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EDITORIAL PREFACE

It is our great pleasure to announce that starting from June 2018; ALAM CIPTA is indexed in the SCOPUS. It is an important milestone for us and we are committed to elevate the quality of ALAM CIPTA higher. The scope of ALAM CIPTA is about sustainability in the context of planning and design. For this issue, nine articles are published and the topics cover the relationship of sustainability with spiritual aspect, human health, food security, city evolution and design process. These articles are received, reviewed and process according to submission and production time frame rather than editorial preferences.

Spiritual aspect of sustainability is a narrative that rarely been discussed in sustainable design framework. By looking into Green Building Index (GBI) rating system, Hailane Salam and Nik Lukman Nik Ibrahim argue that GBI is secular in nature and it is problematic. By focusing on Malay architecture as model of a design with spiritual values but yet sustainable, the authors argue there is a need to embed spiritual values in future development. Meanwhile, Zulkifli Muslim reported that nature with its spiritual values can be transformed into a product design. For the author, nature (plants) should be a basis for design not only for the design form but also for design process itself. In this regards, the design will be more meaningful.

Low Bee Teng, Roslina Sharif, Wan Sofiah Wan Ishak, Marek Kozlowski and Sumarni Ismail discuss the effect of developments and mental health by using literature review method. They argues that the effect is real and in Malaysian context, if the development is not being design wisely, mental and stress issues will increase. Nursuriani Shaffee and Shureen Faris Abd Shukor acknowledge the problem of mental stress and development and therefore, they conducted systematic review about the relationship of nature and stress. They found out that exposure to nature over time will reduce stress greatly. These two articles emphasize how health issue [stress] is important in relation to development. It is an opinion of the editors that stress level should be an indicator how sustainable the development is.

It is interesting to note that Muhammad Shafiq Mokhtar Baharudin, Rahinah Ibrahim, Khalina Abdan and Ali Rashidi argues that the current urban farming system may be limited to several type of crops only and they argues that by introducing vertical system for climbing food plants, more types of crops can be planted. One aspect of sustainability is society well-being and the society needs food to survive and the article providing possibility for more crops to be planted in our cities. It is a hope that one day our city will be able produce totally their own foods thus making the city greener and sustainable.

Zhao Long, Zulkifli Hanafi and Wong Hong Wei described the evolution of Georgetown, Pulau Pinang from 1786, a year Sir Francis Light opened the city as a British trading port. They argue that the physical development of Georgetown not only base on the economic needs but also social factors. The social factors are very much shaping the physical forms or townscapes of Georgetown and they provide meaning to the heritage buildings or spaces that exist today. In order for Georgetown to further maintain it heritage values, these social factors need to be taken into consideration for heritage planning and design as well and the continuance of the sustainability of Georgetown.

Mohd Kher Bin Hussein and Mohd Nazri Bin Saidon analyze the young landscape architects perception for recreational forest and they found that these young professionals even though prefer the forest condition but they are critical towards inharmonious relationship between man-made structures and natural landscapes. Meanwhile, Hassan Alli, Saiful Hasley Ramli, Zulida Rejali, Raja Ahmad Azmeer Raja Ahmad Effendi and Mohd Shahrizal Dolah discuss the important of having users to participate directly to product design process. Hassan Ali is using “product definition method” to validate his arguments, meanwhile, Saiful Hasley Ramli, Zulida Rejali, Raja Ahmad Azmeer Raja Ahmad Effendi and Mohd Shahrizal Dolah test the use of video and mannequin to observe how doctors conducting surgery. The papers highlight that if the product to be sustainable it must be comfort and meeting the needs of the users.

ALAM CIPTA accepts articles that concern with architecture, art and design related to the process, methods, techniques, practices and theories in expanding our understanding to ensure sustainability. All articles in this issue provide very relevant knowledge how can we plan and design our environment, built environment and products better. On behalf of the editors, I would like to thanks all the authors and reviewers who had work very hard. Your contribution is very valuable as it help the advancement and dissemination of knowledge to “cipta” [create] a better world. We encourage your feedbacks at alamciptaeditor@upm.edu.my and thank you for your continuous support of ALAM CIPTA.

EDITOR in CHIEF

ASPECTS OF SUSTAINABLE ARCHITECTURE: AN ISLAMIC PERSPECTIVE

Hailane Salam^{1,2*} and Nik Lukman Nik Ibrahim¹

¹Centre for Innovative Architecture and Build Environment (SERAMBI), Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia.

²Center of Studies for Architecture, Faculty of Architecture Planning and Surveying, Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor, Malaysia.

* Corresponding author:

hailane@salam.uitm.edu.my

ABSTRACT

This paper argues for a much broader role of Green Building by emphasising the relevance of spiritual aspect to its practice values. It focuses on a worldview that is grounded in Islamic intellectual tradition that promotes a holistic vision of sustainability with three major aims. Firstly, it is to present a critical evaluation of the secular view of current Green Building practice that relies on rating systems as a measurement of value. Secondly, this paper seeks to highlight the fact that the spiritual aspect is absolutely essential, which seems to be the underlying quality that is missing in today's society. We have lost the spiritual understanding of nature that has been embedded in our tradition, particularly in the traditional Malay architecture. Lastly, it is to provide an alternative worldview by learning from the tradition that holds the most promise for sustainability. It connects revelations that contain a spiritual message for humans with its symbolic cosmology with all orders of formal reality. For this reason, instead of merely emphasising the physical aspect of the built form, we could ensure the best environmental practices by expanding the Green Building to include the important role of spirituality.

Keywords: *Islamic spirituality, sustainable, traditional Malay architecture.*

1. INTRODUCTION

The words “green” and “sustainable” are used interchangeably in the practice of creating a structure that is environmentally responsible. According to Greenbuildingindex Sdn. Bhd. (2018), “Green building focuses on increasing the efficiency of resources use energy, water, and materials while reducing building impact on human health and the environment during the building’s lifecycle, through better siting, design, construction, operation, maintenance, and removal.” In keeping with this, the Green building rating systems exist to ensure that green building outcomes are being achieved. It rewards relative levels of compliance with specific requirements so that projects are not being harmful to the environment and natural resources (Stephen, Wheeler, & Beatley, 2014). Besides, it also reduces the overall impacts of the built environment and its surroundings. Therefore, in today’s world, there is no question that we must build green, as this will increase the positive results of human health impacts throughout the building’s entire life cycle.

Sustainability is seen differently from various perspectives and on various levels. With every viewpoint we take and every judgment we make, we must take into consideration that in keeping with sustainability goals without having thoughts, the physical world is all that exists. Spirituality is also identified as a necessary aspect of true sustainability (Carroll, 2004; Gupta et al., 2016). Judging from the way humans behave in the world that we live in today, empiricism and rationalism are equally essential in the system of knowledge. We constantly see that truth can be obtained in two different ways: through the senses and/or through reasoning (Allen & Goddard, 2017). For such a perspective, even the bases for many of the Green building rating or certification systems have also been established through an assessment based on rational ideas and empirical evidence.

We tend to give less priority to religious view in everyday life particularly due to the effect of secularism (Al-Attas, 2014a). The acquiring of knowledge today is largely from our senses with empirical and rational thinking; adding to that, sustainability and green concept that we understand were neglecting the spiritual thought (Carroll, 2004). A different understanding of its meanings is limited within the realm of physical reality, rather than its substantial qualities. This does not accord with religious perspectives that give equal attention to balance both the material aspect and the spiritual aspect of human life.

Nasr (2007) has argued that man's ego and the desire to conquer nature for economic motives and many others. It caused the environmental degradation we see today. When people are devoid of any spiritual values, often the exploitation of natural resources increases and done in a non-sustainable way (Phillips & Mighall, 2014). Such degrading values like greed and selfishness can mislead someone into attempts to take advantage, and green-related businesses are no exception. Their primary focus was to maximise profits rather than meeting the actual needs of sustainability. To some extent, there have been some failures in implementing sustainability policies to the current economic and social paradigm, which caused excessive consumption (Howes et al., 2017). Hence, an urgent need for a new economic paradigm arose from these problems focusing on degrowth; a reasonable downscaling of production and consumption.

In today's society, we are gradually losing the relationship between scientific knowledge and traditional wisdom. People have easily absorbed the empirical and materialistic understanding of the natural world because our modern attitudes perceive nature as an object for human purposes, and it does obscure the traditional religious view of nature (Caird, 1883). The thought is that only the material world that we live in exists and that religion is gradually separated from the physical aspect of nature. The idea that the universe consists of a sacred aspect that humans can learn from its phenomena is replaced by a way of life centred on human interests or values. We value sustainability with our sense of meaning. That is why we often see the cosmetic attempts toward sustainability than the real attempts occurring around us (Carroll, 2004).

Previous studies have shown that sustainable practice is not a new concept in Islam (Utaberta, Asif, & Hamzah, 2016; Omer, 2010). Many aspects were discussed especially on the physical and functional aspects of the mosque, including the Prophet's Mosque in Madinah that always be useful to people. Sustainability has always been one of the recognisable features in Islamic architecture that achieved from the total framework of Islam. There must have some connection with the intelligential world that underpins the Islamic architecture. Therefore, there exists a research gap to study the sustainability in its most inward and spiritual dimensions.

The objective of this study is to emphasise the spiritual aspects of sustainable architecture from the Islamic perspective. Especially for the Muslims, the Islamic vision of reality and truth as projected by al-Faruqi (1982) that are based on the worldview of Tawhid have so much potential to give positive emotions and feelings to a person. It is hoped that the concern about spirituality (rohani) will be able to lead an individual's thoughts and actions in achieving comprehensive sustainable architecture.

2. LITERATURE REVIEW

This section is an attempt to shed light on the term "secular" and how it translates into the current worldview. It will lead to a discussion on the effects of secular worldviews on the environment, and then present a critical evaluation of the secular view of the current Green building practices.

2.1 A Separation from Religion

The idea of secularism is "a separation from religion". In a broader context, this means a society functions without religion and sees religion as a separate part of daily life. Secularism began in the westernisation of Christianity, with a mixture of conflicting concepts in the seventeenth century, which led to the scientific revolution by Descartes, to "doubt" and "skepticism". This idea is consistent with his purely rational thinking, without reference to spiritual significance.

With regards to the environment, it is when nature is removed from the realm of sacred to secular. Historically in the West, this was a clear departure from the traditional society, one where religion was at the centre of every day; happened during the Renaissance (Caird, 1883). With the birth of humanism, society's interest gradually moved away from the Divine to scientific inquiry, and the soul was replaced by the mind.

Age of Enlightenment philosophers like Sir William Hamilton, who promoted empirical-rationalist, the worldviews and taught that humans have no faculty or organ of intelligence by means where he or she can perceive the realities of a (Divine) order. This is known as scientific or rationalist humanism. This change of mindset directly contradicts the religious claims of the existence of metaphysical realms and dehumanises mankind.

The belief system that proper means and tools can discover and predefined knowledge, which refers to the positivist, modernist worldview. The philosophers of the Enlightenment, based on the thinking of (i) empiricists like Bacon, Locke, Galileo and Newton; and (ii) rationalists like Descartes, Leibniz and Spinoza, sought to discover the true nature of the world around

them. The empiricists believe that careful observation would enable the human mind to determine its nature, while the rationalists believe that we can come to know about the world through logical reasoning.

2.2 A Secular Worldview on the Environment

“The West has developed technically in direct relationship to the decline of the Christian consciousness, for the simple reason that the ‘secularisation’ of nature, which permits it to be regarded as an object and so exploited technically.” During the time of the industrial revolution, where the height of philosophy resided in thinkers like Descartes and Hamilton, nature was perceived as a vast, open land. In the name of science and progress, humankind has given itself “licensed technical mind to desecrate the whole social context, the entire planet and to send out squads of scientific-technical experts to chart, dissect, ransack and ravage dispassionately, on the basis of empirical evidence and experiment...” (Sherrard, 2007, p73).

The ecological crisis is a result of the secular worldview that sees the environment as separate from humankind (Laitos, 2017). This explains how nature and the environment are removed from being connected with the Divine order and how it is part of a sacred realm to a worldview that sees nature as a commodity. One strategy to combat this ecological crisis brought about by mankind’s endeavour is the implementation of the Green Building standards. Buildings are now required to take consideration of its effects on the surrounding environment.

2.3 The Emergence of Green Building Practices

This awakening towards the catastrophic effects of environmental plunder and neglect was most notable during the industrial revolution. This scenario is popularly portrayed in Charles Dicken’s novels like *Oliver Twist*. Poor living conditions for the factory workers, child labours, polluted air and water, brought about many diseases and deaths in these early industrial towns. Therefore, it was in the twentieth century that the global ecosystem came with a resurgence of environmental concerns to increase the health, wealth and population (Kaya & Duman, 2017). Unfortunately, these macabre living conditions are not something of the past. In fact, it is a common condition in developing countries around the world that are changing their economy from agriculture towards industrial.

There are many initiatives at the international level promoting global debates about sustainability resulted in the implementation of efforts such as the “Earth Summit” which was held in Rio de Janeiro in 1992. It was the United Nations’ Conference on Environment and Development that emphasised the

need for solutions for sustainable development, with allowance for this it came out with a declaration known as Agenda 21. In its Chapter 7, it laid out directions for sustainable urban development (Stephen et al., 2014). Then, in 2003, the Green Building Programme was started after the European Union had come out with its Energy Performance of Buildings Directive (EPBD) (Mallgrave & Goodman, 2011).

2.4 The Current Green Building Practices

Many initiatives and strategies have been done to promote and implement Green buildings. It is clearly outlined in the policies, guidelines and programmes applicable to various types of buildings. The verification of green nature the project is measured through varied rating and certification systems. The responsibilities for Green building across the globe today have led to many versions of assessments and systems available to suit the local conditions, such as BREEAM in the United Kingdom, CASBEE in Japan, Green Marks in Singapore, and LEED in the United States (Iyengar, 2015). Indicators of sustainable development were also created to form a useful basis for decision-making with competitive measures.

Assessments encompass categories such as energy, water, air quality, materials, project management, land use and transportation to achieve the important goal of Green buildings. It measures how the building will affect land use, energy use, communities, as well as the indoors and outdoors environment in order to make improvements. These help to clarify which green standards need to be followed, which suggests that these goals should not be set for new buildings only but also for existing ones and temporary spaces.

In Malaysia, the Green Building Index (GBI) was first introduced in 2009. Since then, we have seen significant changes in how people look at buildings. Today, cooperation can be seen among all government agencies, local authorities, education and industries, who are involved at various levels working towards achieving the same interests, discussing barriers and identifying the needs for greater progress. There are many government agencies in Malaysia that are responsible for planning and executing various green policies, such as:

- i. Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC): Responsible to lead the National Science, Technology and Innovation (STI) Agenda. It has a mission to explore, develop and utilise STI to generate knowledge, create wealth and ensure societal wellbeing towards achieving a competitive, sustainable and inclusive high income economy.

- ii. Sustainable Energy Development Authority (SEDA): The main role is to administer and manage the implementation of the feed-in tariff mechanism under the Renewable Energy Act 2011 [Act 725].
- iii. Department of Environment (DoE), an agency under MESTECC: Responsible for ensuring sustainable development in the process of national development.
- iv. GreenTech Malaysia, an organization under the purview of MESTECC: To catalyze green technology deployment as a strategic engine for socio-economic growth in Malaysia, in line with the National Green Technology Policy 2009.
- v. Energy Commission: Responsible for regulating the energy sector, specifically the electricity supply and piped gas supply industries.

Every city across the world has given a top priority to sustainable urban development on their agenda (Teriman et al., 2009). Apart from the appointed government agencies, the local authorities and municipal council, such as the Subang Jaya Municipal Council (MPSJ) with its vision to be a smart and green city by 2030 (Nathan, 2014), also provide avenues to work with Green building standards by providing facilities. Every level in societies is now having more concern with their surrounding and aims for the sustainable built environment. The architectural practices in Malaysia today are geared towards green buildings and sustainable architecture. Many of the projects have won recognition and awards for the Green building owing to important elements of design concept such as energy efficiency, environmental protection, water efficiency and indoor environmental quality. The Diamond Building that was designed by NR Architect in Putrajaya is one of the best examples of the sustainable building that have good solutions, opportunities and creativity in reducing environmental impacts in our everyday lives.

Treating nature and the environment carried out in the name of science, the whole universe and its entities are sufficient to be controlled. The index systems of measuring the Green building characteristics are quantitatively centred to ensure that the completed buildings are not harmful to the human, man-made and environmental capital. It is not only concerning the buildings that are affected, but also the universe and living organisms like plants and animals. They can be explained and measured in terms of its structure and motion of its parts, as reflected in policy usage.

However, the reality is that humans have used natural resources to a great extent for their own economic ends (Laitos, 2017). There are still many cases where the modern industrial society creates the ambiance for an excessive density of population with chaos and greed. And the worst part is, the policy does not reflect reality and the nature of the universe. We quickly adopt environmental laws and policies based on what we want nature to work instead of how it works. Humans caused nature to turn from harmony into imbalance and disorder. The same worldview has been mentioned earlier, rising from the empiricism and rationalism present in our society up until today. It has a limitation to bring necessary changes, and in any case, this would not ensure genuine sustainability practices.

An attempt to foster the sustainability in the context of the universe best practice without a prior understanding of religious and spirituality will only provide a superficial overview. Spirituality is ultimately connected with, and cannot be regarded in isolation from the build environment. How can this be fostered to meet the contextual needs?

3. METHODOLOGY

This study analysed the sustainability theme, which obtained from two different areas; the current body of knowledge in the field of sustainability and spirituality that has a clear connection to the research problem. A review of substantial amount of articles from diverse sources on how the process of secularization began until the current time has revealed the impact of secularism on the environment. This furthermore has lead to the development of current Green building practices. The researcher was careful when analysing the reasons for incorporating green requirements into building projects to exclude threats to validity. The data were then described the central research problem; the secular worldviews on the environment and reality that environmental law and policies were adopted pertaining to what we wanted nature to work rather than how it does work.

Based on the review results, the analysis will be focusing on understanding the phenomena in a comprehensive way, with the aspiration that nature is not only for human beings. This has resulted in exploring the feasibility of the true sustainability in reference to religious beliefs. Built upon the concepts outlined by the Islamic intellectual tradition, this thought is to elaborate clearly the spiritual and symbolic dimensions. The idea that humankind is God's vice-regent on earth, and God is the Creator and Owner of nature could generates an observable outcome in giving the best recommendations to support a holistic sustainability. Much of this worldview came from the most prominent and influential Islamic philosopher, Abu Hamid Muhammad al-Ghazali with his

contribution in reviving the spiritual dimension of Islam. Several important themes in the Islamic perspective will be discussed particularly on the domains of the Islamisation of contemporary knowledge and of Muslim education by the eminent scholar Syed Muhammad Naquib Al-Attas; on the Islamic spirituality and cosmology by Seyyed Hossein Nasr and William Chittick; and the Islamic principles in the Malay aesthetic by Abdullah Mohamed, who is also known as Nakula. All these have inspirational to the researcher in articulating the Islamic spirituality in the context of sustainability.

The potential role of spirituality consistent with sustainable architecture was then evaluated. The following data were collected; the important role of religion in the environmental conservation and the concept of sustainability according to Islamic perspective. The Islamic view is referred to because sustainability is a fundamental principle that evolves with Islam. Towards the end, a close study of the concepts from the Qur'an and Sunnah revealed the relationship between spiritual and sustainability.

4. RESULTS AND DISCUSSION

It is clear from the above explanations that spirituality is something that is lacking in worldview today. Nature has lost its sacred character in modern science. The concern on spirituality could not be applied directly to Green building assessment systems; it requires courage and commitment. Taking this into account, the Islamic view can bring the focus back to the fact that the spiritual aspect is absolutely essential, and make an immediate impact on our heart and soul. We can learn from the Malays in the past on how they concerned about both physical and spiritual aspects particularly in the traditional Malay architecture. In order to achieve comprehensive sustainable architecture, something must be included in the current system. Instead of complying with the systems of value that measure mainly on material aspects, this thinking needs explore to reach morality and harmonious relationship between the inhabitants and nature. The involvement in sustainable programmes can be implemented in both human-centric and god-centric approaches.

4.1 Green Building Today is Human-centric

Today, many programmes cover a wide range of environmental topics and audiences for the purposes of obtaining Green building status. There are various reasons for them to incorporate green requirements into building projects but somehow, not all are doing with the intention to give a sense of value to the environment, but instead for the sake of an award or certification to prove that they are environmentally friendly so that they can obtain certain incentives.

The carrying capacity of the natural and social system in the practice of Green building is important for the projects to be truly sustainable. Genuine efforts for sustainability exist however, there are also pretentious claims. Despite the claims made by the marketing that their projects are environmentally sustainable, massive development with land clearance altering the natural landscape is still continued. Clearly, there is a need for a higher level of value systems that can help promote an idea in preventing selfishness and greed, which improves the quality of the built environment.

4.2 Returning to Religious Views of Nature

After drawing a historical line and showing how we got to where we are now, there are certain fundamental concepts of sustainability that are so important besides the empirical facts and indicators of the physical evidence that we have created today.

As a by-product of living in a secular society, we have lost the innate spiritual integration of the environment. Being confined to the secular view and aspects, one could only see the benefits of Green building with very human-centric. Nonetheless, problems still exist with regards to the idea of sustainability in the built environment, in the way we view land as a commodity to be bought and sold to make profits. Men have tried as much to take advantages of the opportunities that nature has afforded them. The motif of development is to make profits, and only then it would be considered as a fair return investment (Ravetz, 2013).

It started with the Western neglect of metaphysics on environmental, economic and social aspects. When the spiritual dimension was underdeveloped, it makes us self-centred and divorced from the transcendent; everyone has to take his or her own position as stakeholders, consultants and builders. When religion is no longer seen as a significant purpose in the environment, there exist authorities or agencies, and certifies that set the parameters to rate and award the buildings. Everyone is trying to catch up and come up with solutions to minimise the environmental issues, to the point that they have so many concerns over measuring the success quantitatively with tools they have produced.

Twenty-six years after the 1992 Rio Earth Summit, we are still struggling for architecture to be environmentally sustainable. Sustainability must come with a sense of wholeness and deeper commitments. Our mind has the capacity to comprehend both the physical and spiritual aspects. Expanding the implementation of green building to include spirituality is in conformity with the religious view. In many religious traditions, there is no contradiction

in having both physical and spiritual considerations. The Muslims can access these ideas by seeking knowledge of the natural world and also receive knowledge of the invisible world through revelation. Spirituality is obtained by intellect and in conformity with the knowledge that integrates the belief in Allah as our creator (tawhid). Additionally, one can overcome the apparent limitations within these particular religious traditions that concern our morality to achieve higher levels of sustainability.

4.3 The Various Spiritual Dimensions

The Federal Constitution in Article 3(1) states that 'Islam is the religion of the Federation, but other religions may be practiced in peace and harmony in any part of the Federation.' Regardless of our personal belief, the need to address spiritual and religious concerns in everyday life, there are many dimensions of spirituality in respect of cultural diversity in Malaysia. Besides the Muslims worldview, there are also other views that emphasise the spiritual idea of sustainability specifically to their religious affiliations such as Buddhism, Christianity and Hinduism. Each religion has its own unique understanding of what sustainability means in spiritual and relational terms. Spirituality has a strong connection with a quest for purpose and meaning in life, and it goes beyond the senses to a realm beyond. Every faith system also has the belief that there is a reality beyond the material world. These are a few principles across the diversity of spiritual perspectives that will give some impacts on the way we treat our planet.

Out of this diversity of religions, Islam in Malaysia makes up a total of 61.3% of the entire population (Department of Statistics, Malaysia, 2018). In the Islamic worldview, Allah is the creator of everything and nature is a cosmic book revealing the signs (ayat) of Allah. All that is happening on the planet is based on the law of the universe. Every created being is in a state of submission to Allah. The outward contents like seeing the blossom coming out on trees are the domain of nature that relates to the higher order of reality (Nasr & Chittick, 2007). These are among the proofs of God's existence in the way things are, and that can only happen with God's permission. In this regard, the built environment must be in harmony with its surrounding.

Buddhism is the second largest spirituality underscores the way of life in Malaysia after Islam, representing 19.8% of the entire population. It also stresses the relationship between human beings and the environment at the deepest level (Obadia, 2013). Besides, Buddhism itself is essentially about bringing all these elements of life into balance, whether on a personal level, or a community, or global level. This creates social harmony and equality, protecting the environment and ensuring economic prosperity. It accords with

the concept of sustainable development that is based on respect and concern for all life.

Meanwhile, 9.3% of Malaysians practice Christianity; just like in Islam, Christians believe that humans are God's stewards of the earth. God does not want to see the world polluted or we abuse the world's resources. Christianity also teaches us that God is the Creator and Owner of the universe. It has the principle of sustainability to guide environmental growth, by making sure that man does not compromise the future generation's needs with meeting today's needs. In relation to the wide understanding and moral creativity, the integration between environmental sciences and theological ethics is needed (Jenkins, 2013).

About 6.3% of Malaysia's population practice Hinduism. This religion suggests that simple living is a model for the development of sustainable economies. Protecting the environment is one of the most important duties in Hinduism. Furthermore, the earth can be seen as a manifestation of the goddess and must be treated with respect. Likewise, they also have the practices of meditation and bonding rituals, which are not necessarily centred on the religious faith, but still are a highly individualised form of transcendence (Kalita, 2015).

All of these traditions share the same concern that humans should respect the natural environment, and each has unique interpretations of its associated values. It is clear that the man does not own anything on this planet earth, and therefore we need to respond with these views. In fact, many of these ideas have been implemented successfully in the built environment of the Malays in the past.

4.4 Spiritual Values in the Traditional Malay Architecture

In the past, the utilisation of natural resources in the daily life activities has grown in the Malay tradition. Their architecture is the embodiment of sustainable living as their living was surrounded by nature. Certainly, in the traditional Malay houses, timber constructions with many design features are environmentally sustainable (Gibbs, 1987). Not only on how they are responsible towards natural resources, there are many other aspects of the community's needs that are also worth to be taken into consideration in the practices of Green Building today.

From the Islamic perspective, the physical world that we see is not everything that makes up the whole universe. According to al-Ghazali (2015), nature is a book of symbols. Everything that exists in this world that we live in is a symbol of something in the higher world. Nasr (2007) therefore elaborates

that the universe has a sacred aspect that contains a spiritual message for humans. With a greater understanding to our relationship with the natural world and the purpose of the world is to remind us of Allah, the Muslims look at the universe as a reflection of God. The cosmos and all of its phenomena contain meaning and with that, Islam has brought so much concerned and responsible for maintaining the peace and harmony with nature. This belief has certainly affected the Malays' positive thoughts and attitudes towards environmental values.

In Islam, knowledge is not entirely a property of a human mind, and even the value judgment is not everything based on human reason and sense experience (Al-Attas, 2014b). Assimilation of the Islamic principles from the previous beliefs in all aspects of the Malay life has happened throughout the Islamisation of the Malay world. The knowledge included the spiritual aspects acquired through the teaching of *tasawwuf*. The Malays attempt to harmonise the outer dimensions of Islamic law and worship with the inner dimension of spiritual disciplines up to the ultimate stage of *ihsan*, which is the relationships between the body and the soul.

An excellence in worship is the highest station in spiritual development for the Muslims. Following with this impact of Islamic teaching, the Malays believe in balancing physical and spiritual aspects (Al-Attas, 1963). The physical world exists and is sustained with the spiritual world, and it cannot exist independently. Emphasising the spiritual matter does not mean we ignore the practical or functional aspects of architecture. When the traditional Malays built their houses, the spiritual element superseded the physical element. They saw everything spiritual and this world is ephemeral. This perspective provided an essential faith to persist and accept the universe as it is.

4.5 The Islamic Spiritual Ideas of Nature

Islam is concerned with maintaining everything that interrelates in the universe, and that is governed through the cosmic laws. The divinely inspired concept of sustainability revolves around the Islamic principles will also be comprehended with the knowledge of intellect. This knowledge occupies a higher level of the hierarchy in religious that includes the spiritual retreat with Allah, with His Grace, His magnificent and perfection (Nasr, 2003). It conceptualises and is interpreted with the Islamic vision of the cosmos, which is bound to the spiritual ideas that have sustained even in the Malay tradition. The creation of the world based on the original natural order (*fitra*) can be comprehended with a world-system in reference to the Qur'an and Sunnah. These are the three essential concepts for understanding the spiritual ideas of nature pertaining to sustainability:

From the above table, the three important concepts reflect the knowledge of the whole universe, which tell us that this world is not limited to physical, but also the spiritual. Everything in this world is in a state of well-ordered and must be maintained. The above Quranic ideas of the universe are not only physical, made up of stars and planet, but also comprise a spiritual cosmos that filled by non-physical entities. Not only it can reveal the hidden and symbolic meanings, it is also rich in the Divine Nature.

