp. 55-60.
- Pulido, J. & Lopez, F. (2005). Teleworking in the information sector in Spain, *International Journal of Information Management, Vol. 25*, pp. 229-239.
- Rognes, J. (2002). *Telecommuting resistance, soft but strong: Development of telecommuting over time, and related rhetoric, in three organizations*. SSE/EFI Working Paper Series in Business Administration, No 2002:1, Stockholm School of Economics, Sweden.
- Sabariah Jemali. (2011). Getting the public transport policy right. *The Edge Financial Daily*. Retrieved from <http://my.news.yahoo.com/getting-public-transport-policy-031502581.html>.
- Safirova, Elena & M. Walls. (2004). *What have we learned from a recent survey of teleworkers? Evaluating the 2002 SCAG Survey*. Discussion Paper 04-43, NW: Resources for the Future, Washington, D.C.
- Sullivan, M.A., H.S. Mahmassani & J-R. Yen. (1993). Choice model of employee participation in telecommuting under a cost-neutral scenario. *Transportation Research Record 1413, TRB, National Research Council, Washington, D.C.*, pp.31-41.
- The Star. (2007). Aiming to be premier Islamic university. Retrieved 2011-04-17.
- Thériault, M., P. Villeneuve, M. Vandersmissen, & F. Des Rosiers. (2005). *Home working, telecommuting and journey to workplaces: are differences among genders and professions varying in space?*. The 45th Congress of the European Regional Science Association, 23-27 August 2005, Vrije Universiteit Amsterdam.

- Tremblay, Diane-Gabrielle. (2003). *Telework: A new mode of gendered segmentation?* Université du Québec: Télé Université.
- Tung, L-L. & Turban, E. (1996). Information technology as an enabler of telecommuting. *International Journal of Information Management*, Vol.16 No. 2, pp. 103-18.
- Walls, M., Safirova, E., and Y. Jiang. (2007). What Drives Telecommuting? Relative Impact of Worker Demographics, Employer Characteristics, and Job Types *Transportation Research Record 2010: TRB, National Research Council, Washington, D.C.*, pp.111-120.
- Wan Rozaini Sheik Osman and Haitham Rashdan. (2005). *Exploring the possibility of implementing telecommuting at University Utara Malaysia (Master's thesis)*. Retrieved from <http://etd.uum.edu.my/1187/>.
- Wells, Kimberly, F. Douma, H. Loimer, L. Olson, & C. Pansing. (2001). Telecommuting implications for travel behavior: case studies from Minnesota. *Transportation Research Record*, Vol. 1752, pp. 148-5.
- Yamane, Taro. (1967). *Statistics, An Introductory Analysis 2nd Ed.* New York: Harper and Row.
- Yap, C. S. & Tng, H. (1990). Factors associated with attitudes towards telecommuting. *Information & Management*, Vol. 19, pp. 227-235.
- Yen, J-R and Mahmassani. (1997). Telecommuting adoption: Conceptual framework and model estimation. *Transportation Research Record* 1606: 95-102.
- Yen, J-R. and H.S. Mahmassani. (1994). *The Telecommuting Adoption Process: Conceptual Framework and Model Development*. Report 60055-1, Center for Transportation Research, The University of Texas at Austin, Austin, Texas.



THE POTENTIAL OF URBAN FOREST PARK FOR SUSTAINABLE CITY

Noralizawati Mohamed¹, Noriah Othman² & Mohd Hisham Ariffin³

^{1,2&3}Faculty of Architecture, Planning and Surveying
UNIVERSITI TEKNOLOGI MARA, SHAH ALAM, MALAYSIA

Abstract

The potential of Urban Forest Park and publics' views are clearly pertinent in urban greening and sustainability, yet they are often ignored by certain countries. In line with this, the Town and Country Planning Department and National Landscape Department had taken steps by developing more urban parks and urban forest parks to enhance the quality and sustainability in urban environment. The study was conducted at FRIM (Forest Research Institution of Malaysia) with 375 respondents participated in this study. It is found that the respondents' evaluation on environmental, social and physical contribution at study area is associated with great and intense values for city sustainability. Public opinion and reason to come to the study area should be taken into account by professionals since they are the users and responsible to ensure the sustainability of urban forest for future generation. Even though the overall percentage of survey showed that public gave good expectation, however, the small percentage could be an eye opener as they assumed the existing setting will face big challenge to sustain in the future.

Keywords: urban forest; urban park; city sustainability; environmental evaluation

INTRODUCTION

Malaysia is turning into a sophisticated country and has experienced rapid urbanization process throughout the year. The increasing number of population in urban areas requires the people to have more pleasant and liveable

¹ Lecturer and landscape architect at the Centre of Studies Landscape Architecture.
Email: leezmohd@yahoo.com

² Senior lecturer, horticulturist and certified arborist at the Centre of Studies Landscape Architecture. Email: noriaho@yahoo.com

³ Associate Professor at the Centre of Construction Management and fellow of the Institution of Surveyor Malaysia. Email: hisyamariffin@yahoo.com.my

environment (Noralizawati, 2009). In 2011, the world's population crossed over the 7 billion mark, and the United Nations Population Division projects this figure could reach 9.3 billion by 2050 and more than 10 billion by the end of the century (United Nation Conference on Sustainable Development, 2012).

As for Malaysia, it is predicted that by year 2020, 73% of the population will be urbanites (Nor A'aini and Kamarul'ain, 2007). In line with this, the National Town and Country Planning Department and Landscape Department had taken steps by developing more urban parks and urban forest parks to enhance the quality and sustainability in urban environment. Generally, urban forest parks can be found in gazetted forest areas of urban areas. As mentioned by Noor Azlin and Sabri (1997), these parks are designated areas for conservation of local flora and fauna as well as areas where environmental education and recreation can be conducted. They are also a great assets for the cities and urbanities (Sreetheran, 2007), created to preserve existing vegetation (Noralizawati, 2009), enhance natural environment (Noralizawati, 2011), for people to gain a positive psychology (Kaplan, 1973) and increase aesthetic values in city centre (Noriah, 2004).

Although achieving sustainable cities are crucial in the urbanization world (Yin and Siong, 2011), analysis of the landscape and natural environment literatures showed that these objective can be achieved through systematic planning on natural resource and urban forest parks have been given much attention for this (Chiesura, 2004; Noralizawati, 2011; Oku and Fukamachi, 2005 and Ozguner and Kendle, 2007). The overview of landscape design research by previous researchers agreed that the urban forest park should naturally design and represent great diversity for biotic and abiotic components around the forest (Noralizawati, 2011 and Ozguner and Kendle, 2007). The National Landscape Policies under the Housing and Local Government Ministry of Malaysia interprets these natural resources as national heritage areas which must be conserved and manage sustainably as an investment to benefit the nation. At a higher level, sustainable city approaches that is summarized by the committee of United Nation Conference on Sustainable Development as an important evidence-based for world recognition. Table 1 provides an indicative list of focus areas for priority attention.

Table 1: Focus areas for priority attention at Rio +20 as articulated by member states and major groups

Focus areas for priority attention	
1.	Green jobs, youth employment and social inclusion
2.	Energy access, efficiency, sustainability
3.	Food security, sustainable agriculture
4.	Water
5.	Sustainable city
6.	Management of the oceans, fisheries and other marine resources
7.	Improve resilience and disaster preparedness

Source: United Nation Conference on Sustainable Development, 2012

THE SUSTAINABLE CITY

The Bruntland Report 1987 defines sustainable development as a ‘development which meets the needs of present generation without compromising the ability of future generation to meet their own needs’. Through studies in Hong Kong, Netherland, United Kingdom and Japan, the ability of urban parks as provider of social services and their importance for city sustainability has been addressed (Chiesura, 2004, Lo and Jim, 2010; Oku and Fukamachi, 2005 and Ozguner and Kendle, 2007). The potential of Urban Forest Park and publics’ views are clearly pertinent in urban greening and sustainability, yet they are often ignored by certain countries. In a nutshell, the strategies for certain cities are mainly focus on man-made elements and built components. As mentioned by Yin and Siong (2010), the future of our cities lies in the action we make today. Thus, this aim should be clearly identified and understood by many urban residents in relationship with their surrounding landscapes.

It is known that urban forest parks carry lots of functions in urban environment. Besides important in environmental services such as stabilize the microclimate and air purification, the urban forest parks which were developed in the perimeters of forest reserve in the urban area offered many recreational activities, facilities and were beneficial for education purposes (Noralizawati, 2009). Oku and Fukamachi (2006) addressed that the presence of landscape setting and public choice of activities in forest parks contributes to the quality of life and sustain the communities in many ways. As an example, the Forest Recreational Park at FRIM (Forest Research Institution of Malaysia) has been developed the forest research area into a successful botanical garden, natural trail and recreational spot. This park has received high number of local and international visitors due to its natural setting, recreational facilities and ecological function towards environment. The Bukit Nanas Forest Reserve in Kuala Lumpur and Urban Forest Park in Kota Damansara and Johore Bahru

also becoming the green iconic for urban people too. These parks enrich their quality of life, reduce stress and encourage social integration among visitors.

THE URBAN FOREST PARK

According to Noor Azlin and Ahmad Nazaruddin (2003), the green areas within and near town municipality areas are termed as urban forest. Grey and Deneke (1986) defined urban forest to include all greenbelts, municipal watershed, recreation sites and roadsides. In Malaysia, over than 60% of its total land area is forested and the biodiversity is immense including the urban forest park. The urban forest is a concept that encompasses the natural landscape and series of vegetation of a city. It attempts to provide a different understanding regarding its naturalistic landscape pattern, low maintenance and self-sustaining green area as compared to modern and formal garden.

In 1986, Justice urged Kuala Lumpur to adopt the urban forest landscape concept since it still has lots of reserve forest in the middle of the city. He believed that this concept could be as foundation for better opportunity in greening and sustaining the Kuala Lumpur in future. And today, the Malaysian local planners have also set a plan to gazette more green spaces in master plan development and investigate the value of this Mother Nature which in turn is a key component for sustainable development. The degree for master plan that is ideal and equilibrium for green urban structure may also vary by the size of existing and proposed green space, population density, landscape quality and healthy life style of urban residents. The study was conducted at FRIM (Forest Research Institution of Malaysia). FRIM is located in the middle of Kepong City and surrounded by the Bukit Lagong Forest Reserve. The forest park represents naturalistic landscape pattern and it is maintained through the preservation of existing vegetation and well controlled by human influenced (Noralizawati, 2009). Here visitors will be rewarded with a breath-taking view of the surrounding forest. The sound of birds singing and the occasional shrill of insects tantalize the mind and makes one forget the hustle and bustle of Kepong City activities that surrounds the park.

METHODOLOGY

The data collections have been collected through a survey conducted among visitors at Forest Recreational Park at FRIM. The study used structured designed questionnaires to collect data from the visitors of the study area. Field study observations and a pilot test were done to obtain information on the improvement of the questionnaire. A face-to-face administration of the survey was done and visitors approached in the park were first informed about survey's objectives. Only willing visitors to participate will be taken as respondents for the study. The objectives will be limited to the following issues: (Section A) Demographic background question, (Section B) Reason for visiting the study area- instrumental, social or dispositional reasons, (Section C) Survey on environmental, social and physical contributions of the study area (Section D) Expectation towards urban forest park in meeting their current and future needs.

The survey was conducted on October until December 2011. The statistic of visitors as reported by Human Resource Division of FRIM is 200,000 every year and the monthly average is 16,666 visitors. For this research, there were 375 respondents participated in this study. These numbers projected based on a statistical table by Krejcie and Morgan (1970) cited from Sekaran (2003). They suggested that, if the population (N) is 16,666, the sample size (n) should be 375. The questionnaires have been distributed on both weekdays and weekends during the day and subjected to visitors that agreed to cooperate and spend their time for the survey. The results and findings from the survey provided rooms for urban planners, landscape architects, forest conservator, environmentalist and anybody who are interested to explore the potential of Urban Forest Park in sustaining the city.

RESULTS AND DISCUSSION

The value for the the Cronbach's alpha coefficients for the survey questionnaire is 0.70. According to Pallant (2005), the results between 0.70 – 0.80 shows an acceptable reliability of questionnaires development.

a) Demographic Background

From the demographic background data analysis, 53.3% of respondents were male and 46.7% were female. Malay ethnic represents 38.7% followed by 27.5% for Chinese, 30.9% for Indians. The international visitors that took part in this survey were determined as 0.5% from Sweden, 1.3 % from China and

1.1% from Japan. The average respondents were from 18 to 50 years old. Among all age groups, the highest percentage 40.2% which represents age from 18 to 30 and the lowest is 12.3% represents from 51 years old and above.

The average level of education of respondents is with degree which is 34.0%, and only 14.8% were graduated with Masters and 9.3% with PhD. Workers from private sectors represents 31.5% were the largest group in the distribution of respondents, followed by 30.1% for students, 23.7% for government servant and 14.7% for retired.

b) Respondents' Reason of Visiting

The result in Table 2, 3 and 4 shows the reason of visiting by the respondents. Under Table 2, 45.6% of them gave a 'very strong reason' and 33.3% gave a 'strong reason' answer for Instrumental Reason which is to get result that give benefit to their work and study. For the Social Reason in Table 3, it is reported high rating where 44.3% from the total respondents gave a 'very strong reason' and 39.7% gave a 'strong reason' to accompany or socialize with family and their friends. The Dispositional Reason in Table 4 includes the reason that they really interested with the place and like the recreational activities and 62.4% answered a 'very strong reason' and 26.9% for a 'strong reason'. The overview of the analysis concludes that majority of respondents rated a 'very strong reason' answer for all reason. The result of this study identified a high number respondents showed their interest towards the study area. These findings are also consistent with those of previous documenting people's preference and purpose when visiting forest landscape (Park, 2011; Matsuoka and Kaplan, 2007; Tsunetsugu et al., 2010). The previous research finding (Noralizawati, 2009; Noralizawati, 2011; Ozguner and Kendle, 2006; Todorova et. al, 2004) identified some differences between visitor's reason for visiting and their perception about the forest setting. These findings were taken into account and a set of qualitative analysis was done to measure their perception and several answers on benefits and potentials of study area were identified.

Table 2: Instrumental Reason (to get a result that give benefit to work/study)

Answer	Frequency	Percentage
Very weak reason	11	2.9
Weak reason	57	15.3
Strong reason	125	33.3
Very strong reason	171	45.6
Not a reason	11	2.9
Total	375	100.0

Table 3: Social Reason (to accompany or socialize with family/friend)

Answer	Frequency	Percentage
Very weak reason	19	5.1
Weak reason	30	8.0
Strong reason	149	39.7
Very strong reason	166	44.3
Not a reason	11	2.9
Total	375	100.0

Table 4: Dispositional Reason (really interested with the place and like the recreational activities)

Answer	Frequency	Percentage
Very weak reason	0	0
Weak reason	40	10.7
Strong reason	101	26.9
Very strong reason	234	62.4
Not a reason	0	0
Total	375	100.0

Figure 1 shows the percentage of most mentioned keywords from the survey. Under Instrumental Reason, the feeling of ‘Escape from busy city’ accounts for almost 79.4% of the data obtained. It has been agreed by Chiesura (2004) that a park experience may escape people from hectic and busy city as well as provide a sense of peacefulness and relax our mind. ‘Love the nature scenery’ accounts 64.0% from total respondents. This finding is associated with previous research done by Noralizawati (2009) where the strongly preferred sceneries such as water, dense and matured tree scene were highly rated and according to Hull and Stewart (1995) and Yang and Brown (1992), as in naturalistic landscape, these natural elements are always stated as a positive focal point for visitors. 42.7% told that they also came to the study area to ‘Relax their mind’. This is supported by Schroeder (1986) that natural environments with vegetation and water induce relaxed and less stressful compared with urban scenes with no vegetation. The ‘Research and education benefits’ answer represents 31.2% and majority of the answers were given by school and university students as well as researcher from government and private companies. It is associated with the status of FRIM which is known as the best place to gain and practice knowledge.

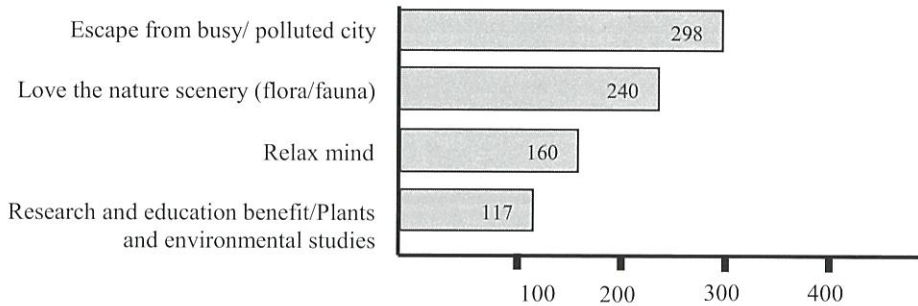


Figure 1: Keywords for Instrumental Reason (to get a result that give benefit to work and study)

A strong relationship has been identified in Figure 2 where the Social Reason somehow plays an important role for the respondents. The reason for ‘Family/friends gathering’ indicates 52.3% and ‘School/university academic trip’ reason indicates 51.2%. Those results portrays that the ability of urban forest parks to function as social network. As stated by Coley et al., (1997) nature encourages the use of outdoor spaces, increase social integration and interaction. The reason for ‘To get privacy’ accounts 41.1% in this study. This finding supported research done by Hammit (2002) that parks can also be a place for people to find degrees of privacy. Noralizawati (2009) found in her previous study that the feeling of privacy also associated with viewing nature and restoring mental and spiritual activities. 13.3% of the respondents answer to ‘Make new friend/Share ideas’. As explained by Conway (1991) the interaction among the park visitors can prevent social tensions thus improving the physical and moral conditions of urban citizens.

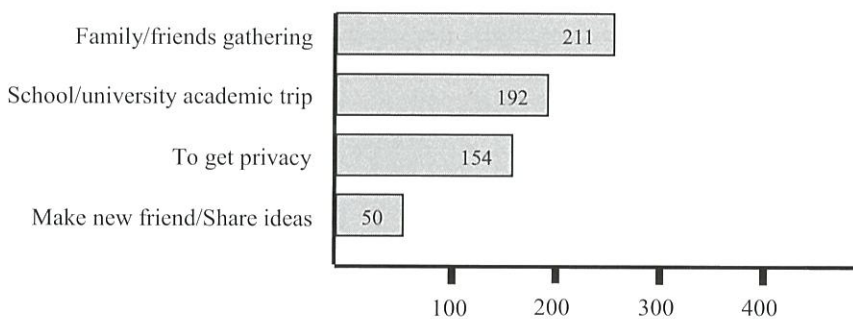


Figure 2: Keywords for Social Reason (to accompany or socialize with family and friend)

Figure 3 shows the Dispositional category results and it is identified that the ‘Like the natural forest setting’ is the most liked reason gave by the respondents and indicates 80.5% from the survey. Study conducted by Park (2011) identified the natural setting is the most preferable for urban residents and Chiesura (2004) stated that the presence of natural assets (i.e. urban parks and forest) and components (i.e. tree, water) in urban contexts contributes to the quality of life and visual. The reason for ‘Exercise/recreation/meditation’ represents 53.3%. Through an observation, some respondents reported that they had a passion for physical activities and it shows that the tendency of visiting the study area is getting higher when it is associated with activities and proper facilities. As highlighted by Noralizawati (2010) and Oku and Fukamachi (2006) the increasing demands for forested areas is for the one that provide good recreational facilities. 57.1% represents for ‘Green and well preserved’ reason and 53.3% for ‘Fresh air/unpolluted water’. It has been identified that the relationship of people and preference towards study area spans a wide range of environmental benefits.

