SUSTAINABLE DESIGN ELEMENTS IN THE BUILDING CONSERVATION POLICY IN MALAYSIA

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SUSTAINABLE DESIGN ELEMENTS IN THE BUILDING CONSERVATION POLICY IN MALAYSIA

by

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LIST OF ABBREVIATIONS

BREEAM	Building Research Establishment Environmental Assessment Method
CO_2	Carbon Dioxide
DETR	Department of Environment, Transport and the Region
EE	Energy Efficiency
EMS	Energy Management System
ETS	Environmental Tobacco Smoke
EU	European Union
GBI	Green Building Index
GHG	Greenhouse gas
IAQ	Indoor Air Quality
ICOMOS	International Council on Monuments and Sites
IEQ	Indoor Environmental Quality
JWN	Jabatan Warisan Negara
LEED	Leadership in Energy and Environmental Design
NREB	Non-Residential Existing Building
SDEs	Sustainable Design Elements
SRI	Solar Reflectance Index
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization.
USA	United States of America
VOC	Volatile Organic Compound

LIST OF APPENDICES

ELEMENT-ELEMEN REKA BENTUK MAMPAN PADA POLISI PEMULIHARAAN BANGUNAN DI MALAYSIA

ABSTRAK

Penggabungan elemen-elemen dan amalan-amalan reka bentuk mampan ke dalam kerja-kerja pemuliharaan bangunan akan membawa manfaat kepada alam sekitar, sosial dan ekonomi sambil mengekalkan nilai sejarahnya. Walau bagaimanapun sebarang kerja pada bangunan bersejarah perlu mematuhi prinsip pemuliharaan bangunan yang menimbulkan cabaran untuk memastikan nilai sejarahnya dilindungi sementara memenuhi keperluan kontemporari seperti elemen-elemen reka bentuk dan perundangan semasa. Pada masa ini terdapat kekurangan pada garis panduan oleh Jabatan Warisan Negara (JWN) Malaysia dalam penggabungan elemen-elemen dan amalan-alaman reka bentuk mampan pada kerja-kerja pemuliharaan bangunan. Tanpa garis panduan yang sesuai, sebarang penggabungan elemen-elemen dan amalan-amalan reka bentuk mampan pada kerja-kerja pemuliharaan bangunan tidak akan holistik. Penyelidikan ini bertujuan untuk mencadangkan elemen-elemen dan amalan-amalan reka bentuk mampan yang sesuai untuk digabungkan ke dalam garis panduan kerja pemuliharaan bangunan oleh JWN. Penyelidikan ini mempunyai 3 objektif. Objektif 1 dicapai melalui penganalisaan dokumen, dimana 60 elemen-elemen dan amalan-amalan reka bentuk mampan telah dikenalpasti dan dikelompokkan kepada 5 kategori utama. Sesi temuduga telah dijalankan dengan 26 responden untuk mencapai objektif 2 dan 3. Didapati bahawa elemen-elemen dan amalan-amalan reka bentuk mampan ini telahpun diamalkan secara sukarela terhadap kerja-kerja pemuliharaan bangunan di Malaysia pada beberapa tahap yang berbeza dan pada peringkat pemuliharaan yang berlainan. Ini

menunjukkan bahawa elemen-elemen dan amalan-amalan reka bentuk mampan ini mempunyai potensi besar untuk disesuaikan sepenuhnya dan diterima pakai ke dalam garis panduan pemuliharaan bangunan sedia ada oleh JWN. Penggabungan elemen-elemen dan amalan-amalan reka bentuk mampan ke dalam garis panduan pemuliharaan bangunan sedia ada ini akan memberikan panduan kepada arkitek, pakar pemuliharaan dan lain-lain pihak berkepentingan untuk mempromosikan amalan pemuliharaan bangunan yang lebih hijau dan mampan di Malaysia.