From an Islamic spiritual understanding, this world has meanings and symbols of a higher degree of reality. The structure of the cosmos contains a spiritual message for humans, which is the same as the revelation that comes from the same source of religion. Assimilation of Islamic belief with the value-based considerations and attitudes does make one respect the nature and become aware of its role as a reminder. Having the connections between Green building assessment and traditional value systems, particularly through the Islamic intellectual tradition, can renew our spiritual understanding of nature. Besides having a vision of nature's hierarchical order, a thorough understanding of the way the universe is functioning will affect humans' responsibilities of themselves, God, the cosmic order. Having thus briefly explained the relationships of the sustainable characters to the spiritual aspects, we shall next see how it has also become a tremendous source of inspiration in the aesthetical elements in the traditional Malay architecture.

4.6 The many levels of existence

As further elaborated by Chittick (2010), the main characteristics of the Islamic traditionalist cosmology include the hierarchy of reality that can be divided into two; the visible world and the invisible world. The physical world (*Alam al-shahadah*), which is observable, and the metaphysical world (*Alam al-ghayb*), which is unseen or unreachable, can only be discussed on religious bases. It mostly gathered from the religious scriptures of Islam and with Islamic intellectual tradition.

Behind the harmony of the cosmos, there is a concept of man's mystical quest for the Divine, which is also known as the Way (*tariqah*) or the journey towards Allah. People tend to use a diversity of expressions in order to represent this concept. For example, Sufism translated this important structure orders as the cosmic hierarchy. It has several layers that are arranged vertically accordingly to its different stages (*tingkat*). The levels of cosmic existence begin with the Source of the cosmos, which is the Divine. "The invisible realm is closer to God and more real than the visible world" (Chittick, 2013). Another example that represents this concept is explained by Nakula (1985), has clarified the symbolic idea to remind human about the different stages of the universe. For

that, he used the tiered pyramid roof of Masjid Kampung Laut in Kelantan as an analogy to demonstrate the levels of cosmic order (see Figure 1).

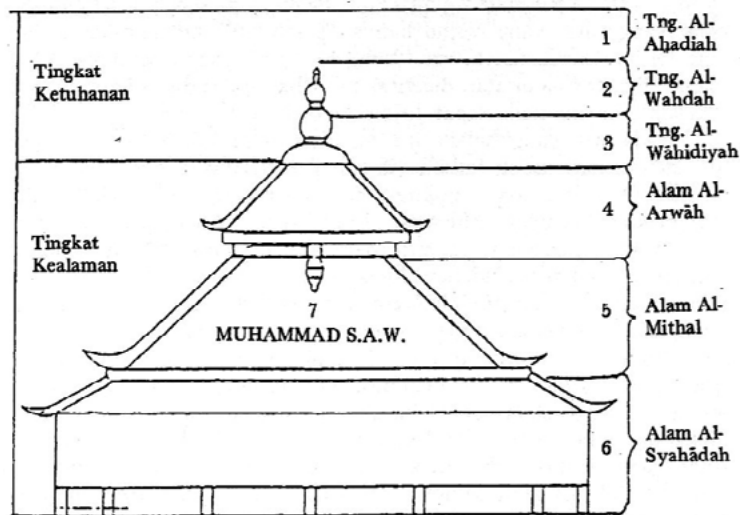


Figure 1: Masjid Kampung Laut, Tumpat, Kelantan as the analogy to demonstrate the levels of cosmic order (Nakula, 1985, p. 38).

Each horizontal segment of the mosque indicates a particular level of existence. This provides a view of how the physical worlds and spiritual world are related to each other, in the vertical direction towards Divine essence. These levels of existence, from the highest order of reality to the lowest level, clarified the nature of the quest.

The foundations of the Islamic spirituality are rooted in the Qur'an and the Prophet's sayings, inspirable from the awareness of Allah and to live in accordance with His will. Spirituality can be attained through intellectual intuition and not simply through the process of logical reasoning. Besides being responsible for and being in harmony with the environment, this sort of view emphasises the practice with the heart that comes from the purification of the soul. It is only then that we are aware of the fundamental aim to preserve the good relationship between God and His creations. Without failure, we should treat the natural environment with love and respect because the very structure of the cosmos contains a spiritual message for man. In this context of sustainability, architecture should respond to nature as it really is instead of the way that what we wish it to be.

Table 1: The spiritual ideas of nature in contact with sustainability.

1) <i>Tawhid</i>	<p>Allah created all things in heaven and on the earth. Everything in the universe comes from Him and returns to Him. The oneness of God (<i>tawhid</i>) is the basis of the Muslim faith and a general view of reality. This principle is derived from the Qur'an:</p> <p><i>Say: He is one God: God the eternal, the Uncaused (Absolute) Cause of all being. He begets not, and neither is He begotten; and there is nothing that could be compared with Him (Qur'an 122:1-4).</i></p> <p>The best description of the characteristics of Allah above is in essence with <i>tawhid</i>. The Qur'an tells us that God in His wisdom has created all forms of existence for a finite duration of time, which is known only to Him. The purpose of creation is in fact for God to be known by man; His perfect instrument of knowledge. Everything we do in this world is for Allah.</p>
2) Protecting the Nature	<p>The purpose of man's creation that is to be a <i>khalifah</i> on earth:</p> <p><i>And [mention, O Muhammad], when your Lord said to the angels, "Indeed, I will make upon the earth a khalifah." They said, "Will You place upon it one who causes corruption therein and sheds blood, while we declare Your praise and sanctify You?" Allah said, "Indeed, I know that which you do not know" (Qur'an 2: 30).</i></p> <p>As the vicegerent (<i>khalifah</i>) of Allah on earth, the role is to protect nature and to delight the created beings, not to conquer it. It is an obligation for the <i>khalifah</i> on earth to preserve and conserve the natural environment. Without spirituality, nature is only seen as something that can be conquered and manipulated for own use without thinking about the consequences. Spiritual knowledge could turn them into the inward dimension and see nature as a symbol that exists in a certain frame. It is only through this transparent reality that will make them understand the real sense.</p>
3) The Concept of "Alam"	<p>In regard to the relation between God, man, and the environment, it is important to understand the meaning and role of cosmos (<i>Alam</i>). This world exists for a purpose and a reason. This world is a place to prepare for the afterlife.</p> <p><i>Those who remember Allah while standing, sitting or (reclining) on their backs, and reflect in the creation of the heavens and the earth, (saying): 'Our Lord! You have not created this in vain. Glory to You! Save us, then, from the chastisement of the Fire (Qur'an 3:191).</i></p> <p>In Islam, the knowledge of <i>Tassawuf</i> is to raise people to a higher station of spirituality. It deals with the internal feelings to cleanse the self and take account of our daily behaviour. This is an important aspect of the spiritual journey that involves observing and contemplating the nature. <i>Alam</i> has always been a "reminder" that gives awareness, where we contemplate it as a mirror reflecting a higher reality.</p>

5. CONCLUSION

It is clear that the Green building rating systems are effective tools and widely used to measure the success of sustainability. However, the extensive

outcomes cannot rely merely on these current mechanisms of measuring sustainability. Regardless of how much emphasis sustainability is placed on the physical aspects, there must always be the spiritual side. They are two sides of one coin that must be addressed together to ensure a holistic result is achieved. Sustainable architecture should refer to Islam perspective because no sphere is left in which the beliefs and actions of Muslim. On a personal level, a heart is an inner self that playing a very important role in fostering sustainability. It is essential to achieve sustainable development at the heart of an individual.

Besides, from the Islamic perspective, the inner aspects (rohani) in its fullness enabled one to see sustainability on the spiritual level. Spirituality is guidance for people to penetrate into the meaning of nature. The whole life of man in all its spheres should be an expression of complete submission to the Creator of this universe. Hence, it is a value added to the current effort in creating awareness of sustainable architecture. This ensures the right outcome of fixing the imbalance that exists in humans today, from trying to dominate nature to act responsibly and attain harmony with nature.

With the objective to emphasis the spiritual aspects of sustainable architecture from the Islamic perspective, this worldview encompasses all domains of life from physical to spiritual realms ensured all the benefits were shared with everyone equally. Spiritual teachings convey the nearness and love of God, which is incredibly important for us to be accountable for the use of natural resources and affirm the sacred quality in nature. Addressing positive attitudes by placing oneself in a bigger cosmological picture, with the role of humans to protect nature can lead an individual's thoughts and actions. This natural and balance order is in corresponds to a cosmological view where humans are the most comprehensive beings and the most manifestations and attributes of God.

Sustainability is not a new concept. To deny its link with spirituality is just like cutting ourselves off from the roots. The Malays in the past have lived sustainably and spiritually in every aspect of life with the Islamic influences. Both sustainability and spirituality that interlinked in the traditional Malay architecture are enhanced in this study. They have clearly shown to be important elements in the Malay architecture. In addition, further research may explore opportunities for developing spiritual consideration to be integrated with the existing education programmes to ensure sustainability. As religion and faith have long been applied in our tradition, genuine sustainability based on spirituality is consistent with its underlying values. In light of this, the traditional Malay architecture is a model to be emulated and applicable to the Malaysian society.

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FEASIBILITY OF GREEN COMMERCIAL VERTICAL SYSTEM FOR CLIMBING FOOD PLANT IN URBAN AREA

Muhammad Shafiq Mokhtar Baharudin¹, Rahinah Ibrahim^{1*}, Khalina Abdan² and Ali Rashidi³

¹Department of Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

²Department of Biological and Agricultural Engineering, Faculty of Engineering,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

²Laboratory of Biocomposite Technology, Institute of Tropical Forestry and Forest Products,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

³Discipline of Civil Engineering, School of Engineering,
Monash University Malaysia, Selangor, Malaysia

* Corresponding author:
rahinah@upm.edu.my

ABSTRACT

Urban development and overpopulation have created a serious issue towards food security in the urban area. One of the potential solutions to solve this problem is by bringing food production nearer to the cities. In the past decade, vertical farming has caught our attention as an innovative system to produce food in a high amount with little land space. However, the existing systems are only limited to a certain type of crops. The main purpose of this study is to evaluate the potential vertical farming systems for cultivating the climbing food plants using hydrophobic green material. This is a review article presenting selected literature investigating vertical farming capability, natural fiber-based hydrophobic green material, and potential manufacturing processes of hydrophobic green materials. The results include determination components on the vertical farming systems for climbing food plant, potential natural fiber based on the hydrophobic green material preparation, and potential mass manufacturing of green materials to support vertical farming concept in urban cities. This study contributes in varying crops when developing urban farming by using the future vertical farming systems.

Keywords: Vertical farming, smart farming, natural fiber-based material, biocomposite, manufacturing process.

1. INTRODUCTION

The total world's populace is postulated to exceed 9.15 billion people in 2050. In 2100, the United Nations gauges that it will increase to 11.2 billion people. Thus, the total population growth in urban areas is expected to reach 66% by 2050, with almost 89% of it spreading across Asia and Africa. Consequently, urban development and advancement have raised concerns over food production and processing, its transportation and utilization. However, populace and per capita consumption tend to increase faster initiating the agricultural industry to hasten its development's pace faster than ever before. Nevertheless, demanding food supply would cause extreme ecological harm. A large-scale urban farming factory plant production could offer new landscape opportunities and take some pressure off the agricultural lands. An innovative strategy, ordinarily known as vertical farming (Despommier, 2009 and 2010), has been developed and now has potential in creating sustainable urban agribusinesses. This investigation concurs with Specht (2014) who sees vertical farming as an inventive form of a smart urban where the aim is combining design, food, and production to deliver sustenance on a bigger scale in urban areas.

In typical rock melon large-scale farm in Malaysia, the farmers encounter some issues related to the climbing structure sustainability which are associated to material and structure design. There are few materials that they use for the climbing structure: raffia rope, fish netting (made up from polypropylene), bamboo stick and many more but most of them still relying

on raffia rope. However, based on good agriculture practice, the raffia rope need to be removed together with the plant before new cycle starts in order to avoid unexpected diseases spread and the reducing strength of raffia rope that may break in any time. Per year 1-acre farm can plant 4000 polybags and can complete 3 to 4 cycle of rock melon plant, each cycle taking about 3 months and could produce 8000 fruits. Each cycle could use up approximately 6 roles of agriculture grade raffia rope. Even though the material is a low cost, rope replacement incurs high labour. This practice eventually will cost more money for the farmers rather than looking for a sustainable solution for the climbing structure issue.

In order to build vertical farms in building-related forms for climbing food plant, the additional weight in the building may lead to the new problems. The authors foresee the implementation of water-resistant green materials biocomposites in the agricultural sector permanent climbing structure that same part as the main structural framing system. Biocomposites are recommended because it is known worldwide due to its lightweight, reliability, strength, and sustainability. The possibility to reduce the dead load would make the vertical farming concept more plausible in a confined building. Hence, this study is foreseen mass production of hydrophobic biocomposites in advancing the idea of sustainable urban agriculture besides reducing further environmental impacts.

2. URBAN FARMING AND FOOD SECURITY

In 2015, Badami et al. described that urban farming plays a significant role in food security. This study agreed with Eigenbrod et al. (2015) who points out that in order to assure food security in urban areas, the agricultural sector should move nearer towards the city development. Despite these novel suggestions, Morgan (2010) debated that adopting urban farming in the city would bring huge challenges to urban city planning, particularly in the developed countries. Herewith, this study finds an opportunity to explore this idea in developing countries. Badami et al. (2015) had also stressed that urban farming can only make a limited contribution to achieve urban food security among low-income countries only. The scholar believes that it could meet food requirements at the household level, compared to rural agriculture that can provide larger quantities and therefore has broader distribution pathways (Opitz et al., 2016). The authors agree with Badami et al. (2015) that most urban farming developments still focus on farming in conventional ways. Collectively, these studies outline a critical role in furthering developing different means of bringing food nearer to the cities where smaller land or working within confined spaces can be turned into mass agricultural production schemes.

2.1 Vertical Farming as New Practice in Cities

The introduction of a novel agricultural practice, such as indoor commercial vertical farming could improve global food security and health by assimilating various new technologically efficiency (Lu et al., 2017). Vertical farming is an innovative level of agriculture knowledge that promotes new practices, harvesting techniques, water management, crop cultivation and yielding (Jegadeesh et al., 2014). He also said that vertical farming is an emerging consideration as an innovative approach in agriculture technology and also thought as an agricultural revolution (Möller Voss, 2013). An earlier study by Despommier (2012) who had identified numerous advantages of the vertical farming system. It brings more benefits even though there are few major limitations that could jeopardize sustainable urban food production in the future. Based on existing commercial vertical farming model, such as Sky Greens in Singapore, such vertical farming system provided proof that it can radically increase vegetative plant yield per unit area by extending crop production into vertical dimension (Touliatos et al., 2016) with a very minimal usage of high technology.

Overall, there is a need to implement the vertical farming system in urban cities to make them more independent and efficient as an ultimate remedy against any risk of future food security crisis. This study found that the vertical farming implementable in an urban area. Since, it could minimize the cost and combine various technologies to produce an efficient vertical farming system to produce high number of yield even with the minimal usage of technologies. All these issues of bringing food back to the cities are creating major challenges for architects and urban planners to reduce the distance traveled by the food (Podmirseg, 2014). However, the concept of vertical farming is still novel and the opportunities can be explored further since there are not much crop varieties currently being farmed with the vertical farming system.

2.2 Limited Type of Crop in Vertical Farming

From the above, there is a little argument on the existing commercial vertical farming concept as a universal food supply component for the cities. However, one outstanding argument involves the limited types of crops that can be cultivated with the vertical farming systems for commercial purposes. Existing vertical farming is much concentrated in small footprint crops which growing time is short from planting to harvesting. According to Kalantari et al. (2017), 10 out of 10 effective vertical farming producers in the world are concentrated on leafy green vegetables, whether they are in or on the building-oriented vertical farming system. These limitations are due to the leafy greens could give a higher overall revenue as opposed to any other types

of crops. Leafy greens are extremely popular as an agribusiness in urban areas, based on the demand created by restaurants and local markets that are always on the lookout for fresh locally planted greens. However, the authors believe there will be possibilities where creation of spatial intervals between the vertical farming systems will allow the cultivation of taller and climbing crops without decreasing any productivity compared to the leafy green-based vertical farming systems.

2.4 Vertical Farming Capability

According to Kamonpatana et al. (2015), in order to produce a successful vertical farming system, it is imperative to define selected components and necessary decisions. There are five components that made up a successful vertical farming system: (i) a water circulation system (ii) a sustainable energy (iii) a climate control system (v) a growth system, (iv) a lighting system (Kozai et al., 2016).

The resources fertilizer, water and energy (water circulation system, climate system, and sustainable energy system) need to be used efficiently with minimal waste. New technological exemplars, driven by innovations in sustainability, are the main factor for resource use efficiency (RUE) in closed control based systems, such as in vertical farming (Lu et al., 2017). The more well known systems in hydroponic systems, such as the deep flow technique, nutrient film technique or aeroponic systems are the essential tools in vertical farming plant factories (Son et al., 2016). On the other hand, another study believes the increasing input usage of commercial nutrients in a closed system cause less harm to the environment after some time of operation (Stewart et al., 2005). Son et al. (2016) stated that with efficient climate system the electrical conductivity (EC), pH, dissolved oxygen, humidity, and environment temperature can be controlled to ensure a better closed control system. Hence, this system eliminates the unstable whether disaster that directly affects the whole world crop production.

One of the latest example are the plant factory with artificial lighting (PFAL) that was designed and adapted for efficient production of food crops with the objective to grow food in indoor environment (Kozai et al., 2016). For the substitution of natural sunlight, artificial lighting (climate system) plays an important role in sustaining crop life especially in indoor vertical farming systems. The resource use efficiency (RUE) of closed plant production systems work best with artificial light (Kozai, 2013). Hence, this study agrees that a new form of plant production via a flexible system is recommended.

Kamonpatana et al. (2015) claim that the vertical farming concept could be innovatively and systematically adopted by linking its identified components and subcomponents in a closed system.

In lieu of this, this paper recommends further exploration on the other component in vertical farming system to include provision for climbing food plants. Despite all of this components, there is another components that the researcher recommend to complement structure system as a fundamental part of designing a successful vertical farming for climbing food plant. In exploring new niche of vertical farming system, structure system plays an important role to support the new concept of vertical farming system for climbing food plant. It would like to propose hydrophobic green materials to create new possibilities in developing an alternative structural vertical farming system plants as a crucial component of creating a successful vertical farming system for climbing food.

3. HYDROPHOBIC GREEN MATERIALS FOR VERTICAL FARMING

This section elaborates on hydrophobic materials requirements. There is a lot of natural fiber available to be implemented in the new hydrophobic material recommendation. However based on a study by Ali et al. (2016) and Saba (2015), kenaf is among the top natural fiber that exert the highest tensile strength (Mpa) that can reach 1200 Mpa (bark fiber) compared to other natural fiber that remain below 1000 Mpa. Besides, kenaf is among the lowest density mean it will be resulting in lower total weight. According to Mahjoub et al., et al (2014) there are three types of kenaf/thermoset composites were tested: kenaf/epoxy, kenaf/polyester, and kenaf/vinyl ester. Among these there composites, kenaf/epoxy has higher ultimate tensile strength than kenaf/polyester and kenaf/vinyl ester composite when total fiber content is 40%. Thermoset resins have a unique combination of properties such as high modulus, excellent chemicals, low shrinkage, heat resistance and relatively high strength that are suitable for applications in harsh farming environment (Alamri et al., 2012).

Water absorbency is one of the most important aspects in determining the mechanical properties and strength of natural fiber-based biocomposites. Therefore, a proposal for new material is recommended to be resistant to water and able to bear with a higher amount of structural and live loads. In view of using the proposed biocomposite for agricultural structures, it is crucial to understand their hydrology and absorbency properties due to their innate biological characteristics.

Table 1: Comparison of natural fibers mechanical properties (Ali et al., 2016)

Plant fibers	Tensile strength (MPa)	Young modulus (GPa)	Specific modulus (GPa)	Tenacity (MN/m ²)	Density (g/cm ³)	Moisture regain (%)
Cotton	400–700	6–10	4–6.5	–	1.55	8.5
Kapok	93.2	4	12.9	–	0.45	10.9
Bamboo	571	27	18	–	1.52	–
Flax	510–910	50–70	34–48	–	1.45	12
Hemp	300–760	30–60	20–41	–	1.43	12
Jute	200–460	20–55	14–39	440–553	1.34	12
Kenaf	300–1200	22–60	–	–	1.30	17
Ramie	915	23	15	–	1.55	8.5
Abaca	14	41	–	–	1.52	14
Banana	530	27–32	20–24	529–754	1.35	–
Pine apple	414	60–82	42–57	413–162	1.44	–
Sisal	100–800	9–22	6–15	568–640	1.45	11
Coir	100–200	6	5.2	131–175	1.15	13

A unique critical awareness is performances of these composites may deteriorate when the materials are exposed to the adverse environments for a long period of time (Rashdi et al., 2010). In his study, he has tested and found that water absorption does affect the tensile strength directly. The specimen of his study was immersed in distilled water for four months to study the effect of water absorption towards the tensile and flexural strength. According to their studies, the higher amount of water it absorbs, the weaker the tensile strength becomes. Additionally, water absorption can be include water uptake attributed to the presence of natural fibers which contain cellulose, hemicellulose and lignin (Anuar H et al., 2011). Rashdi et al. (2010) showed a great loss in the mechanical properties of humid samples, compared to the dry samples. The water absorption behaviour of composites was found to follow the Fickian behaviour (Osman et al., 2013). The law of Fickin behaviour is defined as the higher the percentage of natural fiber, the higher the water is absorbed.

Until recently, there has been no reliable confirmation that natural fiber-based biocomposites could really survive the normal harsh and humid agriculture environment. Most of the studies in hydrology and absorbency properties have only been carried out in research laboratory areas or tested in small scales. However, laboratory data by Rashdi et al. (2010) highlighted that the overall amount of moisture absorbed from natural weather simulations was too low compared to the samples that totally immersed in distilled water. Their study found that the strength of bond between fibers and matrix has

influenced the water absorption of fibers due to micro gap in between the fibers and its matrix. The authors are recommending further investigation on the exact nature of the resin-water interaction. Their results are expected to lead towards the setting up of a standard production procedure of natural fiber-based biocomposite techniques for producing highly durable composites that could support the development of vertical farming structural framing system.

3.1 Pre-Treated Process of Green Materials

Pre-treatment of biocomposite preparation has been explored and found to influence its mechanical properties in several studies. One of the commonly used is Sodium Hydroxide (NaOH) pre-treated process that improve physical bonding and chemical bonding. Firstly, it is the physical bonding could improve rough surface of kenaf fibers resulting in better interlocking between matrix and fiber. Secondly, the chemical bonding such as hydrogen bonding, between fibers and matrix would occur due to the chemical reactions between the hydroxy groups of cellulose and epoxy molecules in the matrix (Mahjoub et al., 2014). The pre-treatment process is regarded as a fundamental factor in increasing the mechanical properties of natural fibers (Khalina et al., 2017). Recent evidence suggests that treated natural fiber based biocomposites produce better mechanical properties compared to untreated natural fibers (Ibrahim, 2010). It is proven that pre-treatment with 4% Sodium Hydroxide (NaOH) removes the lignin, hence can improve the bonding between kenaf fibers and the resin matrix (El-Shekeil et al., 2012). The results show that 40% of fiber loading improves the tensile strength and natural fiber treated with 4% of NaOH enhance the tensile and flexural properties compared to untreated fibers. At the lower concentrations of NaOH, the efficiency to remove the impurities on fiber surfaces is not good enough, which results in poor bonding between fibers with matrix. However, a higher percentage of NaOH does not ensure better biocomposite properties since it can destroy all of the lignin and reduce its bonding area. Author suggests to explore more on combining NaOH pre-treated processes with other types of pretreatment process since each leads to the different effects on natural fibers.

3.2 Manufacturing Vertical Farming Material

Less attention is paid to mass produce natural fiber-thermoset biocomposites despite fact of the biocomposites market is estimated worth more than 5.6 billion dollars in 2019 (Ali, 2016). Literatures indicate multiple ways to fabricate natural fiber-based biocomposites. They include hand lay-up, injection molding and hot press. First, this section presents selected findings on the manufacturing process of natural fiber-based biocomposites using thermoset resin. More than 50% of prior studies found that fabrication of

natural fiber-thermoset biocomposites begins with hand lay-up owing to its simplicity (Azamana, 2013). Yet, the uneven fiber distribution in the natural fiber-based biocomposite system become major obstacles as it leads to fabrication difficulties during the manual separation (Zampaloni et al., 2007). However, the authors found a lack of studies aimed towards mass production particularly in structure materials.

Several studies have attempted discovering the best manufacturing process to produce strong biocomposite using less materials (Azamana, 2013). However upon review of prior studies, this paper is unable to specifically identify the most potential manufacturing procedure for mass production of natural fiber-based biocomposites. Authors have suggested to implement pultrusion method. Pultrusion is a fabrication technique that uses continuous fiber soaked with thermoset resin through heated die to form a composite (Memon & Nakai, 2013). Pultruded profiles of natural fiber-based biocomposites have proven to be better with a higher mechanical properties compared to the synthetic fibers (Azamana, 2013). Those were structurally crucial requirements in industrial and engineered products (Velde & Kiekens, 2001). Therefore, the potential manufacturing process of natural fiber-thermoset biocomposites shall uplift biocomposites to a whole new level (Saba et al., 2015).

The authors would like to propose a better understanding of various types of manufacturing processes that are potentially benefitting in development of natural fiber-thermoset resins. Over for many years, the authors found few studies exploring new manufacturing processes for natural fiber-thermoset biocomposites thus limiting their huge potential and wide applications in various industry. This study recommends further identification of other types of potential manufacturing processes in order to produce independent structurally hydrophobic biocomposite materials for vertical framing systems.

4. DISCUSSION

Vertical Farming for Climbing Food Plants is the Next Frontier of Agriculture. The investigation of food security shows that the concentration on vertical farming can contribute to attain urban food security in urban areas. The researchers are proposed a solution by concentrating on legitimizing the urban and peri-urban regions as agribusiness regions. Such efforts are expected to bring food closer to the urban communities. Coordination of the new different innovations in terms of urban agribusiness and costs related to such development is needed when considering practical and efficient vertical farming systems for climbing food plants. Nonetheless, this study posits that vertical farming can develop a higher stature climbing plants without diminishing the system's efficiency and food productivity. A real

scale prototype is proposed for future study where precise information can be harnessed. Later, the results can become a guideline to establish a larger urban agribusiness space inside an urban space. A new mechanical ability will need to be adapted into the vertical farming plant factory using a modular system framework. Therefore, this study points out the need for practical management without creating additional environmental issues when vertical farming is confined in the cities.

This survey on selected literature has highlighted how vertical farming is emerging as a potential solution to dispose biodiversity treats by creating a modern urban agriculture approach inside the confinement of buildings. Despite its exploratory nature, this study offers a degree of insight into extending the success factors of rooftop greenhouses in urban agribusiness and implementing them as vertical farming structural innovation. Moreover, the feasibility of soilless farming is possible in urban areas by minimizing the cost and consolidating future new material innovations that could deliver functional vertical farming framing structures for varied climbing food plants. In general, the most effective vertical farming system method is to be fully autonomous and structurally independent without eliminating the golden rule of resource use efficiency (RUE).

Preparation of Green Material for Structural System Manufacturing. Literature highlighted that water absorbency is one of the main characteristics to produce suitable natural fiber-based biocomposite materials in an agricultural farm environment. The percentage and diameter of natural fiber in any biocomposite play a significant role in determining the strength of its mechanical properties. However, it is vital to ascertain the precise mixture of its natural fiber content in order to obtain the highest possible mechanical properties in natural fiber-thermoset biocomposites. This study notes the extent of water absorption in natural fiber-based biocomposites that correlates to its natural fibers content. This indicates a strong need to understand the hybridization of biocomposites with two or more natural fibers that possess different lengths and diameters. This is due to each fiber having its own innate characteristics to fill the microscopic gaps in between the fibers. To date, most of these methods have only been applied to thermoplastic biocomposites. This study recommends setting up a standard natural fiber-thermoset manufacturing procedure that is capable to produce high-quality biocomposites. Future study will further modify and improve the fiber content to fortify its mechanical properties and fatigue stress levels.

In view of extensive research carried out on the pretreated chemical processes, NaOH pretreated process still shows more potential and by far, the simplest to apply for the fiber chemical treatment. These studies recommend refining

the percentage of the chemical used by another 0.1 decimal point in order to confidently identify the optimal alkaline solution concentration. Thus, the improvement could strengthen the structural material in a pretreated process. Moreover, this study agrees that a combination of pretreated processes could increase the mechanical properties and fiber matrix bond strength since each chemical used has its unique effect on natural fibers. Such enhancements are recommended to increase their mechanical performances of this group of materials by extending their capabilities and applications.