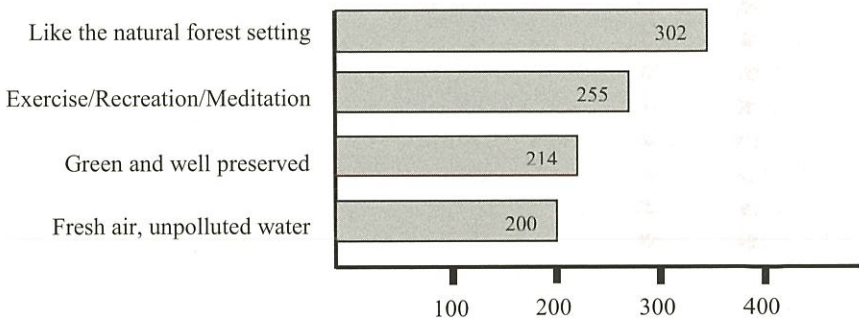


Figure 3: Keywords for Dispositional Reason (really interested with the place)

c) Survey on Environmental, Social and Physical Contributions

It is found that the respondents’ evaluation on environmental contribution at study area is associated with great and intense environmental values. 33.5% of respondents mentioned that the forest setting could balance the urban ecosystem, 29.0% of respondents agreed the forest setting could filter air pollution around the city, while 26.6% of respondents believed it is rich with biodiversity and 10.9% said they like the forest setting and green landscape. This is clearly showed that the biodiversity and forest ecosystem that listed under this component will play a vital role in facilitating sustainable city. Furthermore, according to research article by FRIM Research Unit, an analysis on carbon footprint on June 2012 identified the level of Carbon dioxide

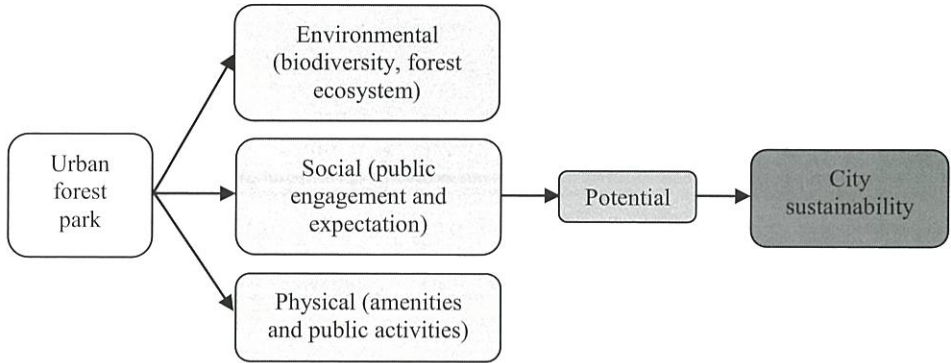
emission of FRIM Research and Design activities was 50 times less than the amount of Carbon dioxide sequestered by the dipterocap trees in FRIM. From this environmental finding, it is clearly shows that the FRIM Forest Recreational Park has a high potential as a tool in developing a sustainable city. Survey on social contribution reported a growing body of evidence indicating that exposure and social activities at urban forest park have beneficial effects on respondents. 42.4% of respondents agreed that the study area provides space for public engagement either formal or informal way. 25.1% of respondents mentioned certain spaces as appropriate for recreation and safe for children, disable person and senior citizens. 17.8% stated it serves as a resource for relief and escape from troubles and tensions and aid in our daily lives. 9.1% said the study area is the best place to be away from crowded city, 5.6% mentioned the place offers them to think through personal matters and share confidence and intimacies with family and friends. From the findings, it is confirmed that respondents' interpretation are valuable and should be taken into account by professionals since they are the users and responsible to ensure the sustainability of urban forest for future generation. Research finding on the physical aspects should be considered as an important contribution just like environment and social. 48% of respondents mentioned they like the landscape character such as landforms, vegetation and water forms and 31.2% stated a well arrangement of facilities for recreational purposes. 13.4% of respondents suggested the management to preserve and protect the flora and fauna, 7.4% suggested the management to upgrade the research facilities and educate public on the function of study area. According to them also, the public choice of activities is very much depending on the safety, functionality and information that provides for them. Therefore, proper design guidelines must be introduced to ensure the suitability and maximize the usage of facilities in the urban forest setting.

d) *Expectation in Meeting Respondents' Current and Future Needs*

The final section is the result on respondent's expectation. Regarding the study area in meeting their current and future needs, it is reported that 66% of them indicated high expectation regarding the capability in protecting natural resource, improve the environment quality and sustaining future needs. As mentioned by Chiesura (2004), the nature fulfills important in-material human needs as well. Only 22% gave low expectation and predict the potential of existing place would shrink since it is located in a middle of the city that exposed to lots of urbanization impact and 8% showed mixed feeling towards the question.

CONCLUSION

According to previous findings above, the researcher illustrates the relationship between urban forest park and city sustainability as shown in Figure 4. Those components play an important role to support the sustainability and healthy urban forest; it must be preserved and avoided from any distraction. This is supported by the World's Civil Society Organizations and as listed by them, the sustainable development goals should make an agreement on healthy forest, green cities and also public participation programme (United Nation Conference on Sustainable Development, 2012). Public expectation and their reasons to come to the study area should be taken into account. Even though the overall percentage of survey showed that public gave good expectation, however, the small percentage could be an eye opener as they assumed the existing setting will face big challenge to sustain in the future. It is hoped that the identified potentials in Urban Forest Park and positive public involvement can serve as reference criteria for local planners, landscape architects, park managers and other related professionals to envision more sustainable city strategies in the future.



Source: Researchers, 2012

Figure 4: Relationship between Urban Forest Park and City Sustainability

REFERENCES

- Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, 64, 129-138.
- Coley, R., Kuo, F., & Sullivan, W. (1997). Where does community grow? The social context created by nature in urban public housing. *Environment and Behavior*, 29, 468-494.
- Conway, H. (1991). *People's parks: The design and development of Victorian Parks in Britain*. Cambridge University Press.
- Grey, G.W and Deneke, F.J.(1989). *Urban forestry*. Second edition. John Wiley and Sons. New York, U.S.A.
- Hammitt, W. E. (2002). Urban Forests and parks as privacy refuges. *Journal of Arboriculture*, 28, 19-26.
- Hisham, M.A.(2008). Motives for participation into Continuing Professional Development Activities by Malaysian Licensed/ Registered Professionals in the Construction and Real Estate Industries. Unpublished research, Universiti Teknologi MARA.
- Hull, R. B., & Stewart, W. P. (1995). The landscape encountered and experience while hiking. *Environment and Behavior*, 27, 404-426.
- <http://www.frim.gov.my>
- <http://www.uncsd2012.org>
- Justice, C.L. (1986). The concept of the urban forest as applied to Kuala Lumpur. *Journal of Arboriculture*, 12, 178-181.
- Kaplan, R. (1973). Some psychological benefits of gardening. *Environmental Behavior*, 5, 145-152.
- Lo, A.Y.H., and Jim, C.Y (2010). Differential community effects on perception and use of urban greenspaces. *Landuse policy*, 6, 430-442
- Matsuoka, R. H., and Kaplan, R. (2008). People needs in the urban landscape: Analysis of landscape and urban planning contributions. *Landscape and Urban Planning*, 84, 7-19.
- Noor Azlin, Y., and Sabri, N. (1997). Forest recreation environment: Visitors preferences and perceptions. *FRIM*, 1, 1-12.
- Noor Azlin, Y and Ahmad Nazaruddin, M.R. (2003). Benefits of urban forest: *FRIM Papers: Habitat Malaysia*, 7, 80-87.
- Noriah, O. (2004). A cross cultural comparison on preferences towards selected urban landscape planting compositions. Unpublished doctoral dissertation, Universiti Teknologi MARA.
- Nor' A aini, O., and Kamarul Ain, K. (2007, November). Keeping the green in urban area: An approach towards sustainable development. *Proceeding of the Seminar Kebangsaan Rupabandar Malaysia*, 28 - 29 November 2007, Lumut, Perak.

- Noralizawati, M. (2009). Public Preferences Towards Naturalistic and Designed Landscape Pattern. Unpublished doctoral dissertation, Universiti Teknologi MARA.
- Noralizawati, M. (2011). Assessing the Visual Quality of Penang Botanical Garden. Unpublished research report, Universiti Teknologi MARA.
- Oku, H., and Fukamachi, K. (2006). The differences in scenic perception of forest visitors through their attributes and recreational activity. *Landscape and Urban Planning*, 75, 34- 42.
- Ozguner, H., and Kendle, A. D. (2007). Attitudes of landscape professionals towards naturalistic versus formal urban landscapes in the UK. *Landscape and Urban Planning*, 81, 34-45.
- Pallant, J. (2005). *SPSS survival manual: A step by step guide to data analysis using SPSS*. Allen and Unwin.
- Park, B.J. (2011). Relationship between psychological responses and physical environments in forest settings. *Landscape and Urban Planning*, 101, 117-145.
- Schroeder, H. W. (1986). Estimating park tree densities to maximize landscape aesthetics. *Journal of Environmental Management*, 23, 325- 333.
- Sekaran, U. (2003). *Research methods for business: A skill building approach*. John Wiley and Sons, Inc.
- Sreetheran, M., and Kamariah, D. (2007). Performance indicators to evaluate urban parks from the safety and security perspective. *Proceeding of the Seminar Kebangsaan Rupabandar Malaysia*. 28- 29 November 2007, Lumut, Perak.
- Todorova, A., Asakawa, S., & Aikoh, T. (2004). Preferences for and attitudes towards street flowers and trees in Sapporo, Japan. *Landscape and Urban Planning*, 69, 403- 416.
- Tsunetsugu, B. (2010). Shirinyoku: Taking in the Forest Atmosphere and Forest Bathing in Japan. *Environmental Health and Preventive Medicine*, 151, 27-37.
- Yang, B. E., & Brown, T. J. (1992). A cross- cultural comparison of preferences for landscape styles and landscape elements. *Journal of Environmental Behavior*, 24(4), 471- 507.
- Yin, N.S and Siong, H.C. (2010). The relationship between urban population density and transportation fuel consumption in Malaysian cities. *Journal of Planning Malaysia*, 8, 45-66.



THE EFFECTIVENESS OF PROVISION OF NEW STATIC INFORMATION SIGNAGE: A CASE STUDY OF INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA, GOMBAK CAMPUS

Syazwani Sahrir¹, Syahriah Bachok² & Mariana Mohd. Osman³

1, 2 & 3 Kulliyah of Architecture and Environmental Design
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Abstract

The provision of road and highway traffic signage on public roads has been regulated in Malaysia, by the Department of Works and Departments of Road Transport Acts, Rules and Regulations 1987. Many studies have focused on the responses and impacts of these types of signage. However, for many private roads which are not regulated under these Acts, Rules and Regulations, several non-conventional types of signage have been provided. There is lack of study, however, on the impacts of and drivers' responses towards these signages. This study, hence, explores the types, contents and locations of these signage. Additionally, the impacts of and responses towards these signages are evaluated in a controlled campus environment. Using the International Islamic University Malaysia's young student drivers as the unique purposive samples, statistical tests including correlation and chi-square analyses have been conducted. It is preliminary reported that gender and observation frequency, to a certain extent, influenced drivers' responses towards the information conveyed by the signages.

Keywords: signage, drivers, information, static, non-conventional.

INTRODUCTION

Researchers have recognized the importance of traffic signs as one of the many traffic control devices on the roadway (Slinn, Matthews and Guest, 2005; Castro and Horberry, 2004; Bell, Bonsall, and O'Falherty, 1997). Traffic

¹ Postgraduate Student (Master of Science Built Environment). Email: syazwani.sahrir@gmail.com

² Assistant Professor at Department of Urban & Regional Planning. Email: syahriah@iium.edu.my

³ Assistant Professor at Department of Urban & Regional Planning. Email: mariana@iium.edu.my

control devices subscribed to the detailed requirements or conditions affecting road use at specific places and times in order that proper actions may be taken so as to avoid accidents or delays (Cunard, 1999). Control devices are necessary for strangers to the locale or for the first time users. The underlying principles of traffic control devices are: 1) design factors, 2) position or placement, 3) maintenance of condition and visibility, and 4) uniformity of application and use (Cunard, 1999).

Traffic signs are signs erected at the side of roads to provide guidance to the road users. Traffic sign can be divided into four which are: 1) warning signs, 2) regulatory signs, 3) informatory signs and 4) direction signs (Slinn, Matthews and Guest, 2005). Traffic signs help creates a safer environment for road users by visually communicating information relating to regulations, warnings, directional and locational guidance to drivers and pedestrians. The information must be unambiguous and conveyed in a manner that is suited to the type of road condition and traffic characteristics. Traffic signs play an increasingly important role in daily traffic. Traffic Signs (Size, Colour and Type) Rules 1959 by Department of Works Malaysia prescribe the types, meaning, dimension, colour, placement and height of signs under Part I through to Part VI. Additionally, many studies have concentrated on the responses and impacts of these types of signage (Abdur Razzak and Tanweer Hasan, 2010; Baas, 2000; Ng and Chan, 2008). However, in many other private roads which are not regulated under these Acts, Rules and Regulations, several non-conventional types of signages have been provided. There however a lack of study is on the impacts and drivers' responses towards these signages.

Accordingly, this research is to assess the effectiveness of information signs provision in International Islamic University Malaysia (IIUM), Gombak campus. The findings from this study are very useful in the enhancement on the understanding of traffic regulations among of several important groups; ranging from the urban planning studies, road users and the IIUM community. Nevertheless, this research only focuses on the new informatory signs in IIUM Gombak campus. The current informatory signs do not subscribe to the informative signs provision under Part IV of the Rules (1995). Therefore, it will be a useful reference for the campus management in providing better traffic signs system in the future. The traffic sign has to be considered carefully when 'designing the street'. It is essential that the campus design translates the university's education philosophy. Thus, the physical forms and configurations shall be conducive for the aims and objectives of the university.

Each campus and each individual faculty has its own unique architectural signature aimed at creating distinctive effect within the overall parts of the campus design. The principle adopted in IIUM is one of a unified campus architecture rather than single-building exhibitionism. The campus is a place of respite where one feels comfortable and relaxed, a place where the landscape of knowledge and the landscape of buildings and grounds synergistically meet. The campus design promotes optimum social dynamics among staffs and students (IIUM Master Plan, 1995). Some important principles of campus planning are the arrangement of faculties, central amenities, and physical environments. Additionally, one of the important safety elements of physical environment of a campus is the provision of effective static information signage. Studying the road user perceptions on the traffic sign provided an insight to behavioural responses to this provision. It can also promote convenience and safety. Future planning for traffic sign in the university needs also to consider better design of the street furniture.

STATIC INFORMATION SIGN

Informatory signs are erected on the road to provide information on direction, destination and roadside, facilities to the road user which may be of assistance to them in making their journey. These cover a wide range of sign messages, from one way signs to junction countdown signs. These sign tend to be rectangular blue signs with a white edge (Slinn, Matthews and Guest, 2005).

Based on Malaysia Guidelines, these signs are rectangular in shape, and the colours are generally either white letters or symbol and border on blue background (Manual of Traffic Control Devices JKR, 2006). In a general way, informatory signs give road users the information that will help them along their way to town, villages or other important destinations in the most simple, direct manner possible to them as well as to inform them of interesting routes.

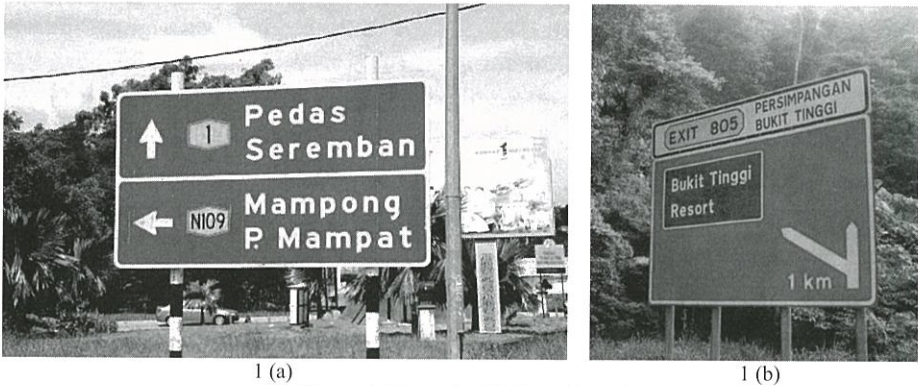


Figure 1: Example of informatory sign

Information sign in International Islamic University Malaysia (IIUM)

Information signs in IIUM are provided in English most of the time, and on occasion bilingually. Staff, students, visitors and business community using the campus' traffic signs are of mixed ethnicity and nationality, representing an international perspective of traffic signs effectiveness. For this reason of distinctiveness, the IIUM Gombak campus has been chosen as a case study. The colours of the informatory traffic signs are the corporate colour for IIUM. The height of the informatory traffic signs in IIUM is 2,750mm. The width for the sign was 1,370mm (CBE, IIUM, 2011). The size of the traffic sign can be considered as appropriate to be seen by the road users.

3.1 Corporate Color IIUM

As for the IIUM logo, the color is PANTONE 1245 C, and to be reproduce using special color print process unless stated otherwise.

PANTONE 1245 C	
C: 0	R: 213
M: 28	G: 159
Y: 100	B: 15
K: 18	

HTML: D59F0F

3.2 Corporate Color IIUM

The turquoise is the corporate color of IIUM. It is the combination of blue and green. The turquoise color chosen is PANTONE 327 C.

PANTONE 327 C	
C: 100	R: 0
M: 0	G: 147
Y: 44	B: 143
K: 17	

HTML: FFC425

CORPORATE COLOUR IIUM

AS FOR THE IIUM LOGO, THE COLOUR IS **PANTONE 1245 C**, AND TO BE REPRODUCE USING SPECIAL COLOUR PRINT PROCESS UNLESS STATED OTHERWISE.

CORPORATE COLOUR IIUM

THE TURQUOISE IS THE CORPORATE COLOUR OF IIUM. IT IS THE COMBINATION OF BLUE AND GREEN. THE TURQUOISE COLOR CHOSEN IS PANTONE 327 C.

Source: Centre for Built Environment, IIUM (2011)

Figure 2: Colour of information sign in IIUM

Tunnard and Pushkarev (1963) argued that human can easily predict objects with higher contrast. The colours of the informatory traffic signs are the corporate colour for IIUM. Colours that are used for traffic signs are the combination of turquoise and grey. The turquoise colour chosen was Pantone 327 C (Figure 2). By means of using the same colour code, the road users can easily identify and recognize the exact informatory traffic signs and the message delivered seemed to be very clear. The large signs should have light colour markings on a dark background of blue, green or yellow (Hobbs and Richardson, 1967). Small signs should have dark coloured markings on a light background either white or yellow (Hobbs and Richardson, 1967). Grey colour is used in background; hence the wording must use the dark colour such as black, to provide a contrasting effect in order to create attraction. However, the wording use turquoise colour. To increase detectability, the suitable colour of the wording could be black in order to contrast the colour of light grey.

In general, attentions are directed to simple, regular shapes because they can easily draw driver's attention. For instance, most road users were familiar with the standard shape and color of the traffic signs. If there are changes in the design and shape of traffic sign, the road users would be confused and these may lead to an accident. The shape for informatory traffic signs in IIUM was rectangular. The design should not be complex where the drivers can get confused (Figure 3).



The shape of the informatory signs is complex than the standard rectangular shape



Source: Field Survey in IIUM Gombak Campus, 2011

Figure 3: Example of informatory sign in IIUM

EFFECTIVENESS OF TRAFFIC SIGN

Matson, Smith, and Hurd (1955) identified that, the effectiveness of any sign depends upon its attention, meaning, response time, size, shape, contrast and illumination. Meanwhile, in order for traffic signs to be effective, signs must attract visual attention, sign lettering and legibility, maintenance, siting of signs, night visibility requirements and standards of traffic sign (Hobbs, 1979).

Visual attention

Visual attention is the characteristics of a sign that would make it be noticeable from its background as well as surrounding objects (Matson, Smith and Hurd, 1955).

- i. Size: Hobbs (1974) asserted that the larger the traffic sign, within the driver's visual cone, the greater its impact on driver's attention. However, there still a limit to size due to practical considerations of siting and lighting as well as aesthetic reasons. Hobbs highlighted that a minimum sign is about 0.3m² of white board area required for each 30m of viewing distance.
- ii. Contrast: The human can easily predict on the object with higher contrast (Tunnard and Pushkarev, 1963). Hobbs and Richardson (1967) identified that colour and contrast are the two basic requirements for the sign to stand out from the background and the message displayed stand out from the sign board. The large signs should have light colour markings (white) on a dark background of blue, green or yellow. Basically, two basic colours are used for the ground colour of traffic sign, yellow for all warning signs and white for all other standard signs (Hobbs and Richardson, 1979).
- iii. Shape: Irregular cut-out shape must be avoided as the basic shape for the traffic signs (Hobbs, 1974). The shapes are (1) the octagon for the stop regulations, (2) the square for warning, (3) the rectangle with major axis on the vertical to convey a regulatory message, (4) the rectangle with major axis on the horizontal to inform or guide road users and (5) a variety of forms for marking other routes (Matson, Smith and Hurd, 1955). Familiarity with legend, brevity and clarity of the message give traffic signs a sense of readability which affects the speed with which meaning is comprehended (Matson, Smith and Hurd, 1955).

Sign lettering and legibility

The sign and style of lettering and their spacing influences legibility. Matson, Smith and Hurd (1967) agreed that word messages including numbers and letters should be listed as simple as possible; not more than three or four familiar and practicable words should be conveyed at one glance. There are two basic forms of lettering that are used comprehensively. They are upper-case and lower-case. The upper-case (capital letters) is used as starting letters to the lower-case words. Meanwhile, the lower-case was used to complete the message. Basically, the height of the letter ascenders or descenders equals to the upper-case letters (Hobbs and Richardson, 1979). Indeed, analysis mentioned on the legibility depends upon size of letter, stroke width, letter and word spacing, and size of margins (Slinn, Matthews and Guest, 2005).

Response time

There exist three factors that may affect the adequate time for response which are the speed of the road users and his vehicle approach, the legibility distance of the sign and its message, and the longitudinal site of the sign (Matson, Smith and Hurd, 1955). Time is required by the road users for changing lanes, changing speed as well as to stop the vehicles. The simpler message may only need 1 sec to understand but the multiple choice of the message may require 3 to 4 sec to be understand (Khan, 2008). This shows that the human had limitation to memorize information and visualization. For example, a car was moving on a road with 110 km/hr which equals to 30.5 m/sec. Traffic sign was about 50m from the car and this minimum distance is required for the driver to get the clear image of a traffic sign. The time can be calculated by using the average velocity algorithm which is given as:-

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{50}{30.5} = 1.6 \text{ sec}$$

Source: Khan, M. T. (2008). *Real-Time Recognition System for Traffic Signs*, pg.12 (pp.12)

Therefore, factors such as speed of vehicles, time reaction, and drivers' visualisation give direct implications towards the size, location and design of the traffic signs (Khan, 2008).

Maintenance

Maintenance is a straightforward undertaking that requires no formal training or special skills. The cleaning and repainting of signs is of the utmost importance in order to stimulate the concentration of the driver and satisfactory of the functions (Hobbs, 1979).

Siting of signs

Other measure of effectiveness is the siting of traffic signs. The correct siting of the traffic sign from the hazard is also vital in relation to vehicle speeds. Locating a sign too close to a hazard is unlikely to give drivers sufficient warning and message (Hobbs, 1979).