SUSTAINABLE DESIGN ELEMENTS IN THE BUILDING CONSERVATION POLICY IN MALAYSIA

ABSTRACT

The integration of Sustainable Design Elements (SDEs) and Practices into building conservation works would bring environmental, social and economic benefits whilst retaining its historical values. However, any intervention to historic buildings must adhere to the principles of building conservation which poses a challenge to ensure its historic values are protected whilst addressing the contemporary needs such as SDEs and statutory requirements. Currently, there is a lack in the present guidelines in Malaysia's Jabatan Warisan Negara (JWN) that integrates SDEs and Practices into the building conservation works. Without proper guideline, the integration SDEs and Practices into building conservation works may not be holistic. This research aims to propose the SDEs and Practices suitable to be integrated into JWN's guidelines on building conservation. This research has three objectives. Objective 1 was achieved through documentary analysis, in which 60 SDEs and Practices items were identified and grouped into five main categories. Interview session has been conducted with 26 respondents for achievement of objectives 2 and 3. It is discovered that these SDEs and Practices had already been practiced voluntarily in some of the building conservation works to some various degrees and at some various conservation works stages. This shows that these SDEs and Practices have large potential to be fully adapted and adopted into JWN's building conservation guidelines. Incorporating these SDEs and Practices into the existing guidelines for conservation works will provide guidance to architects, building conservators and other stakeholders in promoting a greener and sustainable practice of building conservation works in Malaysia.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter discusses the background of the study and justifies the problem and gaps for the research. Following this, the research's aim and objectives are established. In later sections, the research scope and the brief methodology of the research are also presented. This chapter concludes with the brief outline of all chapters included in this thesis.

1.2 Background of Research

The roles of historic buildings and its conservation issues had become more prominent in Malaysia when Melaka and George Town were jointly listed in the UNESCO World Heritage Site in 2008 and became an important agenda in all tiers of government. Apart serving as important physical aspects of cultural elements and strengthened the Malaysian identity, it also becomes important asset in promoting tourism and generate great income revenue. In view of that, the Malaysian Government established Jabatan Warisan Negara (JWN) or National Heritage Department to monitor the status of Malaysia's heritage assets. Its conservation division had produced 'Guidelines on Heritage building Conservation' in 2017 (JWN, 2017) as a guide for all responsible parties in the application and compliance of building conservation principles for all building conservation works in Malaysia. The document is divided into four parts, which are Introduction, Conservation Principles and Processes, Conservation Methods and Technique and lastly Documentation. However, as compared to the established conservation guidelines in the UK (Drury & McPherson, 2008), USA (Grimmer *et al*., 2011) and Australia (Heritage Office & RAIA, 2008),

the document by JWN does not directly link sustainable development or clearly specify any integration of sustainable design in it.

The definition of Sustainable Development mostly cited is by Gro Harlem Brundtland in his Our Common Future (Brundtland, 1987) which is the development that meets the needs of present generation without compromising the future generation to meet their own needs. Since then, sustainability and sustainability development concept had been further developed and expanded through its three main components, which are Environment, Social and Economy.

In construction industry, the environment component plays a big role in integrating sustainability with it (Judson & Wilkinson, 2012; Baek *et al*., 2013). Sustainable design, for example had been integrated into the architecture of buildings or development (Iwaro & Mwasha, 2013; Soflaei *et al*., 2017). Among the aims of sustainable design are to ensure that the building or development is designed and constructed with minimum interruption or physical impact to the local environment and ecology, optimise the utilisation of energy and other resources and minimise the emission of carbon during its construction and throughout its operational period (Ahmad, 2012; GSA, 2018).

When it comes to building conservation, conservation, in its foremost conserve the historic buildings via the processes of preservation, restoration, rehabilitation adaptive reuse and a few more (JWN, 2017). These processes enable the historic buildings to be reused and prevent it from being demolished and reconstructed, hence saving the embodied energy within it and the historic significant of it (Judson, 2012; Sodangi *et al*., 2013).

Conservation works like adaptive reuse and rehabilitation of historic buildings would allow the disused, ineffective or obsolete buildings to be repurposed for new usage that meets the contemporary demand (Dyson *et al*., 2016). Conservation works that have been carried out within the conservation guidelines would ensure that the historic authenticity and architectural integrity of the buildings are maintained for future generations (Webb, 2017). It would revitalise urban areas and cause minimal environmental impacts by reducing unnecessary consumption of materials (Hong & Chen, 2017) and the energy used (Mohamed *et al*., 2017). However, there is a need to address the contemporary needs and requirements expected by the new functions or occupants of the said conserved buildings (Akande *et al*., 2016; Munarim & Ghisi, 2016, Tomšič, 2017). Design issues like occupational health and safety (Alves, 2012), fire-fighting and safety (Hashim *et al*., 2012), accessibility and security (Bullen & Love, 2011a) are some of challenges that need to be addressed in order to integrate within the conserved buildings. Other design issues that has come into the centre stage are energy efficiency (Blagojević & Tufegdžić, 2016) and minimal consumption of natural resources (Elsorady, 2014), which are part of the response for a more environmentally sustainable urban development.