5. CONCLUSION

The trend of globalization and urbanization has inadvertently jeopardized food supply security, thus creating serious issues to feed billions of people in limited spaces around the world. In designing and implementing greener vertical farming systems, new green materials are required in order to build a fully sustainable green environment. New biocomposite structure materials have the strength of steel, yet at a fraction of its weight. This study foresees traditional materials may need to be replaced while green materials emerging as economical in the future. Newly enhanced hydrophobic biocomposite materials manufactured through mass production could provide an alternative solution to the current farming practices. The use of raffia ropes as climbing support are recommended to be replaced and new vertical farming structure design are called for different categories of crops planted. Thereby, the new vertical farming component with emerging material supporting climbing system is recommended in future studies. This paper contributes in developing foundations for designing alternative vertical farming system in an urban setting. Expected results would lead to provision of food in cities thus supporting the development of sustainable smart cities concept.

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URBAN SETTING: INDUCE OR REDUCE MENTAL HEALTH?

Low Bee Teng, Roslina Sharif^{1*}, Wan Sofiah Wan Ishak¹, Marek Kozłowski¹ and Sumarni Ismail¹

¹Department of Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

* Corresponding author:
roslina_sh@upm.edu.my

ABSTRACT

This paper presents and reviews various literature and scholarly studies regarding the effect of globalisation and developments in urban areas which causes mental health issues. It is aimed to provide a comprehensive understanding on the current knowledge in the field of mental health problems particularly at the early stages of stress. This study utilises qualitative content analysis method which focuses on reviewing and summarizing literatures such as papers, journals, articles and books related to urbanization and mental health. The further analysis shall then conclude the relationship between urban setting and stress in Malaysia, as well as the stigma that is attached to it which may resulted in mental deterioration where a new design intervention is required. Hence the proposal for a therapeutic environment particularly in relieving early stages of stress is essential.

Keywords: *Urbanisation impact, mental health issue, urban stress, therapeutic environment, health design intervention*

1. INTRODUCTION

A growing urbanisation is indeed a global movement, and Malaysia is ranked together with East Asia's other more urbanised countries where the urban population continued to increase rapidly from 43% in 2000 to 53% in 2010 (World Bank Group, 2015). Urbanization is not only a demographic movement, but it also involves economic, social and psychological changes. This universal transition is complemented by economic growth and industrialization as well as changes to the social structure which involves the pattern of an individual routine or even families' lifestyle. According to the new World Bank data, Malaysia has 19 urban areas with more than 100,000 people, and Kuala Lumpur is ranked with the highest population of more than 5 million people. The phenomenon of urbanization undoubtedly increased the work opportunities in the cities where everyone seems to be lured to work in the central business district for a greater financial profile. This over-crowded scenario is said to be one of the breeding ground of mental health issues with increasing urban dwellers and increasing number of people traveling from outer regions to the central business districts for work opportunities.

The movement of people to urban areas often required more facilities and a growing system of infrastructure to be made accessible to cater for their needs. However, the current state of developments shows that these requirements do not happen in accordance to the increase of urban dwellers and working groups. This has caused an increasing number of mental health issues to occur and has been a major concern of both governmental and non-governmental organisations worldwide where the World Bank data has revealed that 340 million people worldwide will suffer from depression by year 2020. With this ever expanding and deteriorating condition, the city continues to demand for new design interventions that could provide enriching surroundings for specific activities. Nevertheless, with the lack of evidence based design knowledge

implemented into design planning, the built environment is constantly putting more stress onto daily experience of the people despite having successfully providing them with the space or facilities for work (Whitemyer, 2010).

2. URBAN FARMING AND FOOD SECURITY

The occurrence of mental health issue in Malaysia has been observed by health practitioners in the past with the formation of Malaysian Mental Health Association (MMHA) by University Malaya Medical Centre (UMMC) as a non-profit voluntary organisation in 1967. Today, where most countries are taking progressive strides in dealing with the reality of mental health issues, Malaysian government has also put in a similar effort with the formulation of the National Mental Health Strategic Action Plan which is a five year plan that drafts out effective measures to tackle mental health issues for the government agencies, non-governmental agencies (NGOs), employers, schools and the public (New Straits Times, 2016).

Statistic shows that the global average stress level is at 53% and the stress level in Malaysia is at 63% (Health Works, 2015). The high level of stress is not an issue that only happens to the poor, weak or lonely but also to anyone with regards to the mental state of health. The abundance of mental health issues in Malaysia is at a worrying state where every 3 out of 10 Malaysian is suffering from a form mental health issue throughout their lives according to the National Health and Morbidity Survey (NHMS), and psychologists strongly believe that this number will continue to grow. This is further supported by the NHMS in 2015 which shows an increasing trend in the prevalence of mental health issues among adults in Malaysia where the percentage of mental health issue prevalence has increased from 10.7% in 1996 to 29.2% in 2015 (Ministry of Health, 2015).

Hence, a research has been done to investigate the demographic of the prevalence of mental health issues in Malaysia through socio demographic profiles such as state, age, gender, ethnicity, education level, occupation and income group and the significance of such aspects in the resulting occurrence of mental health issue.

Referring to Table 1, the three states in Malaysia with a higher level of mental health issue occurrence are Sabah and Wilayah Persekutuan (WP) Labuan, W.P Persekutuan Kuala Lumpur and Kelantan with 42.9%, 39.8% and 39.1% respectively. This result however shows a main discrepancy where it comprises of states like Sabah, WP Labuan and Kelantan which experience a more subtle progress and WP Kuala Lumpur which experiences on going major high profile developments.

This could be due to the causal link of such mental health occurrence which is most likely to be different from people staying in a slow developing states and a fast developing states as the mental health levels in rural and urban areas are insignificant. In the rural areas, causes of mental health issues are most likely to be poverty, disasters and poor living conditions in response to the statistic of the same report that shows a higher occurrence of mental health issues among the income groups of RM1999 and less (Ministry of Health, 2015). On the other hand, the mental health issues in urban areas are most likely due to economic and social pressure as well as surrounding environmental pressures such as work, traffic congestions, over-crowding and greater demand for higher quality of life (Srivastava, 2009).

Figure 1 below shows that occurrence of mental health issues in Malaysia is higher among those from the age of 16 to 44 years old. They are either working or studying in the universities and are considered as the most productive group of the population. This means that ignorance towards the knowledge on mental health is a major concern for the future generation and the nation's development.

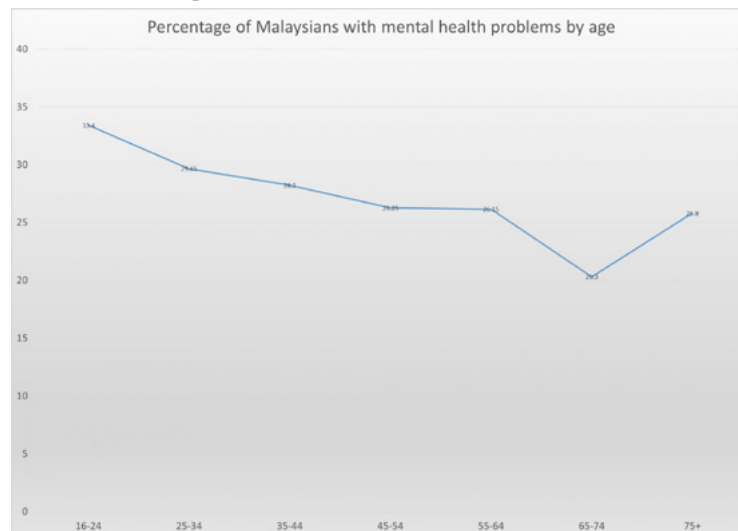


Figure 1: Prevalence of mental health issue by age (NHMS, 2015)

The study by NHMS declared that stress which the younger adults are experiencing mainly comes from the assignment workloads and worrying about future undertakings. On the other hand, working adults often face the problem of growing demand on the work productivity and efficiency at the

workplace. Similarly, the condition of both groups became worst through daily physical environmental factors such as the urban concrete city where they study or work and urban congestions. Unsurprisingly, these are the factors that are prevalent in fast growing cities.

Despite being a developing nation today, Malaysia is reported to have an alarming rate in the number of suicide cases with an average 60 people committed suicide every month in the country, according to the National Suicide Registry Malaysia (NSRM, 2011). Suicidal behaviour is a growing cause for concern in Malaysia since suicide rates have increased by 60% over the past 45 years (MPA, 2007). The Ministry of Health Malaysia had announced that more than 1 000 people killed themselves over the 3-years period of time from the year 2007 to 2010 according to the National Suicide Registry Malaysia Annual Report.

3. MENTAL HEALTH ISSUE: STRESS

The definitions of mental health and mental illness are constantly changing from the mid-20th century to the present time. The major changes depicted a patient-focused explanation of mental illness from an absence of disease model towards stressing on positive psychological function for mental health. Health is defined as, “a state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity” (WHO, 2014). This definition encompasses the empathy towards positivity and enthusiasm in multiple aspects of life, regardless of the presence of a clinical illness. Therefore, mental health is defined as a state of well-being in which every individual realizes his or her own potential, able to cope with the normal stresses of life, work productively and fruitfully and able to make a contribution to her or his community (WHO, 2014).

Nevertheless, mental illness and mental health are commonly being used in a similar context while in fact, these two terms are actually different. Everyone would have experienced mental health; however, not everyone will experience mental illness in their lifetime. This is because mental illness involves recognised and diagnosed disorder which causes significant disturbance in an individual’s cognition, emotion regulation or behaviour that reflects a dysfunction in the biological, psychological as well as development processes fundamental to mental functioning (APA, 2013).

Nonetheless, in the course of a person’s lifetime, struggles or experiencing challenges associated with mental well-being will definitely happen, similar to challenges that everyone will face with their physical well-being from time to time. According to the American Psychological Association (APA, 2013),

the causes of these struggles or stress can be generally categorised into three groups which are social, environmental and biological, as summarized in Figure 2 below.

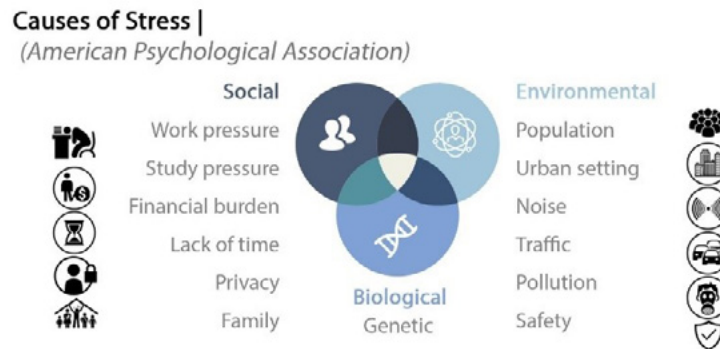


Figure 2: Causes of stress. (Info by APA, 2013 - graphic by author)

There are basically three types of stress which are acute, episodic and chronic. However, the concern of this study is on the acute and early episodic types. Based on Figure 3 below, acute stress is the most common, and it comes from past or future demands and pressures which are closely linked to urban related stress symptoms. Acute stress can crop up in anyone’s life. Fortunately, this complication is highly treatable and manageable.

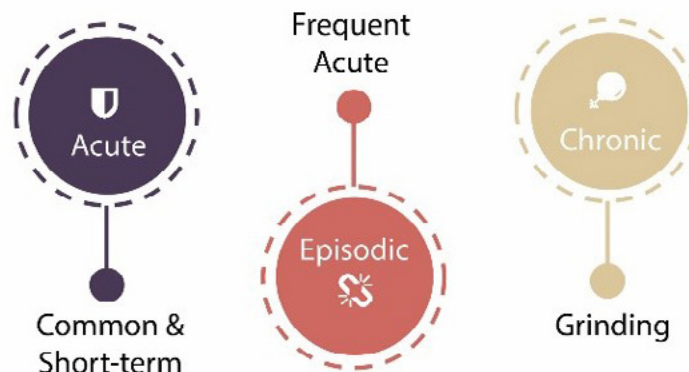


Figure 3: General types of stress.
(American Psychological Association, 2017)

The second type of stress, episodic stress, is also closely linked to urban related stress. Episodic stress is triggered when frequent occurrence of acute stress causes disorder in one's daily routine where situation are always in chaos or crisis. Often, such problems in their daily routine are so habitual that people think nothing of it.

4. STRESS INDUCING URBAN SETTING

In the presence of rapid urbanisation, a higher density urban fabric is inevitable, and the stake holders, either the developers, users or even politicians, often like to see the developments of central business districts as an ideal environment which offer a better variety of destinations such as shopping, eating and playing. In contrast, developments that are more attached to low-density lifestyle with room to spare, huge car porch and wide boulevards is also another form of the urban fabric.

Regardless of which type of the densification divide of the urban fabric one might choose, it is undeniable that living the urban life has an impact on both the body and the mind. This is because other than being in the natural context, most of the time humans are experiencing the built environment whether at home, at work, social, entertainment and even sleeping. It has been proven for quite some time that the rate of mental health issues tends to be higher in busy urban centres compared to the countryside (Ellard, 2012). Many studies have also shown that people born and raised in the urban setting have higher rates of psychosis (OS, 2004), anxiety disorders and depression (Peen, Schoevers RA, Beekman AT, & Dekker J, 2010) where such results may be independent of confounding factors such as socio-economic status or family factors.

Nevertheless, urban social environment is still considered as the most influencing factors among mental health topics where the socio-economic status being the most studied risk factor and highly associated with mental health issues. The social factors in urban settings include social segregation, differences in social economic status and low social capital (Rapp, Kluge, & Penka, 2015). However, it is important to bear in mind that the correlations in these studies does not always linked to actual causation and hence. Other factors still have to be taken into account in order to understand the condition thoroughly.

The other factor which is likely to cause stress is the urban physical environment such as specific urban design which might seem suppressing to urbanites or even physical threats in the urban setting. Researches also show that urban air, water and noise pollution have substantial effects on the mental health of urban populations (Rocha, Pérez, Rodríguez-Sanz, Obiols JE, & Borrell

, 2012). Urban design undoubtedly exhibits a close relationship with mental health (Galea, Freudenberg, & Vlahov, 2005) where better access to green areas, greater walkability and enhanced physical activity are associated with lesser depression and may promote better health (Cohen-Cline, Turkheimer, & Duncan, 2015).

Thus, the cityscape that people navigate through is in fact a medium which affects emotions. In spaces where emotions become intense, materials, sounds, smells, light, spatial navigation and colour have a major influence on how people perceive themselves and cope with their current situations. The human body has an amazing ability to heal itself when immerse in positive healing environments or therapeutic spaces which is enabled by tapping into the internal pharmacies of the body when responding to the surrounding spaces (Sternberg, 2013).

5. URBAN STRESS AND BEST TARGETED STAGE

Mental health issue is a complicated field of studies where Dr. Philip George, a consultant psychiatrist from IMU, has mentioned that according to the National Institute of Health, depression is the most disabling sickness because it is intangible and most people find it difficult to understand (The Star, 2017).

Hence, the targeted stage of stress to be address through urban interventions has to be limited based on an achievable level and not targeting to solve the entire issue. As stress are being distributed into several stages, from the initial alarm stage to post breakout, the target stages of this study are from the normal homeostasis condition to resistance stage as shown in Figure 4 below (Selye, 1936).

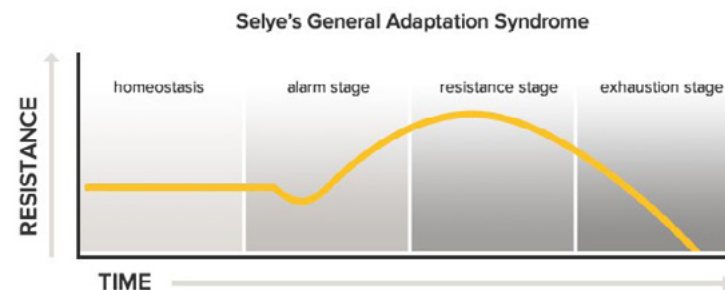


Figure 4: General Adaptation Syndrome in stress response (Selye, 1936)

Post exhaustion or mental breakdown stage is often the only concern where medical treatment would take place. However, as mentioned by Dr Hans

Selye, MD, “every stress leaves an indelible scar, and the organism pays for its survival after a stressful situation by becoming a little older”. Hence, solution should always come before the exhaustion stage. It has to focus on the early stages of mental health issue that is often caused by early stress or depression which emphasizes a full spectrum of thoughts, emotions and feelings that would possibly build up the initial symptoms of mental health problems. It typically refers to one’s level of happiness, and fulfilment relating to problems management and overcoming stressful events such as the nature of social relationships or interactions with the surrounding environment.

6. CONCLUSION

Urbanisation is one of the main health-related factors that humanity is facing today and will continue to face in the future (Adli, M., & Brakemeier, 2016). In conjunction with this growing trend, more urbanites will be exposed to risk factors coming from different experiences in life such as social and economic factors or even the physical environment of the urban setting which may contribute to the increasing stress and eventually, negative mental health.

Specialists believe that the number of mental health cases is often downplayed due to the stigma implanted into the perception of most people where mental health issue is viewed as a disgrace, and people is ashamed to admit it (George, 2017). This stigma often leads to the major breakout stage and even towards the worst scenario of mental issue which is suicidal where there is an estimation of 1 million suicide-related deaths every year around the world. The continuation of such stigmatic scenario without any new approach towards overcoming the mental health issues will result in the escalation of such problem. However, having programmes that expand the knowledge of mental health and produce more specialists to provide mental health services are not adequate when the stigma itself is the problem among the people.

Interestingly, the urbanised city setting provides better access to health care, employment and education despite being one of the major causes of stress. The balance between the effects of urbanisation that is detrimental and beneficial for mental health requires a better understanding of the interaction between urban living and mental health.

In conclusion, urban neighbourhoods play an important role in forming the urban population health due to the crucial socio-ecological environments which constituting both risk and health promoting factors (Mair, Diez Roux, & Galea, 2008). Hence, there have to be a new intervention acting as a catalyst to be injected into the developed urban setting. Therefore, the solution towards mental health issues should not only be confined to the post-breakout

treatment and recovery which often results in a slow progress but should also start at the pre-breakout or minor early stages of stress by incorporating possible solutions into one’s daily routines at urban and building

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THE EFFECT OF NATURAL SETTINGS ON STRESS REDUCTION

Nursuriani Shaffee¹ and Shureen Faris Abd Shukor^{1*},

¹Department of Landscape Architecture, Faculty of Design and Architecture,
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.

* Corresponding author:
shureen@upm.edu.my

ABSTRACT

The Stress Reduction Theory suggests that natural environment elicits greater calming responses which indicates a general reduction of psychological symptoms of stress by viewing natural setting features with restorative quality. The aim of this paper was to analyze literature on a range of natural settings to support the evidence of stress reduction effect related to exposure to the different types of landscape settings. A systematic review was carried out to examine 42 publications in order to identify the current state of the research. The review provides an overview of the relationship between nature setting of green spaces and stress reduction. Findings have shown that nature settings that helped in stress reduction could be divided into five main categories such as tended green spaces, forests, specific landscape elements, restorative landscape characters and nature sounds. Further research is recommended to assess the detail of the landscape characters to help establish the future framework for another population in developing countries in order to provide the best solution in restorative design and planning context.

Keywords: Environmental health design, human well-being, restorative design and planning

1. INTRODUCTION

Empirical studies have demonstrated experimentally that spending time outdoor and direct or visual contact with nature including time spent in a park or garden, in a room with plants, or looking at green spaces, or street trees from windows help reduce negative psychological effects and restore psychological health by reducing stress (Cole & Hall, 2010; Hartig, et. al; 2003). It was after Hartig (1996) claimed that he found no statistically significant difference in the evaluation of a restorative quality obtained between the real exposure visits and simulations. Later, Ulrich (2002) found positive changes in blood pressure, heart rate, muscle tension and brain activity which were produced by significant restoration within less than 5 minutes after viewing the natural settings.

This paper aimed to identify the types of the natural setting used in past studies and analyze the effects of green spaces on stress reduction and human health. The need for studies on the selection of the different types of green spaces to promote psychological and physiological well-being was mentioned by Ulrich (1979). It is significant to identify the types of natural settings used in studies related to stress reduction for several reasons: 1) to provide an overview of the current state of the research on the relationship among green spaces, stress reduction, and human health; 2) to group the diversity of research approaches by identifying the types of natural setting in green spaces, methodology, target groups, and the main outcome measure; and 3) to highlight future prospects of research on green spaces and human health.

1.1 Stress Reduction Theoretical Foundations

The most prominent and long-standing theory concerning stress response is the Stress Reduction Theory (SRT) (Ulrich, 1983). The SRT tends to view the

role of certain characteristics in natural environment (Bermain et. al., 2008) as they convey psychological values, behavior, and perpetual process, and complement each other in regard to understanding the aesthetic response to the natural environment. SRT was developed by Ulrich (1983; 1991), and it was used to understand the aesthetic and affective responses to the natural environment as well as to explain the emotional and physiological reactions toward natural spaces (Ulrich, 1991). Natural elements can elicit greater calming responses that indicate a general reduction of the psychological symptoms of stress. Viewing natural elements such as vegetation and water with restorative quality can activate an individual's positive affective responses, thus decreasing stress by reducing the level of negative feelings and reducing elevated physiological conditions. Ulrich assumed that an individual's first level of response toward the environment is mainly an affective, perceived autonomic, evoked by the visual stimulus of the natural environment. This theory suggests that environmental preferences are affected by people's need to get restoration (Hidalgo et. al. 2006; Van den Berg et. al., 2003; Laumann et al., 2003; Staat et al., 2003; Peron et al., 2002; Purcell et al., 2001), and environment perceived as natural tends to be more restorative than environment perceived to be urban or artificial (Berto et al., 2008; Berto, 2005; Herzog et al., 2003; 1997).

In support of this theory, empirical studies have indicated higher positive effect and less negative effect in participants exposed to natural environments compared to those exposed to urban or built environments (Lee et al., 2011; Park et al., 2007; Hartig et al., 2003;). Higher positive effects were found in participants who were physically present in nature (Lee et al., 2009) and those exposed to laboratory simulations of nature such as the viewing of videos depicting natural environments (Ulrich et al., 1991). This paper reviews previous literature to better understand the state of the art concerning potential types of natural settings and elements that allow a shift toward mediating the negative effects of stress to reduce the negative mood state and enhance positive emotions.

2. MATERIALS AND METHODS

2.1 Literature Search

In order to generate the initial source articles, peer-reviewed articles published in international scientific journals were selected. Studies that were published in national reports or local planning documents or 'grey literature' were omitted. An electronic database search was conducted on PubMed, Medline, American Horticultural Therapeutic Association Journal, Elsevier, Springer, Science Direct, and Academic Press. Full text electronic access was carried out through Universiti Putra Malaysia's link and websites such as Google

Scholar, Therapeutic Landscape Network, OPENspace, and Collaboration for Environmental Evidence. The terms used during the search were: 1) health related terms (restorative, health-promotion, recovery, stress, well-being psychology, nature therapy, and health psychology) and 2) environmental related terms (natural environments, natural settings, green space, open space, garden, and forest). The main search strategy as indicated in Figure 1 considers articles published between 1979 and 2017. The search process of this review was adapted from PRISMA diagram whereby a single diagram showed the multiple results from the search which was the simplest option to summarize for the reader in the least complicated way (Stovold, Beecher, Foxlee, & Noel-Storr, 2014). The search yielded a total of 1,100 documents in the form of peer-reviewed journal papers, dissertations, grey literature, and best practice guidelines. Reference titles and abstracts were independently double-screened against the inclusion criteria. Studies that meet the criteria were retrieved in full text, summarized and organized according to the data extraction items to provide an overview of the findings. From 1100 unique record of peer-reviewed journal papers, forty-two articles between 1979 and 2017 that met the inclusion criteria.

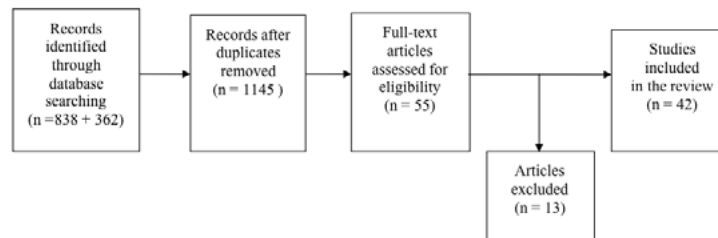


Figure 1: An adapted PRISMA flow diagram for the search of references .

2.2 Inclusion Criteria

Studies were deemed eligible for this review if they met the inclusion criteria: 1) published only in English language peer-reviewed journals, (2) real and virtual exposure stimuli, (3) the outcome related to stress-reduction measures, (4) experimental designs included randomized controlled trials, quasi-experimental studies (nonrandomized controlled trials; randomized or nonrandomized crossover trials) and natural experiments. As for the natural experiments, non-randomized studies were included in order to identify if recorded measures of restoration before and after exposure to nature/non-nature settings as well as excluded the baseline measures after exposure were carried out. However, since the inclusion criteria included only full-text publications in English, therefore this review was effected in a publication and substantial bias on selection.

2.3 Data Extraction Criteria

These data extraction criteria consist of two groups: (1) structural criteria (author, publication year); (2) content criteria that focus on the i) region: where the study took place, ii) target group: who the participants were, iii) study design: how the study was conducted, iv) natural setting: this described the content of the landscapes in the categories of natural/urban and landscape/no-landscape in the reviewed papers, v) stimuli: types of the landscape stimulus used in the exposure, and vi) measure: how stress was measured. Each study selected in the review was divided into eight sub-groups with frequencies of the studies by 1) authors and year, 3) region, 4) target group, 5) study design, 6) natural settings, 7) landscape stimuli used, and 8) stress measures.

3. RESULTS

3.1 Overview and General Patterns

The study on natural settings revealed an overview of the previous four decades of the study area. It is a growing research field, with an increasing number of publications i.e. 12% between the 1970s and 1990s, and most of the 88% (40 studies) were published from the year 2000 onwards (Figure 2). Most of these studies focused on respondents such as university students, the general public, patients suffering from stress, prisoners, and the elderly. These studies were also dominated by findings from Europe, the United States and the United Kingdom with a few coming from Asia and other continents such as Southern America, Africa, and Australia (Figure 3).

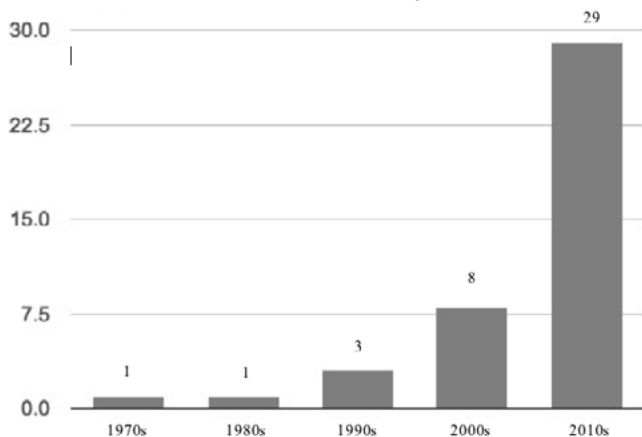


Figure 2: Growing Research Fields from 1970s – 2010s

3.2 Target Groups and Region

Studies on stress-reduction effects and aspects of related natural setting began in 1979 with only one publication, and over the decade, it has become a growing research field, with an increasing number of publications particularly after the 1990s. 14 studies (33%) addressed university students; 13 studies (31%) addressed the general adults; 7 studies (17%) focused on the general public; 4 studies (10%) focused on specific workers; 2 studies (2%) focused on patients suffering from stress; and one study (1%), each focused on prisoners and the elderly, respectively (Figure 3). Additionally, most research were dominated by findings from Europe (50%) and the U.S and U.K (19%), with few findings from Russia, South America and Asia which means there exists a large geographical knowledge gap despite the growing number of papers published on the research area.

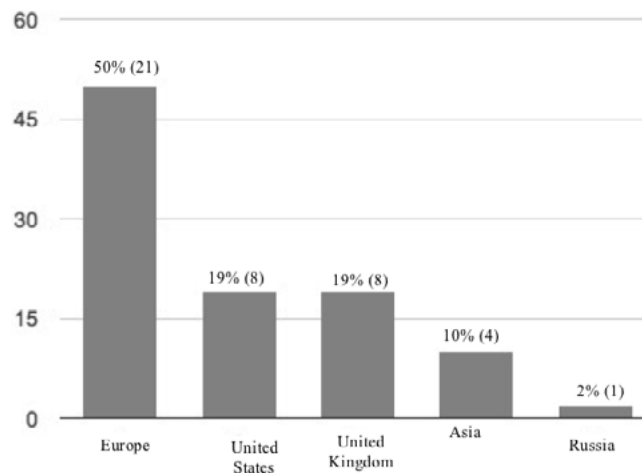


Figure 3: Regional Distribution in the Previous Study

3.3 Study Design, Landscape Stimulus and Natural Setting

Both quantitative (experiments and surveys), qualitative (interview) and mix methods (survey and interview) have been used in the various types of study designs applied in previous studies (Figure 4a). Most of the studies (32%) applied field experiment (outdoor environment and intervention program); 29% of the studies were laboratory experiments; 27% of the studies used the survey method (e.g.; face-to-face, focus group, mail questionnaire); 9% of the study applied mix methodology (survey and in-depth interview); and the remaining 3% of the studies applied the in-depth interview to retrieve important data from participants. Previous study designs have also utilized

several types of natural environment stimuli such as (1) view and walk through in a real exposure of natural setting, (2) view still images of photographs on screen, (3) view a moving image of films on various screen sizes, (4) view combinations of video films and photographs, and (5) view immersive of a virtual reality simulation (Figure 4b).