Illumination

The application of lighting or illumination is the deliberation of light to achieve some aesthetic or practical effect. Lighting includes use of both artificial light sources such as lamps and natural illumination of interiors from daylight (Matson, Smith and Hurd, 1955). Practically all traffic signs use retro reflective sheeting. Retro reflective sheeting is designed to return light from the headlamps with just sufficient spread of beam to include the driver's eyes (Matson, Smith and Hurd, 1955).

GUIDELINES IMPLEMENTATION FOR TRAFFIC SIGNS

The authority of Department of Public Works (JKR) (2006), Malaysia has come out with crelevant guidelines that need to be observed in providing the traffic signs. The purpose of these guidelines is to establish uniformity in design and application of all traffic signs and control devices in Malaysia for the benefit of road users, road and traffic authorities, and manufacturers of traffic signs. The standardisation is very important in order for the road users to experience and be familiar with the traffic signs. The uniformity in design encompasses the shape, word messages, symbols, size, colour, illumination or reflectorization (Manual of Traffic Control Devices JKR, 2006).

Guidelines for Informatory signs

The informatory signs are provided for the convenience of road users as well as for improving the efficiency and safety for roadway. There are four classifications of informatory signs which are (1) destination signs, (2) distance Signs, (3) information signs and (4) route markers (Manual of Traffic Control Devices JKR, 2006). This study will be focusing more on the informatory sign.

i. **Colours and Shapes of Guide Signs**

Basically, the informatory signs are rectangular in shape and the colour generally either white letters or symbol and border on blue background. However, for local streets, the letterings and arrows should be yellow in colour.

ii. **Size of Guide Signs**

The size of informatory signs must be legible to road users and follow the standard size. However, for other guide signs, the legend is so varied that the size must be fixed in terms of the length of word messages and the size of lettering and spacing necessary for proper legibility are ensured.

iii. **Lettering On Guide Signs**

The lettering for the informatory sign should be clear, open capital letters of the type approved. The names of places and rivers should be in lower-case lettering with initial capitals.

CASE STUDY OF STATIC INFORMATION SYSTEM

Several criteria like conspicuity, legibility, distinctiveness, and comprehension must be met for a sign to be effective. There are five cognitive features are of central concern in sign research (Ng and Chan, 2008). They are familiarity, concreteness, complexity, meaningfulness, and semantic distance. Ng and Chan (2008) employed a 0 to 100 points scale for rating cognitive features. Familiarity is defined in terms of the frequency with which icons had been encountered. For a group of novice subjects, significant and positive relationships were found amongst the cognitive features of familiarity, concreteness, meaningfulness and semantic closeness (Ng and Chan, 2008).

Furthermore, the study by Schnell (2010) investigated the effect of luminance and letter size on the information acquisition time and transfer

accuracy from simulated traffic signs. Luminance on the sign legend was administered at five levels; 3.2 cd/m², 10 cd/m², 20 cd/m², 40 cd/m² and 80 cd/m², on positive-contrast textual traffic sign stimuli with contrast ratios of 6:1 and 10:1. The simulated signs were positioned at 33 foot/inch and 40 foot/inch legibility indices viewed under conditions simulating a night time driving environment. The findings suggested that increasing the sign luminance significantly reduced the time to acquire information. Similarly, increasing the sign size also reduced the information acquisition time (Schnell, 2010). Furthermore, as the text size decreased, the reading times showed a much more dramatic increase at lower luminance levels (Schnell, 2010). These findings suggest that larger and brighter signs are more efficient in transferring their message to the driver by reducing information acquisition time, or alternatively, by increasing the transfer accuracy. In return, reduced sign viewing durations and increased reading accuracy is likely to improve roadway safety.

METHODOLOGY

The primary data obtained were research derived from site observations and questionnaire surveys. The site observations were to identify the existing physical conditions of the informative traffic signs in IIUM Gombak campus. Personal interviews can generate a very high response rate. The questionnaire survey was to gather the information of the respondents' perception and approach towards the effectiveness of the informative traffic signs in IIUM. The respondents were selected from Zone 1: Ahmad Ibrahim Kulliyah of Law (AIKOL) and Zone 2: Kulliyah of Architecture and Environmental Design (KAED) areas in IIUM.

This research tends to focus on respondents from different faculties in order to identify the differences of perceptions of the students as they were from different backgrounds of study and characteristics. The selection was based on AIKOL students being knowledgeable and familiar with laws and regulations as they were studying in law. Meanwhile, the selections of KAED students were because they were knowledgeable and familiar with urban design setting and traffic and transportation matters as they were studying built environment and design. However, the analysis and findings may not be applicable to other universities due to IIUM signages being different from other universities. The population was divided into homogenous groups (based on faculties). Due to the large number of population, the purposive sampling has been used.

The questionnaire survey was divided into four sections. The first section was the revealed preference where the respondent provided their perception on the effectiveness of the traffic sign. These variables were the dependent variables. Meanwhile, the second section was on the trip characteristics. The third section dealt with the driving characteristics of the respondents. Trip and driving characteristics were independent variables. The last section was on the basic questions pertaining the respondent’s backgrounds. Variables such as gender, age and faculties have been asked. These variables were the independent variables. Likert Scale was used for the relevant perception questions.

DATA ANALYSIS AND FINDINGS

Effectiveness of New Static Information Signage in IIUM

The questionnaire has been distributed to 130 respondents. 128 have been analysed after the data cleaning. The Relative Importance Index (RII) method was adopted by many researchers (Kometa, et al., 1994). This method was adopted to analyse the data collected from the questionnaire survey. The respondent’s perception towards the traffic sign has been scaled by; 1=very unsatisfied, 2=unsatisfied, 3=satisfied and 4= very satisfied. The four-point scale 0–3 mentioned earlier was transformed into relative importance indices for each satisfaction of related question on font size, board size, illumination, colour of sign, language and siting of sign. The indices were then used to determine the rank of each item. These rankings made it possible to cross compare the relative importance of user’s satisfaction and the measure of traffic sign effectiveness. The RII was used to determine the variables most effective for informatory traffic sign in IIUM.

Table 1: Relative Importance Index (R.I.I)

Measure of Effectiveness	Very Satisfied (Score of 3)		Satisfied (Score of 2)		Unsatisfied (Score of 1)		R.I.I	Rank
	52	156	74	148	2	2		
Language of sign	52	156	74	148	2	2	0.79	1
Board Size	30	90	86	172	12	12	0.71	2
Font Size	26	78	75	150	27	27	0.66	3
Colour of sign	28	84	58	116	42	42	0.63	4
Siting of sign	18	54	78	156	32	32	0.63	5
Luminance	24	72	52	104	52	52	0.59	6

Based on the findings, language of sign most effective, with a R.I.I scores 0.79 highlight in the Table 1. IIUM was known as international university, which was why English language was used as the main language.

Thus, it shows that the respondents were really satisfied with the use of English language on sign. The luminance has the lowest score as during the observation that has been done by the researcher, only certain time the lighting would be turned on.

Chi-Square test

The chi-square test analysis can be carried out with two different variables which are nominal and ordinal variables. In order to reject the null hypothesis, the p value (significant level) should be <0.05. As for the chi-square test, the hypothesis tested was to identify whether respondent’s profile gave an impact to the effectiveness of traffic signs.

An alternative form has been deduced as:

Hypothesis #1: “There is a relationship between gender and the perceptions of the respondents toward the effectiveness of traffic signs”

Table 2: Summary on hypotheses tested

Variables	Hypotheses Tested			Significant
	Chi-Square Value	df	Asymp. Sig. (2-sided)	
Font size versus gender	6.889	2	.032	Significant
Board versus gender	5.885	2	.050	Significant
Illumination versus gender	8.821	2	.012	Significant
Colour of traffic signs versus gender	6.962	2	.031	Significant

From the table, it can be seen that calculated chi-square for illumination versus gender was 8.8 which was higher than critical chi-square at two degree of freedom (5.99). In addition, the p-value was 0.01 which was lower than 0.05. The research alternative can be accepted. Therefore, satisfaction of illumination of the signage was influenced by being male or female. In other word, visual attention towards the luminance of traffic sign is different between genders. The same conclusion applies to board and font size where gender has significant influence on. In addition, the calculated chi-square for colour versus gender was 6.9 which were higher than critical chi-square at two degree of freedom (5.99). In addition, the p-value was 0.03 which is lower than 0.05. The alternative research hypothesis can be accepted. Therefore, satisfaction of colour of the signage was influenced by being male or female. In other word, visual attention towards the colour of traffic sign is different between genders. A research by

Dorcus (1926) found that yellow had a higher affective value for the men than women.

Kendall Tau-b Correlation analysis

Kendall's tau is a measure of correlation, i.e. the strength of the relationship between two variables. Kendall's coefficient ranges from 0 to 1. Larger values indicate a stronger association among appraisers' ratings. In order to reject the null hypothesis, the p value (significant level) should be <0.05.

An alternative form has been deduced as:

Hypothesis #2: "There is a relationship between frequency of signage observation and the perceptions of the respondents towards the effectiveness of traffic signs"

Table 3: Summary on hypotheses tested

Variables	Hypotheses Tested				Significant
	Kendall Tau-b Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.	
Font size versus frequency of observation	.178	.073	2.429	.015	Significant
Board size versus frequency of observation	.093	.082	1.131	.258	Insignificant
Illumination versus frequency of observation	.019	.073	0.256	.798	Insignificant
Colour versus frequency of observation	-.088	.079	-1.17	.264	Insignificant
Language versus frequency of observation	.045	.079	.569	.569	Insignificant
Siting versus frequency of observation	.078	.079	-.98	.323	Insignificant

From Table 3, it can be seen that the p-value for font size versus frequency of observation was 0.015 which is lower than 0.05. This shows that there was significant relationship between frequency of signage observation and the perception on font size of traffic sign. The alternative research hypothesis has been accepted. Therefore, satisfaction of luminance of the signage was influenced by frequency of signage observation. The variable of frequency been tested to perception on luminance, board size, language, colour as well as siting but none of this had a significant and relationship towards effectiveness of the

traffic signs. However, insignificant relationship may be due to the small number of sample size.

SYNTHESIS OF THE RESEARCH

The research was aimed at determining the effectiveness of the informatory traffic signs in IIUM, which was guided by four objectives. Basically, the effectiveness of the traffic sign depends upon visual attention, sign lettering and legibility, response time, maintenance, siting of signs as well as illumination.

Analyses show that:

- i. It has been found that gender was the factor that influenced the perceptions of the respondents towards the effectiveness of the colour and illumination of traffic signs. Dorcus (1926) found yellow had a higher affective value for the men than women.
- ii. It can be concluded that the frequency of signage observation influenced the perceptions of respondents toward the font size of the traffic signs.
- iii. Familiarity with legend, brevity and clarity of the message give traffic signs a sense of readability which affects the speed with which meaning is comprehended (Matson, Smith and Hurd, 1955).

Thus, it can be concluded that, the effectiveness of the traffic signs depends upon the gender as well as the familiarity with the signs.

RECOMMENDATIONS

Visual Attention

One of the measures of effectiveness of traffic sign was visual attention. Comprehension must also take place in sufficient time so that the driver can act upon the sign message without distraction from the surrounding situation. That was why the standardisation of traffic sign should be taken into consideration by the agency involved. However, visibility often been impede by hedges, trees, curvature and others. The human ability in visualization was limited. It will be apparent on values such as on contrast and board size as highlighted below:

- i. Contrast: Hobbs and Richardson (1967), in their analysis of the traffic signs identified that colour and contrast were the two basic requirements for the sign stands out from the background and the message displayed stand out from the sign board. Contrast depended on the brightness of the colour. Contrast can be effective by the use of different colour and brightness. The existing background for the informatory traffic signs in IIUM was grey in colour, and the lettering are turquoise. For instance, lettering that used black colour and light grey colour for its sign's background is more legible compared to wording in turquoise colour (Figure 4 and 5).



Figure 4: Existing condition

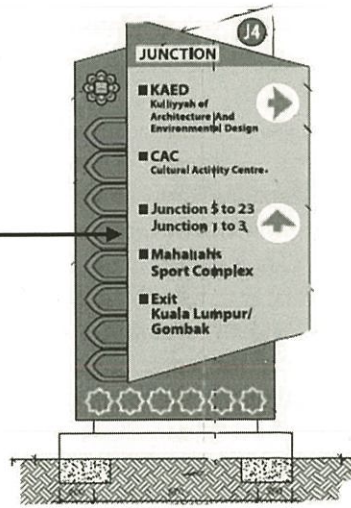


Figure 5: Example of recommendation

In this context, the differences between letter and its background will enlighten the image due to the contrast of the background colour against dark lettering coloured of the sign. Even though the location of the signage is strategic, reasonable size and colour contrast are important for the sign to be effective.

Table 4: Recommendations of colour

Before	After
Background- grey in colour Lettering- turquoise	Background- light grey in colour Lettering- black

- ii. Maintenance: In order to achieve the necessary effectiveness, it is imperative that the traffic signs provided at any site are adequate in size for the speed of the road it is erected on. The correct siting of the traffic

sign from the hazard is also vital in relation to vehicle speeds. Locating a sign too close to a hazard is unlikely to give drivers sufficient message.

There were some traffic signs that were hidden by the trees. It is essential to reiterate that, the humans had their limitation in visualization. Basically, traffic sign were placed adjacent to the junctions. However, the placements of some of the traffic sign were hidden by the trees and shrubbery and this interrupted the drivers' view of the signs. The siting of traffic signs are recommended to be located at the right siting and follow the guidelines. The responsible agencies should maintain the vegetation growth (trees and shrubbery) so that they will not interrupt the drivers' attention. Trees and shrubbery need to be cut as the vegetations grow and obscure the line-of-sight to the signs.

CONCLUSIONS

Traffic signs are important in promoting road safety towards the road users. However, the effectiveness of the traffic sign must take into consideration. Several aspects including colours, contrast, legibility, maintenance, siting of signs, night visibility requirements and standards of traffic sign needs improvement measures through a systematic planning and implementation of proper guidelines must be imposed to create good image as well as enhancing the visual quality of traffic sign. Erection of traffic signs at inappropriate locations has produced some problems and issues, which need to be mitigated in the future. For instance in the case of IIUM, the resulted in applications of visual attention elements still need to be enhanced and increased for better legibility of traffic sign. Consideration has to be made in colour, gender of the users, familiarity with multilingual signage and legibility. This research has proven that these factors influenced the effectiveness of signage and recommended the respective of strategies.

REFERENCES

- AbdurRazzak and TanweerHasan. (2010). Motorist understanding of traffic signs: A study in Dhaka city. *Journal of Civil Engineering (IEB)*, 38 (1), 17-29.
- Baas P. *Influencing driver behaviour through road marking*. University of Waikato and TERNZ Ltd.
- Babbie, E. R. (2002). *Fundamentals of Social Research*. Nelson Education.
- Bell, M. G. H., Bonsall, P. W., and O'Falherty, C. A. (1997). Driver Information system. In O'Falherty, C. A. (Ed.). *Transport Planning and Traffic Engineering* (pp. 517-531). Butterworth Heinemann: London.
- Castro C. and Horberry T. (2004). *The Human Factors of Transport Signs*. CRC Press: United States of America.
- Centre for Built Environment (CBE) .(2011). IIUM.
- Conover W.J. (1980) *Practical Non-Parametric Statistics*, 2nd edn. John Wiley and Sons :New York.
- Cunard, R. A. (1999). Traffic control devices: Signs. In Institute of Transportation Engineers (Ed.). *The traffic safety toolbox: A primer on traffic safety* (pp. 47-56). Institute of Transportation Engineers (ITE): United States of America.
- D.W. Harwood, et al., (2002) *Safety Effectiveness of Intersection Left- and Right-Turn Lanes*, Federal Highway Administration Office of Safety Research and Development.
- David V. And Moldoveanu Ş.(2002). Sample preparation in chromatography. *Journal of chromatography library*. Elsevier : Netherlands.
- Dewar R. (1998). Design and evaluation of public information symbols. In Zwaga H, Boersema T. and Hoonhout H. (Ed.) *Visual information for everyday use: design and research perspectives* (pp. 285-304). Taylor & Francis: United Kingdom.
- Dorcus R. M. (1926). *Color preferences and color association*. John Hopkins University.
- Hobbs, F. D. and Richardson B. D. (1967). *Traffic Engineering* (Vol. 2). Pergamon Press: Britain.
- Hobbs, F.D. (1979), *Traffic Planning and Engineering* (2nd ed.). Pergamon Press: Britain.
- IIUM Master Plan.(1995). IIUM Publication.
- Jackson S. L. (2003). *Research Methods and Statistics: A Critical Thinking Approach*. Thomson Wadsworth: United States of America.
- Keeble, L. (1969). *Principles and Practice of Town and Country Planning*. Timber City Books.

- Kendrick, P., Copson, M., Beresford, S., and McCormick, P. (2004). *Roadwork: Theory and practice* (5th ed.). Elsevier Butterworth-Heinemann: Britain.
- Khan, M. T. (2008). *Real-Time Recognition System for Traffic Signs*. Department of Computer Engineering, Dalarna University
- Kometa, S.T.; Olomolaiye, P.O. and Harris, F.C. (1994) *Attributes of UK construction clients influencing project consultants' performance, Construction Management and Economics*, 12(2), pp. 433-443.
- Kurniawan Sri H. and Zaphiris P. *Investigating the Age Effects on Subjective Assessments of Traffic Signs*. Dept. of Industrial and Manufacturing Engineering and Institute of Gerontology Wayne State University.
- Manual of Traffic Control Devices (2006). Department of Public Works: Malaysia.
- Manual on Uniform Traffic Control Devices (MUTCD) (2003). Department of Transport: United State of America.
- Matson T. M., Smith, W. S., and Hurd, F. W. (1955). *Traffic Engineering*. McGraw-Hill Book Company: New York.
- Newman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches*. Pearson Education Inc.: United States of America.
- Ng W.Y A. and Chan H.S. A. (2008) Visual and Cognitive Features on Icon Effectiveness. Proceedings from 'International Multi Conference of Engineers and Computer Scientists' Vol II IMECS 2008: Hong Kong.
- Rencher Alvin C. (2002). *Methods of multivariate analysis* (2nd ed.). John Wiley and Sons: United States of America.
- Roess, R. P., Prassas, E. S., and McShane, W. R. (2004). *Traffic Engineering* (3rd ed.). Pearson Prentice Hall: United States of America.
- Schlabach K. "Traffic Calming in Europe". Institute of Transportation Engineers.
- Schnell T., Yekshatyan L., Daiker R. and Konz J. (2010) *Effect of Luminance on Information Acquisition Time and Accuracy from Traffic Signs*. Unpublished Thesis: University of Iowa.
- Slinn M, Matthews P. and Guest P. (2005). *Traffic Engineering Design: Principles and Practice* (2nd ed.). Oxford: Amsterdam
- Traffic Signs Manual (2003). Department of Transport : United Kingdom.
- Tunnard C. and Pushkarev B. *Man-made America: chaos or control?: An inquiry into selected problems of design in the urbanized landscape*. Yale University Press: United States of America.
- Wohl, M. and Martin, B. (1967). *Traffic systems analysis for engineers and planners*. McGraw-hill Book Company: United States of America.



THE CONSTRUCTION AND DEMOLITION WASTES IN KLANG VALLEY, MALAYSIA

Muhammad Abu Eusuf¹, Mansor Ibrahim² & Rafikul Islam³

^{1&2} *Kulliyah of Architecture and Environmental Design* & ³ *Kulliyah of Economics and Management Sciences*

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Abstract

Numerous activities in construction and demolition (C&D) projects are generally considered as complex and distant that may affect surrounding environment and public health. Construction, remodelling, repairing, refurbishing or demotion works of buildings and other infrastructures such as roads generate huge amounts of hazardous and non-hazardous materials. In the present work, an attempt has been made to highlight a number of issues in C&D waste management in the Klang valley of Malaysia and which then discusses the current traditions of managing those materials in Malaysian perspectives. The paper concludes with a number of recommendations that can help to improve C&D waste management in Malaysia national perspectives.

Keywords: Construction and demolition wastes, Waste management, Solid waste, Klang valley of Malaysia, national perspectives.

INTRODUCTION

Generally, waste is defined as a substance or object which is disposed of or is intended for disposal or is required to be disposed of by the provisions of laws. Wastes are generated in solid, liquid, sludge or gaseous form during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and many other human activities (Wang, 2010). Due to rapid urbanization and industrialization coupled

¹ Associate Professor at the Department of Building and Technology Engineering.
Email: abueusuf@iiium.edu.my/ eusuf2001@yahoo.com

² Professor at the Department of Urban and Regional Planning. Email:
profmansor@iiium.edu.my

³ Professor at the Department of Business Administration. Email: rislam@iiium.edu.my

with ever increasing population growth have led to an increase in solid wastes in most developing countries. The wastes generated from various human activities, both industrial and domestic, can result in health hazards and have a negative impact on the environment. In Peninsular Malaysia, the amount of solid waste generated per day increased from an estimated 23, 000 tonnes in 2010 to 25, 000 tonnes in 2012, averaging about 0.9 kilograms per person per day. Solid waste in Malaysia on average consists of 45.0 per cent food waste, 24.0 per cent plastic, 7.0 per cent paper, 6.0 per cent iron, and 3.0 per cent glass and others (Ahmed, 2010).