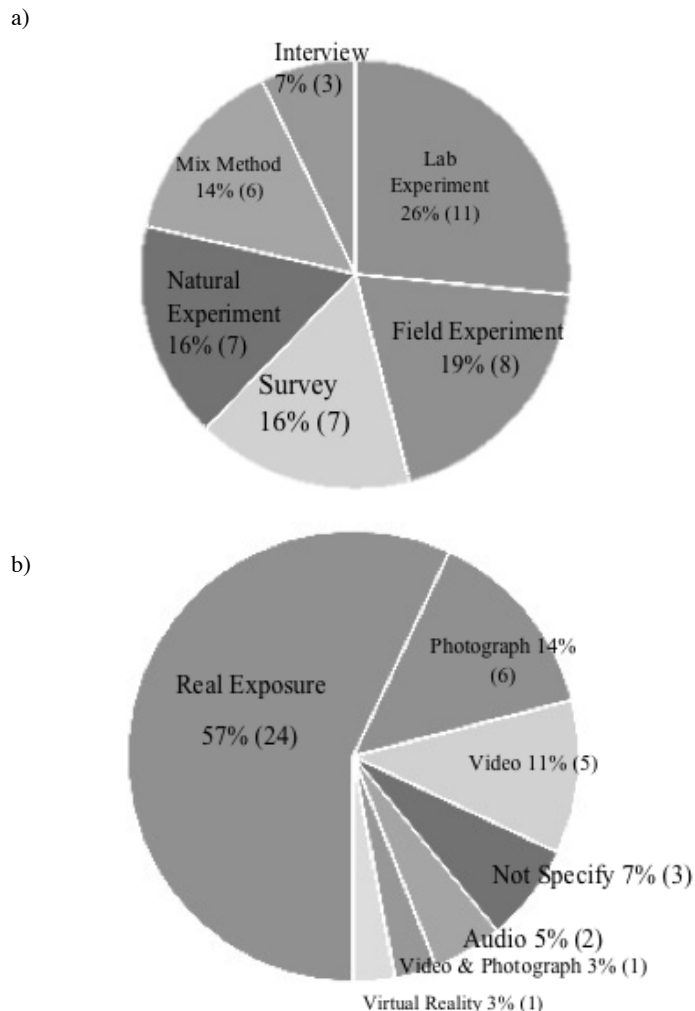


Figure 4(a): Methods and 4(b) Types of stimuli used in the previous studies

Figure 5 shows the types of natural setting used on the effects of stress-reduction identified and grouped into five categories: 37.5% of the studies were assessed in the range of tended green spaces which are the most common natural settings applied in the studies, followed by 25% in natural forests; 22.5% surrounded by specific landscape elements; 10% in potential restorative environments; and 5% involves the use of natural sounds.

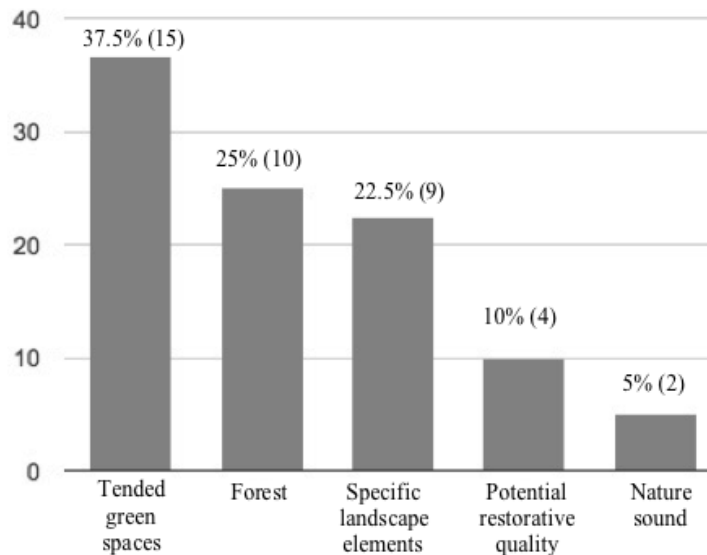


Figure 5: Types of Natural Setting in the previous studies

3.4 Stress Measure Used in the Literature

The research designs used in the reviewed studies involved a range of stress measurements i.e. quantitative, qualitative, and mix-methods (Table 1). The quantitative method is the most common research method (emotional state, frequency of sick-call visits, brain activity, heart rate, pulse rate, blood pressure, skin conductance response, muscle tension, salivary cortisol, emotion test, attention-tests, frequency of follow up sessions, respiratory rate, hair cortisol, and nervous response), followed by the qualitative method (interviews).

Table 1: Types of Stress Measure Applied in the Studies

Types of Measure	Author
Self-Reported Emotional State	Triguero-Mas et al. (2017), Wang et al. (2016), Tyrväinen et al. (2014), Annerstedt et al. (2013), Brown et al. (2013), Sonntag-Öström et al. (2011), de Kort (2006), Hartig et al. (2003), Rodiek (2002), Ulrich (1979)
Frequency of sick-call visit	Moore (1981)
Brain Activity	Change et al. (2008),
Heart Rate (Electrocardiogram)	Triguero-Mas et al. (2017), Wang et al. (2016), Tyrväinen et al. (2014), Annerstedt et al. (2013), Brown et al. (2013), Alvarsson et al. (2010), de Kort (2006), Ulrich (1991)
Pulse Transit Time	Ulrich (1991)
Blood Pressure	Triguero-Mas et al. (2017), Tyrväinen et al. (2014), Brown et al. (2013), Hartig et al. (2003), Ulrich (1991)
Skin Conductance Response	Wang et al. (2016), Alvarsson et al. (2010), de Kort (2006), Ulrich (1991)
Muscle Tension	Ulrich (1991)
Workload Pressure	Leather (1998)
Self-Reported Well-Being State	Ward Thompson et al. (2016), Brown et al. (2013), Ward Thompson et al. (2012), Leather (1998)
Salivary Cortisol	Triguero-Mas et al. (2017), Ewert et al. (2016), Tyrväinen et al. (2014), Roe et al. (2013), Annerstedt et al. (2013), Beil & Hanes (2013), Ward Thompson et al. (2012), Rodiek (2002)
Emotion Test	Triguero-Mas et al. (2017), Van den Berg et al. (2014), Van den Berg et al. (2003)
Attention Test	Triguero-Mas et al. (2017), Wang et al. (2016), Tyrväinen et al. (2014), Brown et al. (2013), Sonntag-Öström et al. (2011), Van den Berg et al. (2003), Hartig et al. (2003)
Interview Questionnaires	Ratcliffe et al. (2013), Gatersleben & Andrews (2013), Ward Thompson et al. (2012), Adevi (2012), Stigsdotter & Grahn (2011), Sonntag-Öström et al. (2011), Stigsdotter (2014), Grahn & Stigsdotter (2003)
Self-Rating on Perceived Health	Triguero-Mas et al. (2017), Arnberger & Eder (2017), Stigsdotter et al. (2017), Memari et al. (2017), Gidlow et al. (2016), Ward Thompson et al. (2016), Wang et al. (2016), Sidenius et al. (2015), Sahlin et al. (2014), Roe (2013), Beil & Hanes (2013), Gatersleben & Andrews (2013), Ward Thompson et al. (2012), Stigsdotter (2010), Grahn & Stigsdotter (2009), Hansmann et al. (2007),
Frequency of Follow-up Session	Sidenius et al. (2015), Corazon et al. (2002)
Respiratory Rate	Brown et al. (2013)
Behavioral Observation	Sidenius et al. (2015), Sahlin et al. (2014)
Self-Rating Green Space Access	Gidlow et al. (2016), Ward Thompson et al. (2016),
Hair Cortisol	Gidlow et al. (2016),
Nervous Response Rate	Triguero-Mas et al. (2017)

4. DISCUSSION

4.1 Measurement of Environmental Influence Variables

While the majority of the assessed studies were exploratory in nature settings, they were also predominantly empirical, which means that many of the potentially influential environmental variables were defined by the investigators in advance of research commencement with the input from research target group. Environmental variables that were commonly assessed as having potential influence on stress reduction effects included measures of: nature dominated by vegetation (Ulrich, 1979); farmland (Moore, 1981);

nature setting with water (Ulrich, 1981); trees, vegetation, plants and foliage (Leather et al., 1998); forest roadside (Parsons, Tassinari, Ulrich, Hebl, & Grossman-Alexander, 1998); horticultural garden (Rodiek, 2002); vegetated hillsides (Hartig, 2003); natural element with and without creek (van den Berg et al., 2003); urban green space (Grahn & Stigsdotter, 2003); garden at workplace (U. A. Stigsdotter, 2004); semi open landscape area (de Kort, Meijnders, Sponselee, & IJsselsteijn, 2006); city park (Hansmann, Hug, & Seeland, 2007); wilderness area (Chang, Chen, Hammitt, & Machnik, 2007); restorative environment (Grahn & Stigsdotter, 2010); natural sounds (Alvarsson, Wiens, & Nilsson, 2010); green space (Stigsdotter & Grahn, 2011); forest (Lee et al., 2011); different types of forest (Sonntag-Öström et al., 2011); potential restorative green space character (Ulrika Karlsson Stigsdotter & Grahn, 2011); rehabilitation garden (Adevi & Grahn, 2012); healing forest (Corazon, Schilhab, & Stigsdotter, 2011); green space at residential area (Ward Thompson et al., 2012); natural area (Gatersleben & Andrews, 2013); different types of outdoor setting (Beil & Hanes, 2013); nature and built environment (Brown et al., 2013); virtual natural environment with and without sound (Annerstedt et al., 2013); nature element sounds (Ratcliffe, Gatersleben, & Sowden, 2013); green space in neighborhood park (Roe et al., 2013); types of nature, gardens, and green space (Sahlin, Ahlberg, Matuszczyk, & Grahn, 2014); different types of urban environment (Tyrväinen et al., 2014); different types of green space setting (Van den Berg, Jorgensen, & Wilson, 2014); therapy forest (Sidenius, Stigsdotter, & Refshauge, 2015); different types of public spaces (Arnberger & Eder, 2015); different types of urban green spaces (Wang, Rodiek, Wu, Chen, & Li, 2016); types of green spaces at residential areas (Ward Thompson, Aspinall, Roe, Robertson, & Miller, 2016); green space and agriculture land (Gidlow, Randall, Gillman, Silk, & Jones, 2016); undeveloped natural area (Ewert, Klaunig, Wang, & Chang, 2016); different characters of potential restorative environment (Memari, Pazhouhanfar, & Nourtaghani, 2017); different characters of forest (Ulrika Karlsson Stigsdotter, Corazon, Sidenius, Refshauge, & Grahn, 2017); green, blue, and urban environment (Triguero-mas et al., 2017); botanical garden (Vujcic et al., 2017); and forest environment (Ulrika K. Stigsdotter, Corazon, Sidenius, Kristiansen, & Grahn, 2017). A common feature of most of the assessed studies is the use of researcher-defined definitions of environmental influences on the stress reduction effects on human health.

Based on the 42 studies assessed in this review, the types of natural setting used on stress-reduction effects were identified and grouped into five categories: 1) 37.5% range of tended green spaces specifically for pleasure (horticulture garden, garden at workplace, therapy garden, and botanical garden) which are the most common natural settings applied in the studies; 2) 25% forests (natural woodland, parkland, wildwood, and therapy forest);

22.5% of the studies conducted in surrounding with specific landscape elements (trees, shrubs, stream, lawn, bushes, flower bed, water); 10% of the studies conducted in potential restorative characters (refuge, nature, prospect, serene and rich in species), and 5% of the studies conducted using natural sound (bird, water and pleasant natural sound). A majority (n=42) reported a significant, independent relationship between environmental conditions and human stress reduction through the psychological and physiological outcomes even though two studies identified used only natural sounds.

4.2 Knowledge gap

The Stress Reduction Theory explains the relationship between environmental influences and health, especially those exploring the potential types of natural elements that allow a shift toward mediating the negative mood state and enhancing positive emotions by reducing stress (Ulrich, 1979). Therefore, this review helps to synthesize current research on the influences of different types of green spaces and stress reduction effects of different subject areas using a wide range of methods across unevenly distributed case areas from around the world. Having critically reviewed 42 research papers, some important future prospects in green space-related health studies and environmental health design and related research are highlighted:

- i- The review reveals that although previous studies compared the stress-reduction outcomes to the different types of natural settings, the categories compared are still very coarse and are barely related directly to specific elements. These coarse categories have clearly failed to reflect the variety of natural settings that are important in defining the landscape characters and elements.
- ii- Four studies analyzed responses toward specific elements that are related to the presence or absence of water in natural and urban scenes (Ulrich, 1979); trees and flowers (Leather, 1998); vegetated hill and stream (Hartig, 2003); lawn and bushes (de Kort, 2006; however, the number of representative case studies is limited to predominantly Western Europe, the U.S and the U.K thus, providing little information on which landscape elements that contribute the most to reduction of stress among adults, the public, patients, and the elderly (Velarde et al., 2007) from other regions. Therefore, developing countries need to contribute actively to the scientific research in order to establish a new framework that can be used and adapted in other climates such as the tropical region of Asia Pacific.

- iii- The selection of students as respondents has been used extensively in these studies due to easy access on data availability. Only one study analyzed responses to the garden and nature elements by comparing the effects of an outdoor garden and a non-garden group of the elderly (Rodiek, 2002). For an improved understanding of the nature setting issues among the elderly, it is important to encourage the elderly's participation in explaining the relationship between landscape elements and the health and well-being of the elderly as more empirical evidences that yield results that provide a reliable representation requires further validation.
- iv- Garden and urban green spaces have been known for their restorative effects on both psychological and physiological health. Several authors have analyzed a design framework that can contribute to improved stress outcome. Nevertheless, more empirical studies are needed to convince urban planners and designers on the multiple benefits of green spaces and landscape elements, and to provide the best solution on how to use the research results in the implementation of a specific national design and planning context with regard to spaces (Hartig & Jahncke, 2017).

5. CONCLUSIONS

The study has identified the types of green spaces that have an environmental influence in the relationship between stress reduction and human health. The findings show that the green spaces used in previous studies could be described into five main categories: 1) tended green spaces; 2) natural forests; 3) specific landscape elements; 4) restorative environment; and 5) natural sounds. Key findings from the literature review reveal that the main health aspects of exposure to green spaces are related to psychological outcomes (cognitive function, psychological stress, well-being, and depression and anxiety symptoms); physiological outcome (self-reported health, incidence of diseases, quality of life, and physiological measure); nature settings (tended green spaces, natural forests, specific landscape elements, and restorative environment); and specific landscape elements (trees, flowers, vegetated natural environment, stream, lawn, and bushes).

Regardless, although this review has the possibility of limitations, some strategies can be used to ensure the scientific rigor. Therefore, future research could continue to explore and confirm the initial findings by adding the mentioned landscape elements to the conceptual framework in different

context, location and culture in the effort to design a better responsive restorative outdoor spaces.

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YOUNG LANDSCAPE ARCHITECTS' PERCEPTIONS FOR MALAYSIAN RECREATIONAL FORESTS

Mohd Kher Bin Hussein^{1*} and Mohd Nazri Bin Saidon¹

¹Department of Landscape Architecture, Faculty of Design and Architecture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

* Corresponding author:
mohdkher@upm.edu.my

ABSTRACT

The beauty of Malaysia's recreational forests depends on the quality of their natural landscapes. These include flora and fauna, soil, topography/landform, geological features, and water bodies. Man-made elements such as bridges, litter bins, walkways, playground equipment, and shelters also contribute to the forests' landscape beauty. Natural assets and man-made elements need to be in harmony with one another to maintain the visual attractiveness of these forests. However, there have been few studies on young landscape architects perceptions of Malaysia's recreational forests. This study aimed at understanding this group of professionals' perceptions of recreational forests and their site development in Malaysia. Two recreational forest sites were selected for this study. They are Sg. Chongkak Recreational Forest and the Ampang Recreational Forest in Selangor. A survey was conducted using photo-questionnaires with photographs as surrogates of the actual environment. A total of 119 young landscape architects participated in this study. Results showed that these young landscape architects perceived the natural landscapes of both parks as decent but the man-made facilities in both forests did not harmonize well with the existing natural surroundings. The findings in a form park management with regards to managing the beauty of recreational forests and efforts should be geared towards appreciating their aesthetic values, the architecture, and the overall ecology of these recreational forests.

Keywords: Malaysia's forest, recreational, landscape architect, perception

1. INTRODUCTION

The idea of recreational forests originated in Europe during medieval times when royalty and the aristocratic class took part in hunting (Bell & Petursson, 2009). In the United States, forest recreation was first officially established in 1905 as a locus for recreation for the growing urban population spurred by rapid industrial growth (Cregan & Murphy, 2006). In Malaysia, the first recreational forest, the Templer Recreational Forest was officially opened by Sir Gerald Templer, the British High Commissioner in Malaya before Independence, in 1954 (Mohd Kher, 2012). Today, recreational forests are created for the economic benefits as well as fulfilling people's need for leisure and recreation. Most recreational forests in the Country are equipped with basic facilities such as chalets for users to stay overnight. However, these developments put pressure on the pristine forests and their surrounding areas.

Malaysia's recreational forests are a significant recreational and tourism asset. Visitors seek to view and experience the diversity and beauty of the tropical forests ecosystems. These forests are endowed with diverse flora and fauna as well as other natural attractions (Nur Hafizah, 2014). Moreover, these forests allow people to experience outdoor activities such as bird watching and other wildlife viewing, jungle trekking, camping and nature walks, jogging, mountain biking, and, in some areas, bathing, freshwater fishing, canoeing, kayaking, rafting and river tours. Idris, et al. (2013) reported that more than 500,000 visitors visited the 10 recreational forests in Selangor in 2011. The Bukit Nenas Recreational Forest alone received 5,278 foreign and 1,092 local visitors in 2011 (Forest Department of Peninsular Malaysia, 2012). Most of these visitors aged between 15 to 40 years old.

Malaysia defined recreational forests as an area of Permanent Forest Estate used for leisure, sports, research activities, and education as well as for

conserving flora and fauna (Manual Perhutanan 2003, p. 1628, 2005). These forests are provided with constructed facilities to attract visitors (WWF Malaysia, 1996) and serve as areas for urban dwellers to escape from the hectic and stressful city life. Recreational forests consists of natural landscapes (e.g.: vegetation, soil, land form, geology, fauna and water bodies) and man-made elements (e.g.: bridges, litter bins, walkways, and shelters) can to attract the younger age groups to indulge in physical activities.

Malaysian recreational forests have been designated for public recreational uses since the First Malaysian Plan (Nor Azlin, 1999). In pursuant to the National Forestry Act, these forests are continuously being developed in the Malaysia five year plans (Jalil & Chee, 1983). In 2011, the Forest Department of Peninsular Malaysia listed 124 recreational forests that were still opened to the public (Idris, et al., 2013). The goals of their establishments are to provide places for the public to relax and carry out outdoor family or group activities; to create awareness among the public on the importance of maintaining the environment for a better life; to enhance individual performance and to escape from the stress of work and busy city life; to provide opportunities for the public to explore forest areas and enjoy its natural beauty; to function as open laboratories for conducting research and education; and as ecotourism attractions for additional revenue to the Country (Forestry Department of Peninsular Malaysia, 2013).

Yet despite their values as a major tourist attraction, these forest environments are sensitive to environmental damage and degradation. These include soil compaction, fire damage, vegetation trampling, water contamination, and soil erosion. Irresponsible waste and trash disposal, unmanaged interaction with flora and fauna, and uncontrolled modification of landscapes from soft adventure activities also became major problems as well as causing disturbances to wildlife and the habitat. Over time, these cumulative impacts caused eroded and unattractive landscapes, poor habitat, sparse vegetation, polluted rivers and fewer animals and birds for visitors to enjoy. These greatly reduce the attractiveness of the forest destinations for tourists. In addition people in general are sensitive to human interventions, especially local infrastructure provisions and signs of human presence (Qiu et al., 2013).

This paper presents a study on young Malaysian landscape architects' perceptions of current development in the recreational forest in light of their conservation. Landscape architect is a relatively young profession in Malaysia but its contribution towards the planning and design of natural landscapes is getting more significant. It is important to solicit landscape architects' views of these forests because they are now perceived by other land development professionals as important contributors in the planning,

design, and construction related to natural areas. They are more involved in the initial stages of a design or restoration project, contributing more to the functional and aesthetic aspects of site design (Minich, 2011). Even though recreational forests in Malaysia had been developed for more than 50 years, there has never been a study on how professionals like landscape architects perceive their development.

Being young Malaysians, these landscape architects are also frequent users of the recreational forests. This group had shown more favourable attitudes towards the forest landscape compared to older groups who have relatively low preferences for the wilderness but rather higher preferences for managed natural settings. This is due to the older groups greater physical and physiological vulnerability, which may make them more at risk from the dangers of wilderness areas (van den Berg & Koole, 2006). Landscape architects are more aware of landscape degradation due to their better understanding of landscape perception through their professional educational. Thus, it is assumed that information gained from them are more reliable for use as a basis for creating a framework for policy formulation, planning, assessment, and monitoring of landscapes as well as to support decision-making (Tveit & Ode, 2014).

2. YOUNG GROUP AND RECREATIONAL FORESTS

Malaysia's National Youth Development Policy (1985) defines "young" as those between the ages of 15 and 40 years. This age group prefers to do outdoor recreational activities such as camping, jungle trekking, and other similar activities. Recreational forests are able to offer these activities for the young to enjoy through the provision of facilities and amenities (Zainol & Au-Yong, 2016). Apart from sites, facilities, and safety, the ability to perform physical activities also play a significant role in attracting these youngsters to spend their time in recreational parks (Baran et al., 2013). According to Gardsjord et al. (2014), the young tended to visit parks to enjoy the outdoors and natural scenery, provided there are some attractive features (Zainol & Au-Yong, 2016). Furthermore, outdoor activities benefit the young in terms of satisfaction and personal development as well as to promote social interactions among them. Bell et al. (2007) suggested that mental well-being is also supported through the role of play in helping to establish personal and community identity for young people and children. The most important benefit of forest is that it has a positive influence on the psychological and physiological health of people (Tyrväinen et al., 2014).

Recreational forests provide numerous resources for human well-being such as trees, scenic views, geological formations, river, and lakes (Chen et al., 2016). These resources influence the aesthetic, recreational, educational, and cultural aspects of people. However, these landscape resources could change dramatically when they are not managed properly and will impact future young generations. Therefore, there is a need to understand how young people perceive and use recreational forests. Thus, this study attempts to understand young landscape architects' perceptions on recreational forest development based on their knowledge of the environment and its planning and design. It is necessary to understand their perceptions and thoughts in connection with landscape management and conservation practices because they will inherit these landscapes in the future. The younger generations will inherit the impacts of large-scale landscape changes and will likely live longer and experience the consequences of those changes (Chen, 2016).

Recreational forests contain diverse flora depending on their location and site characteristics such as altitude. The diversity of these species has increased forests beauty. For instance, the floor of montane ericaceous forests (above 1,500 meters altitude) are mostly dominated by species from the Ericaceae family while lowland Dipterocarp forests are dominated by Meranti and Balau (Shorea spp) and Kapur trees (*Dryobalanops aromatica*). In many coastal and riverine areas, mangrove (*Rhizophora* spp) forests with their unique stilt roots and pneumatophores as well as thick leaf structures dominate the area. The diverse vegetation found in the recreational forests provides interesting opportunities for the young users to have nature-based outdoor activities such as nature study, camping, and conservation work. This will enhance the young people's' mind towards forests as well as building up their responsibility towards nature.

Moreover, wonderful topographical features in recreational forests such as waterfalls and mountainous terrain become attractions to young people to enjoy the panoramic view of the forest. A study done by Mapjabil et al. (2015) discovered that waterfalls and rivers are the major attractions that draw young visitors to visit these recreational forests. Besides visual appreciation, the uneven terrain provides the young with challenging activities such as mountain biking, climbing and hiking. Geological features such as the limestone and rock outcrops (granitic rock and megacrystic granite) displaying varied textures offer young recreationists geological experiences. Water flows on the hard geological surface of granite rocks, and falls from the hills and rapids, offer waterfalls and lakes for bathing and swimming. Caves found in hilly areas offer opportunities for visitors to these forests to enjoy nature through caving activities. These nature's gifts are priceless and need special care and attention from everyone because they tell the story of the Earth's early formation.

On the other hand, landscape architects also understood that the varieties of wildlife in recreational forests can provide enjoyment for them. Their activities include observing wildlife, participating in outdoor activities such as bird watching, insect collecting, photography, hunting and fishing (University of California, 2007). Forest mammals such as monkeys, otters, deer, rodents and rabbits are the most recognized wildlife. Meanwhile, birds add colour, movement, and sound to these forests and play crucial roles in the forest ecosystem by dispersing seeds, pollinating plants, and by eating insects and rodents.

Despite the numerous opportunities provided by the recreational forests, there is currently little empirical evidence on how young professionals, especially young landscape architects perceive the forests. Thus, it is important to investigate their insights because they have been exposed in evaluating and understanding landscapes. They were trained to observe and judge specific landscape attributes based on the principles of art, design, resource management, and ecology. They also act as representative of the younger generation that forms the highest percentage of recreational forests' users. A study carried out by Tierney et al., (2008) found that young people (more than 50% out of 1828 respondents ages 18-44 years surveyed) made up the most number of visitors visiting natural areas in Barcelona (Spain), Glasgow (UK), Los Angeles (US) and Morelia (Mexico). Furthermore, Rosilawati et al. (2012) found that the mean age of respondents in their study was 23.96 years old with a minimum age of 14 years (3%) and a maximum age of 48 years (1%). These results can be used to understand young users' needs and wants in recreational forests. The information is useful for park planners and managers in their efforts to improve the recreational forests.

Managing aesthetics and scenic landscape qualities are part of landscape architects responsibility. Laughlin (1984) carried out a study on attitudes of landscape architects in the USDA Forest Service toward the Visual Management System (VMS). The majority of landscape architects in the Agency were between the ages of 30 and 50 years old (54% below 40 years old, which is considered as young). The study was designed to explore the attitudes and opinions of this professional group towards the VMS and to determine their perceptions of the relationship between the methodology and the management of the National Forests. Based on the attitudes expressed, projections were made on the probability that the VMS provided a firm foundation to manage the forest visual resource. Thus, it can be seen that study about landscape perception is necessary in order to know what people like or dislike as well as to know how people view their landscapes.

Landscape architects can take a leading role in fostering environmental consciousness among foresters, land planners and designers towards conserving

recreational forests. This can lead to healthy recreational forests development in Malaysia. Thus, understanding the sense of beauty of recreational forests, requires an understanding of how people perceive it. Lückmann et al. (2013) suggested that it would be valuable to take the time and effort to investigate adolescents' insights into landscapes if we want to understand what different landscapes in botanical gardens mean to young people. Therefore, the aim of this study is to analyse and understand young Malaysian landscape architects' visual scenic perception of recreational forests.

3. METHOD

Data was gathered through a survey using a photo-questionnaire with photographs as surrogates of the actual environment. The Sungai Congkak Recreational Forest (SC) and Ampang Recreational Forest (AR) (Figure 1) were selected because they are among the more popular recreational forests in Selangor, Malaysia.

A total of 119 young landscape architects participated in the study. They made up of 12% out of 975 members of the Institute Landscape Architect, Malaysia (ILAM) in 2016. Participants were selected based on judgemental or expert sampling from a list of landscape architects provided by the Institute and based on the following criteria: a) their companies must be more than a year old, b) must be registered with ILAM, c) they must have worked for more than a year, d) have a degree in landscape architecture, and e) willing to volunteer for the survey. Once identified, they were contacted and invited to participate. The respondents were then briefed on the procedure and supplied with self-administered photo-questionnaires.

A set of colored photographs representing a variety of natural recreational forest landscapes (vegetation, soil, topography, geology, and water bodies), facilities (benches, toilets, wakafs, etc.), site layout, and maintenance activities made up the photo-questionnaire (Figure 2). All photographs were taken at eye level using a digital camera with a lens set at 50 mm, horizontal views, and proper angles (balance, depth, focus and panoramic). The photographic-collection was screened to remove poor quality and inappropriate photographs. There were 69 photographs chosen and used in this photo-questionnaire survey (39 photographs of SC and 30 photographs of AR). These images depicted Natural Settings (NS) (27 photographs), Design Elements (DE) (14 photographs), and Maintenance Aspects (MA) (14 photographs). The layout plans of the study sites representing site planning were also attached to the survey instrument. The photographs were taken from the study sites during a fieldwork on sites' existing conditions. To ensure the photographs were without bias, they were shown to other researchers for validation. A Likert scale (5 = very good; 4 =

good; 3 = normal; 2 = bad; 1 = very bad) was used to measure respondents perception. Foursets of evaluation forms together with the photographs were distributed to four respondents respectively. The evaluation forms were collected after three days to allow the evaluators enough time for their evaluation. Fortunately, all of the respondents are able to complete the task within the time given. Landscape variables had been grouped into the five parameters in this study (Table 1).

Table 1: Landscape parameters

Parameters	Variables
Natural Landscapes	Vegetation, Soil, Topography, Geology and Water
Design	Facility and Accommodation
Planning	Layout and Respect to nature
Maintenance	Natural elements and Man-made elements
Cleanliness	Site condition



Figure 1: Location of Sg. Chongkak Recreational Forest and Ampang Recreational Forest

Forest



Respect to nature –
scale/size



Respect to nature -
location



Respect to nature -
colour



Respect to nature
– form/shape



Respect to nature -
material

4. Maintenance



Vegetation



Barbeque grill



Camp site



Pergola



Signboard

5. Cleanliness



The dry leaves
swept



Road surface



Grass cutting



Pathway cleanliness



Water quality

Figure 2: Sample photographs of recreational forest scenes

4. RESULTS AND DISCUSSION

4.1 Demographic

This study had grouped the respondents' age according to the Malaysia's National Youth Development Policy (1985) it is between the ages of 15 and 40 years. They were grouped into three group categories with twelve years intervals (Table 2). These are labelled as Teenagers (15 – 27 years); Adolescents (28 – 40 years); and Elderly (> 40 years). However, this study found that young landscape architects in Malaysia's usually start work at the

age 23 years old, that is, after their graduation. Therefore, the Teenagers group for this study actually is from the ages of 23 to 27 years old. Table 3 shows that the majority of respondents were in the Teenager group (58.82%), while the Adolescents made up 39.50% of the respondents. The ethnic backgrounds of the respondents were Malays (82.35%), Chinese (15.97%), and Indians (1.68%). Malay respondents were dominant in this study because the majority of ILAM members are in this ethnic group.

Table 2: Respondents background

Respondents		Total	Percentage (%)
Gender:	Male	51	42.86
	Female	68	57.14
Young Groups (years):	teenagers (15– 27)	70	58.82
	adolescents (28– 40)	47	39.50
	elderly (>40)	2	1.68
Ethnicity: Malay		98	82.35
	Chinese	19	15.97
	Indian	2	1.68

It was also reported here that none of the respondents rated for all the variables as “normal” thus, this value was not shown in the Table 2.

Table 3 shows respondents’ perceptions on the landscape attributes of the study sites. Most of them perceived the natural landscapes of both forests as “decent.” This means that the vegetation, soil, topography, and water quality in the study sites are acceptable to the respondents.

a. Vegetation

The existing vegetation in both recreational forests are perceived to be in good conditions (SC: n=78; 65.55%; AR: n=73; 61.34%). This is true where both parks are still densely covered with big, tall trees, and thick undergrowth. The dense stands of trees provide shelter from the sun.

b. Topography

Most respondents perceived the topography in SC more attractive than in AR (SC: n=86; 72.27% while AR: n=65; 54.62%). It was observed that SC has a larger flat area providing ample space for users to carry out their leisure activities. They also perceived that SC has better geological features (n=82; 68.91%) and water features (n=82; 68.91%) compared with AR (Geology: n=70; 58.82%; Water: n=62; 52.10%). In fact, the main stream in SC runs a straighter course through the recreation forest. It also has gentle riverbanks and continuous, voluminous, and clear water. On the other hand the stream in AR does not have any waterfall or rapid, and thus lacking interesting opportunity for recreational activities.

c. Natural setting

It shows clearly here that the natural settings of both recreational forests (including plants, animals, insects, etc.) were perceived to be in good condition as captured by many of the images

presented to the respondents. The positive perceptions of the respondents in this study have been influenced by the richness, diversity, and variety of the vegetation as well as the existence of water elements which were present in the given photographs.

d. Layout

Most of the respondents preferred the layout of SC and described it as attention-grabbing as compared to the layout in AR (SC: n=86; 72.27%; AR: n=68; 57.14%).

e. Design of facilities

Only half of the respondents perceived the design of existing facilities to be in harmony with the surrounding forest environment (SC: n=56; 47.06% and AR: n=55; 46.22%). This indicates that the designs of the facilities are less integrated with the surrounding natural features. Thus, this contributes to the reduction of aesthetic values and decreases the pleasurable experiences of users. However, slightly more than half of the respondents perceived the planning and design of both recreational forests as respecting nature (SC: n=67; 56.30% and AR: n=61; 51.26%).

f. Maintenance aspects

With regard to site maintenance, slightly more than half of the respondents perceived this aspect as good for the natural elements (SC: n=73; 62.18% and AR: n=77; 64.71%), while half of them perceived man-made elements to be in good condition (SC: 50.42% and AR: 54.62%). Nevertheless, only half of the respondents perceived the state of cleanliness as good for SC (n=62; 52.10%) and AR (n=60; 50.42%). Therefore, more efforts are required for the management of both places to increase the maintenance quality. Maintenance can adversely affect users’ experiences of the recreational forests (Mohd Kher, 2014; Dorwat, 2004). This is in line with a study by Bedimo-Rung et al. (2005) who concluded that badly maintained green spaces may fall into disrepair and lower the visual qualities of the setting. It may give the impression that negative social behaviours are accepted.

In general it can be said that there is good management planning in both study sites. However, only between 47-72% of respondents perceived the overall attributes as good. This means that there is a need to improve the planning and management of their resources in the future to protect their

attractiveness. This calls for better emphasis on strategic and operational training of personnel involved to protect the park's attractiveness, which are especially sensitive to visual alterations. Otherwise, the beauty of these two recreational forests continues to degrade and reduce their attractiveness to visitors.

Table 3: Young professional landscape architects perception of landscape of the study sites

Subject	Very Good		Good		Bad		Very bad		Mean Score	Std. Deviation
	n	%	n	%	n	%	n	%		
Sg. Chongkak Recreational Forest										
Natural Landscapes: Vegetation	28	23.53	78	65.55	10	8.40	3	2.52	3.10	0.64
Soil	12	10.08	72	60.50	33	27.73	2	1.68	2.79	0.64
Topography	11	9.24	86	72.27	22	18.49	0	0.00	2.91	0.52
Geology	25	21.01	82	68.91	12	10.08	0	0.00	3.11	0.55
Water	25	21.01	82	68.91	11	9.24	1	0.84	3.10	0.57
Planning & Design:										
Layout	12	10.08	86	72.27	19	15.97	2	1.68	2.91	0.57
Facility	10	8.40	56	47.06	49	41.18	4	3.36	2.61	0.69
Respect to nature	28	23.53	67	56.30	20	16.81	4	3.36	3.00	0.74
Maintenance:										
Natural elements	19	15.97	74	62.18	21	17.65	5	4.20	2.90	0.71
Manmade elements	8	6.72	60	50.42	45	37.82	6	5.04	2.59	0.69
Cleanliness	8	6.72	62	52.10	41	34.45	8	6.72	2.59	0.72
Ampang Recreational Forest										
Natural Landscapes: Vegetation	43	36.13	73	61.34	3	2.52	0	0.00	3.34	0.53
Soil	12	10.08	63	52.94	43	36.13	1	0.84	2.72	0.65
Topography	17	14.29	65	54.62	37	31.09	0	0.00	2.83	0.66
Geology	13	10.92	70	58.82	36	30.25	0	0.00	2.81	0.61
Water	22	18.49	62	52.10	27	22.69	8	6.72	2.82	0.81
Planning & Design:										
Layout	25	21.01	68	57.14	24	20.17	2	1.68	2.97	0.69
Facility	34	28.57	55	46.22	27	22.69	3	2.52	3.01	0.79
Respect to nature	19	15.97	61	51.26	36	30.25	3	2.52	2.81	0.73
Maintenance:										
Natural elements	26	21.85	77	64.71	15	12.61	1	0.84	3.08	0.61
Manmade elements	16	13.45	65	54.62	35	29.41	3	2.52	2.79	0.70
Cleanliness	25	21.01	60	50.42	31	26.05	3	2.52	2.90	0.75

5. COMPARISON OF LANDSCAPE ATTRIBUTES

A paired-samples t-test was used to compare the landscape attributes of both study sites. Table 4 shows the differences in perceptions of landscape attributes between Sg. Chongkak Recreational Forest (SC) and the Ampang Recreational Forest (AR). There are significant differences in the perceptions of vegetation, geological features, water, facilities, maintenance, and cleanliness at both sites. Respondents perceived vegetation in SC (M=3.10, SD=0.64) as less attractive than AR (M=3.34, SD=0.53), $t(118) = -3.45$, $p = 0.000$. This could be due to AR having good maintenance and tree stands with trimmed hedges along the roads, which provides neat and attractive image of the area. They also perceived the geological features of SC (M=3.11, SD=0.55) to be more attractive than AR (M=2.81, SD=0.61), $t(118) = 4.44$, $p = 0.000$. This could be attributed to the river in SC having more attractive rock formation with smooth and beautifully formed boulders and rocks.

They also perceived water in SC (M=3.10, SD=0.57) to be more attractive than water in AR (M=2.82, SD=0.81), $t(118) = 3.99$, $p = 0.000$. The water in SC is well acknowledged by past visitors for its coolness, refreshing, and clear due to the upper region of the river passing through undisturbed forest. On the other hand the water quality in AR is frequently low, the flow is tediously slow, and the water quality deteriorates further due to the construction of the East Klang Valley Expressway (EKVE) project which when completed will run through the Ampang forest reserve. In terms of appearance of facilities AR (M=3.01, SD=0.79) was perceived better managed and tidy compared with SC (M=2.62, SD=0.69), $t(118) = -4.54$, $p = 0.000$. This is based on the photographs supplied to them in the photo-questionnaire.

In term of maintenance of man-made elements, respondents perceived them as fairly well maintained in AR (M=2.79, SD=0.70) as compared to SC (M=2.59, SD=0.69), $t(118) = -2.83$, $p = 0.005$. This could be due to the low maintenance work appearing in SC's photographs where the colours of the structures appeared dull and untidy. In some ways, what they see in the photographs represented the aspect of site maintenance because a majority of the landscapes had been evaluated, appreciated and perceived according to situations with good maintenance functions as the enhancement (Nassauer, 1997). Finally, the respondents had differences in perceiving cleanliness. Table 5 shows that they considered AR (M=2.90, SD=0.72) cleaner and tidier than SC (M=2.59, SD=0.72), $t(118) = -3.69$, $p = 0.000$. This could be the result of SC receiving a higher number of visitors than AR leading to higher maintenance load in the former than the latter. Furthermore, there is also a higher problem with vandalism and littering within the area ever since the recreation forest was established.

6. CONCLUSION

This study found that young Malaysian landscape architects perceived the forest recreation management cared for their landscapes and the undisturbed natural vegetation provided good ambiance and visual attractiveness for recreation activities. They also perceived that the sites are planned with respect for nature. However, many of them felt that the design of the facilities such as the benches and playground equipment did not harmonize well with the forest surroundings in term of colour and material used. They also agreed that the maintenance of the sites could be further improved.

The landscape architects opined that the management of these recreation forests needs to ensure that the landscape beauty of the forests should be of high quality to give pleasurable experiences to visitors. Landscape resources should be protected as they are the Country's valuable heritage to be enjoyed

Table 4: The differences of young professional landscape architects perception towards landscape beauty of the study sites

	Sg. Chongkak Recreational Forest		Ampang Recreational Forest		Pair t-test		
	Mean	Std. Deviation	Mean	Std. Deviation	df	t	p
Geology	3.11	0.55	2.81	0.61	118	4.44	0.000**
Vegetation	3.10	0.64	3.34	0.53	118	-3.45	0.001**
Water	3.10	0.57	2.82	0.81	118	3.99	0.000**
Respect to nature	3.00	0.74	2.81	0.73	118	2.81	0.006
Topography	2.91	0.52	2.83	0.66	118	1.04	0.301
Layout	2.91	0.57	2.97	0.69	118	-0.94	0.348
Maintenance of natural	2.90	0.71	3.08	0.61	118	-2.51	0.013
Soil	2.79	0.64	2.72	0.65	118	0.83	0.407
Facility	2.62	0.69	3.01	0.79	118	-4.54	0.000**
Maintenance of manmade	2.59	0.69	2.79	0.70	118	-2.83	0.005**
Cleanliness	2.59	0.72	2.90	0.75	118	-3.69	0.000**

Notes: **significance at the 5% level

by the present and future generations. The natural landscapes are important resources for people. Therefore, the management needs to reduce impacts on these resources. They should provide quality outdoor recreation opportunities to visitors so that they can enjoy quality outdoor recreation experiences in these forests. Managing and keeping recreational forests beautiful will bring environmental, social, and economic benefits. Comprehensive management plans for these sites are vital and they should be sensitive to the main forests parameters which are the natural landscapes, design, planning, maintenance and cleanliness. Insensitivity to these attributes can contribute to the degradation of landscape beauty of these forests.

This study highlighted the need for recreational forest management to take concrete actions to improve the manmade elements. The management should realize that it is very important to have recreational forests that offer harmonized facilities and accommodation with the existing forest environment so that it can enhance the forest beauty and at the same time provide convenience to users. Maintenance aspects also need to be given priority by the management as these were perceived to be less satisfactory. In relation to this, the maintenance aspect is vital in providing a good recreation ambiance and quality experience to users and indirectly this can enrich their quality of life and wellbeing.

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RELATING DESIGN PRINCIPLES WITH ISLAMIC SPIRITUALITY BASED ON THE TRANSFORMATION OF NATURE IN DESIGN PROCESS

Zulkifli Muslim^{1*}

¹Department of Industrial Design, Faculty of Design and Architecture,
Universiti Putra Malaysia 43400 UPM, Serdang, Selangor
Malaysia

* Corresponding author:
zulmuslim@upm.edu.my

ABSTRACT

The biological, physical and visual aspects of the environment influence life philosophy, culture, society, tradition and creativity development. However, the potential of environmental resources such as plants can contribute to the design production has not been examined adequately and analyzed systematically. There is a lack of exploration on linking the design process and idea with the Islamic principles embedded in the Islamic spirituality. This paper presents an analysis of the design process of nature (plants) and its relationship with the Islamic principles, design and qualities. The principles and terminology are discussed in relation the Islamic spirituality and the qualities of Asma' ul Husna to gain a comprehensive understanding of the creative process and the aesthetic content of design products. The study highlights the potential to interpret design works based on the internal process of human creativity. The link to the spiritual values originated from the Light of the Creator, Allah swt has been made evident in the creative process. The findings provide a process of linking the external and internal processes of designing exemplified by an analysis of nature as the source of ideas thus increases the value and content of Islamic design products.

Keywords: Nature, design process, Islamic design principles, Islamic spirituality, Asma' ul Husna

1. INTRODUCTION

One of the most amazing God's creations is nature and its growth. It is important to examine the way humans observed nature in design and create systems in the creative design process. There is a need to study nature at all levels – from the function and form of biological molecules, to the structure and process of tissues and organs, to the behavior and gross anatomy of entire organisms, to complex interrelations between the numerous species of an ecosystem. In this regards, innovations in design through transformation based on the fundamental study of transformation principles have informed the significance of new and original designed products with enhanced function (Xiang et al., 2015). Design concept inspired by nature resource provides us with combinations of shapes and colors and textures. It is possible to incorporate these basic images into our design. The vision in graphic design is to promote respect for the natural world by incorporating nature into the visual design and spiritual values. This paper analyzes the transformation process of design in light of the understanding of the potential growth of nature and Islamic principles and meanings. It requires the understanding of the relevant definition of the concept of transformation in accordance with the application of design ideas into design products.

The Quran emphasizes on the importance of unity, which means Muslims are meant to be an united ummah, which is justly balanced in nature between the legal aspect of religion and the spiritual dimension, also between the internal and the external aspects of life. Through symbol design that integrates the concept of Islamic spirituality, the stability, harmony and prosperity of life could be felt and valued in accordance with the understanding and practice of the Quran, the hadith and the spirit of Asma' ul Husna (God's "most beautiful Names").

The core idea of nature growth and Islamic spirituality concept is a science that studies nature's ideas and then regenerates these designs and processes to solve human problems, with the understanding of Islamic principles. According to Zakaria & Mohammed (1994), since the beginning of life people's thinking has been affected by the natural elements and resources. In addition, the influence of the shape and character of plants have been incorporated in the development of human life and social behavior. However, the process requires the understanding of the definition of the concept of transformation by changes in applications and technology and the production process (Muslim, 2016)

Apart from the influence of culture and traditions, images of plants also serve as a symbolic element to show the meaning that could be applied in various design patterns for building, the traditional pattern for textiles, tiles and transformation process of creation of Islamic symbols in the context of cosmology. The problem relates to the inability of designers to translate the forms and shapes of nature based on an understanding of Islamic principles thus the products designed have devoid of spiritual meanings. Lack of emphasis is given to the process of translating the idea based on Islamic principles and the adaptation to the design products is weak (Muslim, 2018). This is evident in the end products of nature-based such as traditional motifs using plants and geometric patterns that are repeatedly used in various contexts such as buildings and furniture without addressing the spiritual meanings according to where the idea is applied. Therefore there is a need to examine the design and translation process to link the development of the forms and shapes to the qualities associated with Islamic spirituality.

Laleh Bakhtiar (1997: 9) has described the process in his book entitled 'Design Process of Symbolic Meaning in Islamic Sufism'. According to the analysis, the design can be translated using dynamic and static forms. The transformation of the design generated from the form of round, triangle, square and point, where the process is moving and changing shape to forms of dynamic and static. This associates the forms with the ideology and terminology in the context of Islamic Sufism. It discusses the creation of god, the level of knowledge and practice of human divinity in Islamic cosmology. The researcher also highlights his point of view on the interpretation of the design of geometric shapes based on the Islamic concept that has been interpreted according to the Quran as explained by Tarek El Bouri and Keith Critchlow (1993: 55) as follows:

"The foundation and principles by Issam El-Said in geometric design identified as 'Usul', which he conceived as the system of creativity in the Islamic artistic heritage and as the conceptual essence of al-

Mizan, the 'balance' mentioned in Al-Qur'an: "and the sky He exalted and established the balance..." (Surah Ar-Rahman: 50).

The objective of this paper is to examine the image of local plants and relating it to the Islamic design concept and principles. It includes searching for new and current methods in the design process to discover the potential of nature. The image of plants inspired by Islamic design can be observed in the design product such as tiles, lamps and furniture design. The design terminology, the process and method of application could be more effective by developing the conceptual and methodological framework based on the Quran and Asma'ul Husna. This integrated design approach has a great potential to be explored by designers and researchers in increasing the value of the product.

2. METHODS

In the production of design, a lot has been discussed on the quality of the product but there is a lack of emphasis on the processes involved, the way the design is produced and its influence in the development of Islamic design concept. In terms of the source of ideas in Islamic design characteristics, there is a gap between the design process and the sources from the Quran, the hadith and the Asma'ul Husna, in contributing to the value of the design product. Therefore, a clear and systematic design process with an adaptation of the Islamic principles the creation and production process is still unexplored by designers. In this investigation, the Islamic principles and concepts in the design process will be translated and discussed in light of the qualities associated with Islamic spirituality and Asma'ul Husna.

The content of the product design should also relate to the interpretations of Islamic spirituality and visual symbolism, which elaborated from the pillars of Islam and Faith. Through a system of a transformation process, an observational analysis of nature and environment resource as a potential elements for Islamic design ideas and inspiration to produce a functional design to suit with the current lifestyle, culture and contemporary modern living environment.

In examining the design transformation process, the criteria for the transformation process will be established through the manipulation of forms and shapes. The method is designed by selecting the most relevant design elements. The design phase includes the process of recognizing, refining and strengthening the design criteria by producing more detailed transformation processes and translation. The principles of design will be translated into Islamic spiritual concepts and values based on the beautiful qualities of Asma'ul Husna.

3. ISLAMIC DESIGN AS SPIRITUAL PROCESS AND THE MIRROR OF THE DIVINITY OF ALLAH SWT.

Islamic design should be regarded as spiritual development process. It can be reflected in the shape of circles, which have no end therefore infinite. Conceptually, these elements remind the designers and observers that Allah is infinite. Complex designs create the impression of unending repetition, and this also helps a person get an idea of the infinite nature of Allah.

The repeating units also demonstrate that in the small space we can find the infinite. A single element of the pattern implies the infinite totality. The use of each unit is part of the way that Islamic art represents nature and objects by their spiritual qualities, beyond their physical and material qualities. The repeated shapes of each design motifs often make use of plant motifs. The integration of arts and crafts into everyday life was very much the norm in the traditional Islamic world. The idea is that Islam is integral to every part of a Muslim's life and makes it beautiful, so Islamic design should influence the beauty of everyday life. The emphasis in Islamic design is on ornamentation rather than on art for art's sake.

The art of the Islamic world reflects its cultural values, and reveals the way Muslims view the spiritual realm and the universe. For the Muslim, reality begins with and centers on Allah. Allah is at the heart of worship and aspirations for Muslims, and is the focus of their lives. Islamic design focuses on the spiritual representation of objects and beings, and not their physical qualities. The Muslim artist does not attempt to replicate nature as it is, but tries to convey what it represents. This lets the designer and those who experience the art, get closer to Allah. For Muslims, beauty has always been and will always be a quality of the divine. There is a hadith of the Prophet Muhammad that says: "Allah is beautiful and He loves beauty."

A common feature of Islamic design is covered with geometric and organic constructions of design. This use of elements is thought to reflect the language of the universe and help the believer to reflect on life and the greatness of creation.

4. THE INTELLECTUAL AND SPIRITUAL THINKING IN ISLAMIC DESIGN

The concept aims to encourage intellectual, spiritual and philosophical thinking and the meaning of existence and macrocosmic laws, enhance the soul and nourish the spirit. Adopted in the design process and design expressions, cultural or religious symbols are perceived with their meanings. A universal version of a symbol, through the application of the digital tool

generates the simplicity of the symbolic form. Tradition, history and religion become the key elements beyond the physical design, while being in tune with the essence of nature. The design concept explores the rich heritage tradition of the Islamic world, with a particular focus on the philosophy, the concept and creative thinking. The element of lines and structure normally emphasis with the harmony, nature and qualities of beauty that complement the tradition of Islamic design civilizations. The concept incorporates with numbers of each part with the meanings of God's manifestations. An Islamic spiritual meaning that represents the tawhid, the servant of God, the submission to God, the purity, the Quest (talab), the Love (ishq), the Gnosis (ma'rifat) the Contentment (istighna), the Content, the Wonder (hayraf), the annihilation (faqr-o-fana) and others.

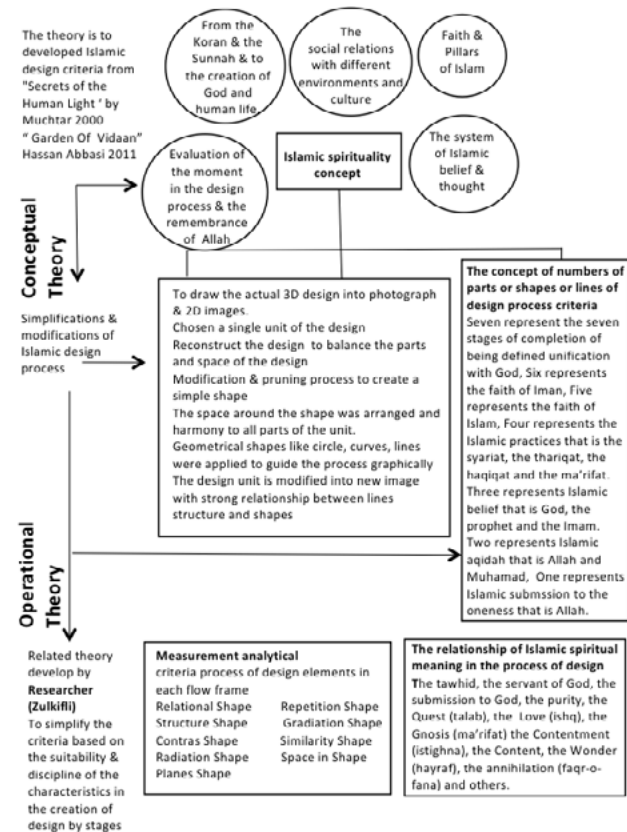


Figure 1 : Theoretical development of Islamic spirituality concept in the process of design creation

4.1 Design Concept Relating to God’s Light in Islamic Spirituality

The transformation process associated with the concept of the manifestation of the light of God towards human beings, quoted from the book of “Secrets of the Human Light ‘ by Baginda Muchtar. The link between the design process and the Light manifested in the human heart as a perfect human can be conceptualized in the following diagram (see Figure 2). The relationship can be translated in a way that the end product or the outcome of the design is not considered as the reality. The reality is embodied in the spiritual process of the human as a perfect creation. For instance, the spiritual process of the intention is a manifestation of God’s creation that reflected as the design intention (the pre-process towards the goal of the design process). The light of the heart is the light flow of ideas that are reflected as the source flow from the origin of the image or design output. The light of the movement is the implementation of the development of the design process. The light of the soul captures a sense of feeling that is reflected in the appreciation of design (the beauty and aesthetic). Thus, the light of the mind is to translate action and the results are reflected in the creativity of design.