Waste management is defined as the discipline associated with the control of generation, recovering, processing and disposal of wastes in a manner that is in concordance with the best principles of human health, economic, engineering, aesthetics, and other environmental considerations (Tchobanoglous, 1993/ 2003). It is an important part of the urban infrastructure, as it ensures and provides protection of the environment and human health. In order to ensure proper management of waste, it is vital that the types of waste are identified. Different wastes need different handling treatment and disposal. According to Wolley (2000), reducing, reusing and recycling appear to be profitable alternatives that will increase the lifetime of landfills and reduce exploration of natural resources. In addition to that, some European countries' waste management practices are based on prevention (minimization), recovery and restriction (reusing and recycling). Though construction is one of the vital issues for national economic growth, however, the activities pertaining to construction pose various kinds of hazards to the environment and public health (CIDB, 2009). Proper management of construction and demolition (C&D) wastes is a burning issue (European Commission, 2000). There is an urgent need to look for improvements to the present C&D waste management practices so as to ensure good public health in an atmosphere that is environment friendly. All professionals have important roles in better management of C&D waste materials. The present research is conducted with reference to Malaysian perspectives through a case study on Klang Valley in peninsular Malaysia. The main objectives of the present research are as follows:

- i) To identify the common types of waste materials generated at the construction sites and find out the common causes of generation;
- ii) To identify the most common methods applied in managing C&D wastes at construction sites;
- iii) To recommend the ways through which the present C&D management practices can be improved in Malaysia.

BACKGROUND OF KLANG VALLEY

Klang valley which is generally considered as a showcase of Malaysia consists of an area comprising Kuala Lumpur and its suburbs attached with adjoining cities and towns in the state of Selangor. Geographically, it is delineated by the Titiwangsa Mountains to the north and east and the Strait of Malacca to the west. The conurbation of Klang Valley is known as the heartland of Malaysia's industry and commerce and has a total population of about 6.6 million as of 2010 (Wikipedia, 2011) with 1.7% average growth rate. Klang valley is comprised of the following district areas: Federal Territory of Kuala Lumpur; Federal Territory of Putrajaya; Selangor District of Petaling, Klang, Gombak, Hulu Langat, Sepang, Kuala Langat, Kuala Selangor, Sebak Bernam and Hulu Selangor. Principal cities/ towns in the Klang Valley are shown in Figure 1.



Source: Wikipedia (2011).

Figure 1: Principal cities/towns in Klang Valley and the borders of state of Selangor and Kuala Lumpur

AN OVERVIEW OF MALAYSIAN POLICIES AND LEGISLATIONS IN SOLID WASTE MANAGEMENT

The construction industry in Malaysia has experienced a wide range of expansions during the past 20 years. Today, most of the construction projects undertaken are complex in nature, demand greater skills and superior technologies, fast track and concurrent work practices, and are very competitive in terms of price. In order to promote environmentally sound and sustainable development, combined with the aims of continued robust economy, the Malaysian government has established a legal and institutional framework for environmental protection regarding solid wastes. If the construction solid waste is not properly managed then it will affect the neighbourhood and consequently, it will have negative impact on all kinds of planning activities. The Environmental Quality Act (EQA) was enacted in 1974 for the prevention, abatement and control of environmental pollution and to enhance the general quality of the environment. The amendments were deemed necessary to incorporate new developments and issues in the control of the environment.

The Local Government Act was adopted in 1976. This Act has provided a better institutional and legal framework for local authorities to carry out their duties. The Act prohibits the deposition of waste in any stream, channel, drain and river. The Act also provides power to local authorities to maintain cleanliness in towns and put up sanitary measures for the removal of waste in their respective operational area. Further, Malaysia has developed a comprehensive set of legal provisions related to the management of waste. The regulation is based on the “cradle to the grave” principle. A facility which generates, stores, transports, treats or disposes scheduled waste is subject to the following regulations:

- Environmental Quality (Prescribed Premises) (Schedule Waste Treatment and Disposal Facilities) Order 1989;
- Environmental Quality (Prescribed Premises) (Schedule Waste Treatment and Disposal Facilities) Regulations 1989;
- Environmental Quality (Prescribed Conveyance) Order 2005;
- Environmental Quality (Scheduled Waste) Regulations 2005.

Overall, the government’s policy is to ensure:

- the clean, safe, healthy and productive environment for present and future generations;

- the conservation of the country's unique, diverse cultural and natural heritage with effective participation by all sectors of the society; and
- a sustainable lifestyle and pattern of consumption and production.

A BRIEF LITERATURE REVIEW ON C&D WASTE

Increased Generation of C&D Waste

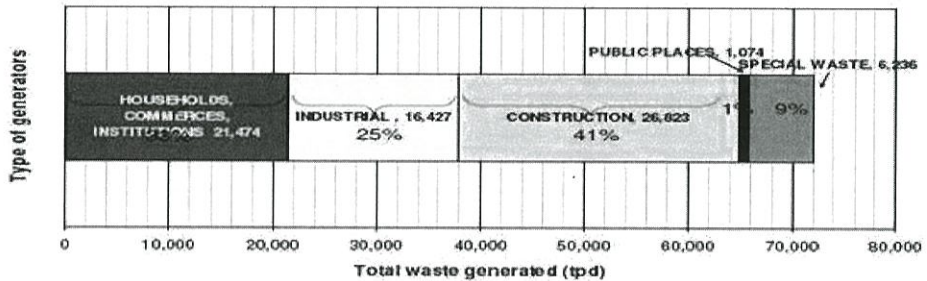
The materials generated from C & D waste activities are quite different, the reason is related with construction activities make use of presently available industrialized processes and materials while demolition activities often remove existing unusable or abandoned structures form the proposed construction site, and consequence of different waste stream (Colin Jeffrey, 2011). Fishbein (1998) stated that construction waste is one of the main contributors to serious environmental problems in many developing countries. According to statistical data, Construction and Demolition debris (C&D) recurrently makes up to 10-30 % of the wastes received at any landfill sites all over the world. For example, in Hong Kong an average of 7030 tonnes of C&D waste were disposed of at landfills every day in 1998, representing about 42% of the total wastes (Environment Protection Department, 1999/ 2000). Approximately, 136 million tonnes of C&D wastes were generated in the United States in 1996 (refer to Table 1), of which 53% accounts from residential areas (Franklin Associates, 1998).

Table 1: Summary of C&D Debris Generation in USA in 1996.

Sources	Residential		Non- residential		Total	
	Tonnes	%	Tonnes	%	Tonnes	%
Construction	6,560	11	4,270	06	10,830	08
Renovation	31,900	55	28,000	36	59,900	44
Demolition	19,700	34	45,100	58	64,800	48
Totals (%)	58,160 (43)	100	77,370 (57)	100	135,530 (100)	100

Sources: Franklin Associates, EPA530-R-98-010, 1998

Figure 2 shows the classifications of solid wastes generators in Peninsular Malaysia: 1) Households, commerce, institutions (33%); 2) Industrial (25%); 3) Construction sector (41%); 4) Public places (1%); and 5) Special waste (9%). We observed that the construction industry has contributed the highest percentage (41%) due to rapid development followed by households, commerce and institutions (33%) and 25% generated from Industrial process.



Source: MHLG/ Danida

Figure 2: Solid Waste Generation in Peninsular Malaysia year 2007

From above description it obvious that due to increase the C&D waste quantity, dearth of enough landfills and then long-term unpleasant environmental, economic and social impacts of the disposal of C&D waste, where effective C&D waste management is indispensable to protect neighbourhood environment (Muluken *et. al*, 2012).

Types and Components of C&D Wastes

Generally, wastes are divided into a number of different categories according to their physical, chemical and biological properties. Another classification is made by their composition. Solid wastes are waste materials that contain less than 70% of water which includes materials such as household garbage, some industrial wastes, some mining wastes, and oilfield wastes, e.g., drill cuttings (Chen and Li, 2006). Hurley (2003) affirmed that the main solid wastes present in the construction are gravel, concrete, asphalt, bricks, tiles, plaster, masonry, wood, metal, paper and plastics. Franklin Associates (1998) explained that construction debris from building sites typically consists of trim scraps of construction materials, such as wood, sheetrock, masonry, and roofing materials.

Concrete: Concrete is a material that consists of cement, aggregate, water and a number of other chemical admixtures. Generally, concrete is the most commonly used component for both substructure and superstructure of buildings and other infrastructures. Poon (2004) found that the material wastage in construction is mainly due to the disparity between the quantity of concrete ordered and that required, mostly in the case of ready mix concrete supply. It is also due to poor planning by the contractors on the amount of concrete required

for the construction. Further, project delays and inefficient material handling processes also create wastes on site.

Reinforcement: Reinforcement bars are regarded as an essential component of reinforced concrete and reinforced masonry structures in construction. It provides better frictional strength to the concrete. The main causes of its wastage are careless cutting by the labourers and inaccuracy in estimated dimension. Poon (2004) confirmed that damages during storage and rusting also contribute to the volume of wastes.

Wood: According to the California Integrated Waste Management Board (2008), the primary constituents of wood waste are used lumber, trim, shipping pallets, and other kinds of wood debris from construction and demolition activities. Wood waste is, by far, the largest portion of the waste stream generated from construction and demolition activities. The main cause of wood wastes is natural deterioration (Poon, 2004), especially in the demolition activities.

Bricks and blocks: Bricks and blocks are mostly used to form the internal walls, fixtures and partitions of a building. Study conducted by Poon (2004) shows that the generation of bricks or blocks during construction process begins from the transportation to the site until its point of use.

Various Causes of C&D Wastes

There are two kinds of C&D wastes – direct and indirect. Direct waste is defined as a loss of value of those materials due to damage and normally these cannot be repaired/ used again (Mahanim *et al.*, 2007). Some of the causes of direct wastes are: Transportation, delivery and internal site movements (Formoso *et al.*, 1999); poor storage of materials (Skoyles, 1987); Problem in fabrication (Mahanim *et al.*, 2007); poor attitudes of construction workers (Udayangani *et al.*, 2006); design change/variation (Graham and Smither, 1996). On the other hand, indirect wastes occur principally from replacement of materials.

INTEGRATED C&D WASTE MANAGEMENT

C&D Waste Management is a part of a growing movement towards developing a sustainable world. Sustainable or “green” management techniques are designed to protect the environment, save resources, and conserve energy.

Proper use of construction waste management techniques has proven to have economic benefits for the construction industry (Simpson, 2006). No matter what the scale or complexity of the project be, from large new building offices to manufacturing facilities, waste management best practice strategies save construction costs and dramatically reduce the impact on the environment. Integrated Waste Management (IWM) is defined as the selection and application of suitable techniques, technologies and management programs to achieve specific waste management objectives and goals (Tchobanoglous, 2003). At the same time, the process takes into consideration of technical, legislative, economic, socio-cultural, institutional and environmental aspects of waste management. The authors of this study have identified four basic management options for IWM: 1) source reduction; 2) recycling and composting; 3) combustion; and 4) landfills.

The waste management process consists of material reduction in the design and planning stages, reducing scrap and waste at building site, reusing materials on site, and recycling materials which cannot be reused. All the processes involved are to be carried out within existing legal, social and environmental guidelines that protect the public health and the environment and are economically acceptable. For a successful integrated C&D waste management plan, it is essential that all the disciplines including administrative, legal, construction professional and workers, etc. communicate and interact with each other and maintain a positive interdisciplinary relationship.

Reduction of C&D Wastes

Chadravanthani (2006) asserts that in Malaysia, wastes are being generated at an alarming rate. Despite the widespread acceptance of recycling as a formal waste management method, however, in Malaysian national domestic recycling rate still stay close around a mere five per cent. According to Kibert and Languell (2000), the first priority of C&D waste management should go to reducing the amount of waste generated. Next priorities should go to reusing, recycling, composting, burning and land filling.

Pichtel (2005) maintains that waste minimization must be given high priority in order to limit any unfavourable environmental impacts, to hold down disposal costs as well as minimizing future liability. He also asserts that reducing C&D waste requires commitment and attention from all parties involved.

Reuse of C&D Wastes

Many materials extracted from demolition or deconstruction can be reused or stored for future potential use (Mahanim *et al.*, 2007). Tchobanoglous and Keith (2002) underlined that, in any construction or demolition project, a broad variety of reusable and unused items should be found which include lumber of different sizes, plywood, asphalt shingles, insulation, heating ducts, etc. Furthermore, wastes such as broken concrete, blocks and bricks can be used in a number of applications.

In addition to the above, functional building or architectural components can often be reused for the next construction job. According to Pun *et al.* (2006), demolition waste reuse and recycling play important roles in value transformation for building material lifecycle, local economics, sustainable environment and natural resource conservation.

Recycling of C&D Wastes

Recycling is the process of collection, separation, clean-up and processing of waste materials to produce a marketable material or product and therefore contributes to the economy, both in providing jobs and business opportunities (William, 1998; Sherman, 1996). In 1996, it was estimated that an average of 20 to 30 per cent of the C&D debris generated were recycled (Southeast Regional Environmental Finance Center, 1996).

The waste materials to be recycled are determined on the basis of a number of factors that include their market value, their access to potential markets, and the quantities in which they are available (Dolan *et al.*, 1999). Tchobanoglous and Keith (2002) have shown that the principal materials that are now recovered from C&D waste for recycling include concrete, wood, asphalt shingles, drywall, metal and soil.

Composting of C&D Wastes

The present researchers assert that composting, which is an element of an integrated solid waste management strategy, can be applied to mix up municipal solid waste as well as it can contribute to the reduction of the amount of waste produced. Accordingly, construction and demolition debris, tree limbs, and other fibrous organic materials may be grounded to produce wood chips, mulches, and feedstock for composting. If the site layout provides an area to store the compost, it may be kept and used for landscaping. The compost may

be marketed to landscaping firms for commercial use. Compost can be used as a soil treatment, artificial topsoil, or growing medium amendment.

Combustion and Land-filling of C&D Wastes

It is also emphasized that burning should be one of the last alternatives for C&D waste with the permission from necessary authorities. Caution must be taken when burning takes place in order to prevent and avoid adverse health effects as well as uncontrolled burns. A landfill, also known as a dump, is a site for the disposal of waste materials by burial and is the oldest form of waste treatment. Historically, landfills have been the most common methods of organized waste disposal and remain so until the modern era in many places around the world.

RESEARCH METHOD

To fulfil the objectives of the present research, a survey method was adopted. The prospective respondents are decided to be mainly contractors, engineers and quantity surveys. The present survey is self-administered and the sample size is 32. After collecting all the responses from the respondents, SPSS version 19.0 has been used to analyse the data. In particular descriptive statistics, analysis of variance (ANOVA), multi-variate analysis of variance (MANOVA) components have been used. To conduct the present research, a questionnaire covering all the salient aspects of C&D wastes was formed that consisted of the following sections:

Section A - Background of the Respondents: The respondents were asked to provide information on position/profession, gender, age, and working experience.

Section B - Generation of C&D Waste: In the first two questions, the respondents were asked to articulate whether they are aware about construction and demolition wastes and their level of agreement on the statement "Construction industry now-a-days generates the C&D waste which creates substantial impacts on the environment and human health". Further, on a set of factors pertaining to C&D waste, the respondents were asked to state their level of knowledge ranging from very poor to excellent. Next, from among construction, renovation, refurbish, remodel, repair and demolition, the respondents were asked to tick the item(s) that contribute(s) largest amount of wastes.

Section C - Practice on C&D Waste Management: In this section, the respondents were asked to articulate their level of awareness on C&D waste management and rating of its practice in his/her Construction Company. They were also asked to specify the waste management method (Reduce, Reuse, Recycle, Composting, Burning, Land filling) that has been in use in his/her company in reference to a variety of waste materials.

Section D - Minimizing C&D Waste: Using the 1-5 Likert scale (where 1 = minimally potential and 5 = maximally potential), the respondents were asked to rate several strategies in order to minimize the C&D waste materials. Altogether 50 questionnaires were distributed to the respondents that include mainly contractors, engineers, and quantity surveyors in Klang valley area. All the respondents were contacted personally. The questionnaire was pilot tested through one quantity surveyor. He recommended rewording some of the questions which was done before communicating to the survey respondents.

DATA ANALYSIS

Thirty two completed questionnaires were analysed. Table 2 provided the category of respondents who completed the questionnaires. The profile of the respondents is shown in Table 3.

Table 2: Category of respondents.

Respondents	Distributed	Responded	Percentage of return
Contractors	20	12	60%
Engineers	12	8	67%
Quantity Surveyors	12	9	75%
Others	6	3	50%
Total	50	32	64%

On the question of awareness, 88% of the respondents (28 in number) mentioned that they were aware on C&D wastes and the rest 12% were not aware about that. Figure 3 represents respondents’ agreement/disagreement on the impacts of C&D wastes on environment and public health. As we observe, 72% of the respondents agree that C&D waste affects environment and public health, with 12% of them strongly agreeing or remaining neutral on the issue. Only 4% disagreed.

Table 3: Respondents' demographic information

Personal Information	Frequency	Percent
Gender		
• Male	25	78.12
• Female	7	21.88
Age group		
• Less than 25 years	7	21.88
• 25-34 years	9	28.12
• 35-44 years	8	25.00
• 45-54 years	6	18.75
• 55 years or more	2	6.25
Working experience		
• Less than 5 years	11	34.37
• 5 -14 years	11	34.37
• More than 15 years	10	31.25

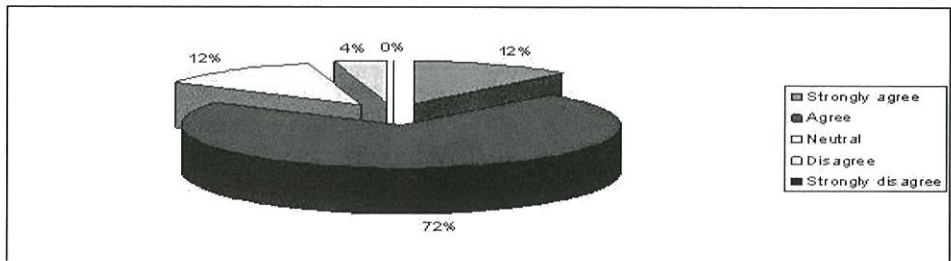


Figure 3: Respondent's perception towards the impacts of C&D waste to the environment and public health

Table 4 presents the respondents' level of knowledge on various aspects of C&D waste and its management. Last column shows the mean values of the level of understanding. We observe that the respondents' level of understanding below average on the following matters: Current percentage of C&D waste products; Waste management hierarchy; Malaysian policies and legislation in C&D waste. Apart from the above three matters, the respondents possess above average knowledge in all other aspects. In fact they are most knowledgeable in the following four matters (refer to Table 4): Definition of C&D waste; Types of C&D waste; Factors contributing to C&D waste; Benefits of C&D waste management.

Table 4: Level of knowledge on various aspects of C&D waste

Matter	Level of knowledge					Mean
	Very Poor (1)	Poor (2)	Average (3)	Good (4)	Excellent (5)	

Definition of C&D waste	0 (0)*	2 (6)	17 (53)	9 (28)	4 (13)	3.47
Types of C&D waste	0 (0)	4 (13)	17 (53)	9 (28)	2 (6)	3.28
Factors contributing to C&D waste	0 (0)	5 (16)	17 (53)	9 (28)	1 (3)	3.19
Benefits of C&D waste management	0 (0)	4 (13)	19 (59)	8 (25)	1 (3)	3.19
Roles of construction of people in managing and reducing C&D waste	1 (3)	5 (16)	16 (50)	10 (31)	0 (0)	3.09
Integrated waste management	0 (0)	8 (25)	17 (53)	6 (19)	1 (3)	3.00
Malaysian policies and legislation in C&D waste	3 (9)	9 (28)	16 (50)	2 (6)	2 (6)	2.72
Waste management hierarchy	1 (3)	11 (34)	17 (53)	3 (9)	0 (0)	2.69
Current percentage of C&D waste products	3 (9)	10 (31)	16 (50)	3 (9)	0 (0)	2.59

* The first and second numbers show the number of respondents and percentage, respectively. The same mode has been adopted in many of the subsequent tables. It is noted here that the total sample size is 32.

Does the respondents’ demography (particularly, profession and extent of experience in work) have any effect on their knowledge on various aspects of C&D waste? One-way ANOVA has been performed for all the items shown in Table 4 for both profession and number of years of working experience. In this ANOVA analysis (also subsequent MANOVA analysis), independent variables are ‘profession’ and number of years of working experience and dependent variables are various aspects of C & D waste. Minimum p-values were found to be 0.143 (F=2.094) and 0.122 (F=2.266) for profession and working experience, respectively. Hence, respondents’ profession and years of working experience do not have significant impact on the results. In other words, contractors, engineers, and quantity surveyors do not differ significantly in their opinion on the knowledge of CDW and its management. Same is the case for people having different amount of working experience. Two-way ANOVA (profession versus working experience) also confirms the findings. No interaction was found to be significant for any item (minimum p-value = 0.168 was observed for ‘benefits of CDWM’). Since ANOVA considers only one dependent variable at a time, both 1-way (profession and working experience, separately) and 2-way (profession and working experience together) MANOVA were performed and the results are shown in Table 5. None of the p-values was found to be significant. Therefore, considering all the items together, the respondents’

opinions do not differ significantly across various types profession and the number of years of working experience.¹

Table 5: 1-way and 2-way MANOVA tests results on the level of knowledge on various aspects CDW.

Type of MANOVA	Independent variable	Wilk's λ	F	p	Partial η^2	Observed power
1-way	Profession	0.567	0.655	0.830	0.247	0.351
	Experience	0.412	1.238	0.279	0.358	0.683
2-way	Profession	0.245	1.358	0.239	0.505	0.638
	Experience	0.222	1.496	0.176	0.529	0.693
	Profession * Experience	0.108	1.050	0.434	0.426	0.711

Figure 4 shows the respondents' opinion towards the types of projects that contribute largest generation of C&D wastes. It is found that 75% of the respondents' view is that residential construction projects generate maximum amount of wastes and this is followed by non-residential demolition projects (69%).