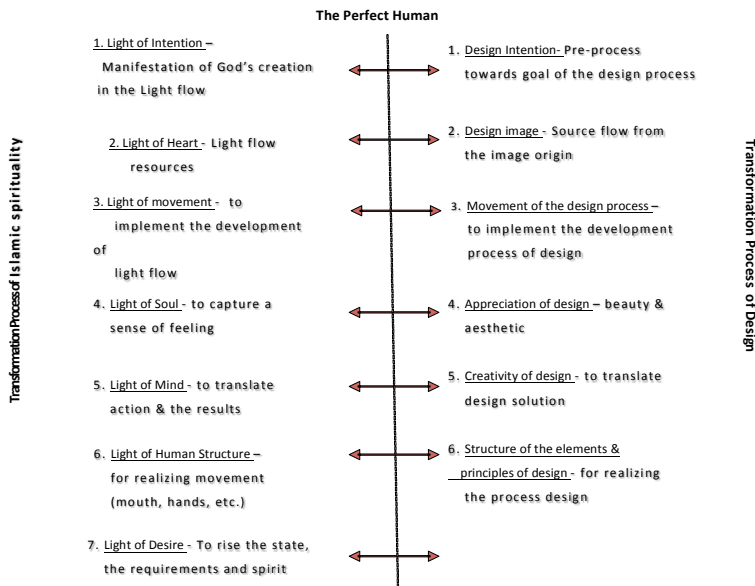


Figure 2 : Linking Islamic spirituality with design transformation process

4.2 The qualities of Asma’ul Husna

The qualities of Asma’ ul Husna are experienced when a human soul absorbs the higher qualities of God’s creations and transform the qualities in a design creation. The following tables summarize the relationship developed as a result of the translation of the design elements with the qualities of the Asma’ul Husna

Table 1 (a) to (d) : Linking the design elements and principles with qualities of Asma’ul Husna: The Structure

(a)

The basic structure - Absorbing the qualities of Al-Musowwir			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma ul Husna
	Interpretation of Pillars of Islam and Faith		
The Basic Structure	The pillars of Islam	Islamic foundation	Al-Musowwir - المصور (The One who forms His creatures in different pictures)

(b)

The balance structure - Absorbing the qualities of Al-Hakam			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The Basic Structure	The balance of Ritual Practice	Islamic Balance	Al-Hakam - الحكم (The Arbitrator, The Judge)

(c)

Structures that Merge/Separation - Absorbing the qualities of Al-Waarith			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
Structures that Merge/Separation	The relations among Muslims	Merges	Al-Waarith - الوارث (The One whose Existence remains)

(d)

The Basic Structure - Absorbing the qualities of Az-Zohir			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The external lines	The relations of physical practices	The outer appearance	Az-Zohir الظاهر (The Manifest)

Table 2 (a) to (d) : Linking the design elements and principles with qualities of Asma'ul Husna: The line, the form and basic structure

(a)

The Basic Structure - Absorbing the qualities of Al-Baathin			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The internal lines	The relations of spiritual practices	The inner spirit	Al-Baathin - الباطن (The Hidden)

(b)

The Flow of Lines - Absorbing the qualities of Ar-Roqib			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The flow of lines	The journey to God	The flow of Rivers	Ar-Roqib - الرقيب (The One that nothing is absent from Him. Hence it's meaning is related to the attribute of Knowledge)

(c)

The Connecting Lines - Absorbing the qualities of Al-Waarith			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The connecting lines	The journey to God	Lineage of Faith	Al-Waarith - الوارث (The One whose Existence remains)

(d)

The Dominant Form - Absorbing the qualities of Al-Qahhar			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The dominant form	The truth and honest in Islamic principles	Islamic control	Al-Qahhar - القهار (The Dominant)

Table 3 (a) to (d) : Linking the design elements and principles with qualities of Asma'ul Husna: The structure, form, color and texture

(a)

The Function of Form - Absorbing the qualities of As-Somad			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The function of form	The faith in destiny and the divide decree	The function of destiny	As-Somad - الصمد (The Master who is replied upon in matters and reverted)

(b)

The Primary Colors - Absorbing the qualities of Al-Musawwir			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The primary colors	The reflection of unity among human beings	The reflection of colors	Al-Musawwir - المصور (The Organizer, The Designer)

(c)

The Message/Concept of Elements - Absorbing the qualities of Al-Halim			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The Message/Concept of Elements	The guidance of Quran and Sunnah	The elements of messages	Al-Halim - الحليم (The One who delays the punishment for those who deserve it and then He might forgive them. The Gentle. The most patient, the Clement)

(d)

The Secondary Colors - Absorbing the qualities of Al-Barr			
2D Design Terminology	Islamic Symbolism	Islamic Principles	Absorbing the qualities of Asma' ul Husna
	Interpretation of Pillars of Islam and Faith		
The Secondary Colors	The reflection of unity among human beings	The elements of messages	Al-Barr - البار (The Benefactor, The Beneficent, The Pious)

5.THE ART OF WISDOM, THE DESIGNER AND THE DESIGN PROCES

The art of wisdom & Islamic principle in design process

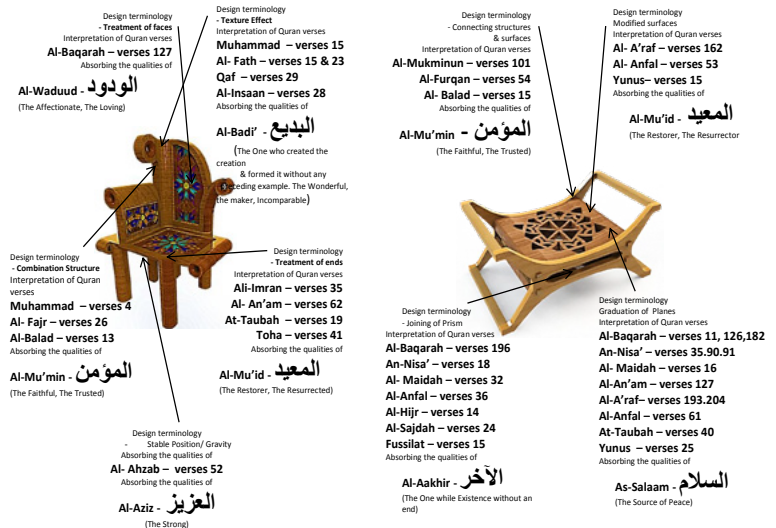


Figure 3: The Art of Wisdom: -Translating Islamic Principles in Design Process

Evaluation of the design process and the remembrance of Allah

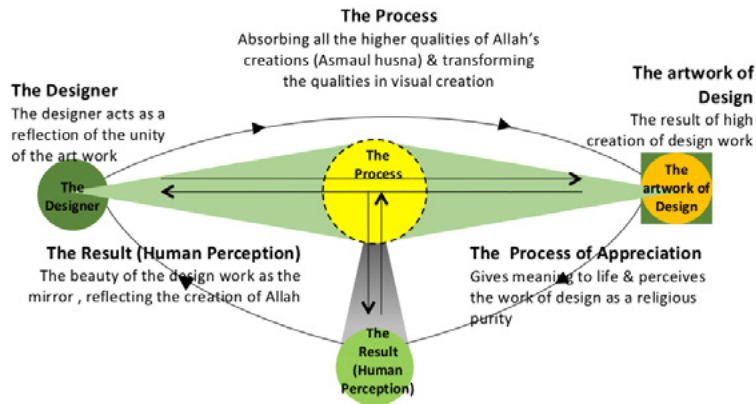


Figure 4: Linking design process, the designers and the Remembrance of Allah swt

Table 5(a) to (d) : Designers as a reflection of the higher qualities of Allah's creation

b)

The spirit of Hearing As-Samik السميع				
The All-Hearing, The Hearer, The One who Hears all things that are heard by His Eternal Hearing without an ear, instrument or organ.				
Purity practice of spiritual zikir	Amount of practicing	Absorbing the higher qualities of Allah 's creations	The process of spiritual practice	The outcome - Islamic human perception
Al-Samik السميع	7 Times of Spiritual practice of 'As-Samik" daily	The spirit of Hearing	The work of design as a religious purity	The sense of hearing spiritually and enhance the aesthetics of the design work as the mirror , reflecting the creation of Allah

c)

The spirit of Saying Al-Muhaimin المهيمين				
The Protector, The One who witnesses the saying and deeds of His creatures.				
Purity practice of spiritual zikir	Amount of practicing	Absorbing the higher qualities of Allah 's creations	The process of spiritual practice	The outcome - Islamic human perception
Al-Muhaimin المهيمين	7 Times of Spiritual practice of 'Al-Muhaimin" daily	The spirit of Saying	The work of design as a religious purity	The beauty of saying spiritually and enhance the aesthetics of the design work as the mirror , reflecting the creation of Allah

d)

The spirit of Seeing Al-Basir البصير				
The All-Seeing, The One who Sees all things that are seen by His Eternal Seeing without a pupil or any other instrument.				
Purity practice of spiritual zikir	Amount of practicing	Absorbing the higher qualities of Allah 's creations	The process of spiritual practice	The outcome - Islamic human perception
Al-Basir البصير	7 Times of Spiritual practice of 'Al-Basir" daily	The spirit of Seeing	The work of design as a religious purity	The beauty of seeing spiritually and enhance the aesthetics of the design work as the mirror , reflecting the creation of Allah

The spirit of Smell - Al-Waajid الواجد				
The Perceiver, The Finder, The Rich who is never poor. Al-Wajid is Richness.				
Purity practice of spiritual zikir	Amount of practicing	Absorbing the higher qualities of Allah 's creations	The process of spiritual practice	The outcome - Islamic human perception
Al-Waajid الواجد	7 Times of Spiritual practice of 'Al-Waajid" daily	The spirit of Smell	The work of design as a religious purity	The sense of smell of fragrance spiritually and enhance the aesthetics of the design work as the mirror , reflecting the creation of Allah

From the analysis, it can be summarized that the Interpretation of design can be interpreted in various forms based on different beliefs and the dominant principles applied. Interpretation of a design depends on the level of understanding and a way of assessing it. To create innovation, designers can translate their skills in the beautiful and divine elements from religious design and culture. The knowledge of design creation has been linked with the appreciation in the remembrance of Allah creation. The qualities of Asma' ul Husna can be associated with various principles such as the beauty of seeing spiritually, sensing the smell of fragrance spiritually and enhancing the aesthetics of the design work as the mirror, reflecting the creation of Allah swt and reflected in the colors, balance and the designed elements. The design process should be regarded as a spiritual process that directly linked to the qualities manifested from the Islamic spirituality. The aesthetic quality of the design should be internalized as the manifestation of the beauty of Allah swt as the sole creator. Thus the link between the internal and the external occurs in the process of designing and interpretation of the design will follow according to the spirit of the elements explored in the design process.

With regards to the spiritual process, in order to achieve the Islamic value, Muslim designers need to practice spiritual zikir and absorb all the higher qualities of Allah's creations (Asma' ul Husna) and transform the qualities in design creation. This appreciation will give meaning to life and perceive the value of works in design as a religious purity. The value of the products can be assessed based on the level of interpretation and closeness to spiritual qualities associated with the elements based on the transformation of nature as the source of reference.

6. CONCLUSION

The study analyzes the design process relating to nature and Islamic concepts. Based on the natural resources and Islamic understanding, the value of technology, cultural and aesthetic is built. The study has established a link between the processes of production and creativity of nature-based designs and Islamic spirituality. Islamic designers should translate their work based on the variance of the reality that combines artistic vision and philosophical thought, scientific and aesthetic values. There is a meaningful relationship between the design process and spiritual meanings and experience. The internal process of human creativity should be linked to the spiritual values originated from the Light of the Creator, Allah swt. The findings provide a potential link between the external and internal process of designing exemplified by an analysis of nature as the source of ideas thus increases the value and content of the end product.

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EVALUATION THEORIES OF PRODUCT DEFINITION METHOD FOR A SUCCESSFUL NEW PRODUCT

Hassan Alli^{1*}

¹Department of Industrial Design, Faculty of Design and Architecture,
Universiti Putra Malaysia 43400 UPM, Serdang, Selangor
Malaysia

* Corresponding author:
halli@upm.edu.my

ABSTRACT

In this paper, The Product Definition Method is used to facilitate the product designer to establish successful product design characteristics. It presents a complete process to involve users in the product definition stage of the design process. The validation of this method is conducted through using one example of a very successful product as a case study. In addition, the in-depth study of sales performance through Correlation Test and Regression Analysis of its success. The result identified that The Product Definition Method is a systematic method as well as a decision making tool in order to involve the user in the design process and will assist them to develop the product design specifications. It also allows the product designer to verify the product quality and make decisions to contribute to its success.

Keyword: *New Product Development, Product Design Definition Method, Design Process and Successful Product*

1. INTRODUCTION

Innovation begins with creative ideas. Idea quality generated by a user consists of novelty, feasibility, strategic relevance and elaboration. Users can be the source of new ideas to develop an innovation (Riedl et. al., 2010 and Taha et. al., 2013; Alli, 2018). User knowledge provides more opportunities in supporting the innovation idea. Much has been written about the expected consequences of user contribution in the entire product development process, whereby their relationship with product developers increase the level of innovation performance and the way the product become a success in the market. The user requirements also influence the development of a new product by providing the product direction, while preferences determine the product success. A deep understanding of how users gain value including an accurate understanding of user's need and wants, is required if the product developer wants to be commercially successful. The success of a new product not only often requires satisfying the user requirements and preferences, but also the systematic process (Taha et. al., 2013; Alli, 2014; Alli, 2018).

Product development deals with many aspects, it not only concerns bringing a new product innovation but also conceptualizing the redesigning or reengineering of a product. The empirical studies implied the outcome of coordinating product development activities and resources with users in the product definition stage of the design process. It is a valuable means of enhancing the development process and increasing the like hood of product success (Awa, 2010 & Bhuiyan, 2011). User involvement in new product development has been widely discussed among academicians and product developers from various disciplines of engineering, design, management and marketing. The collaboration of the product designer and user in the design process is highly required to produce the perfect new product (Lee, 2008; Taha et. al., 2013; Alli, 2018). They become important as an effective means to

identify a unique solution for an intended new product. The product definition phase is known as an important phase to identify and develop the specification of a new product. In addition, it covers the upfront product development activities that are more considered for understanding user needs, market analysis, priority decision criteria list, organizational support and others. The involvement of the user in product development needs a systematic and effective strategy in order to obtain user requirements and preferences, and incorporate them as part of product design specifications (Alli, 2014; Alli, 2018).

A number of researchers have investigated and found that a lack of collaboration between product designer and user brings conflict and failure on new product ideas. The development of a new design methodology is important to support the early design activities in the early stage of the design process. The Product Design Definition Method (PDDM) is developed to incorporate the three characteristics of product design (design requirements), user requirements and successful product in an attempt to establish successful product design characteristics and increase the probability of product success (Figure 1).

Table 1: Product Design Definition Method process

STEP	Description	Tools
STEP 1	User input is required, which product designers' team should capture information needed according to SPDC Map	Tool 1 SPDC Map
STEP 2	Prioritizing successful design specification design (PDS)	Tool 2 SPC Matrix
STEP 3	Verifying product design specification (PDS) through clustering process.	Tool 3 PDS Matrix
STEP 4	Building successful product design characteristics (SPDC) into the success factor (XS) Detailed Description worksheet.	Tool 4 XS-Detailed Description

The successful product design can be identified through the following formula:

$$XS = SPDC [SPC + PDS] + TS$$

Success Factor (XS) =
Successful Product Design Characteristics (Successful Product Characteristics + Product Design Specification) + Technical Specification

Product development is aimed to deliver the product specification that would satisfy and identified needs. However, there are many factors that can influence the success of a new product. In the context of product purpose, does it meet the user's need? In addition, how do the user requirements and preferences contribute to the success of a new product? To be able to clarify the factors that influence product success, the investigation conducted involved a mobile Smartphone. The discussion is based on decision making process in product development, in which there is need to incorporate the elements of product design in establishing the characteristics of a new product. It has extended the knowledge from product designer and users as a strategy for improving the efficiency of generating a new product idea, product quality and probability to increase product success. The Product Definition Method is used in the product definition phase of the product process in order to establish the characteristics of a new product and contribute to its success.

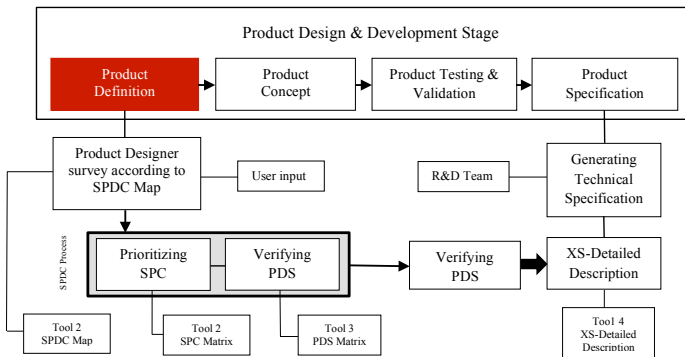


Figure 1: Product Design Definition Method

The PDDM is intentionally developed as a process to identify and establish the successful product design characteristics (SPDC) in the product definition stage of the design process. There are four steps that the product designer should follow to use the proposed PDDM framework in order to establish the successful product design characteristics (Table 1).

2. METHOD

A case study is conducted in order to identify and prove the success factors of Apple iPhone mobile through sales performance. Four successful product characteristics and the design specifications were identified as having a strong influence - multi function (usability), advanced technology (technology), good performance (performance) and user friendly (interface). The results indicated that multi-function characteristics, through usability which has increase the number of product features from previous iPhone models to the new iPhone model, has influenced of product success (Table 2).

Table 2: Successful Product Design Characteristics for iPhone mobile

Successful Product Characteristics (SPC)	Product Design Specifications (PDS)	Technical Specifications (TS)
Multi-function	Usability	Features
Advanced Technology	Technology	Camera and display
Good Performance	Performance	CPU, graphics and memory
User Friendly	Interface	Application Communication

2.1 Correlation and Regression

The success of a new product can be identified through it sales performance. Sales performance through Regression Analysis was conducted in order to provide evidence that the seven characteristic for success have a strong influence and become factors that contribute to sale performance. Apple iPhone mobile was selected as case study. The Apple mobile was selected based on its sale performance and user satisfaction. Factor analysis was carried out through correlation and regression methods using the SPSS software. The correlation result will be accepted if the correlation is significant $p < .05$, while, the regression analysis was used to analyze the relationship between interval variable. It contains two value dependent (Y) and independent variables (X). The regression analysis of the variable in this analysis can be identified through the formula $Y = a + bX$ and $Y = a + b_1X_1 + b_2X_2 + \dots + b_kX_k$

3. RESULTS AND DISCUSSION

Table 3 shows the correlation between the sales and features variable of the iPhone. The results show that there is a significant and very strong correlation between the sale and features variable ($r = 0.98; p < .05$). The results indicate that $R^2 = 0.95$ showing 95 percent of the features variable strongly influenced the increment sales.

Table 3: Correlation sales and features variable

		Sales	Features
Sales	Pearson Correlation	1	.976*
	Sig. (2-tailed)		.004
	N	5	5
Features	Pearson Correlation	.976*	1
	Sig. (2-tailed)	.004	
	N	5	5

* Correlation is significant at the 0.05 level (2-tailed)

The results also show that if more features variable were added to the product it would increase the sales volume. The increment of sales has been proven by using the formula $Y = a + bX$. The correlation is found as $Y = -14003.05 + 7856.23X$

3.2 Correlation Test for Advanced Technology Characteristics

There are two variables from the advanced technology characteristics X1 (camera) and variable X2 (display) that are also shown to contribute to the sales of the iPhone. Table 4 shows the correlation between sales and the two technology variables. The results indicate that there is a significant and very strong correlation between the sales and variable X1 ($r = 0.94; p < .05$). Variable X2 shows that there is a significant and very strong correlation ($r = 0.97; p < .05$). Therefore, variable X1 and variable X2 show that there is a significant and strong correlation ($r = 0.90; p < .05$) with sales.

Table 4: Correlation sales and technology variable

		Y	X1 (camera)	X2 (display)
Pearson Correlation	Y	1.000	.940*	.967*
	X1 (camera)	.940	1.000	.895*
	X2 (display)	.967	.895	1.000
Sig. (1-tailed)	Y	.	.009	.004
	X1 (camera)	.009	.	.020
	X2 (display)	.004	.020	.
N	Y	5	5	5
	X1 (camera)	5	5	5
	X2 (display)	5	5	5

* Correlation is significant at the 0.05 level (1-tailed)

Note: Y=sales, X1=camera (megapixel), X2=Display (ppi)

The results also indicate that $R^2 = 0.96$ showing that 96 percent of both technology variables strongly influenced increment of sales. In addition, if more X variable is added to the product it will increase the sales volume. The increment of sales is proven using the formula; $Y = a + b_1X_1 + b_2X_2 + \dots + b_kX_k$. The correlation result is shown as $Y = -3343.18 + 11945.71X_1 + 19.31X_2$

3.3 Correlation Test for Good Performance Characteristics

The performance of the product shows that the contribution to the increment of the iPhone sales was through three variables; variable X1 (CPU), variable X2 (graphics) and variable X3 (memory). The three variables show a consistent influence in the increment of iPhone sales. Table 5 shows the correlation between the sales and the three performance variables. The results show that there is a significant and strong correlation between sales and X1 ($r=0.87;p<.05$). Variable X2 is also strongly significant and has a very strong correlation ($r=0.97;p<.05$). Variable X3 has a significant and very strong correlation ($r=0.99;p<.05$). Therefore, variables X1 and X2 have a significant and strong correlation ($r=0.96;p<.05$). Variables X1 and X3 show a significant and strong correlation ($r=0.91;p<.05$).

Table 5: Correlation of sales and performance variable

		Y	X1 (camera)	X2 (display)
Pearson Correlation	Y	1.000	.940*	.967*
	X1 (camera)	.940	1.000	.895*
	X2 (display)	.967	.895	1.000
Sig. (1-tailed)	Y	.	.009	.004
	X1 (camera)	.009	.	.020
	X2 (display)	.004	.020	.
N	Y	5	5	5
	X1 (camera)	5	5	5
	X2 (display)	5	5	5

* Correlation is significant at the 0.05 level (a-tailed)

Note: Y=sales, X1=CPU core (MHz), X2=Graphics (MHz), X3=memory (DRAM)

The results also indicate that the value of $R^2=0.98$ showing that 98 percent of good performance variable strongly influences increment in sales. In addition, if more performance variable is added to the product, it will increase the sales volume. The increment of sales is proven using the formula; $Y=a+b_1X_1+b_2X_2+\dots+b_kX_k$. The resulting correlation is indicated as; $Y=6943.67 + 54.82X_1 + 122.42X_2 - 29.39X_3$.

3.4 Correlation Test for User Friendly Characteristics

The interface variable from user friendly characteristics shows that they contribute to the increment in iPhone sales. Table 6 presents the correlation between sales and the interface variable. The results indicate that there is a significant and very strong correlation between sales and the interface variable ($r=0.92; p<.05$).

Table 6: Correlation of sales and interface variable

		Sales	Features
Sales	Pearson Correlation	1	.923*
	Sig. (2-tailed)	5	.025
	N	5	5
Interface	Pearson Correlation	.923*	1
	Sig. (2-tailed)	.025	5
	N	5	5

* Correlation is significant at the 0.05 level (2-tailed)

The results also indicate that the value of $R^2=0.85$ showing that 85 percent of the interface strongly influences the increment in sale. In addition, if interface variable is added to the product, it will increase the sales volume. The increment in sales is proven using the formula; $Y=a+bX$. The correlation results are indicated as $Y = -18637.51 + 7847.01X$

4. CONCLUSION

A good and successful product development is often supported by a systematic management and robust approach by the companies. The systematic innovation process can prevent unexpected results and the failure of product development output, reduce time and the cost of the product process. New product development shows that the user is truly essential for the success of a product. The PDDM was designed by introducing an adequate framework to establish successful product design. This method also becomes a decision-making tool in which the product designer can determine a new product that meets the user needs and determine the likelihood of product success, as was proven through validation study of a very successful product. The in-depth study of sales analysis shows that products with more technical functions and higher specifications tend to be successful, and thus, have higher sales.

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VIDEO OBSERVATION FOR DESIGNERS: A CONTEXTUAL IMMERSION OF THE O&G MANNEQUIN IN CLINICAL TRAINING

Saiful Hasley Ramli^{1*}, Zulida Rejali², Raja Ahmad Azmeer Raja Ahmad Effendi¹ and Mohd Shahrizal Dolah¹

¹Department of Industrial Design, Faculty of Design and Architecture, Universiti Putra Malaysia 43400 UPM Serdang, Selangor, Malaysia

²Department of Obstetric and Gynaecology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia 43400 UPM Serdang, Selangor, Malaysia

* Corresponding author:
shr@upm.edu.my

ABSTRACT

The use of mannequin is essential in the training of future Obstetrics and Gynaecology (O&G) doctors as it allows them to gain crucial practical experience in conducting medical procedures before performing these procedures on live patients. Despite of the beneficial technology and design emphasised on the existing mannequin used in the O&G domain, propositions have been made by the O&G experts for a new mannequin to be designed. This proposition was therefore addressed through a co-design project. The Contextual Immersion from Mocking-Up co-design approach was used in this project as it suits the designer-clinical expert co-creation circumstances, and it also enables designers to understand the specific user context. This paper reported the process of preparing video observation for designers as a tool in understanding the context in which the O&G mannequin is used in clinical training. Eight different sessions of clinical simulation were video recorded and analysed in this study. These videos used by designers to provide insights to the respective context such as understanding the usage of relevant mannequin in training medical student. Secondly, the video showed the interaction between the expert and novice users to the mannequin. These factors helps the designers to address the related design issues.

ception

Keywords: Co-design, mocking up, O&G Mannequin, Video Observation, Sustainable Product.

1. INTRODUCTION

1.1 Issue

The main objective of the project was to develop a mannequin as a teaching aid for clinical examinations and procedures of the female genitalia. As this project is specific and situated in a very specific domain, the designers need to be prepared with the context as a guideline in designing the mannequin. For this purpose, a group of O&G doctors collaborated to share their expertise in the project. However, there was a time constraint on these experts' side due to their clinical commitments and academic tasks. Therefore, a suitable method of understanding the context was essential for the project to be undertaken.

1.2 Mannequin for training in obstetrics and gynaecology

Mannequin has been used for a considerable period of time as a medical simulator in the training and research of the wide-ranging domain of medical and surgical (Cooper & Taqueti, 2004). In the O&G area, mannequin too has been extensively used (Gardner, 2008; Reynolds, 2008; Gordon, 2014). The current complex culture for obtaining experience with patients made the mannequin a significant alternative to vagina examination (VE) practice and other procedures. The mannequins used in the O&G area are various in types and purposes: birthing, suturing, vaginal examination and pelvic examination. This research explores the uses of these mannequins in training to understand the user context.

1.3 Designing a new mannequin

The project was initiated based on the propositions regarding the use of the current mannequin put forth by a group of O&G doctors. The initial issues

raised by these doctors were on the usability of the mannequin. To begin a design project, the designers need to have immense understanding on the context of mannequin usage in the O&G training. A reachable strategy for designers to gain this understanding is through observation (Koskinen, et al., 2011).

Mocking-Up is an example of a designing method involving a collaboration between designers and clinical experts (Ramli, 2014). Similar circumstances occurred in this project wherein a group of O&G academic doctors put forward a number of issues related to the mannequins that they had been using. Mocking-Up is based on a collaborative design concept of co-design and co-creation by Sanders and Steppers (2008) where creative activities are undertaken by both the designers and non-designers in a design project. Mocking-Up consists of three designing stages: (1) proposition made by users, (2) contextual immersion by designers, and (3) co-evolution of problems and solutions through the production of mock-ups (Fig. 1).

MOCKING-UP: A Collaboration Design (Co-Design) approach for Designers and Expert Users

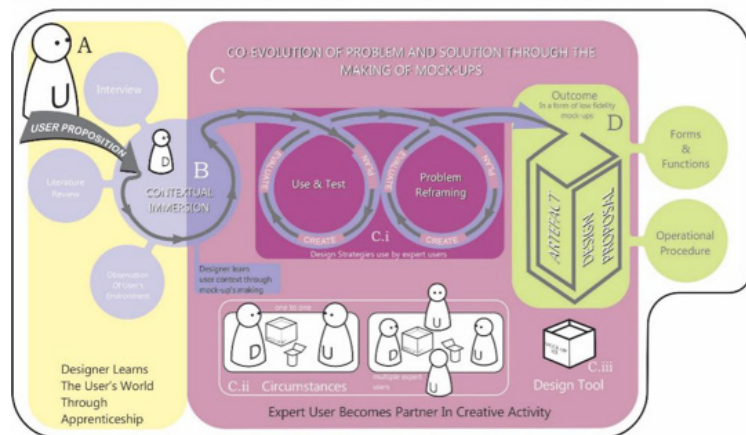


Figure 1: Mocking-Up process by Ramli (2014)

Contextual immersion is a method to understand and immerse with the user context. Techniques used in the original version of Mocking-Up are reviewing of scientific literature, familiarisation of the specific human anatomy and observation of simulated procedures. In this project, clinical simulation training was recorded as a tool of observation. This observation is important to allow the designers to have adequate information before undertaking another Contextual Immersion session with the doctors.

1.3 Learning the context of use of O&G mannequin

Clinical experts are eventful professionals (Ramesh, 2011). This is especially true for those who are involved in the academic world (Leuthardt, 2006). The nature of their job has prohibited them from engaging themselves in innovation activities. A similar situation was encountered in this project. The doctors had tight schedules and limited time to involve in research and innovation activities. Due to this, the research processes had to be tailored according to their availability.

Observation of clinical simulation training was suggested by the doctors as it encompasses the context of use of the mannequin. These video-recorded scheduled classes were participated by 25 students who were divided into several groups, and were held in four rooms with different training types. This differs from the original Contextual Immersion where the designer engaged in self-learning through scientific literature and review on anatomy (Ramli, 2014).

2. METHOD

2.1 Research circumstances

In the original Mocking-Up approach, the researchers plays the same role as the designers. However, in this study, the researchers only facilitated the design process environment to be used by the designers and the doctors. Similar to other design projects in the medical domain (ref), the users would put forth a proposition, and the researchers would choose a co-design approach to address the proposition. Seven O&G doctors involved in this project had immersed themselves with the user context grounded on observation during undergraduate medical training to understand the usage of mannequin in the O&G training.

2.2 Setting

Eight sessions of simulation training were held at the Clinical Skill Lab, Universiti Putra Malaysia in two distant days. This training was part of the standard academic training arranged by the O&G department, and this presented the researchers with the opportunity to understand the user's context as several types of mannequins were used in this training as the simulators. The eight simulation training sessions were video-recorded with small portable cameras. Planning on the setting was undertaken a day before the sessions were held. This was to determine the number of cameras needed, the placement of the cameras and also the best recording angles. The research

team followed one of the student groups to every session. Such a set up was undertaken as all of the students groups attended the simulation training sessions in the four rooms on a rotational basis.

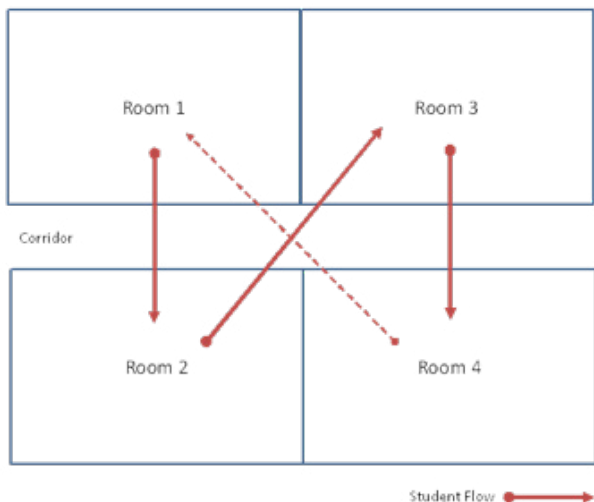


Figure 2: Flow of student transition between rooms

2.3 Video recording

Two action cameras were used for all of the sessions; one was set to capture the overall situation while the other one was installed on a volunteered student to capture the user view angle (Fig. 3 and 4). Action cameras were chosen are small in size and are easy to be set up. Furthermore, they have eclectic-type accessories which are suitable to use for most situations. Wood (2012) reported that a small camera is beneficial as it will result in the participants to act more naturally as they are not aware that they are being video-recorded.



Figure 3: View from the static spot action camera with the overall view of



Figure 4: View from the action camera strapped on the volunteer's head

All the four rooms share the same layout; hence, the static action camera was set up at the exact same location in each of the rooms. The location of the static action cameras were determined beforehand to comply with the rapid transition from one simulation to another in different rooms. One action camera was set up using a head strap on a volunteered student, and controlled and viewed from smartphone (Fig. 6).



Figure 6: A volunteer was equipped with a head-strapped camera during the clinical simulation training

As mentioned above, the researchers followed the selected student group to all of the four simulation training sessions. However, it was ensured that certain distance was maintained from the student group as to not interfere

with the authentic conditions. In other words, the researchers were genuine observers rather than participant observers as in the original Mocking-Up (Dewalt & Dewalt, 2002).

2.4 Preparing videos for the designers

The recorded videos captured all of the clinical simulation training sessions. To ensure effective video observation for the designers, these videos were analysed to identify the most crucial scenes for the designers to understand. The videos were segregated into several sections and coded according to the actions of the subjects as below (Table 1).

Table 1: Coding for subject's actions

No	Description of action	Code
1	Oral explanation by trainer/ doctor	OE
2	Mannequin engagement by doctor	MED
3	Mannequin engagement by student	MES
4	Pause (everyone stopped communicating and moving)	P

Eight simulation session videos were analysed and tabled (Table 2). Four of the sessions were conducted for 30 minutes each, and the other four sessions were conducted for 25 minutes each. These videos will be edited by removing the OE and P as they do not contain any physical action towards the mannequins used. The total duration for the OE section was approximately 12 minutes. The P section, on the other hand, was recorded for 8 minutes in total, and it only occurred in one recording. The table also shows that the physical MED and MES actions were each recorded for 81 minutes. Therefore, the total duration of the video observation that will be shown to the designers is 162 minutes or 2 hours and 40 minutes.

3. DISCUSSION AND CONCLUSION

Observation is an effective method in designing in order to understand user context and propositions (Blomberg et al., 1993). This ethnographical approach which was originally more holistic and undertaken in an intense period of time was adopted in the designing process and has been more focused and compact (Wood, 2012; Crabtree, 1998; Millen, 2000).

Table 2: Segregation of actions in the video recording

Vid. No	Description	Facilitator	Day	Duration	OE	MED	MES	P
					min	min	Min	Min
1	Gynaecology abdominal examination	Academic doctor	1	30 min	7	15	8	-
2	Examination for pregnancy	Academic doctor	1		3	19	8	-
3	PAP smear	Academic doctor	1		1	7	14	8
4	Normal delivery	Staff Nurse	1		4	17	9	-
5	Eclampsia – Pelvic examination	Academic doctor	2	25 min	8	-	17	-
6	Postpartum haemorrhage (PPH)	Academic doctor	2		12	-	13	-
7	Cord prolapse	Academic doctor	2		4	13	8	-
8	Shoulder dystocia	Academic doctor (Associate professor)	2		11	10	4	-
Total				220 min	50	81	81	8

Rapid ethnography is a good example and has become the model for contextual immersion method in understanding the users (Millen, 2000). In this project, the designers need to understand how the mannequin is used in the training and also the users' propositions. The edited videos could directly show the usage of the mannequin without the need to understand the scientific context such as the terms and jargons used during the training. This will be the preparation for the designers before they undertook co-design workshop with the doctors. This includes understanding the context of the usage and the interaction between the mannequin and the users hence the considerable collaborative proposition with the doctors.

However, some explanation may be needed during the video observation as this could help the designers to attain deeper understanding of what is being observed. More generic terms may need to be used for the benefits of the designers as previously done in rectal clamp and fistula project, the clinical experts had to substitute the medical jargon for more general words when working with the designers (Ramli, 2014). This may be different to this project as the designers are not required to have face-to-face sessions with the clinical experts. Nevertheless, this recording could supply preliminary understanding of how the mannequins are used.

Two cameras were used to record the training; one camera was strapped on a volunteer, and another one was placed at the corner of the rooms. This was to ensure that the data collected could provide the designers with the context of mannequin usage in clinical training. Although both cameras produced good recording, only the recording from the camera strapped on the volunteer was used. During the reviewing process, it was decided that the recording from this camera could provide more valuable input; for example, it captured the hand movements of the participants during the training. Hence, all the eight recording from the strapped camera were edited and compiled for the purpose of designer's video observation.

In Wood's (2012) recording approach, a hardly visible camera was used in the recording of research data. This is to enable the subjects to act naturally as they were less conscious that they were being recorded. This approach was adopted in this research in which relatively small action cameras were used. However, some of the subjects, for example the staff nurse and students, were caught looking at the strapped camera for a few times during the recording, especially during the transition of the training sessions. This may be due to the fact that the head gear was alien to the training environment and therefore had caused a distraction to the subjects. Nevertheless, it did not affect the important part of the recording which was the engagement with the mannequin. This process will be continued with video observation with the designers. The edited videos will be used to introduce the context of the product which is related to the clinical environment.

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THE TOWNSCAPE EVOLUTION OF HISTORIC PORT SETTLEMENT OF GEORGE TOWN, PULAU PINANG, MALAYSIA

Zhao Long^{1*}, Zulkifli Hanafi¹ and Wong Hong Wei¹

¹Department of Architecture, Faculty of Architecture and Built Environment, Infrastructure University Kuala Lumpur, Kajang, Selangor Darul Ehsan, Malaysia.

* Corresponding author:
urbanplanning@vip.163.com

ABSTRACT

George Town was listed as World Heritage Site with Malacca by UNESCO in 2008. As a historic city in Strait of Malacca, beginning from 1786, when Francis Light founded the first British trade point on Penang island for carrying out the trade with India, China, and the Malay islands, George Town started to develop as a colonial port city. In this process, the townscape of George Town was changing with the development of port trade, multi-culture, and urban construction. What is of interest here is to know the evolution of townscape over time within the context of colonialism. This study concentrates on the evolution of townscape in George Town, analyzing and summarizing the historic course of townscape development from the late eighteenth century to the late twentieth century, making a comprehensive portray of the townscape. This paper not merely combines with the historical background but also based on the interpretation of social basis which promoted the evolution. Furthermore, in this study, a recent survey of the literature outlines the urban landscape changing process clearer and shows an explicit landscape memory and narratives of George Town. The findings demonstrate great understanding of townscape evolution of British port settlement in George Town. To go further, highlight the continuity and authenticity of built heritage. The finding is significant as the contribution to explaining and interpreting the heritage value of the place and understanding the context of George Town.

Keywords: Malaysia, George Town, Pulau Pinang, Port settlement, Evolution of townscape

1. INTRODUCTION

In Malaysia, colonial architecture is one of Penang's attractions, the old historic building makes the most significant contribution in conferring on such township its unique image, the oldest extant urban dwellings consist of shophouses which strengthen the identity of the country. In August 2008, George Town was listed as a world heritage site by UNESCO in the name of Historic Cities of the Straits of Malacca: Melaka and George Town. In the description of UNESCO, the townscape of George Town is "unique and cultural townscape in East Asia and Southeast Asia" (UNESCO, 2008).

The townscape of Southeast Asia needs to be studied from a global perspective first, before going into macro-level regional analysis. Historically, over the last four hundred years, most of Africa, Asia, and South America became colonies of the industrializing Western powers as a result of either military intrusion or economic penetration. A particular form of a city, the colonial city, was born. These cities were characterized by white settlement areas with planned street design, spacious houses, clubs, theaters, and administrative buildings - an implant of western form in the newly established colony (Ashok, K.D., Yi-Chun, X., & Frank, J.C., et al., 1994: p. 27). Anthony D. King (1985: p. 8) states that colonial situations can be classified according to various criteria: time (seventeenth, twentieth centuries); culture (European, Arab); society (Dutch, French, as well as sections within these societies); economic system and energy base (pre-industrial/agricultural, industrial, with animate or inanimate energy sources); political economy (mercantile capitalism, industrial capitalism, socialism), and no doubt others.

Social science views the city as a focus of civilization, which creates “a way of life” and exhibits a rigid class structure (Sjoberg, G., 1960: p. 108). It is in cities that “technical skill achieved its utmost, schools of thought flourished, the arts prospered and the human spirit was raised to its utmost pinnacle” (Jones, E., 1966: p. 1). Culturally, an intensive area of influence is also maintained by the cities, by daily contacts (Dutt, A.K., 1972: p. 32) and by newspapers, telecommunications, and service activities (Ashok, K.D., 1994: p. 26). Carl O. Sauer argues that culture is the agent, the natural area is the medium, the cultural landscape is the result (Robert, P.L. & Gary, P., 1983: p.139-144). When colonization arrived in Asia, it brought along a whole new set of cultural imports, both Western and non-Western to be absorbed. A new architectural typology was thus necessary to solve the housing and commercial needs of these new immigrants (Li, T.L., 2007: p. 41), and the rural setting in the colony turned to a cosmopolitan city over time. Thus, townscape is not a vague notion. In George Town, port settlements, the evolving process of townscape started in the late eighteenth century and the townscape which we have seen today is the result of urban construction, cultural amalgamation, and progress of civilization.

2. METHODOLOGY

Many preservationists tend to view cultural landscape simply as comprising physical entities instead of as a method of considering, analyzing, and evaluating places (Richard, L., 2008: p. 1-20). In this study, historical studies, cross-references and literature review was conducted in order to illustrate the evolution of townscape in George Town. Firstly, the historical research contains a sequence of events that take place over a time period. It mostly follows a chronological order and usually contains a link to the data and evidence correlating to the townscape. Secondly, ICOMOS Principles for the Recording of Monuments, Groups of Buildings and Sites (1996) points out that cross-references to related building records and reports, photographic, graphic, textual or bibliographic documentation, archaeological and environmental records as an evidence to establish the date of origin, authorship, ownership, the original design, extent, use and decoration. It facilitates to establish the subsequent history of its uses, associated events, structural or decorative alterations, and the impact of human or natural external forces. In thinking about this, therefore, the interpretation of early paintings, images, survey maps, and urban archives have become an important basis for this study. Of course, except images, survey maps which was recorded in a scientific way, at any one time the meaning of the primary data such as early oil/watercolor painting works or sketches would not have been completely consistent even inaccurate, thus, secondary data (literature review), is added as much as possible to reconstruct the historical facts and represent the townscape in

a specific period. Upon these methods, here I outline the evolving process of townscape and illustrate the implications these shifts may have for the preservation of cultural landscape in George Town.

3. INVESTIGATION OF STUDY AREA

Pulau Pinang was rising as an entrepot trade hub in the colonial era due to its geographical advantage (Figure 1). George Town as the capital city is situated on the north-eastern tip of the island. Obviously, George Town can be classified as the city grew and developed after the intervention of colonial powers. With the colonial powers come, the economic development, and wealth accumulation, it has gradually become a significant regional port city. Scholars have noted that topography has a visible impact on the layout of a city. Understandably, there are many cases of such visible impact in the townscape and urban morphology of George Town. From Figure 2, in the north-east was a triangle of plain, this plain penetrated almost to the foot of the mountains in a flat valley that became a favorite agricultural area (Ayer Itam which nested within the central valleys). There was a patch of plain on the west coast as well, while scattered through the hills were isolated handkerchiefs of soil. The main plain, however, was a strip three miles wide down the east coast, facing the Peninsular Malaysia, from George Town to the south. It was crossed by several small streams, of which, from the south coming north, the Kluang, Dua, Glugor and Pinang were the most important.

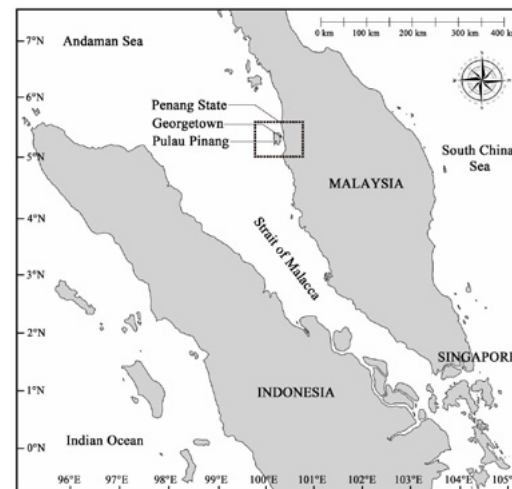


Figure 1: Location of George Town and Pulau Pinang in the Strait of Malacca

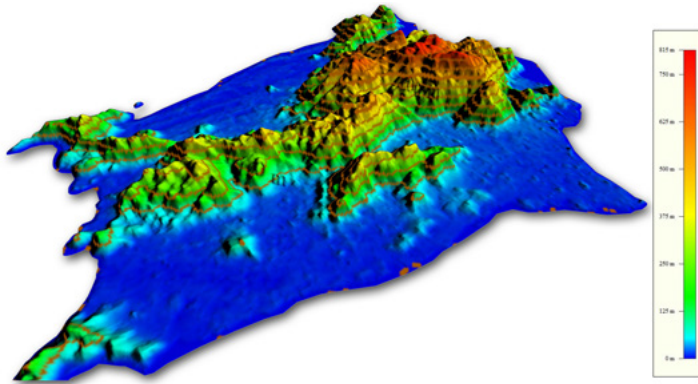


Figure 2: Analysis of Elevation and Geographical Morphology by Global Mapper V. 14.0

Colonialists needed to quickly and efficiently collect natural resources from colonized countries and sell newly processed goods in their territories (Lee, S.W., Song, D.W. & Ducruet, C., 2008: p. 378). Thus, they sought accessible places with deep water, large spaces, and good connections between the foreland, or the overseas region, and the hinterland, or the interior region (Kuby, M. & Reid, N., 1992: p. 272-289). Penang was ceded from Kedah in 1786 on behalf of the British East India Company by Francis Light, and the Sultan of Kedah was forced to part with additional land in 1800, which became Province Wellesley. The British secured the town of Malacca from Dutch control in 1795, after the cession of Singapore by Sir Thomas Stamford Bingley Raffles in 1819, Straits Settlement established in 1826 as part of the territories controlled by the British East India Company which consisted of the four individual settlements of Malacca, Dinding, Penang, and Singapore. These British Settlements along the Straits of Malacca that shortened the trading route and constructed a trading network and links between the English East India subcontinent and their connection with trade in the Straits, the archipelago and China. Captain Francis Light, a trader by profession, arrived in Penang on 15 July 1786 with a body of Marines and hoisted the British flag on August 1786, and rename the island “Prince of Wales Island” (Sinha, V., 2011: p. 32).

4. THE SOCIAL BASIS OF GEORGE TOWN'S TOWNSCAPE

4.1 Urban Function: Colonial Settlements and Trading Port

One insight into the social basis of George Town is through a study of the urban function. The city's functions and its history will be used more as a means for explaining the landscape than as ends to be indicated by the landscape (Price, E.T., 1964: p. 242-275). In Southeast Asia, almost every colonial city had a port for trading activities like George Town, Singapore, Malacca, and Manila, in this sense, ports had been considered as an engine of economic development and a hub of labor resources for the regions where they were located. The spatial and functional changes in port peripheral areas have had a considerable impact on port cities, a city and a port interplay with each other as a single node in terms of economic and spatial structure (Lee, S.W., Song, D.W. & Ducruet, C., 2008: p. 372). Besides, a port as a link between the downtown area and their neighbor cities.

One of the reasons why the English acquired Penang was trade (Dianne, L., 1977: p. 17-33), the key fact is that the English believed that Penang was the best location to replace Benkulen colony, Sumatra, which was far from the main trading route (Hussin, N., 2005: p. 69). Francis Light was seeking a base for the English East India Company at the end of the Straits of Malacca, thus Light with high hopes for making Penang a naval base and a major center for trade and spice cultivation (Turnbull, C.M., 2009: p. 30-31) after the cession. In the early colonial days of Penang, George Town existed as a port town where traders sold nutmeg, pepper, cloves, betel creams and textiles to the Europeans, Chinese, Arabs, and Indians. Large ships were loaded with cloth and opium from India, small ships transported tin, rattan, bird's nest, and pepper to Siem Reap, Sumatra and Malaya. By the early nineteenth century, British colonial towns and their hinterlands served as naval bases and ports of call for the India-China trade (Lynn, H.L., 2017: p. 17). After the signing of the Pangkor Treaty in 1874, Penang began to thrive as an export hub in the northern territories of Straits Settlement.

4.2 Cultural Pluralism: Adaptation, Transformation, and Integration

George Town, Pulau Pinang, as the former possession of British Straits Settlement during the colonial era was developing with the colonialism which expanded all over the world. In the seventeenth and eighteenth centuries, western culture was apparently sufficient to transplant, with some adaptation, transformation, and integration by the colonial governor from what were essentially pre-industrial European towns to pre-industrial colonial

settlements to cater to the new social, economic, political or environmental conditions. Cultural implications of Asia and Europe gave this Southeast Asian coastal city a rich and hybrid cultural pattern, it developed into an important transportation hub of the North Malacca Strait from an insular tropical island to a colonial port town.

Like other colonial cities, the affluent and ruling classes dominated the popular culture and values, more specifically, the dominant colonial minority is culturally European. In George Town's townscape, there are early European settlements, cemeteries, forts, customs, the supreme court and government buildings with western style. Europeans replanted their culture to the colonies, mix together with native culture and immigration culture gradually like a huge melting pot. Subsequently, cultures from Europe, East Asia, South Asia, and Southeast Asia, highlighting the characteristics of inclusiveness of George Town. In short, therefore, these symbols can be observed in the urban landscape of George Town today after a long evolution process. The administrative buildings, churches, old plazas and fortifications in George Town represents the quintessential urban landscape of British colonialism since the late eighteenth century.

4.3 Immigrant Communities

The colonial city, like colonialism itself, provided the setting for the encounter of races and civilizations - yet one that took place in a situation of structured inequality (Ashok, K.D., 1994: p. 26). When Francis Light occupied Penang, his stall only five members. Apart from these, European civilians numbered only fourteen; two merchants, a tavern-keeper, a ship's carpenter, a caulker, a cooper, a planter, a dealer, a blacksmith, a builder, a shopkeeper, a beachmaster, a mariner and a shipbuilder (City Council of George Town, 1966: p. 1).

Francis Light introduced the idea of a free port into Penang. The result was a dramatic one, small businesses which traveling through Malaya's small port and Dutch Port in-fluxed into Penang. Subsequently, Penang attracted a large population rapidly, including Europeans, Chinese, Indians, Bugis, Arabs, Americans, Persian, Siem Reap, Burmese and Sumatran (Figure 3). In October 1786, Light reported that "our inhabitants increase very fast, Choolias, Chinese and Christians, they are already disputing the ground, everyone building as fast as he can", and the inhabitants in 1792 increased to ten thousand (City Council of George Town, 1966: p. 1-13). In 1792 Light wrote, with pardonable pride, that the Island which six years ago had been one entire wood, now had a population of 10,000; this total he divided up into 7,000 "inhabitants"; Company's servants with their followers 1,000; Malays

1,500; and strangers who come and go in ships and "prows" anything from 1,500 to 2,000 (Jenkins, G., 2008: p. 36; Garnier, R.K., 2015: p. 17).



Figure 3: Different Races in Pulau Pinang from all over the world
(Source: Penang State Museum)

In 1804, Sir George Alexander William Leith, the Lieutenant Governor, recorded that the races in George Town were English, Dutch, Portuguese, Armenians, Arabs, Parsees, Chinese, Choolias, Malays, Burgesses, Burmese, Siamese, and Javanese, etc. and formed an ethnic village that distributed widely in George Town. From its foundation in the late eighteenth century the town, according to the Gwynn Jenkins, University of Hull, it increasingly

attractive to traders, craftspeople, and laborers from various parts of Asia and the Middle East, though there had been significant local settlement prior to the arrival of the British, and the expanding population comprised Malays, Armenians, Arabs, Parsees, Burmese, Siamese, Bugis, and Javanese, Chinese (mainly Hokkien, Cantonese, Teow Chew, Hakka, and Hainanese), Indians (Hindu and Muslim, mainly from south India, though there were also Sikhs, Bengalis, and Gujaratis, among others), as well as Portuguese, Dutch, Japanese and British. Cheap labor was also brought from India and China under an indentured immigration system (Jenkins, G., & King, V.T., 2003: p. 46-48). Influxes of immigrants make up Penang's population that came in large numbers in the eighteenth, nineteenth, twentieth centuries, the most representative one is immigrants that from southern China, and today, large-scale Malaysian Chinese take up nearly half of the population of Penang. In 2016, the total population of Penang is 1,719,300 with a Malaysian Chinese population of 689,300. The Malaysian Chinese population accounted for 40.1% of the total population. (Department of statistics of Malaysia, Population Quick Info).

From the late eighteenth century, the multi-cultural context of Georgetown started growing, different cultures intertwined with urban development and reflected on the townscape, making the city a perfect crossroad for the meeting of Eastern and Western cultures. Immigrants from Europe, China and Indian brought construction methods and rules from their hometown respectively to George Town. Consequently, it is normal in a colony that the townscape is changing with the economic and social development, and meanwhile reflects rich culture or great diversity from several dimensions in the scenery, for instance, global forces, the value of ethnic communities, religious or worship, ritual symbolism, and construction traditions.

5. TOWNSCAPE OF GEORGE TOWN IN THE LATE EIGHTEENTH CENTURY

As aforementioned, the influences of Asia and Europe have endowed the George Town with a specific multicultural heritage that is both tangible and intangible. With its government buildings, churches, squares, and fortifications, George Town represents the British era from the end of the eighteenth century.

According to the records, the first British fleet visit Penang was in 1592, when Captain James Lancaster anchored the *Edward Bonaventure* in Penang. James and his sailors got scurvy, and they stayed on this island for several weeks for replenishing supplies. But in Lancaster's navigation log, no records that mention the people living on the island. Until the late eighteenth century, Penang island was virtually uninhabited (Turnbull, C.M., 2009: p. 30), in this

stage, Penang controlled by Kedah, a Muslim kingdom, in the northern part of the Peninsula Malaysia and bordered by Siam. The cemetery found on the island in the eighteenth century proved that the indigenous people had lived on the island and the pirates lived on this island as well until they were expelled in 1750 and 1786 by the Sultan of Kedah. Before arriving of British, Penang had been the transfer station for replenishing fresh water for a long time, to some extent, it's a sparsely populated tropical island, but evidence such as cemetery, plowed land, and planting of fruit tree showed that the earlier aborigines were living on this island.



Figure 4: The Early Colonial Period: View of the North Point of the Prince of Wales's Island. Engraving by Captain Elisha Trapaud, 1786 (Source: Penang State Museum)



Figure 5: Urban survey map by Sir H.R. Popham in 1799 (Source: Georgetown Special Area Plan, 2016)

On 17th July 1786, when Francis Light landed, clearing the jungle on Penaga Point and going on to mark out what are still the central thoroughfares viz. Light Street, Beach Street, Chulia Street, and Pitt Street, the first two converging on the stockade which was to be named Fort Cornwallis (City Council of George Town, 1966: p. 1-13). The streets in the town had been marked out with a width of sixty-five feet and as nearly at right angles to each other (Figure 5). Generally, this planning method of the grid-iron pattern of streets has the advantage of land division, transaction, and assessment in the aspect of property holding system and resource allocation. Buildings constructed in the square and rectangular grid shape land provide an advantageous space in the civic daily life and public activity, especially for the trading activities, grid-iron pattern of streets exert powerful efficiency in flow of goods and services, and in the colonial period, such planning method facilitates the flexibility and efficiency of the military during which a war is in progress (Weng, C.S., 2002: p. 111-129). Same planning and control method were copied in Singapore after the cession of Singapore by Stamford Raffles in 1819.

In 1786, Captain Elisha Trapaud's wood engraving work shows a natural scenery of George Town in its early colonial days without large-scale urban construction, and only with a few canvas tents and Malay attap houses (Figure 4). Elisha Trapaud raised the Royal Union Flag on the island, and describing that there were "58 people in Malay-style houses". During this period, roughly speaking, George Town was a small fishing village in the scale. The house was built with attap roof and walls, large overhang for shading, attap was used as a traditional roofing material in the house, which is known as attap dwelling (Figure 6). For hot and humid tropical climate, lightweight construction using low thermal capacity materials, stilted house to catch winds of higher velocity, these building methods contribute to absorb the damp air and reduce the physical effects of indoor temperatures, it has a strong regional and ethnic characteristic in terms of landscape architecture, but attap is an easily flammable building material. Before the large-scale urban construction, the townscape of George Town presented a natural and indigenous feature in its early colonial stage.

The year 1786 marked the entry of British power in the Malay Archipelago, after 1786, Kedah was further weakened without the protection from the East India Company to against Siamese conquest. Refugees from Kedah flooded into Penang, boosting Province Wellesley agricultural sector while the town grew as a port and trading center (Loh, W.L., 2009: p. 10). Kedah Sudan sent laborers to the island and undertook the rough grading work for the British, subsequently, people in different parts of the Peninsula, southern China and India arrived at the island. These people became the main labor force in the Penang's urban construction and economic development process. They



Figure 6: Attap dwelling with attap roof and walls in Malay village

built house and road in George Town, engage in fishing and rickshaws, raise livestock, plant fruits, and vegetables, cultivate land, work on tin mining, load and unload on board, do housework (Sarnia, V., 1991: p. 5). The settlers had built some two hundred houses by January 1788.

In 1790, when Francis Light reported to the East India Company in Calcutta, he described that 200 houses were finished and the swamps under the foothills were reclaimed for the construction of a drainage project and established a new path to the Penang Hill. In the Brick Buildings on Prince of Wales Island 1793, statistics show that the amount of brick building is around thirty-nine, including dwelling houses & offices of colonial managers, houses & shops and sundry shops, bakeries & godowns. In the meanwhile, Light expected to sell the local agricultural products to China, Penang was soon dotted with small estates, using Chinese labor (Lynn, H.L., 2017: p. 22), 1,000 hectares of land was developed for growing crops, which would produce 340,000 kilograms of rice per year and a variety of fruits, coconuts, peppers, sugar cane and betel nut for the world market. At this time, the townscape of George Town was farming landscape plus natural landscape. The farming landscape around the residential area and natural landscape in the farther suburbs, large-scale new lands in the western suburbs were used for agricultural cultivation. Light died in October 1794, he was succeeded by Philip Mannington in 1795. Municipal activities began in George Town with plans like obtain a fund for clearing, making proper drains, repairing the street. However, there was

no immediate result and nothing further had been done when Mannington resigned. In Major Forbes Ross Macdonald's time, the succeeded official, the public buildings in George Town comprised the Custom House, Hospital and Jail. Only one road led from Fort Cornwallis to the interior of the island "with various degrees of excellence for four miles", and "the rest are but miserable footpath" (City Council of George Town, 1966: p. 2).

Sir H.R. Popham's map (Figure 5) in 1799 shows a clear townscape in the late eighteenth century that the Fort Cornwallis was built with its early stockades and bastions on all faces and corners, no piers had then been built in the tideland or low water. Early settlers of Penang, their brick building was distributed in the central area of the grid-iron pattern of streets, at the intersection of Bishop Street and Church Street, Portuguese Church and Presbytery nearby (Ooi, K.G., 2002: p. 57). The legend word of the map shows the locations of public buildings (Portuguese Church, Mosque, Customs, Christians place, Provosts Guard, Hospital and Commissary) and brick building for shops, and the information regarding to the land use (Malay Town, China Street, plantations, paddy fields, burial ground) and geographical conditions (tideland, swamps, pond, river, and mound) can be read in this map. Town areas expanded along the coastline, commercial activities around the port became more frequent. Agricultural or trading activities promoted the townscape evolution from an insular island to a small "urban village", the subsequent population growth, municipal construction stimulated the expanding of the urban area and generated new townscape.

6. TOWNSCAPE OF GEORGE TOWN IN THE NINETEENTH CENTURY

At the beginning of the nineteenth century, the momentum of impending urban changes was emerging with the concomitant of trading development, population increasing and urban construction. With the sprawl of urban area in the flatlands and human intervention on the periphery of the town, townscape was changing gradually in the inner town and rural area, the scenery was transformed into a port settlement in the town area and farming landscape outside the town. The early painting after 1821 offers the information of a specific period that the urban area was concentrated on the headland where's the Fort Cornwallis and the port located, the layout of the roads led from the inner town and spread in the periphery, landscape element like coastline, river, vegetation, large-scale farming land, Penang Hill, as well as the distant mountains on the Malay peninsula shows a British bucolic landscape in George Town (Figure 7) .



Figure 7: Natural Scenery from Strawberry Hill, Prince of Wales Island after 1821 (Source: Penang Views, 1770-1860)

In the nineteenth century, George Town entered into a rapid urban growth stage, the prosperous of trading paved the way for the urban sprawl, new area had been developed for residential or commercial use in the townships. In terms of population, Sir Norman Macalister, the governor of Penang, recorded that "a large number of settlers on the island, no less than 2,000". With the growth of the port and urban area, diverse forms or styles of architecture became more and more common in the landscape, especially sacrificial places which were built with more permanent materials. Often the builders and craftsmen would leave traces of their cultural practices on the buildings of other cultures. The white stucco church of Saint George's followed the influences of Georgian architecture of England imported through India. Hindu temples from southern India adorned with a "mountain" of colorful figures above their main entrance, were sited close to Hokkien temples with their sweeping swallow tail roofs, Cantonese temples of somber grey brick and the Indian-influenced mosques with onion domes and Mogul arches, early bungalows, adapted from the indigenous Malay building form, were detached and raised on stilts above the ground allowing cool air to flow beneath the first floor (Jenkins, G., 2008: p. 49). Early shophouses were constructed by mangrove logs and sawed boards, which were short and rough in style (Khoo, S.N. & Halim, B., 2009: p. 54-65), simpler in construction, contained a single pitched roof, no decoration on the facade and there was no five-foot way in the ground floor. When Chinese became the main population, Chinese shophouse in the urban areas was built rapidly as a new scenery in the township.