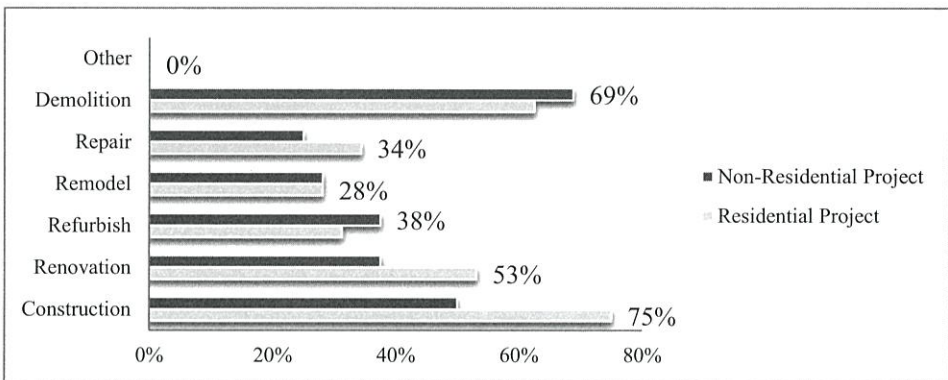


Figure 4: Respondents' opinion on types of projects which causes the biggest generation of C&D waste

According to the data obtained, 75% of the respondents' view is that residential construction projects generate maximum amount of wastes and this is followed by non-residential demolition projects (69%). One of our objectives was to identify the components of construction materials that contribute to the C&D wastes. The respondents were asked to rank the components provided from the least contributor (1) to the most contributor (5). Table 6 provides the results.

¹ For all the ANOVA and MANOVA tests of the present study, 'Others' and 'No experience' categories under Profession and Working experience, respectively were omitted owing to smaller sample size.

Table 6: Respondents’ opinion on the composition of C&D wastes.

Component	Level of contribution					Mean
	Least contributor (1)	Less contributor (2)	Moderate contributor (3)	More contributor (4)	Most contributor (5)	
Wood	0 (0)	0 (0)	16 (32)	8 (25)	8 (25)	3.75
Concrete	0 (0)	5 (16)	6 (19)	14 (44)	7 (22)	3.72
Bricks	0 (0)	5 (16)	11 (34)	8 (25)	8 (25)	3.59
Plastics	0 (0)	3 (9)	16 (50)	9 (28)	4 (13)	3.44
Others	0 (0)	1 (3)	6 (19)	1 (3)	2 (6)	3.40
Reinforced Concrete	0 (0)	5 (16)	17 (53)	8 (25)	3 (9)	3.38
Paper/ Cardboards	3 (9)	4 (13)	10 (31)	10 (31)	5 (16)	3.31
Rubble	1 (3)	8 (25)	12 (38)	5 (16)	6 (19)	3.22
Metals	2 (6)	3 (9)	17 (53)	8 (25)	2 (6)	3.16
Reinforcement	2 (6)	4 (13)	11 (34)	13 (41)	1 (3)	3.13
Drywall	1 (3)	2 (6)	22 (69)	6 (19)	1 (3)	3.13
Roofing	1 (3)	8 (25)	13 (41)	8 (25)	2 (6)	3.06
Rubber	2 (6)	7 (22)	18 (56)	2 (6)	3 (9)	2.91
Glass	3 (9)	8 (25)	12 (38)	8 (25)	1 (3)	2.88

*It is noted here that the total sample size is 32

It is clear that wood, concrete, bricks, and plastics constitute the bulk of C&D waste materials. From the whole table, the single highest percentage (69) of respondents said that drywalls constitute moderately to C&D wastes. Generally speaking, most of the respondents held the view that the components either constitute moderately or more than moderately to the C&D wastes (this is evident from the columns “Moderate contributor” and “More contributor”). We also observe that rubber and glass comprise the least amount to C&D wastes. From the mean values, we can also conclude that moderate contributors are reinforced concrete, drywall, metals, rubble, and paper/cardboards. In addition to the above findings, with one way ANOVA, one & two way MANOVA has also been performed. In this regard, the independent variables are profession and working experience and dependent variables are various composition of C & D waste. One-way ANOVA test shows that respondents’ profession does not have significant impact on their opinion except the component ‘Roofing’. On this component, quantity surveyors (M=3.778) and contractors (M=2.417) differ significantly (F=8.559, p=0.001). With regards to working experience, 1-way ANOVA reveals that ‘less than 5 years’ (M=3.000) differ significantly from the ‘5-14 years’ (M= 3.636) (F=3.815, p=0.034). However, they do not differ on the remaining components. One-way as well as two-way MANOVA tests confirm the findings as shown in Table 7.

Table 7: 1-way and 2-way MANOVA tests results on the composition of CDW.

Type of MANOVA	Independent Variable	Wilk's λ	F	p	Partial η^2	Observed power
1-way	Profession	0.001	2.576	0.318	0.973	0.167
	Experience	0.003	1.148	0.571	0.941	0.104
2-way	Profession	0.0.000	9.554	0.099	0.989	0.417
	Experience	0.000	5.989	0.152	0.982	0.301
	Profession * Experience	0.000	3.368	0.142	0.959	0.362

A 3×3 factorial ANOVA was employed to determine the effects of profession and working experience on the respondents' opinion on the ranking of construction materials. The main effect of profession $F(2,20)=5.449$, $p=0.013$, $\eta^2=0.353$ and interaction $F(4,20)=3.674$, $p=0.021$, $\eta^2=0.424$ were found significant for 'Reinforced concrete'. Overall, quantity surveyors ($M=3.667$) consider that reinforced concrete contribute more to the production of CDW compared to contractors ($M=2.917$). No other significant difference was observed in this factorial design experiment. Respondents were also asked to provide their opinion on the extent they agree/ disagree on a number of factors that generate C&D wastes. Table 8 shows the summary results.

Table 8: Respondents' opinion on factors that generate C&D wastes.

Factor	Level of agreement/disagreement					Mean
	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	
Waste due to the nature of building demolition or renovation works	0 (0)	2 (6)	6 (19)	13 (41)	11 (34)	4.03
Poor storage of construction materials	0 (0)	0 (0)	7 (22)	18 (56)	7 (22)	4.00
Carelessness of workers in handling materials	1 (3)	1 (3)	9 (28)	14 (44)	7 (22)	3.78
Waste due to design changes/ variations	1 (3)	2 (6)	8 (25)	14 (44)	7 (22)	3.75
Excessive handling	0 (0)	4 (13)	12 (38)	14 (44)	2 (6)	3.44
Problems during fabrication	2 (6)	1 (3)	14 (44)	12 (38)	3 (9)	3.41
Waste due to negligence	1 (3)	3 (9)	16 (50)	10 (31)	2 (6)	3.28
Waste due to poor design specifications	1 (3)	6 (19)	10 (31)	14 (44)	1 (3)	3.25
Carelessness during quantity analysis and measurement	2 (6)	4 (13)	14 (44)	8 (25)	4 (13)	3.25
Substitution (materials delivered to the site are used for other purposes)	2 (6)	12 (38)	8 (25)	10 (31)	0 (0)	2.81

*It is noted here that the total sample size is 32

Most of the respondents are of the opinion that wastes depend on the nature of demolition/renovation of buildings. They also concur that following are three major reasons for generation of waste:

- Poor storage of construction materials;
- Carelessness on the part of workers in handling materials;
- Waste due to design changes/variatioins

However, the following three items were not found as significant in terms of generation of C&D wastes:

- Waste due to poor design specifications;
- Carelessness during quantity analysis and measurement;
- Substitution (materials delivered to the site are used for other purposes)

One-way ANOVA results show that respondents on the basis of profession differ on their opinion about ‘Substitution’. Quantity surveyors (M=3.333) opined that substitution generates more wastes compared to contractors (M=2.333) (F=4.205, p=0.026). Tukey HSD post hoc test also confirms the findings (p=0.041). With regards to working experience, respondents having experience ‘less than 5 years’ (M=3.200) and ‘5-14 years’ (M=3.273) consider that substitution generates more wastes compared to the respondents having experience ‘15 years or more’ (M=2.000) (F=8.197, p=0.002). Tukey HSD homogeneous subsets are shown in Table 9.

Table 9: Tukey HSD homogeneous subsets for ‘Substitution’.

Experience	N	Subset for alpha =0.05	
		1	2
Less than 5 years	10	2.000	
5-14 years	10		3.200
15 years or above	11		3.273
Sig.		1.000	0.977

When profession and experience were considered jointly, 2-way ANOVA experimental design test confirms that both (Profession: F(2,20)=3.926, p=0.036, $\eta^2=0.282$; Experience: F(2,20)=3.968, p=0.035, $\eta^2=0.284$) differ significantly on ‘Problem during fabrication’. Contractors (M=3.583) and quantity surveyors (M=3.556) held the view that ‘Problem during fabrication’ contributes in generating CDW more than engineers (M=2.875). On the other hand, respondents having working experience ‘5 to 14 years’ (M=3.818) consider that ‘Problem during fabrication’ contributes more towards CDW compared to ‘less than 5 years’ (M=3.200) and ‘15 years or

more' (M=3.200). However, their interaction was not found significant ($F(4,20)=1.206$, $p=0.334$, $\eta^2=0.194$). One-way and two-way MANOVA tests results are presented in Table 10, which indicate that respondents do not differ significantly on the items when they are considered together.

Table 10: 1-way and 2-way MANOVA tests results on the factors that generate CDW.

Type of MANOVA	Independent Variable	Wilk's λ	F	p	Partial η^2	Observed power
1-way	Profession	0.351	1.169	0.335	0.408	0.645
	Experience	0.366	1.240	0.277	0.395	0.699
2-way	Profession	0.198	1.639	0.236	0.554	0.640
	Experience	0.188	1.434	0.205	0.566	0.666
	Profession * Experience	0.031	1.633	0.057	0.580	0.930

Next, the results of a number of Yes/ No type of questions are presented (refer to Table 11). It is surprising to find that more than 50% of the respondents are either not familiar or they are not sure about C&D waste management. Further, almost 50% of the respondents are either not familiar or not sure about 3R principles of waste management. Again less than 50% of the respondents' companies practice 'Reuse' to lessen the burden of C&D waste materials.

Table 11: Familiarity with C&D waste management

Question	Yes	No	Not Sure
Are you familiar with C & D waste management?	13(41)	5(16)	14(44)
Are you familiar with Reduce, Reuse and Recycle (3R), composting, burning and land filling options?	18 (56)	4 (13)	10 (31)
In order to prevent larger amount of generation of C&D wastes, does your construction company practice reusing of construction materials?	13 (41)	7 (22)	12 (38)

Figure 5 provides the results on ratings (1 = Very poor, 5 = Excellent) of C&D waste management in the respondents' companies construction sites. Clearly, in most of the companies, the level of C&D management is average.

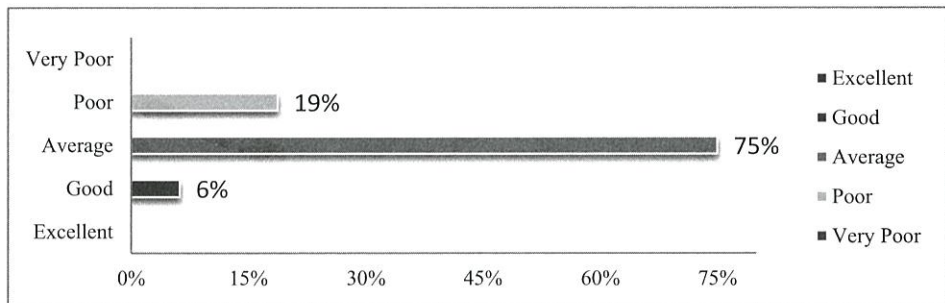


Figure 5: Rating Level of C&D waste management on construction site

C&D waste management is a part of a growing movement towards developing a sustainable world. It is important to identify the most common methods being used at the construction sites in order to protect the environment as well as to save resources, and conserve energy either directly or indirectly. Figure 6 shows the percentage of usage of various waste management methods that include reduce, reuse, recycle, composting, burning or land filling. The listing has been done for materials: wood, concrete products, reinforced concrete, reinforcement, drywall, metal products, plastics products, roofing, rubble, bricks, glass products, rubber, paper or cardboards and others.

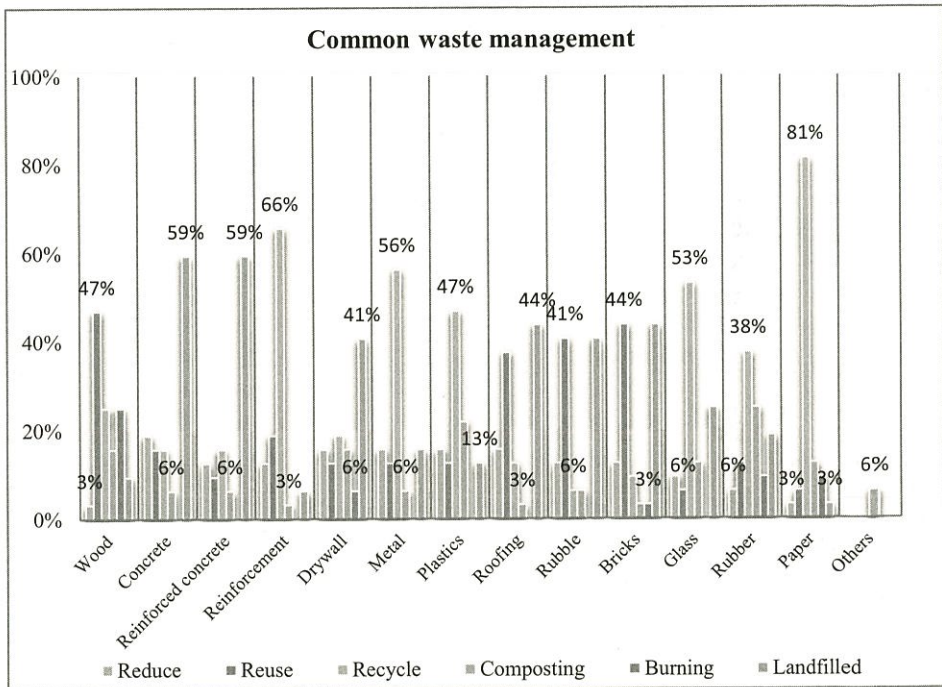


Figure 6: Extent of applications of various C&D waste management methods

From the figure, we note the following points:

- According to 47% of the respondents, reuse is the most common method to handle wood waste
- The most common method for dealing with concrete, reinforced concrete, drywall, rubble waste, roofing, and bricks is land filling; the reason could be that land filling is a cheaper option.
- Metals, plastics, papers/ cardboards are mainly recycled
- Rubbers are recycled.

Table 11 provides the summary of the most commonly used methods to deal with varieties of C&D waste materials.

Table 11: Application of C&D waste management methods

Types of C&D waste	Waste management method					
	Reduce	Reuse	Recycle	Composting	Burning	Land fill
Wood						
Concrete						
Reinforced Concrete						
Reinforcement						
Drywall						
Metals						
Plastics						
Roofing						
Rubble						
Bricks						
Glass						
Rubber						
Paper/ Cardboards						
Others						

All possible measures need to be taken to minimize the construction wastes. Respondents were asked to provide their opinion on the effectiveness of a number of wastes minimization strategies. Table 12 provides the summary results.

Table 12: Opinion on waste minimization strategies

Potential waste minimization strategies	Level of agreement/disagreement					Mean
	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	
Appropriate location for storage	0 (0)	1 (3)	7 (22)	17 (53)	7 (22)	3.94
Fabrication: Handling and cutting of materials appropriately	0 (0)	1 (3)	9 (28)	14 (44)	8 (25)	3.91
Standardization and flexibility in designs	1 (3)	1 (3)	7 (22)	16 (50)	7 (22)	3.84
Ensure appropriate dimensions and quality of materials	0 (0)	2 (6)	9 (28)	14 (44)	7 (22)	3.81
Proper implementation of materials management plan	0 (0)	2 (6)	7 (22)	18 (56)	5 (16)	3.81
Early plans for purchases and deliveries	0 (0)	1 (3)	11 (34)	15 (47)	5 (16)	3.75
Return ability of unused containers and pallets	0 (0)	1 (3)	11 (34)	16 (50)	4 (13)	3.72
Accuracy in take-off quantities	0 (0)	1 (3)	14 (44)	12 (38)	5 (16)	3.66
Provide convenient containers for materials storage and retrieval	0 (0)	2 (6)	15 (47)	8 (25)	7 (22)	3.63

*It is noted here that the total sample size is 32

According to the respondents, the most preferred strategies are the following:

- Appropriate location for storage
- Appropriate cutting and handling of materials
- Design standardization and flexibility in design
- Ensure appropriate dimensions and quality of materials
- Proper implementation of materials management plan

Surprisingly, respondents’ profession and extent of working experience do not have significant effect on the findings on the waste minimization strategies. In the relevant 1-way ANOVA, the minimum p-value and the corresponding F-value were found to be 0.166 and 1.926, respectively (profession); the corresponding values for working experience are 0.083 and 2.722, respectively. Same is the observation even considering all the strategies together as it is noted from Table 13.

Table 13: 1-way and 2-way MANOVA tests results on the waste minimization strategies.

Type of MANOVA	Independent Variable	Wilk’s λ	F	p	Partial η^2	Observed power
1-way	Profession	0.461	0.947	0.534	0.321	0.518
	Experience	0.413	1.237	0.280	0.358	0.683
2-way	Profession	0.473	0.606	0.861	0.312	0.280
	Experience	0.358	0.894	0.591	0.401	0.423
	Profession * Experience	0.116	1.009	0.483	0.417	0.688

However, the 3×3 ANOVA experimental results show significant interaction on two strategies, namely, ‘Standardization’ ($F(4,20)=4.892$, $p=0.006$, $\eta^2=0.495$) and ‘Unused containers’ ($F(4,20)=3.151$, $p=0.037$, $\eta^2=0.387$). With regards to main effect, experience ($F(2,20)=4.773$, $p=0.020$, $\eta^2=0.323$) has significant impact on ‘Purchase plan’. Contractors ($M=4.000$) consider that this strategy has more potential to minimize CDW at construction sites compared to quantity surveyors ($M=3.300$). At the end of the questionnaire, the respondents were asked to provide more recommendations which they feel appropriate in order to reduce C&D waste materials and improving efficiency of waste management at the construction sites. The following recommendations are provided herewith that possess higher frequencies:

- Implement the Industrialized Building System (IBS);
- Control the purchasing activities systematically in order to prevent surplus materials;

- Plan appropriately at the early stage for the whole construction project;
- Use recycled materials for the future construction in order to reduce the amount of wastes generated;
- Enforce rules and regulations on proper site management and control with strict monitoring and supervision.

Since the sample size of the present research (i.e. 32) is rather small caution should be exercised to generalize the forgoing findings.

Table 14: Differences in respondent’s opinion across profession, and experiences

No	Independent variables	Dependent Variables	Differences
1	Profession	Various aspect of C & D Waste	No significant difference
	Working Experiences		No significant difference
2	Profession	Composition of C & D waste	On ‘roofing’ component, quantity surveyors and contractors differ significantly.
	Profession and working experiences	Composition of C & D waste	Quantity surveyors consider that reinforced concrete contributes more to the production of CDW compared to contractors when working experience is considered.
3	Profession	Factors that generate C&D wastes.	Quantity surveyors are of the opinion that substitution generates more waste compared to contractors.
	Profession and working experiences	Factors that generate C&D wastes.	Contractors and quantity surveyors contend that ‘Problem during fabrication’ contributes in generating CDW more than engineers, when working experience is considered.
4	Profession	Waste minimization strategies	Contractors (M=4.000) consider that ‘purchase plan’ has more potential to minimize CDW at construction sites compared to quantity surveyors.

The summary of the significant differences in opinion between professional experiences are provided in Table 14.

CONCLUSIONS AND RECOMMENDATIONS

Over the years, SWM has attracted considerable attentions from the researchers. Since solid wastes are being generated at an increasingly higher rate all over the world, improvements in SWM techniques are in genuine need. In the present work, an attempt has been made to highlight a number of issues in SWM, particularly C&D waste management in the Klang Valley of Malaysia. First, we have observed that the main wastes generated are: wood, concrete, bricks, plastics, and reinforced concrete. The two main causes of the generation of

excessive amount of wastes are poor storage of construction materials and carelessness in handling and cutting of materials. Therefore, in order to reduce waste, appropriate actions are to look for better storage and in the provision of an adequate amount of training of the construction workers, especially how to reduce the amount of wastes. We anticipate high return on investment of training to the ground level construction workers.

The following recommendations are also put forward towards improving C&D waste management in Klang Valley:

- The utilization of Industrialized Building System (IBS) to reduce waste, as suggested by some respondents;
- In order to minimize C & D wastes, awareness among various parties involved is absolutely essential;
- Hire personnel with higher professional skills and those who have greater sense of responsibility and accountability at the grass root level of construction sites.

Caution needs to be exercised to generalize the findings as the sample size of the present study was rather small. Especially, the respondents' demographic effects on the findings could be different sample size is increased.

REFERENCES

- Ahmad Haji Kabit, (2010). *Strategic Solid Waste Management: The Malaysian Approach*, Keynote Address from Secretary General of Ministry of Housing and Local Government Malaysia, at the Second Meeting of the Regional 3R forum 4th October 2010 at Sunway Hotel Resort & Spa, Kuala Lumpur.
- California Integrated Waste Management Board. (2008). Retrieved April 20, 2008, from California Integrated Waste Management Board: www.ciwb.ca.gov
- Colin Jeffrey (2011), Construction and demolition waste recycling: A literature review,
Dalhousie University's Office of Sustainability, Resource and Recovery Fund Board of Nova Scotia
- Chen, Z and Li, H (2006), *Environmental management in construction: A quantitative approach*. New York: Taylors & Francis.
- CIDB (2009), *Construction Opportunities in 9th Malaysian Plan*, <http://www.cidb.gov.my/v6/files/>
- Dolan, P.J., Lampo R. G., and Dearborn J. C.(1999). *Concepts for reuse and recycling of construction and demolition waste*, US Army Corps of Engineers Construction Engineering Research Laboratories. Diane Publishing.
- European Commission (2000). *Management of construction and demolition waste*, Working Document No.1.
- Environmental Protection Department (1999). Environmental Hong Kong. EPD-HKSAR: HK
- Environmental Protection Department (2000). Environmental Hong Kong. EPD-HKSAR: HK
- Environmental Protection Department (2005). *Hong Kong waste treatment and disposal statistics*. Hong Kong: Department of Hong Kong. Retrieved 3rd March, 2008, from www.epd.gov/hk
- Fishbein, B. (1998). Building for the future: Strategies to reduce construction and demolition waste in municipal projects. *Waste prevention: promoting waste prevention and design of less wasteful products*, 5, 102.
- Formoso, C. T., Isatto E. L., Hirota E. H, (2000), Method for waste control in building industry, IGLC-7. California: University of California.
- Franklin Associates, F. (1998). *Characterizations of building related construction and demolition debris in the United States*. New York: Techlaw, Inc.

- Graham, P. & Smither, G. (1996), Construction waste minimization for Australian residential development. *Asia Pacific Building and Construction Management Journal*, 2, 14-19.
- Hurley, J. (2003). Construction, innovation and global competitiveness: How to SMART Waste the construction industry. *10th International Symposium*. I & II. London: CRC Press LLC.
- Kibert, C.J. & Languell, J.L. (2000), *Implementing Deconstruction in Florida: Materials Reuse Issues, Disassembly Techniques, Economics and Policy*, School of Building Construction, Univ. of Florida.
- Mahanim et al. (2007). Construction waste management: The way forward. *Proceedings of Quantity Surveying International Convention*, (pp.142-156). Kuala Lumpur.
- Muluken Yeheyis, Kasun Hewage, M. Shahria Alam, Cigdem Eskicioglu, and Rehan Sadiq (2012), An overview of construction and demolition waste management in Canada: a lifecycle analysis approach to sustainability, *Clean Technologies and Environmental Policy*, Springer
- Pitchtel, J. (2005). *Waste Management practices: Municipal hazardous and industrial*. New York: Taylor & Francis Group.
- Poon, C.S. (2004). *Low-waste building technologies and practices*. Hong Kong Polytechnic University, Hong Kong.
- Pun S.K., Liu C., Langston C., Treloar G., & Itoh Y. (2006). Promoting the reuse and recycling of building demolition materials, *World Transactions of Engineering and Technology Education*, 1.
- Sherman, R. (1996). *Managing construction and demolition debris: A guide for builders, developers and contractors*. AGRIS Centre: NAL/USDA (USA), North Carolina Cooperative Extension Service.
- Simpson, S. (2006). Sustainability Progress Report; *General Administration State of Washington*.
- Skoyles, J. (1987) *Waste Prevention at site*. Mitchell Publishing.
- Southeast Regional Environmental Finance Centre (1996), Construction and demolition debris recycling for environmental protection and economic development, University of Louisville.
- Tchobanoglous, G. and Kith (2002). *Handbook of Solid Waste Management*. New York: McGraw Hill.
- Tchobanoglous, G. (2003). *Handbook of Solid Waste Management*. New York: Mc Graw Hill.
- Udayangani, K., Dilanthi A., Richard H., Raufdeen R (2006). *Attitudes and perceptions of construction workforce on construction waste in Sri Lanka*, *Management of Environmental Quality: An International Journal*, Volume 17, Number 1, 2006 , pp. 57-72(16)

- Wang Hongzhong (2010). *Municipal Solid Waste Management in Beijing in Perspective of World City*, C40 Cities Waste Workshop, London 22-24 March 2010
- Williams, P.T.(1998). *Waste treatment and disposal*. England: John Wiley & Sons.
- Wikipedia (2011). The Klang Valley, http://en.wikipedia.org/wiki/Klang_Valley
- Wolley, G.R.(2000). "Waste materials in construction", *Science and Engineering of Recycling for Environmental Protection Proceedings of Waste 1*, pp(685-694). Harrogate: pergamon.



THE FUTURE OF COASTAL MANAGEMENT PROGRAMME IN MALAYSIA: MAKING THE COAST VISIBLE TO PLANNERS

M.Zainora Asmawi¹

¹*Kulliyyah of Architecture and Environmental Design*
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

Abstract

The concept of coastal management which is regarded as an effective management tool has been widely used globally for more than 40 years. It works across sectoral, disciplinary and institutional boundaries to manage coastal resources. In many coastal nations, it is highly regarded as an essential approach in formulating coastal strategies and objectives towards a sustainable coastal development. However, the coastal management strategies are currently not extensively incorporated in the institutional framework of Malaysian land use planning system. This situation leads to this study in which it looks into the scenario of the planning practice and coastal management from the perspective of public town planners. For data collection, questionnaire survey was conducted throughout 40 coastal Local Planning Authorities in Peninsular Malaysia. The results revealed a few pertinent points: the level of awareness on the concept of coastal management is rather low; very few Local Planning Authorities have their coastal management plans and programmes or any activities associated with coastal management; and no expertise and lack of man powers were identified as the main reasons for not involving in coastal management. These findings relatively indicate that the acceptance of Malaysian planners was rather unsatisfactory. It is clearly evident that lacking of awareness led to disintegrated approach between town planning and coastal management.

Keywords: coastal management, land use planning, planning practice, planners, Malaysia.

INTRODUCTION

Going to the coasts will definitely create a pleasant feeling as generally it offers a good combination of the sea, sand and sun. The features of coast are undeniably diverse from inland areas or offshore areas. Its marvellous bountiful

¹ Assistant Professor at Department of Urban and Regional Planning. Email: zainora@iiium.edu.my

richness has not only inspired human, but also sustained our survival on the earth. As such, the author would like to take a positive look at the future of coastal management (CM) programme in a town planning (TP) context. The notion of CM has been accepted greatly in many parts of the worlds, covering developed nations and developing nations, following the success of Earth Summit meeting held in Rio de Janerio in 1992 (Asmawi, 2010). In the context of Malaysia, the concept of CM can be considered quite new and not many practitioners are aware of its existence in the true meaning. Its implementation is very close to the practice of town planning system. However, it is doubtful whether the Malaysian planners realise the potential of TP to be integrated in the CM practice. In Malaysia, research on coastal and estuarine areas is still new and fragmented between various disciplines, like coastal geomorphology, coastal engineering and marine biology, which according to Abdul Salam (1998), it is oriented to be institutionally or individually efforts. Thus, this research studies and examines the TP system practised by the Malaysian Government with respect to the application of development plans and development control in managing coastal areas. This paper however does not offer a wide ranging discussion of the issues and problems encountered in managing coastal areas in terms of resources and management techniques as the focus in given to the discipline of TP in facilitating the coastal management programmes.

OBJECTIVES

This study aims to show that the TP system has potential to operate as a tool of CM in Peninsular Malaysia. This paper attempts to discuss the level of acceptance of Malaysian planners towards the concept of CM in relation to the scope of TP. Hence, the outline objectives for this study are:

- a. To study and examine the existing CM programmes in Peninsular Malaysia;
- b. To examine the content and practice of the present Malaysian TP system; and
- c. To analyse the relationship between TP and CM.

CONTEXT OF STUDY

The context of this study starts with the development of CM, which is greatly considered as a useful medium for managing coastal areas in many countries. The development of CM is accepted in many countries, especially with the impetus gained following the Earth Summit meeting in Rio de Janeiro in 1992. So far, there is no legal framework for establishing CM in Malaysia. In the local context, Abdullah (1999) and Basiron (1998) state that CM in Malaysia has traditionally been carried out on a sectoral basis with a top-down approach to dealing with the matter. Though this has many limitations such as conflicts of interest, overlaps and duplication, Abdullah (1999) suggests that the sectoral-based approach has worked relatively well during the past decade. Its drawbacks signal a number of improvements required for developing a better system of managing the coastal areas efficiently.

In Peninsular Malaysia, the Federal Constitution 1957 apparently indicates that the TP system falls under the Concurrent List (List III), meaning it involves Federal, State and Local powers (Government of Malaysia, 1999). Therefore, the involvement of all these levels of government in the TP system is necessary when dealing with planning and managing the coastal areas. Asmawi (2010) suggests that TP could be employed as a tool that has great influence on CM in Malaysia. Though the international perspective indicates that TP should be seen as one sector in CM, the situation in Malaysia does not reflect this opinion. Perhaps it reflects that Malaysian planners have not thought a great deal about CM. In Malaysia, coastal management and TP have been set up in a sectoral basis and there is a lack of appropriate communication, co-operation, co-ordination and collaboration. The existing poor relationship between the TP system and the coastal management approach demonstrates the need for a study on this matter. A comprehensive investigation of the relationship between the TP system and coastal management is necessary. This is to show that the relationship could be more effective, and that an appropriate relationship could contribute to the better implementation of CM.

A brief observation indicates that CM concentrates on environmental resource elements and is poorly integrated with TP. Some writers (e.g., Allmendinger, Barker & Stead, 2002; Halliday, 1986; Kay and Alder, 2005; Taussik, 1998, 2001, 2004) include the TP system aspect in their studies in coastal management. In Malaysia, very few studies have been undertaken to show the links between the planning system and coastal resource management in a local context (see e.g., Abdul Salam, 1998; Mokhtar & Aziz, 2003; Usuluddin, 1999).

The Malaysian context echoes the international picture, though at a slower pace. Evidence of environmental degradation, with reference to serious coastal erosion problems in the early 1980s, triggered some initial action on coastal management. Due to those problems, the Government launched the National Coastal Erosion Study (1984-1985) under the Environment and Natural Resources Division of the Economic Planning Unit (EPU) in the office of the Prime Minister (Basiron, 1998; Loi, 1993 in Cicin-Sain & Knecht, 1998). Consequently, two important institutions related to coastal management were established in 1987: the Coastal Engineering Technical Centre (CETC) and the National Coastal Erosion Control Council (NCECC). Another major national-level coastal area management effort involved the Environmental Impact Assessment prescribed by the Environmental Quality Act 1974 (Act 127). At the national level, coastal management activities are co-ordinated on a project or programme basis by the Office of the Prime Minister's Environment and Natural Resources Division.

More major efforts at the local level are aimed at integrated coastal zone management (Basiron, 1998). In 1992, the first Coastal Resources Management Plan for South Johore (CRMPSJ) was prepared with support from various agencies: the Association of South East Asian Nations (ASEAN); the United States Agency for International Development (USAID); the Coastal Resources Management Project of the Ministry of Science, Technology and Environment; the Implementation Co-ordination Unit of the Office of the Prime Minister; and the Department of Fisheries (Ministry of Science, Technology and the Environment, 1992). There are three pilot projects for CM initiatives being undertaken in Sabah, Sarawak and Penang in 1999 to formulate an CM strategy at the respective State level (Jakobsen, Hartstein, Frachisse and Golingi, 2007). According to Basiron (1998), the main aim of the projects is to have all states in Malaysia replicate the effort and then produce their respective CM programmes. The progress in CM in these states represents the Malaysian commitment to Chapter 17 of Agenda 21. These actions should provide the basis for developing further workable frameworks for coastal zone management plans in Malaysia (Basiron, 1998). The recent project for the coastal management initiative at the local level is the Port Klang CM programme (2001). However, the success of these coastal management plans still has to be evaluated. In 2011, the Town and Country Planning Department (Federal) conducts a study on Physical Plan for National Coastal Zones (*Rancangan Fizikal Zon Persisiran Pantai Negara*), a comprehensive study on coastal environment in relation to planning aspect. This is a positive effort considering that the nation's coastline is facing various challenges due to the climate change effects globally. More importantly, it is

expected that the report is applicable to become as a workable mechanism in coastal management. Although there are difficulties in implementing Chapter 17 of Agenda 21 in the local context (Chong, L.S., 2001), Malaysia has accepted the challenge of this agenda as evidenced by taking early steps in launching programmes on coastal management and establishing government-related agencies under various ministries (Harakunarak, 2001). The Agenda provides a good framework to distil valuable lessons that could pave the way for the wise use of coastal resources through sustainable coastal management in Malaysia.

Focusing on the Malaysian scenario, the conceptual idea of TP as a tool in CM applies to Malaysia. However, the interaction between these two activities is limited. The establishment of the TP system in Peninsular Malaysia dates back 30 years, whereas the CM system only started 14 years ago which makes it quite new in the national development agenda. The differences in their setting up put them apart. The legal backup of TP (i.e. Town and Country Planning Act 1976, Act 172) places it in a strong position while CM has no statutory basis. CM needs support for its operation and for implementation. If CM is to succeed, it demands serious attention to resolve these planning and development issues as well as issues related to other sectors. Since TP has a more established status in Malaysia, it could be the key to the successful implementation of the development related aspects of CM, like coastal settlement development and tourism. Town planner is one of the key stakeholders in planning and managing coastal areas that could contribute to a sustainable coastal management. In line with that, this paper tries to assist by investigating how town planners *via* the TP system can contribute best to CM in the Malaysian context.

LITERATURE REVIEW ON TOWN PLANNING AND COASTAL MANAGEMENT

Many parts of the coast around the world are considered risk areas because significant coastal erosion, pollution, flooding, hurricane and tsunami events occur frequently in many coastal nations. Coastal hazards are created where natural processes interact with, and threaten, human environments (Klee, 1999). This situation requires good management of coastal areas. Jones and Westmacott (1993), the Department of the Environment (1995) and Haslett (2008) suggest that the dominant elements of CM are the coastal resources and coastal system itself, and human intervention in terms of skillful planning and management within the coastal zone. The United Nations (1982) also recognises

that the principle of CM is to understand the interrelationships between the many parts of the natural system.

Many scholars in TP field agree that TP relates with a government activity that regulates the development and physical use of land in the public interest (see Blowers, 2000; Gubbay, 2003; Southgate, 2003). As stated by Dumashie (2001) and Rydin (1998a, 1998b), there are two principal instruments underlie the TP framework, i.e. development plan system and development control decisions. Development plans are considered the ‘heart’ of the forward planning framework, and development control, which is the implementation mechanism (Bishop, Tewdwr-Jones & Wilkinson, 2000). Most forward planning systems generally involve these two elements of TP practice.

A major instrument of CM is the coastal management plan or programme (Stojanovic, 2002). This provides an important context for local authorities and other relevant organisations involved in CM in producing development strategies. CM has some objectives that can only be achieved by curtailing development. Only TP has the power that lies in a statutory regime. The legislation back-up of TP practice sets a powerful system. Therefore, CM must be able to create a communication and collaboration partnership efforts with TP. At a local level, the TP system can make a contribution to CM by using its development plan and development control systems. Coastal policies could be widely incorporated into development plans and development control decisions made based on development plans.

Compared to many other sources in the literatures (e.g., Pido & Chua, 1992), Vallega’s classification of coastal users covers many important users (Table 1). This covers a comprehensive list of activities on the coast, demonstrating that effective management tools are needed to control all the activities without them falling into conflict with each other. The list consists of various coastal users, indicating the importance of an integration process to accommodate the complexity of the coast.

Table 1: Generic coastal users in literatures

Sorensen and McCreary (1990)		Pido and Chua (1992)		Vallega (1992)	
1.	Fisheries	1.	Agriculture	1.	Seaports
2.	Natural area protection systems	2.	Fisheries and aquaculture	2.	Shipping, carriers
3.	Water supply	3.	Infrastructure	3.	Shipping, routes
4.	Recreation development	4.	Mining	4.	Shipping, navigation aids
5.	Tourism development	5.	Ports and harbours	5.	Sea pipelines
6.	Port development	6.	Industry	6.	Cables
				7.	Air transportation

7. Energy development	7. Tourism	8. Biological resources
8. Oil and toxic spill contingency planning	8. Urban development	9. Hydrocarbons
9. Industrial siting	9. Forestry	10. Metalliferous renewable sources
10. Agricultural development	10. Shipping	11. Renewable energy sources
11. Mariculture development		12. Defence
		13. Recreation
		14. Waterfront man-made structures
		15. Waste disposal
		16. Research
		17. Archaeology
		18. Environmental protection and preservation

Source: Based on Vallega, 1999

The classification by Sorensen and McCreary (1990) was set up to show the issues (such as coastal erosion) and economic prospects (such as recreation and development) which, at that time, were perceived by the contemporary decision-makers as important. As a result, most of the categories are in the economic sector. Pido and Chua (1992) also include common sectors associated with the coasts and natural resources. Vallega (1992) shows a wider scope of sectors, including: resources (biological and energy resources); the economic sector (e.g., seaports and air transportation); man-made structures; and environmental protection.

THE CURRENT INSTITUTIONAL ARRANGEMENTS FOR TP AND CM IN PENINSULAR MALAYSIA

The current interaction between TP and CM in Peninsular Malaysia with reference to socio-economic and physical planning at three levels of administration involved: Federal; State; and Local. Traditionally, a top-down approach has been applied with the significant driving force being the Federal Government. At the Federal level, the preparation of national documents like the National Coastal Zone Policy (NCZP), the National Physical Plan (NPP) and Physical Plan for National Coastal Zones are undertaken by Federal agencies, namely, the Economic Planning Unit (EPU) and the Federal Town and Country Planning Department (TCPD) respectively. Any development documents produced at the Federal level, which come under the sector of socio-economic and physical planning, interact with TP and CM. These two activities should have two-way interaction since they would need to reinforce policy, implement policy and set the context for policy, as well as exchanging information.

At present, there is no overall CM plan at the State level in Peninsular Malaysia, except for Penang. Unlike TP, which requires a Structure Plan to be prepared for every state in Peninsular Malaysia, CM does not have a State CM to reinforce the coastal management strategies and objectives. This is a missing link between Federal and Local levels in the CM system. However, many related technical agencies, such as the Department of Environment (DOE), the Department of Irrigation and Drainage (DID) and the Department of Forestry (DOF), have two-way interactions with the state Structure Plans by supplying information and getting feedback.

At the Local level, only three CM programmes have been established in Peninsular Malaysia: Port Klang; Kuantan; and South Johore. These initiatives are not led by LPAs even though they are the bodies that have powers to control any development on land. For example, the Selangor Waters Management Authority (SWMA) leads the Port Klang CM programme with major assistance from Klang Municipal Council and Kuala Langat District Council. At this level, currently, the practice shows that both CM and TP interact with the technical agencies at State level.

METHODOLOGICAL APPROACH

This research employs descriptive and argumentative analysis to explain the relationship between the two activities. Generally, the methods employed for this study consist of the content analysis from the document search and questionnaire survey (Figure 1).

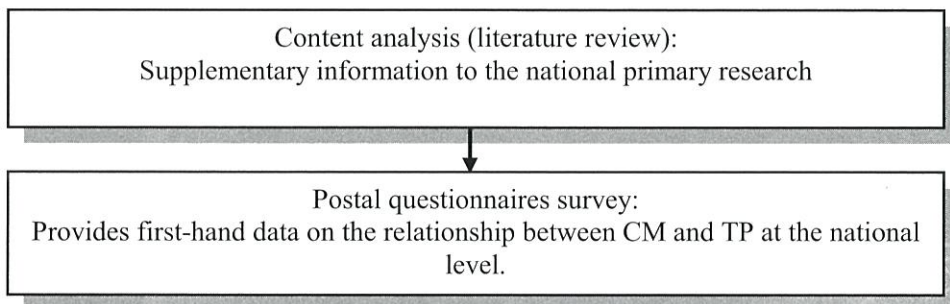


Figure 1: The sequence of methods used in the national study

Study Area

Malaysia, a country of Southeast Asia, is composed of two non-contiguous regions – Peninsular Malaysia (West Malaysia) and East Malaysia - separated by some 400 miles (650 kilometres) of the South China Sea. The latter, comprising the states of Sarawak and Sabah, is located along the northern and western edge of the island of Borneo. The study area, i.e. Peninsular Malaysia, as the name suggests, is bounded by the sea, except in the north where it is attached to mainland Asia *via* the Isthmus of Kra with Thailand. It is bordered on the north by Thailand, on the south by Singapore, on the west by the Strait of Malacca, and on the east by the South China Sea (Figure 2). Peninsular Malaysia comprises the Federal Territory of Kuala Lumpur and 11 states (Perlis, Kedah, Penang, Perak, Selangor, Negeri Sembilan, Malacca, Johore, Pahang, Terengganu and Kelantan) with a total area of 50,810 square miles (131,598 square kilometres). Formerly, known as the Federation of Malaya (1948-63), it contains the bulk of Malaysia's population.