A painting of the cape, in 1800, shows timber, stilt structures at the water's edge, possibly indicating an early "jetty" settlement, the forefathers of today's clan jetty communities (Jenkins, G., 2008: p. 48-50). James Wathen's of George Town of 1811 captures his written description: turn the eye southward, George Town and the harbor are seen, the various styles in the construction of habitations of this small town have a strange effect - the European house, the Hindoo bungalow, the Malay cottage, the Chinese dwelling, and the Burman hut are mingled together with regularity and apparently without plan, the first settlers having each built his residence according to custom of the country (Clodd, H.P., 1948: p. 120).

The different ethnic groups tended to settle in separate ethnic and linguistic quarters or enclaves of the town, with their own distinctive settlement patterns, built-forms and architecture, though during the nineteenth century the Chinese shophouse became the dominant urban form and the Chinese the main inner-city population (Jenkins, G., & King, V.T., 2003: p. 46-48). The European area, early Chinese area, extended Chinese area, Malay and Indian area were located in the different part of George Town. These areas were divided by the streets and forming a neighborhood relationship. Each ethnic residential area consisted of building clusters with their own architectural styles, co-existence in the townscape, expressed a tendency of cultural pluralism.

In March 1808, an unprecedented fire destroyed a large area of George Town. During this period, dwellings were constructed by flammable wood and roofed with attap, moreover, the density of blocks in the central area was very high, once there is a fire, it is hard to be extinguished. This catastrophe drew the attention urgently to enact building codes and fire prevention policy in George Town, Captain Elliot, the superintending engineer, wanted to ban the use of flammable materials in the house building process but failed. After all, the wood or attap is the low-cost material and easy to access. However, after two serious fires in 1813, the colonial authorities decided to take effective measures to reduce the incidence of the fire, and the advisory committee was instructed to separate the attap-roofed house in the row, leave a 50-foot gap for every 200 feet, besides, widen the main street and dig new wells. Indeed, these measures had a certain effect on the avoidance of fires, but the regulation was implied only in the central area of the town. Notably, in the early nineteenth century, tiles started to be used in the buildings and gradually replaced attap as the main roof covering material, and U-shaped or V-shaped tiles were placed over the roofs widely, therefore, a key feature of the townscape was generated. The roofs in the town were being transformed from gray attap to reddish tiles, the red roofs made the overall townscape lively and formed a coordinated and continuous urban landscape as a whole.

Singapore's urban construction provided a good sample for other colonial cities in the Malaya Peninsula. Under this background, there was a transformation in the colonial cities that the overall townscape changed from "vernacular", "aboriginal" or "ethnic" features (Figure 8) to "international" or "eclectic" (Figure 9). On the one hand, it's good to avoid some disasters especially the fire in the urban area, on the other hand, buildings in the urban area were asked to follow the colonial authorities' building regulations or acts. From a townscape point of view, such changes demonstrated that a strong culture began to dominate or even tried to replace the original cultural patterns and tended to establish a new face in these colonial cities. Thus, a cultural monopoly emerging in the townscape of the nineteenth century, the dominant cultural group impose its attitudes, values, beliefs, and customs onto the smaller or less powerful cultural groups, a key fact in the townscape was that the landmark building with a strong governor or suzerain's ideology. In Singapore's master plan, British colonial authorities stipulated a 5-foot corridor on the ground floor for public use, because the governor was prone to the consecutive and uniform streetscape in the two-story shophouse blocks. Dr. Huang Lan-shiang, Professor and Director from the graduate institute of art history, Taiwan Normal University, states that, in fact, the British had a clear urban image of Singapore when to create the five-foot way in shophouse blocks, this pattern was the same as Malacca and Penang (Huang, L.X., 2015: p. 19-54).

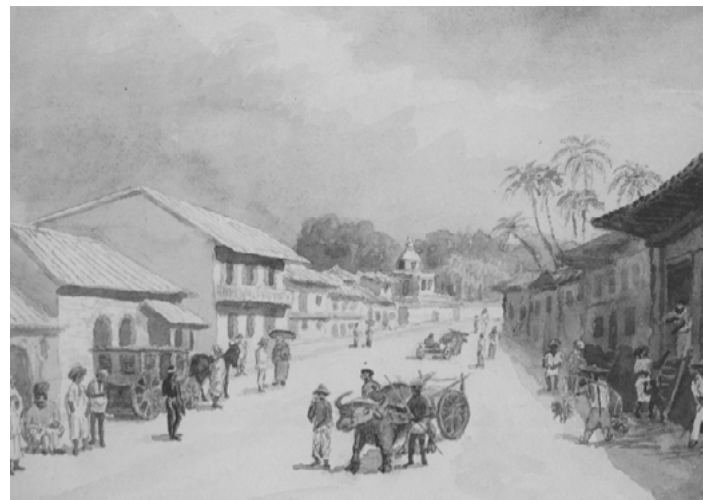


Figure 8: Edward. H. Cree's watercolor painting: a street in Penang, 1845
(Source: Penang Views 1770-1860)

Architecture is not solely the mirror to the aesthetic of a particular elite, or even a matter of spatial organization, as often as not, it is a political statement (Hambly, G.R.G., Metcalf, T.R. & Tillotson, G.H.R., 1992: p. 602). India historian and heritage conservationist, Samita Gupta (1988: p. 99-108) states that throughout the eighteenth and a greater part of the nineteenth centuries, the architecture produced by the English in India quite faithfully reflected the various stylistic revivals that followed each other in Victorian England. The neoclassical, Neo-Greek and Neo-Gothic styles were all represented here in the various public buildings put up by the Government, this phenomenon occurred in George Town as well. In order to develop an architectural style that should convey the spirit of British Imperialism, T. Roger Smith, an English architect, and scholar argued that “we ought to like the Romans and the Mohammedans, take our national style with us. Our buildings ought to hold up a high standard of European art. They ought to be European, both as a rallying point for ourselves, and as raising a distinctive symbol of our presence to be beheld with respect and even with admiration by the natives of the country” (Smith, T.R., 1867: p. 197-208; Gupta, S., 1988: p. 99).

Recognition of the complexities and ambiguities of ruling an Oriental empire resulted in the adoption of a revived Indo-Saracenic style (Hambly, G.R.G., 1992: p. 603), soon to be countered by a classical revival originating in Great Britain and then exported. In 1870, British Madras, governor-general Lord Napier explored another version of the imperial architecture that illustrated the authority of British rulers, in which new symbols were added to the old symbols to show a new empire image. In this case, British Architect Robert Chisholm who pioneered the Indo-Saracenic style of architecture in Madras integrated Neo-Classical and Gothic Revival in the Victorian Era with patterns in Indian and Islamic architectural styles. This style was widely used in colonial public buildings, such as municipal administration buildings, railway stations, post offices, and courts. By 1900 Indo-Saracenic had become almost universally accepted as the appropriate style for substantial public building in India (Metcalf, T.R., 1982), and spread to other British settlements. In addition, Neo-Classical style is one of the favored styles in the strait’s settlements. Hence, under the influence of these mixed styles, the building in George Town constructed in an eclectic way, and new buildings started to change the townscape (Figure 7). In 1890, when Major Sir Maurice Alexander Cameron and his retinues built the new colonial official residence, the prestige of British Imperialism was consolidated. The importation of the metropolitan styles served a dual purpose, On the one hand, they emphasized the fact that the country was now dominated by a European power, and on the other hand, they served to identify the sources, traditions and cultural roots of that power (Gupta, S., 1988: p. 99).



Figure 9: Colonial architecture in the townscape of George Town in the nineteenth century (Source: Cheah Jin Seng, 2008; Neil Khor, Mariana Isa & Maganjeet Kaur, 2017)

After the mid-nineteenth century, the landscape of George Town was transforming from the forest landscape to the agricultural landscape with the meaning of agrarian transformations, especially in the rural area. The landscape of settlement was changing both in housing appearance and functions, but the settlements forms and patterns remained unchanged, an idyllic island emerging.

The discovery of tin in Perak and Selangor in the 1840s turned Penang into an intra-Straits gateway to Peninsular Malaya. Tin transformed the town (Goh, D.P.S. 2014: p. 89). Moreover, in the 1840s, steam engines would drain the swamps and power refineries, with the demand for sugar rising, adventurers of many sorts turned swamps into sugar plantations, albeit without much machinery (Lynn, H.L., 2017: p. 25-26). The sugarcane plantations in Province Wellesley employed a lot of Malay labors, and labors from Java, south China, India, Myanmar, and even Arab. After the First Anglo-Chinese War (1839-1842) in the mid-nineteenth century that provided the bulk of immigrants, Chinese immigrants in Penang increased markedly, the town grew denser. The newcomers from Guangdong and Fujian brought the vernacular construction technology from their hometown to the new settlement, some architectural details in southern China were applied in George Town shophouse, and to the end, had a strong impact on the townscape.

With the renewal of the land policy in the late nineteenth century, a land survey was carried out in 1886. Subsequently, burning of forest land for the cultivation of crops happened rapidly, the flatlands of the island turned to farmlands and settlements on a massive scale, deforestation occurred in the forest area which adjoined the hilly zone. In some ways, to the contrary, the construction of public buildings, road, railway, and bridge was rather active in these regions, there is a sharp secular change in the overall townscape. Following Singapore harbor's footsteps, the first section of Weld Quay was reserved for government offices and its administrative center. Over a course of twenty years from 1884, a number of government offices were built: The General Post Office, the Government Telegraphy Office and the Government Telegraphy Exchange, the Government's Office, the Resident Councilor's Office, the Audit Office, the Public Work Department, the Land Office, and the Marine Department (including the Harbor Master's Office and the Office of the Solicitor-General) (Brochure of The House of Yeap Chor Ee, p. 5-9).

Building regulations in the 1880s showed that all of the buildings should be erected of strong, durable materials such as bricks, tiles, and reserved a five-foot walkway in front of the door. Townscape was changed under the building regulations, and dirty, decrepit wooden houses in the townships were replaced by brick, red tiles and tidy shophouse with a continuous corridor, and wider lanes between the buildings could be used for preventing the big fire. The width of these old shophouses is usually between thirteen and twenty feet, and the depth at least two or three times the width, and wooden shutters either plain or louvers were used for the windows on the upper floor (Wan

Hashimah & Shuhana, 2005, p. 7), the regulations of 1880's, combined with design principles imported from the west, initiated the advent of the typical two-story old shophouse (Yeang, K., 1992: p. 23-40).

According to the observation of Isabella Bird (1831-1904), an England globetrotter, she described the townscape of George Town by in 1880s was that "as one lands on Pinang one is impressed even before reaching the shore by the blaze of color in the costumes of the crowds which throng the jetty....., the sight of the Asiatics who have crowded into Georgetown is a wonderful one, Chinese, Burmese, Javanese, Arabs, Malays, Sikhs, Madrassesees, Klings, Chuliahs, and Parsees, and still they come in junks and steamers and strange Arabian craft, and all get a living, depend slavishly on no one, never lapse into pauperism, retain their own dress, customs, and religion, and are orderly....., there are about six hundred and twelve Europeans in the town....., but they make little show, though their large massive bungalows.....give one the idea of wealth and solidity" (Turnbull, C.M., 2009: p. 3).

Besides, vehicles in the townscape of the late nineteenth century is an interesting facet, trams, carriage, jinrikisha, gharry, and bullocks brought vitality to the urban daily life and townscape. The wealthiest class had their carriage, but most of the citizens used jinrikisha or gharry was common. In the 1880s, the only regular public transport was that provided by the enterprising Mr. Gardner, whose trams ran on the Ayer Itam Road and Waterfall Roads. There were eleven cars on these routes in 1890, and a line of light rails for the horse-drawn cars was opened from Magazine Road along Penang Road and Chuila Street to Weld Quay (City Council of George Town, 1966: p. 52).

7. TOWNSCAPE OF GEORGE TOWN IN THE TWENTIETH CENTURY

The townscape in the twentieth century witnessed the introduction of European architectural elements and features from the Art Nouveau and Art Deco movements, as well as Modernism styles. Yet a substantial part of the general fabric, appearance, cultural vibrancy and ethnic diversity of the inner city have managed to survive up until quite recently (Jenkins, G., & King, V.T., 2003: p. 46-48). During this period, the eclectic buildings emerging. this style blended eastern and western architectural elements and was used in the shophouses, temples, ancestral halls, villas, and bungalows. Furthermore, reinforced concrete was used in the construction process to meet the needs of wider roof and overhang (Figure 10).



Figure 10: Townscape and bustling street of inner George Town in the early twentieth century
(Source: Khoo Salma Nasution & Wade Malcolm, *Penang Postcard Collection: 1899-1930s*)

A series of landmark buildings, including the administration building, were also built in the early twentieth century. The decision to build the Municipal building was taken in 1900, and the project finished in March 1903, at the same time, another landmark was Mr. Cheah Chen Eok's offer in 1897 to present the Municipality with a Clock Tower to commemorate the sixtieth

year of the Queen's reign. When the Clock Tower was completed and handed over at a ceremony on 23rd 1902, the Queen had passed away (City Council of George Town, 1966: p. 47), but until today, the Clock Tower is still an important landmark in the townscape.

Regulating street width and direction was seen as a key to controlling growth and ensuring long-term planning (Bond, S. & Worthing, D., 2016: p. 28). With the rapid urbanization in the twentieth century, new development of roads appeared in George Town. In the early twentieth century, electric power began to be applied in George Town. After a short time run in the early twentieth century, the steam tramway was replaced by electric tram from 1906, the regular service between the Prison and the Jetty (Figure 11). In 1925, trolley-buses were first put into service but the last tram was not replaced until 1936 (City Council of George Town, 1966: p. 52-53). Moreover, electric power brought revolutionary influences to the townscape. In July 1904, 41 arc lamps in public streets were put into use, while electric current gradually entered into households, increasing from 15 in 1904 to 336 in 1908. After WWI, the Municipal Council lobbied business owners on the seaward side of Beach Street to relinquish a portion of the front of their buildings to allow for widening of the road, this had been precipitated by the increased congestion in the busy business section of Beach Street, aggravated by the coming of the motor car (George Town World Heritage Incorporated, 2015: p.11).

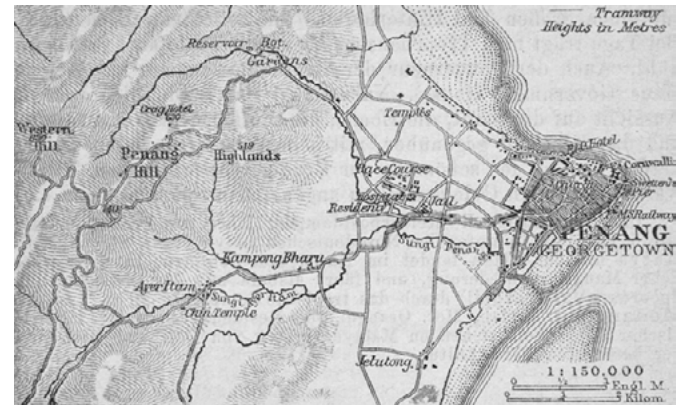


Figure 11: The old Penang Tramway map in 1914
(Source: Perry-Castañeda Library Map Collection, University of Texas at Austin)

During WWII, invading from the north, the Japanese rapidly overran Malaya and took Singapore in 1942, Japanese forces bombed and conquered George Town, 1,100 shophouses were destroyed in the bombing and looting. After the war, during the reconstruction period (1946-1951), urban reconstruction work was very slow, worse still, the available land in the old inner town was limited. The problems such as lack of construction land and overcrowded of buildings were emerging (Figure 12), with the population growth the housing problem acute in major metropolitan areas. In this case, on the one hand, the colonial government proposed to provide low rent public housing under the Rent Control Act, and on the other hand, planned to move part of the population out to the urban periphery, and facilitated the land development in these rural areas. Hence, from the mid and late twentieth century, shophouse leasing business was booming in the old town. It relieved the pressure from the population explosion and housing shortage temporarily and provided a place for the civic with a comparatively low rent, however, the situation of “housing crisis” without change. There were no actual measures to conserve shophouse buildings or maintain urban aesthetics quality in George Town before the 1980s. A large number of shophouses had been conserved not because of conservation awareness or conservation decrees from public and government, but the existence of Rent Control Act in this particular social background. Although the Rent Control Act can ensure the original status of shophouse buildings, it caused many shophouse buildings to be dilapidated. The act prevented tenants to be evicted without compensation, which was a positive aspect on the one hand. Low benefits from the rent had another result, it also dispelled the enthusiasm of the landlord for any renovation, reconstruction, and restoration of the shophouse, and to some extent, played a positive role in the conservation of the shophouse buildings.



*Figure 12: Aerial view of the city, the 1960s
(Source: Penang Past and Present, 1786-1963)*

More broadly, heritage reflects the dominant culture and ideology on the part of the ruling elites. After Malayan Independence in August 1957, Penang became one of the 13 states in the Federation of Malaya, the desire for national symbols in the urban construction began to emerge, to some extent, the decoration and design language derived from local culture began to compete with the original European urban landscape, and the original harmonious physical environment of George Town began to be disturbed gradually, heritage politics plays a certain role when dealing with built heritage, in particular, the commercial shophouses which were clustered in the town center.

In the 1970s and 1980s, just as in Singapore, Penang became industrialized and urbanized rapidly. In the early 1980s, the KOMTAR Tower (Kompleks Tun Abdul Razak) was built as an urban renewal project to transfer the bottleneck of urban development to the 65-story building and its commercial complex, thereby protecting the large area of shophouse blocks. However, the project was built at the expense of demolishing 250 shophouses and other public buildings in the downtown area (Tan, Y.W., 2016: p. 68-77). The completion of the KOMTAR and the Penang Bridge outlined a fast-growing and industrialized scene in George Town. The townscape constantly highlighted modern urban characteristics, new buildings were built among the historic buildings, the new and old townscape formed a striking contrast and cultural contrast, the historic urban landscape was living on the edge of fragmentation (Figure 13).

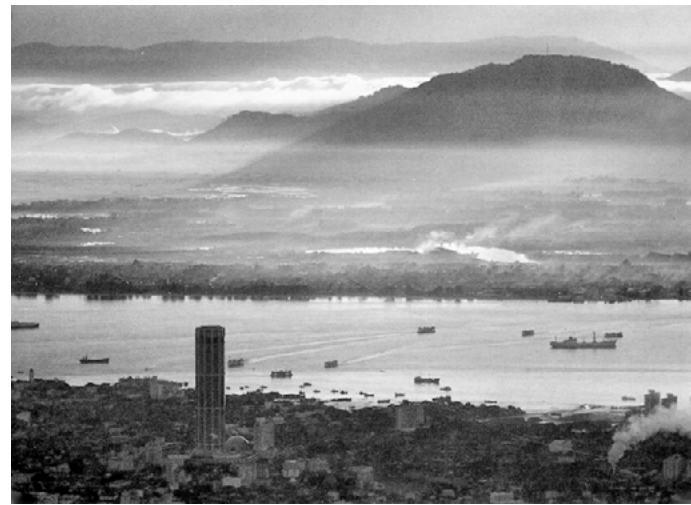


Figure 13: Townscape in the old urban area in George Town, 1985

Early in the 1980s, the preservation of George Town's built heritage was raised, Survey for the Penang Island Structure Plan recognized the needs to protect Penang's historic buildings, historic sites, culture, and architectural interests, particularly in George Town. In 1987, in the Design Guideline for Conservation Areas in Inner City of George Town Penang, five heritage preservation areas were identified, and subsequently increased to six. Since the early 1990s, the state has actively sought to promote built heritage as a tourism commodity. Entering the 21st century, in 2005, the Council of Penang State issued Guidelines for Conservation Areas and Heritage Buildings, reflected the state's desire to make the old town as a real "Living Heritage City". Finally, in 2008, the city of George and Malacca were both listed as world heritage sites by UNESCO in the name of the historic city of the Strait of Malacca. However, in fact, even after becoming a world heritage site, the conservation task of the historic urban landscape in George Town is still very slow, complicated and indeterminacy. Cultural homogenization, alienation of community value and place spirit, and the insufficient ability of sustainable development have become new problems of heritage conservation in George Town. In addition, the government's exclusiveness in cultural policies and attitudes will kill the historic urban landscape gradually which formed in the multicultural background.

8. FINDINGS AND DISCUSSION

Cultural landscape studies, as Geographer Carl O. Sauer developed them, focused on the evolution of places and included the "combination of natural and man-made elements that comprises, at any given time, the essential character of a place" (Hayden, D., 1995: p. 16). To go further, the urban landscape consists largely of streets, buildings, gardens and other open spaces, and walls, moreover, the shape, arrangement, material, and decoration of these features may serve as a starting point for investigation of the city (Price, E.T., 1964: p. 242-275).

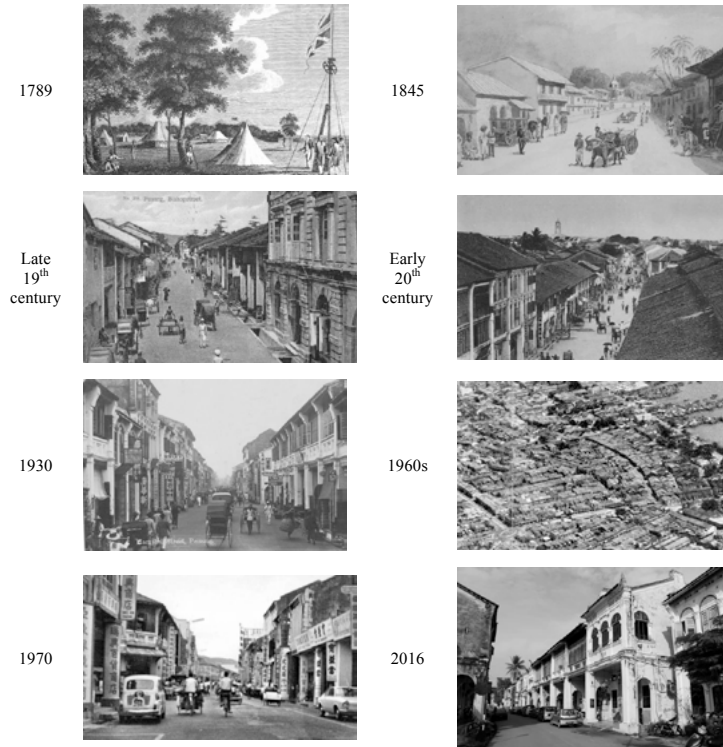
This study explores the evolution of townscape in different periods through the analysis of a series of paintings, images, survey maps, and urban archives. Edward Relph (1981: p. 23-24) states that the history of the idea of the landscape has to be traced in the works of poets and artists, for it is only in the present century that there has been any technical or academic discussion of the meaning of landscape as a concept. By studying the subjects chosen by painters and poets, and the manner in which these are depicted or conveyed,

it is possible to recognize the main shifts in the meaning of "landscape" from about 1500 up to the end of the nineteenth century. As Datuk Seri Dr. Lim Chong Keat (1986: p. 13-22) wrote in his book *Penang Views 1770-1860*, "each picture is supposed to convey more than a thousand words, and certainly the early paintings of Penang tell us a lot about the historical environment and about the perception of the artists, through the eyes of the painters of that period, we can observe the landscapes and vistas, the townscapes and the degree of urbanization, the monuments, the great houses, their estates, and gardens". Older buildings and areas help to explain a place's history and facets of the character of its population and are a welcome indigenous counterpoint to ubiquitous internationalized and homogenized cityscapes (Henderson, J.C., 2012: p. 47-55). The character of the landscape thus reflects the values of the people who have shaped it, and who continue to live in it. The culture itself is the shaping force. The landscape is a cultural expression that does not happen by chance but is created by the design which relates directly to our ideologies (Ken, T. & Jane, L., 2011: p. 537-554).

Retrospect briefly, every former colonial city has their own unique townscape to tell about their story. It can be through the cultural pluralism, cultural and social stratification, ethnic groups, and political or economic power, in detail, it embedded deeply in the architecture, the lifestyle, the festival or any other things. Rabindra, J.V. (2016: p. 18) states that when one talks about the historic cities and the settlements, the salient features are their endogenous characters, their layers of historic evolution and their continuity in its tradition as a record of culture. This study shares a townscape changing history about George Town chronologically from the early colonial era to the recent century to illustrate an evolution course, many photographs, maps, diagrams, and drawings are adopted in the study process.

As aforementioned, the townscape of George Town has evolved since its cession in the late eighteenth century, the city experiences a development course from an insular island, early colonial settlements, colonial trading port, colonial commercial center, colonial or postcolonial modern city, and finally, to the historic city Straits of Malacca. Comparatively, the townscape is changing from tropical island landscape, agricultural landscape, trading port townscape, to the modern townscape and historic urban landscape (Table 1). What is noteworthy is that the evolution process is always forced by the derived power (social, economic, and political). In this process, the townscape is a combination of buildings of different styles, different periods, and

Table 1: Evolution Image of Shophouse Townscape in George Town



different functions, it's a product of the historical process, and a manifestation of social phenomenon and cultural power. More broadly, it can be suggested that the townscape evolution process in a general sense might include the three points discussed below.

To begin with, in essence, social, political and economic factors in the early colonial era promoted the development of George Town as a port city, the transformation of townscape from tropical insular island to port town had been realized. In this stage, the townscape presented a cultural pluralism characteristic, and different immigrant groups adopted their own traditional culture and construction methods, moreover, forest landscape, agricultural landscape, and urban landscape coexisted in George Town.

Secondly, in the mid-colonial era, apart from the promotion of political and economic factors to the townscape, the influence of European cultural

factors became stronger as a political statement to convey the spirit of British Imperialism and began to affect the overall urban construction of George Town. Inevitably, the original native culture and the immigrant culture were gradually diluted and replaced by the strong and dominant western culture. The British colonial authorities deliberately institutionalized the colonial architecture especially in the public architecture as a symbol of the imperial power and recreated the image of the British as the legitimate ruler, in the hope of leading the western culture and western values in the colonies, it's a soundless political propaganda in the townscape to persuade people's attitude, beliefs and behaviors. In fact, it damaged the diversified structure of the urban landscape. When the western culture dominated George Town, it was followed by the transformation of attitude, beliefs and behaviors and the collapson of ethnic values. The townscape changed to be dominated by western culture, and this influence continued until the late colonial period.

Thirdly, after WWII, with the declination of the British economy, and after Malaya independent, people's demands for local culture and ethnic symbols became increasingly high. However, George Town's townscape is built heritage, any change would reduce the heritage significance especially in world heritage sites. From a theoretical perspective, at the aspects of authenticity in conservation, a careful investigation of the historical layers and its successive decoding to establish the authenticity of the monument and site is important, and each successive layer is understood through the kind of breakthroughs in its evolutionary process and no monument is seen without its settings, even a monument frozen in history has its sense of time and that never remains static over a period of time unless it is neglected and allowed to ruin (Rabindra, J.V., 2016: p. 19). Building new cities around the old town is a good manner appropriate to preserve this heritage. However, the new landscape lacks the urban characteristics and the effective connection of the urban history, the cultural context is obscure, thus, a sharp contrast between the images in the new cities and the old inner town appeared.

9. CONCLUSION

Cities are the product of time (Mumford, L., 1938: p. 3-10), when we seek to understand the dynamism, the processes of human activity over time, the city serves us much better (Vance, J.E., 1978: p. 132), it's a product of the integrated use of various powers (Vance, J.E., 1990: p. 41-50). It is apparent that the townscape must be considered extremely important for stabilizing individual and group identities, particularly in times of stress (Hubbard, P. 1993: p. 359-373). In retrospect, literature related to colonial port townscape of George Town is limited, much of the literature refers to conservation, restoration, and vitalization. However, it is worth pointing out that, the idea

of townscape evolution analysis is fundamental to the conservation activity in George Town. Establishing and analyzing the character, dynamics, and setting of the townscape in the evolution process helps to interpret the value of local history, place spirit, the background of multi-culture, and seeks to understand the structure and vitality of George Town.

Although on a theoretical level, townscape study is only one facet that explains the complexity of historic cities, it not merely focus on the appearance description but explore the landscape narrative, intrinsic driven force and evolution mechanism as well. Urban society changes in the time-scale or at major historical conjunctures reflected on the townscape rapidly, no doubt that the evolution is constantly at work, physical build as the urban enduring feature is the direct evidence in George Town and construct a psychological link between people and place for present and future generations. Hopefully, the results of townscape evolution research of George Town will complement and reinforce the conservation work, leading to increased confidence in interpretation.

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