Figure 2: The study area of Peninsular Malaysia

The total coastline in Peninsular Malaysia is 1970 kilometres (Abdullah, 1992; Economic Planning Unit, 1985). Physiographically, the coastline of Peninsular Malaysia is of varied character and configuration (Abdullah, 1992). Abdullah states that the 860 kilometres long east coast of Peninsular Malaysia consists of straight sandy beaches in the north whilst the southern half comprises a series of large and small hook, or spiral, shaped bays. In contrast, the west coast, which measures 1,110 kilometres long, is made up of low elevation coastal plains of marine clay and river alluvium with mangrove swamps constituting 640 kilometres of its coastline (Syed Abdullah, 1992). Malaysia's coastal areas are endowed with valuable marine ecosystems and valuable resources. It provides economic opportunities and resources of developable land. But, at the same time, Abdul Salam (1998) states that coastal areas face many critical problems associated with wastewater discharge, erosion and coastal pollution. This situation has created a dilemma as how to plan and manage the coastal areas in a sustainable manner whilst, simultaneously, encouraging economic development in Malaysia. Since there is no specific overall national legislation, administrative or planning system for Malaysian coastal areas, and no single coastal development authority, this suggests that immediate action on coastal planning and management is crucial and timely.

Questionnaire Survey

Government officials of Planning Unit at Local Planning Authority (LPA) were selected as the respondents to supply required information. Only LPA that have coastal areas were involved in the survey. Coastal LPAs are defined as the superior local authorities that administer one particular coastal district. The survey covered all 40 coastal LPAs in Peninsular Malaysia. The response rate was 65% and this could be considered as sufficient to provide a broader picture of the level of acceptance of planners towards the concept of CM (Figure 3). The formulation of the questionnaire form was based on the aspects of coastal management concept.

Table 2: Rationale for the questions in the survey

Topic of question	Rationale
1. Background details	To determine the level of confidence that could be placed on the answers and to show the pattern of expertise involved in CM programmes
2. Awareness of the concept of CM	To see whether Malaysian town planners are aware of the concept of CM.
3. Availability of CM plan for that coastal LPA	To identify the level of commitment of coastal LPAs to developing CM initiatives by producing CM plans
4. Availability of any other programme on coastal	To identify whether any other programme on

5.	management Reasons for lack of programme on CM	coastal management had been established To discover the obstacles stopping LPAs from having CM programmes.
6.	Intention to set up a coastal group	To identify the intentions of LPAs in coastal management

Data Analysis

The questionnaires apply the closed-ended questions with various choices. Respondents were asked to answer to a series of questions without prioritising their responses. In order to establish the most important issues, analysis involved applying the Likert Scale. This technique is commonly used to measure attitudes, knowledge, perceptions, values, and behaviour changes. Responses were coded into numerical forms to produce ordinal data that is based on a scale representing a range. It is one of the most standardised and acceptable response techniques in the field of social sciences. Thus, this has allowed the author to make the analysis based on the priority of items, as shown in the analysis tables. The following steps were used in applying the Likert Scale to the qualitative types of the questions designed in the study:

- a. Respondents were requested to evaluate the extent of their agreement with a series of attitude statements;
- b. Each degree of response was given a numerical value or score. For example, very important (3), moderately important (2), of little importance (1), or not important (0);
- c. The numerical values of the scores for a set of questions were summed to arrive at a total score where the highest total score is associated with the most important item; and
- d. The resulting summed scores permit inferences to be made about the selection of a specific group of people or specific issue.

RESULTS AND DISCUSSION

Background of respondents

The respondents to the national study were all personnel of coastal LPAs. Figure 3 shows the breakdown of their backgrounds. Half of the respondents were professional town planners. This is followed by assistant town planners (29%) and planning technician (21%) respectively. The pattern of respondent different roles indicates the validity of data in analysing the acceptance of CM among the planning officers in Peninsular Malaysia.

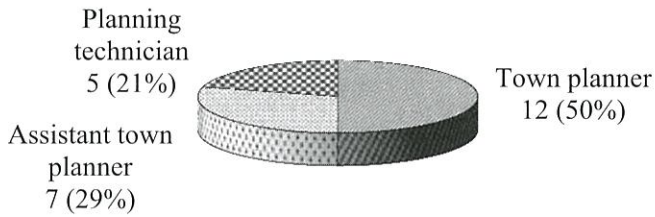


Figure 3: Roles of respondents in the national study

The national questionnaire covered 40 coastal LPAs. The state of Selangor provided the largest number of responding coastal LPAs. There was one response from at least one LPA in each of the 11 states, indicating that the overall coastline of Peninsular Malaysia was covered. Figure 4 shows the coastal LPAs involved in the national survey. The distribution of responses was quite evenly spread between the west and east coasts of Peninsular Malaysia. Thus, this means that the following analysis represents the whole study area of Peninsular Malaysia.

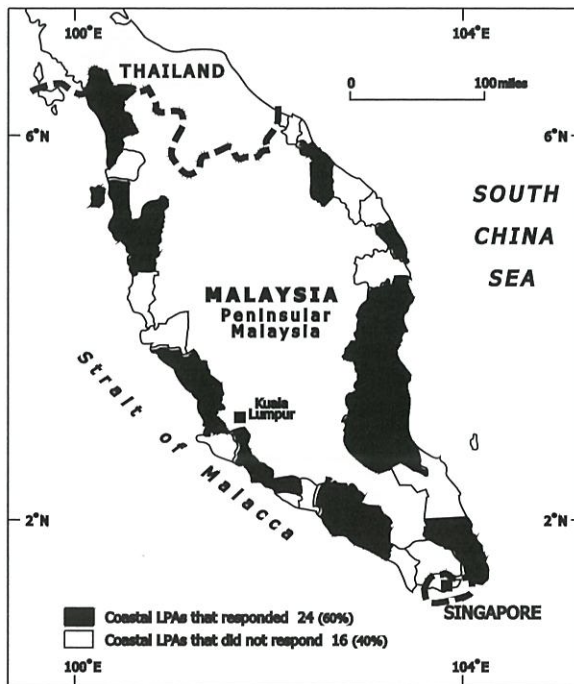


Figure 4: Coastal LPAs involved in the questionnaire survey

Awareness of the concept of CM

Currently, Malaysia as a whole has not developed a national coastal management programme. As one of the stakeholders in the coastal management initiative, planners were asked to see the level of the awareness of the coastal management concept (Figure 5). This question is limited at local level; over half (58%) of the respondents considered they were poorly aware. A further 17% did not know about the relevance of CM in their daily planning work commitments. This is not surprising given the limited national achievement on CM and the fact that respondents were town planners who mainly concentrate on terrestrial issues, particularly related with land matters. The result indicates that planners did not really realise that their works eventually contribute significantly towards the achievement of coastal strategies.

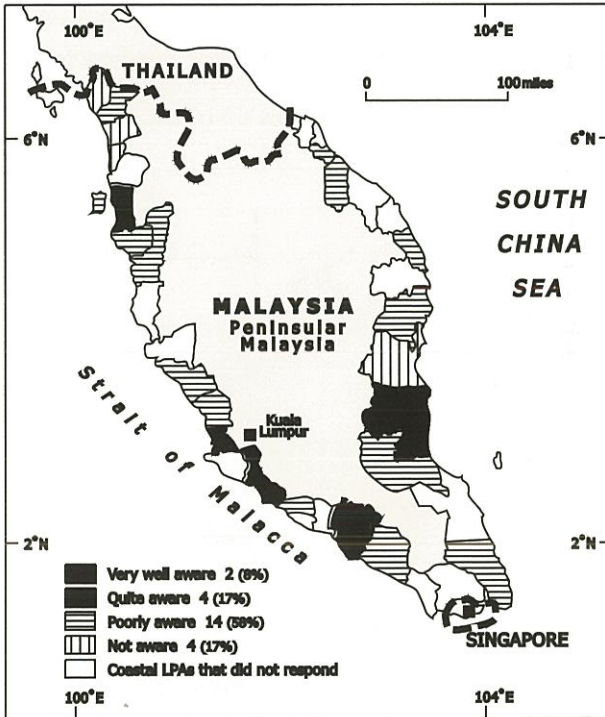


Figure 5: Level of awareness of the coastal management concept

Availability of CM plans and programmes

The previous question leads on to the subject of the availability of CM plans and programmes. As expected, few, 13% responding authorities had any CM

plan (Figure 6). It was reported that these plans were prepared because there were some substantial conflicts between economic development, environment and tourism in those LPAs areas (i.e., Klang Municipal Council, Seberang Perai Municipal Council and Pekan District Council). These areas have widespread development located within their coastal stretch in which the collaboration between TP and CM should be regarded as highly recommended. The plans, however, were merely on voluntary efforts and did not have statutory status. This situation consequently leads to the issue of lacking of implementation works on the ground. Similarly, only four responding authorities (17%) had a CM programme as shown in Figure 7. The LPA are Klang Municipal Council (declaration on Port Klang Coastal Strategy), Muar Municipal Council (a programme integrating the coastal and river management sectors of its development plans), Sepang Municipal Council (coastal development of Bagan Lalang area) and Kuala Selangor District Council (conservation of mangrove forest reserve). This demonstrates that the nature of programmes was basically focused on the environmental management resources, targeting on specific coastal issue. Currently, no comprehensive CM programmes were undertaken in an integrated approach between the agencies involved in TP and CM.

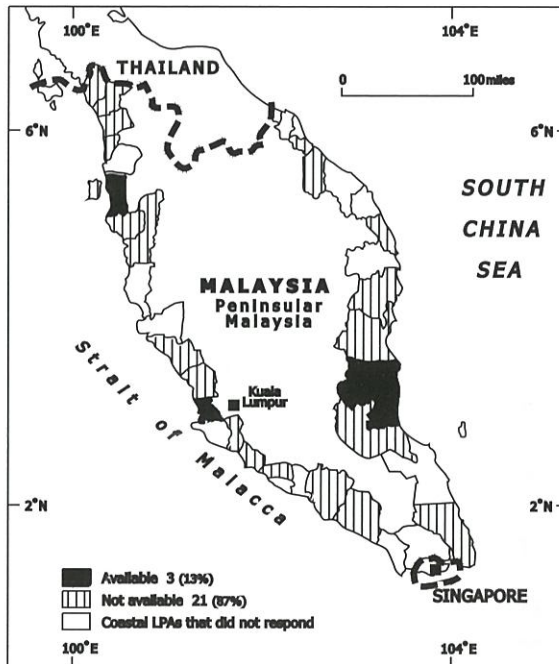


Figure 6: Availability of CM plans

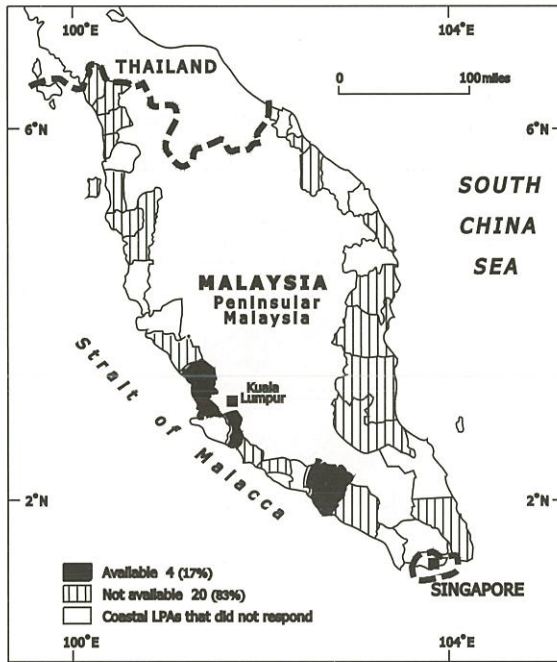


Figure 7: Availability of CM programmes

Availability of any other programmes on CM

LPAs can be involved in CM indirectly through coastal groups. This could allow CM objectives to be delivered through TP practice. However, generally throughout the country, there is little commitment to coastal groups. Only Alor Gajah Municipal Council and Penang Municipal Council (8%) said that they have coastal groups (Figure 8). The main tasks of these groups are cleaning up the coastal areas or maintenance of the facilities provided at the beach for public use. These groups were formed by the department for planning and development control. The low response on having coastal groups is the main concern of this study where it reflects the priority is not given to the CM work as part of the TP works. Meanwhile, four other LPAs (Port Dickson Municipal Council, Marang District Council, Kubang Pasu District Council and Yan District Council) intended to set up coastal groups. A specific question was asked about the reasons for setting up coastal groups as shown in Table 3. Generally, the result demonstrates that concern for public safety seems to be the most important reason for setting up coastal groups, followed by (in priority order):

- a. Increased environmental pollution (Score of 9);
- b. Economic benefit from coasts (Score of 9);
- c. Loss of habitat (Score of 8); and
- d. Increasing onshore development (Score of 8).

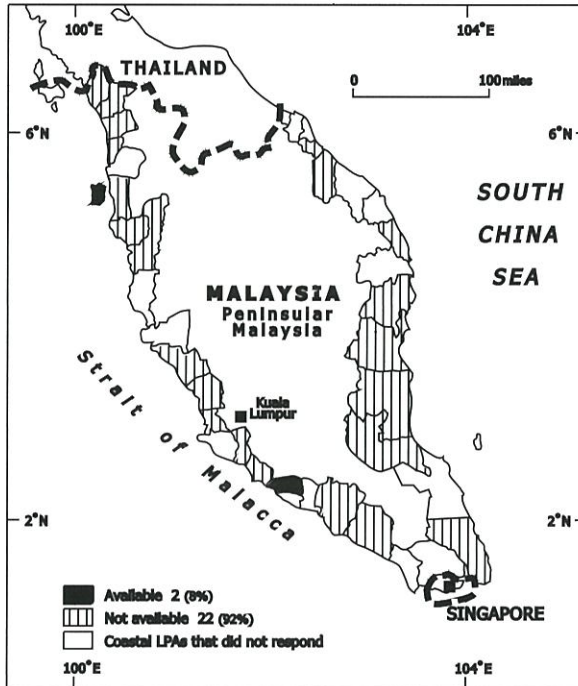


Figure 8: Availability of coastal group

Table 3: Reasons identified for setting up coastal groups

Reasons	Very significant (Score of 3)		Moderate significance (Score of 2)		Minor significance (Score of 1)		Not relevant (Score of 0)		Total	
	No. (%)	Score	No. (%)	Score	No. (%)	Score	No. (%)	Score	N (%)	Score
	1. Concern about the protection of public safety within coastal areas	3 (75)	9	1 (25)	2	0	0	0	0	4 (100)
2. Increasing environmental pollution	2 (50)	6	1 (25)	2	1 (25)	1	0	0	4 (100)	9
3. Economic benefit from coasts	1 (25)	3	3 (75)	6	0	0	0	0	4 (100)	9

4. Increasing loss of habitats	2 (50)	6	0	0	2 (50)	2	0	0	4 (100)	8
5. Increasing onshore development	1 (25)	3	2 (50)	4	1 (25)	1	0	0	4 (100)	8
6. Increasing importance of fisheries activity	1 (25)	3	1 (25)	2	2 (50)	2	0	0	4 (100)	7
7. Importance of having an integrated approach	0	0	3 (75)	6	1 (25)	1	0	0	4 (100)	7
8. Commitment to Agenda 21	0	0	3 (75)	6	1 (25)	1	0	0	4 (100)	7
9. Concern about sea-level rise	1 (25)	3	0	0	2 (50)	2	1 (25)	0	4 (100)	5
10. Increasing navigational activities	0	0	2 (50)	4	1 (25)	1	1 (25)	0	4 (100)	5
11. Increasing offshore development	0	0	2 (50)	4	1 (25)	1	1 (25)	0	4 (100)	5
12. Directive from federal administration/government	0	0	2 (50)	4	1 (25)	1	1 (25)	0	4 (100)	5

Note: Total respondents answering this question 4 (Port Dickson Municipal Council, Marang District Council, Kubang Pasu District Council and Yan District Council)

Reasons for lack of programme on CM

The poor response on the awareness of CM and efforts undertaken in relation to TP and CM triggered the curiosity to the underlying reasons for that scenario. The main reason given for not being able to produce any programme on CM is that expertise in CM is not available (Table 4). Lack of manpower, combined with severe financial constraints, suggests there is a need to develop human and institutional capacity in CM at the local level because the limited expertise that exists is concentrated in universities, government organisations or independent research agencies.

Table 4: Reasons for not producing any programme on CM

Reasons	Very significant (Score of 3)		Moderate significance (Score of 2)		Minor significance (Score of 1)		Not relevant (Score of 0)		Total	
	No. (%)	Score	No. (%)	Score	No. (%)	Score	No. (%)	Score	No. (%)	Score
	1. No expertise in coastal management	15 (75)	45	3 (15)	6	0	0	2 (10)	0	20 (100)
2. Lack of manpower	13 (65)	39	3 (15)	6	1 (5)	1	3 (15)	0	20 (100)	46

3. Financial constraints	12 (60)	26	6 (30)	12	0	0	2 (10)	0	20 (100)	38
4. No directive from top administration	5 (25)	15	6 (30)	12	6 (30)	6	3 (15)	0	20 (100)	33
5. Poor level of awareness of coastal issues among administrative personnel	5 (25)	15	5 (25)	10	6 (30)	6	3 (15)	0	20 (100)	31

Note: Total respondents answering this question 20.

MAKING THE COAST VISIBLE TO PLANNERS

For too long the coast has been seen as a limited environmental issues and remained invisible in mainstream policy where planners involve largely in the process. With the advent of new approaches to coastal policy and planning, if the coast to receive the attention it demands from planners, then its wider social relevance must be elaborated and widely communicated. Taking into consideration the global movement on the significance of CM, it is essential that the TP system in Malaysia must be given a coastal focus. Previous practices indicate that the coast barely receives a mention in development plan and where it does, and then it is only in relation to major elements, all with a strong environmental focus, concerning the water environment and coastal erosion. This happens when the LPAs rely heavily on coastal areas for important economic sectors such as tourism activities. The formulation of Physical Plan for National Coastal Zones (*Rancangan Fizikal Zon Persisiran Pantai Negara*) by the Federal Town and Country Planning Department has marked a tremendous milestone for the nation in engaging coastal areas in planning practice. It is hoped that with this important document, the coast will not continue to remain virtually invisible in future spatial planning and policy in this country.

CONCLUSION

In terms of the relationship between CM and TP, the analysis of this paper suggests that generally planners have little awareness of CM. The notion of CM is rarely understood by Malaysian planners. Consequently, they do not recognise the importance of TP to CM or the nature of relationship between the two activities. This reduces the ability and capability of Malaysian planners to implement coastal policy but also leaves them with an expectation that TP can

play an over extended role in CM. In addition, this paper also discovers that development planning is greatly considered as the means by which TP can implement CM strategies. It is recognised that the development plan of TP can help implement CM objectives and strategies. This is the major mechanism by which TP can contribute to CM. As such, this study suggests TP has a vital role in implementing CM, considering town planner as the main player in the overall system of CM in Peninsular Malaysia. While planning is, perhaps, uniquely placed to lead this and there are advantages in it doing so, this study also has to acknowledge the drawbacks of this. In the end, it is felt that the planning function, with greater guidance and support from the government, could provide a platform for the future success of CM in Malaysia.

REFERENCES

- Abdullah, K. (1999). Malaysian coastal environment: planning, development and management of the environment in preparation for the next millennium. *Proceeding of the international symposium and exposition on coastal environment and management: challenges in the new millennium*. 13-15 October, 1999. Kuala Lumpur, Malaysia.
- Abdul Salam, M.N. (1998). *An overview of integrated coastal and estuarine area management*. Kuala Lumpur. World Wildlife Fund-Malaysia.
- Allmendinger, P., Barker, A. and Stead, S. (2002). Delivering integrated coastal zone management through land use planning [Electronic version]. *Planning Practice and Research*, 17 (2), 175-196.
- Asmawi, M. (2010) *Integrated Coastal Management and Town Planning in Peninsular Malaysia: Concept and Practice*, Mauritius: VDM Publishing.
- Basiron, M.N. (1998). The implementation of chapter 17 of Agenda 21 in Malaysia: challenges and opportunities. *Ocean and Coastal Management*, 41, 1-17.
- Bishop, K., Tewdwr-Jones, M. and Wilkinson, D. (2000). From spatial to local: the impact of the European Union on local authority planning in the UK [Electronic version]. *Journal of Environmental Planning and Management*, 43 (3), 309-334.
- Blowers, A. (2000). Ecological and political modernisation [Electronic version]. *Town Planning Review*, 71 (4), 371-393.
- Chong, L. S. (2001). Coastal zone management: the Malaysian experience. *National conference on hydrology, hydraulics and sustainable water resources management*. Kuala Lumpur.
- Cicin-Sain, B. and Knecht, R.W. (1998). *Integrated coastal and ocean management: concepts and practices*. USA: Island Press.
- Department of the Environment. (1995). *Coastal planning and management: a review of earth science information needs*. London: HMSO.
- Dumashie, D.A. (2001). *Strategic management of the coast: landowners, local authorities and coastal zone management*. Unpublished doctoral dissertation. UK: The University of Wales.
- Economic Planning Unit. (1985). *National coastal erosion study phase 1*. Kuala Lumpur: Economic Planning Unit.
- Gubbay, S. (2003). From land use planning to sea use planning. In Earll, R. (ed.) *Spatial planning in the coastal and marine environment: next steps to action*. CoastNET conference 1 October 2003, SOAS, University of London.
- Halliday, J. (1986). *Coastal zone management in England and Wales. a study of*

- area, organisation and attitude. Unpublished doctoral dissertation. UK: University of Wales.
- Harakunarak, A. (2001). *Malaysia: ICM Country Profile*. Retrieved September 14, 2005 from www.globaloceans.org/country/malaysia.
- Haslett, S. (2008). *Coastal Systems* (Second edition). UK: Routledge.
- Jakobsen, F., Hartstein, N., Frachisse, J. and Golingi, T. (2007). Sabah shoreline management plan (Borneo, Malaysia): Ecosystems and pollution [Electronic version]. *Ocean & Coastal Management*, 50 (1–2), 84-102.
- Jones, V. and Westmacott, S.E. (1993). *Management arrangements for the development and implementation of coastal zone management programmes*. World Coast Conference 1993. International Conference on Coastal Zone Management. The Netherlands: Coastal Zone Management Centre.
- Kay, R. and Alder, J. (2005). *Coastal Planning and Management* (Second edition). UK: Taylor and Francis.
- Klee, G.A. (1999). *The coastal environment: toward integrated coastal and marine sanctuary management*. New Jersey: Prentice Hall.
- Ministry of Science, Technology and the Environment. (1992). *The coastal resources management plan for South Johore, Malaysia*. Manila: ICLARM
- Mokhtar, M. and A.Ghani Aziz, S.A. (2003). Integrated coastal zone management using the ecosystems approach: some perspectives in Malaysia [Electronic version]. *Ocean and Coastal Management*, 46, 407-419.
- Pido, M.D. and Chua, T.-E. (1992). A framework for rapid appraisal of coastal environments. In Chua, T.-E. and Scura, F. (Eds.), *Integrative framework and methods for coastal area management* (pp. 133-148). Manila: International Center for Living Resources Management.
- Rydin, Y. (1998a). Land use planning and environmental capacity: reassessing the use of regulatory policy tools to achieve sustainable development [Electronic version]. *Journal of Environmental Planning and Management*, 41 (6), 749-765.
- Rydin, Y. (1998b). *Urban and environmental planning in the UK*. Basingstoke: Macmillan Press Ltd.
- Sorensen, J.C. and McCreary, S.T. (1990). *Institutional arrangements for managing coastal resources and environments*. Washington D.C.: U.S. National Park Service.
- Southgate, M. (2003). The plan-led approach. In Earll, R. (ed.) *Spatial planning in the coastal and marine environment: next steps to action*. CoastNET conference 1 October 2003, SOAS, University of London.
- Stojanovic, T.A. (2002). *Coastal strategies in England and Wales: principles for managing information*. Unpublished doctoral dissertation. Cardiff:

University of Wales, Cardiff:

- Syed Abdullah, S.M. (1992). Development plan for coastal zone management in Malaysia: issues and recommendations. In Tjia H.D. and Syed Abdullah, S.M. (Eds.), *The coastal zone of Peninsular Malaysia* (pp. 63-71). Kuala Lumpur: Universiti Kebangsaan Malaysia.
- Taussik, J. (1998). The contribution of town and country planning to the management of coastal resources: England/Wales and Sweden. *Scandinavian Housing and Planning Research*, 15, 175-182.
- Taussik, J. (2001). *Collaborative planning in the coastal zone*. Unpublished doctoral dissertation. Cardiff: Cardiff University.
- Taussik, J. (2004). *Changes to the planning system*. Unpublished document.
- Usulludin, Y. (1999). *A legal and policy analysis of integrated coastal zone management within the framework of sustainable development: protection and preservation of the Malaysian coastal environment*. Unpublished doctoral dissertation. UK: University of Wales.
- Vallega, A. (1999). *Fundamentals of integrated coastal management* (Vol. 49). The Netherlands: Kluwer Academic Publishers.

NOTES TO CONTRIBUTORS AND GUIDELINES FOR MANUSCRIPT SUBMISSION

INTRODUCTION

The Journal of the Malaysian Institute of Planners or PLANNING MALAYSIA is a multidisciplinary journal related to theory, experiments, research, development, applications of ICT, and practice of planning and development in Malaysia and elsewhere.

The objective of the journal is to promote the activity of town planning through dialogue and exchange of views concerning professional town planning practice. PLANNING MALAYSIA will welcome any news, feature articles, or peer reviewed (including book reviews, software review, etc.) articles for publication. All articles should be original work by the authors. **Articles, views and features will not be taken to be the official view of the Malaysian Institute of Planners (MIP) unless it carries the name of MIP as the author.** This is to encourage open discussion on diverse issues and opinion for the advancement of town planning practice. Articles and contributions will be accepted from MIP members and non-members worldwide.

In year 2010, PLANNING MALAYSIA Journal has been indexed in SCOPUS. Previous issues of PLANNING MALAYSIA Journal can be viewed on the MIP website.

SUBMISSION OF MANUSCRIPTS

Manuscript should be emailed to pmjournal@gmail.com. Manuscript should ideally be in the range of 8-10 pages long. Each manuscript should have a title page and an abstract of about 150 words. The title page should contain the title, full name(s), designation(s), organizational affiliation(s), a contact address, and an email address. All manuscripts are received on the understanding that they are not under concurrent consideration at another journal. Exclusive copyright of accepted manuscripts shall be assigned to the Publisher (i.e. the MIP), and in consideration for this, one copy of the current Journal will be provided for each article. Additional reprints of article can be ordered, at cost, by the author(s). PDF format of the article (if available) can be obtained from the Publisher.

LAYOUT

Manuscript should be typed in single spacing (including footnotes, endnotes and references) on one side of the paper only (preferably A4) with the following margins: right and left - 4.25 cm, top - 5.5 cm and bottom - 5.2 cm (including header – 4.5 cm and footer – 4.3 cm) in 11 point Times New Roman font. Footnotes should be numbered consecutively and placed at the end of the manuscript. Footnotes should be kept to a minimum. Tables and diagrams should be provided in the text. References should follow the APA (6th Edition) referencing format. All foreign words must be typed and transliterated. The Editorial Board reserves the right to change the transliteration of all historical names, titles and non-English terminology to bring them into conformity with its own style.

USE OF FORMULA, FIGURES AND TABLES

Formula (mathematical formula) should be used only when necessary and the CONCLUSION derived must be explained and made intelligible to a non-mathematical reader. Wherever possible, authors are encouraged to place the mathematical parts of the article in an appendix. In cases of empirical articles, authors are expected to make readily available a complete set of data and any specialized computer programs to interested readers.

All illustrations, figures and/or tables in the manuscript must be captioned, in clear black and white (grayscale) and ready for reproduction.

REFEREEING PROCEDURE

Manuscripts will be acknowledged upon receipt. Only selected (preferred) manuscripts will be **reviewed by two (or three) referees** in addition to the editors. Editorial decision will normally be made within **two to six months**, but circumstances beyond control occasionally dictate a longer cycle. If authors are invited to prepare a revision for further consideration, the major issues to be resolved will be outlined and will be forwarded to them as quickly as possible.

ACCEPTED ARTICLES

Authors of accepted articles will be requested to provide a digital copy of the manuscript, preferably in Microsoft Word to the MIP (the Publisher) via email at pmjournal@gmail.com. MIP will not be responsible for the loss or damage of the digital copy.

COPYRIGHT

Copyright & Creative Commons Licence
eISSN: 0128-0945 © Year. The Authors. Published for Malaysia insitute of planner.
This is an open-access article under the [CC BY-NC-ND](#) license.

The authors hold the copyright without restrictions and also retain publishing rights without restrictions.

Contact:

Editor-in-Chief
PLANNING MALAYSIA
Journal of the Malaysian Institute of Planners
B-01-02, Jalan SS7/13B, Aman Seri, Kelana Jaya,
47301, Petaling Jaya, Selangor Darul Ehsan, MALAYSIA
Tel: +603 78770637 Fax: +603 78779636
Email: pmjournal@gmail.com
Homepage: www.planningmalaysia.org

ETHIC STATEMENT

The Journal of the Malaysia Institute of Planners or **PLANNING MALAYSIA** is a peer-reviewed journal. This statement spells out ethical behaviour of all parties involved in the act of publishing an article for this journal, i.e. the author, the peer-reviewer, the chief editor and editors, and the publisher. This statement is based on COPE's Best Practice Guidelines for Journal Editors. URL: http://publicationethics.org/files/u2/Best_Practice.pdf

DUTIES OF AUTHORS

Reporting Standards

Authors of original research should present an accurate account of the work done as well as an objective discussion of its significance. Data of the research should be represented accurately in the article. An article should contain sufficient detail and references to permit others to replicate the work. Fraudulent or knowingly inaccurate statements constitute unethical behaviour and are unacceptable.

Data Access and Retention

Authors may be asked to provide the raw data in connection with an article submitted for editorial review, and should be prepared to provide public access to such, if practicable, and should in any event be prepared to retain such data for a reasonable time after publication.

Originality and Plagiarism

Authors should ensure that they have written entirely original works, and if the authors have used the work and/or words of others this must be appropriately cited or quoted. Such quotations and citations must be listed in the Reference at the end of the article.

Multiple Publication

An author should not in general publish manuscripts describing essentially the same research in more than one journal or primary publication. Submitting the same manuscript to more than one journal concurrently constitutes unethical publishing behaviour and is unacceptable.

Acknowledgment of Sources

Proper acknowledgment of the work of others must always be given. Authors should cite publications that have been influential in determining the nature of the reported work.

Authorship of the Paper

Authorship should be limited to those who have made a significant contribution to the conception, design, execution, or interpretation of the study, and should be listed as co-authors. Others who have participated in certain substantive aspects of the research project, they should be acknowledged or listed as contributors.

Corresponding Author

Corresponding author is the author responsible for communicating with the journal for publication. The corresponding author should ensure that all appropriate co-authors and no inappropriate co-authors are included on the paper. All co-authors have seen and approved the final version of the paper and have agreed to its submission for publication.

Acknowledgment of Funding Sources

Sources of funding for the research reported in the article should be duly acknowledged at the end of the article.

Disclosure and Conflicts of Interest

All authors should disclose in their manuscript any financial or other substantive conflict of interest that might be construed to influence the results or interpretation of their manuscript.

Fundamental Errors in Published Works

When an author discovers a significant error or inaccuracy in his/her own published work, it is the author's obligation to promptly notify the journal editor or publisher and cooperate with the editor to retract or correct the paper.

DUTIES OF REVIEWERS

Contribution of Peer Review

Peer review assists the chief editor and the editorial board in making editorial decisions while editorial communications with the author may also assist the author in improving the paper.

Unqualified to Review or Promptness

Any reviewer who feels unqualified to review the assigned manuscript or unable to provide a prompt review should notify the editor and excuse himself/herself from the review process.

Confidentiality

Manuscripts received for review must be treated as confidential documents. They must not be shown to, or discussed with, others except as authorized by the chief editor. Privileged information or ideas obtained through peer review must be kept confidential and not used for personal advantage.

Standards of Objectivity

Reviews should be conducted objectively. There shall be no personal criticism of the author. Reviewers should express their views clearly with supporting arguments.

Acknowledgment of Sources

Reviewers should identify relevant published work that has not been cited by the authors. Any statement that had been previously reported elsewhere should be accompanied by the relevant citation. A reviewer should also call to the chief editor's attention any

substantial similarity or overlap between the manuscript under consideration and any other published paper of which they have personal knowledge.

Conflict of Interest

Reviewers should decline to review manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors.

DUTIES OF EDITORS

Decision on the Publication of Articles

The chief editor of the PLANNING MALAYSIA is responsible for deciding which of the articles submitted to the journal should be published. The chief editor may be guided by the policies of the journal's editorial board subjected to such legal requirements regarding libel, copyright infringement and plagiarism. The chief editor may confer with other editors or reviewers in making this decision.

Fair play

Manuscripts shall be evaluated solely on their intellectual merit.

Confidentiality

The chief editor/editors and any editorial staff must not disclose any information about a submitted manuscript to anyone other than the corresponding author, reviewers, potential reviewers, other editorial advisers, and the publisher.

Disclosure and Conflicts of Interest

Unpublished materials disclosed in a submitted manuscript must not be used by anyone who has a view of the manuscript while handling it in his or her own research without the express written consent of the author

PLANNING MALAYSIA JOURNAL: THE PAST ISSUES

Volume 1, 2003:

- Incorporating Sustainable Development Objectives Into Development Plans Through Strategic Environmental Assessment
– *Muhammad Faris Abdullah & Ishak Ariffin*
- Environmental Concern In Local Planning Practice
– *Foziah Johar*
- Ecotourism Planning: Who is Really Responsible?
– *Badarudin Mohammed & Abdul Aziz Hussin*
- Towards A Sustainable Built Environment: Environmentally Conscious Planning, Design and Construction
– *Norhayati Mahyuddin*
- Rural Sustainability: An Examination Of The Practice Of Sustainable Development Principles In A Rural Community In Malaysia
– *Ibrahim Ngah*
- Managing Urban Development Process By Using Spatial Information System: A Case Study of *I-Space*
– *Alias Abdullah, Muhammad Faris Abdullah & Fauzan Nordin*
- USM Pushing The Frontier Of Town Planning
– *Lee Lik Meng*
- The Suburbanisation Of The Kuala Lumpur Metropolitan Region
– *Jamalunlaili Abdullah*

Volume 2, 2004:

- Creating The Essence Of Cities: The Putrajaya's Experience
– *Jebasingam Issace John*
- A Study To Evaluate Child-Friendly Neighbourhoods Through A Set Of Child-Friendly Indicators
– *Alias Abdullah & Nik Mumerahanim Nik Muhammad*
- The Evaluation Of Beaches In Northern Malaysia
– *Badarudin Mohammed, Rahmat Azam Mustafa, Adrin Abdullah, A. Ghafar Ahmad & Shida Irwana Omar*
- Urban Land Use Change & The Langat Basin Ecosystem Health
– *Shaharudin Idrus & Abdul Samad Hadi*
- Application Of Land Use Approaches In Controlling Industrial Wastewater Discharge Into River
– *Muhammad Faris Abdullah*

Volume 3, 2005:

- Planning Education, Accreditation & Inter-Professional Links
– *Mohd Thalha Alithamby*
- Electronic Local Authority Management System
– *Tan Thean Siew*

- A Study On The Demand Of Spatial Planning & Decision Support System In Malaysia
– *Muhammad Faris Abdullah, Alias Abdullah, Mansor Ibrahim & Dazilah Abdul Samad*
- The Technology Of Asset Management & Maintenance Culture In Ensuring Sustainable Development
– *Khairiah Talha & KC Leong*
- Tessellation Planning & Honeycomb Housing
– *Mazlin Ghazali, Michael J. Durack & Mohd Peter Davis*
- The Application Of The Concept Of Defensible Space For Secured Housing Environment
– *Saari Omar & Megat Arif Shah Megat Omar*

Volume 4, 2006:

- How We Failed To Plan For Habitability
– *Lee Lik Meng, Aldrin Abdullah, Tan Sook Fern, Nurwati Badrulzaman & Ahmad Sanusi Hassan*
- Cairo's Al-Azhar Park: Millennium Development Goals Etched In Green
– *Khaled el-Khishin*
- Knowledge Cities: Examining The Discourse Smart Villages, Internet Cities Or Creativity Engines
– *Ali A. Alrouf*
- A Preliminary Investigation Of A Model On The Decision To Implement Teleworking In The Japanese Business Organisations
– *Abdul Azeez Kadar Hamsa & Masao Miura*
- An Integration Of Multicriteria Analysis With GIS In The Malaysian National Physical Plan
– *Nor Sallehi Kassim & Rafikul Islam*

Volume 5, 2007:

- Effectiveness of Public Participation Programme: A Feedback from Participants (Sabak Bernam District Local Plan and Kuala Lumpur Structure Plan)
– *Dasimah Omar & Oliver Ling Hoon Leh*
- Multicriteria Analysis of Flood Causes in Kuala Lumpur
– *Nur Fazzillah Muhamed Noordin, Alias Abdullah & Muhammad Nur Azraei Shahbudin*
- Urban Housing Development: Town Planning Issues
– *Ibrahim Mohd @ Ahmad, Ezrin Arbi & Ahmad Ramly*
- Sustainable City Planning: Emphasis on The Management of Environmentally Sensitive Areas
– *Halimaton Saadiah Hashim, Joy Jacqueline Pereira & Ibrahim Komoo*
- The Environment Component in Sustainability Assessment at The Local Level Plan
– *Abdul Hadi Harman Shah, Shahrudin Idrus & Abdul Samad Hadi*
- Developing a Communicative Planning Approach to Resolve Land Use Conflicts in Jelutong Area of Georgetown, Penang, Malaysia
– *Mohammad Abdul Mohit & Raja Mohd. Firdous B. R.M. Harun*
- Komuniti Mapan: Penilaian Tahap Kemapanan Komuniti Orang Asli Temiar Di Perak
– *Khairul Hisyam B. Kamarudin & Ibrahim B. Ngah*

- Book Review: “The Boulevard Book”
– *Shu Charng Yen*

Volume 6, 2008:

- Safe City Programme: Are we on the right path to reduce crime?
– *Kamalruddin bin Shamsudin*
- The Contribution of *Fiqh al-Jinayat* (Islamic Criminal Law) To The Planning of A Safe City
– *Azila Ahmad Sarkawi, Ahmad Basri Ibrahim & Alias Abdullah*
- Urban Crime and Safe Neighbourhood: Community Perspectives
– *Khairiah Talha*
- Towards A Safe Place for Children in Today’s Residential Neighbourhoods
– *Halimaton Saadiah Hashim, Joy Jacqueline Pereira & Ibrahim Komoo*
- Role of Land Use Planning in Improving Public Health: Way Forward For Malaysia
– *Ainul Jaria Maidin*
- Energy Consumption and Carbon Dioxide Emission Considerations in The Urban Planning Process in Malaysia
– *Wee Kean Fong, Hiroshi Matsumoto, Chin Siong Ho & Yu Fat Lun*

Volume 7, 2009:

- Urbanization, Environmental Planning and Management: A Challenge for Jamaica.
– *Leiska J. Powell*
- Structural Changes of The Malaysian Economy and Its Spatial Incidence on Regional Economic Growth
– *Mohammad Abdul Mohit*
- Urban Sustainability and Growth Management in South-East Asian City-Regions: The case of Kuala Lumpur and Hong Kong
– *Suharto Teriman, Tan Yigitcanlar, Severine Mayere*
- Urban Sprawl in Malaysia: Evidences From Three Largest Metropolitan Areas
– *Jamalunlaili, Mohd. Zulhafidz Yahaya, Mohd Zuwairi Mod Yunus & Mohd Shakir Md Ali Safudin*
- An Integrated Approach for The Prediction of Water Quality Index Based on Land Use Attributes Using Data Generation Method and Back Propagation Network Algorithm
– *Faris Gorashi & Alias Abdullah*
- Groundwater Extraction Modeling for Kuala Lumpur Water Resource Planning
– *Pieter E. Stek*
- Power of The Local Authority in Regulating Land Planning and Development Control: Whither Control
– *Ainul Jaria Maidin & Bashiran Begum Mobarak Ali*
- Australia Planning Report Card – Telling It Like It Is!
– *Liz de Chasterl*

Volume 8, 2010:

- Vehicle Ownership and Quality of Life in Urban Residential Neighbourhoods, Northern Peninsular Malaysia

- *Abdul Ghapar Othman & Hassim Mat*
- Analysis of Commute Characteristics and Residential Location Choice of IIUM Gombak Campus Employees of Malaysia.
- *Mohammad Abdul Mohit & Mootaz Munjid Mustafa*
- The Relationship between Urban Population Density and Transportation Fuel Consumption in Malaysian Cities
- *Neoh Siew Yin & Ho Chin Siong*
- The Socio-technical Factors in the Use of GIS at the Planning Departments of the Kuala Lumpur City Hall
- *Mohd Ramzi Mohd Hussain*
- Book Review: Handbook of Research on E-Planning: ICTs for Urban Development and Monitoring, Carlos Nunes Silva (Eds.) IGI Global Publishing Company, Hershey, Pennsylvania, USA (2010). 454 pages. ISBN-13:9781615209293.
- *Alias Abdullah & Carlos Nunis Silva*

Volume 9, 2011:

- City Development Strategies (CDS) Contribution Toward Sustainable Urban Development in Developing Countries
 - *S. Mostafa Rasoolimanesh, Nurwati Badarulzaman & Mastura Jaafar*
- Urban Residents' Attitude Toward Wildlife in Their Neighbourhoods: The Case Study of Klang Valley, Malaysia
 - *Nik Hanita Nik Mohamad*
- Evaluating Stakeholders' Preferences: Reconciling Heritage And Sustainability In Kuala Lumpur Traditional Area
 - *Noor Amila Wan Abdullah Zawawi & Alias Abdullah*
- Solid Waste Generation Characteristics: The Malaysia Local Authorities' Outlook
 - *Muhammad Abu Eusuf, Mansor Ibrahim, Shamzani Affendy Mohd. Din & Rafikul Islam*
- Urban Air Environmental Health Indicators: A Preliminary Set for City of Kuala Lumpur
 - *Oliver Ling Hoon Leh, Shaharuddin Ahmad Kadaruddin Aiyub & Yaakob Mohd. Jani*
- Classification of Satellite Fused Data for Land Use Mapping in Development Plan
 - *Norzailawati Mohd Noor, Alias Abdullah & Mazlan Hashim*

Special Issue, 2011:

- Conservation with Development: Showcasing Langkawi Geopark - An Introduction
 - *Halimaton Saadiah Hashim & Rahimah Abdul Aziz*
- Geopark for Heritage Conservation: A Need for Integrated Planning and Management
 - *Rahimah Abdul Aziz, Halimaton Saadiah Hashim, & Ibrahim Komoo*
- Implementing Langkawi Geopark Through Land Use Planning
 - *Noor Yazan Zainol, Hapiz Abd Manap, Ibrahim Yacob, Mahani Muhammad, Mariam Tajuddin & Ikhwan Mohd Said*
- The Importance of Geological Heritage Resources in Land Use Planning: Experience From Langkawi Geopark
 - *Che Aziz Ali & Tanot Unjah*
- Land Use Planning Statutes for Langkawi Geopark Conservation and Development
 - *Sarah Aziz, Halimaton Saadiah Hashim, Rahimah Abdul Aziz, Chan K. L. Geraldine & Tanot Unjah*