According to the report by United Nations Development Programme (UNDP), issued in 2011, the building sector in Malaysia consumed approximately 7750 GW/h of electricity and emitted 5301 kt of greenhouse gas (GHG) emissions in 2008 (Kamaruzzaman *et al*., 2016), and projected an annual increases of energy consumption and GHG emissions (Bernama, 2015). Shika *et al.* (2012) highlighted that 40% of Malaysia's GHG emissions was partly contributed by the existing buildings. Malaysia, in its Eleventh Malaysia Plan (2016-2020) had voluntarily commit to reduce 40% of its CO_2 emissions by 2020 and refurbish 100 of its existing

buildings, which includes the historic ones (Kamaruzzaman *et al*., 2016). Hence, existing buildings, including historic ones also play essential roles in addressing sustainability through sustainable design and practices in existing and historic buildings. Ahmed and Nayar (2008) predicted potential 15-25% of energy reduction to Malaysia's existing buildings operation through sustainable design such as improving its energy efficiency.

This research looks into the present implementation of Sustainable Design, its elements and practices in the established building conservation policies of historic buildings from a few countries around the world and compare with its present implementation in the Malaysia's building conservation works. The Sustainable Design Elements (SDEs) and Practices implemented in the building conservation elsewhere would be identified and analysed for its' implementation in Malaysia's own building conservation works. A framework to integrate these identified SDEs and Practices with building conservation guidelines would then be proposed to be adapted and adopted by JWN's 'Guidelines on Heritage Building Conservation.

1.3 Problem Statement

It is worldly recognised that built environment is the major contribution of greenhouse gas emission (Milford, 2009; IEA, 2011; Stephan et al., 2011) where 45% of CO_2 emission is directly or indirectly contributed by the construction sector (Cabeza *et al*., 2018). The sector is also the world's major energy consumption (UNEP, 2009; Miller & Doh, 2015). In the European Union (EU), their buildings generate almost 50% of greenhouse gases and consume 40% of global energy demand. These data had driven the world governments to address and develop strategies and policies that improve and enhances their building's sustainability performances (Pisello *et al*.,

2014). These strategies are mainly focus on new buildings and for retrofitting existing buildings. Conservation building is seen as having a different agenda in which to conserve the building whilst maintaining its originality and identity. Sustainability of building conservation is seen from the perspective of prolonging the use of the building for current and future generation. The aspect of sustainable design in conservation building is a secondary factor as it may be in conflict with the building's original state. Due to the conflict between the conservation of historic buildings, the policies that implement the integration of sustainable design are excluded from the historic buildings (Martínez-Molina *et al*., 2016; Caro & Sendra, 2020).

In recent years, however, there had been increasing numbers of policy-makers and researchers that perceive the exclusion of historic buildings from this decarbonisation procedures produces its own risk of being condemned to 'comfort obsolescence' or to 'energy wasting' (Caro-Martínez & Sendra, 2018) and jeopardize their healthy survival. In Europe, few research programmes and initiatives to improve the sustainability performance of historic buildings were launched like 3ENCULT, Climate for Culture, EFFESSUS and NEW4OLD (Vieites *et al*., 2015; Caro & Sendra, 2020). This development is evidenced in some of the established building conservation policies and guidelines, ie. from the United Kingdom, USA and Australia (Drury & MacPherson, 2008; Heritage Office & RAIA, 2008; Grimmer et al., 2011; Heritage Tasmania, 2015; Grimmer, 2017) where the elements of sustainable design (SDEs) are being integrated with the conservation practices including various technical guidance for its implementation.

With rich history and culture, Malaysia has many buildings which are more than 100 years old and can be categorised as historic and heritage buildings. Under JWN, few of these buildings have been properly restored following the JWN's

guideline. Research on conservation of heritage building in Malaysia focused more on the technical aspect of conservation such as preservation techniques (Ahmad & Rahman, 2010; Johar *et al*., 2011; source), process (Lee & Lim, 2010; source), statutory and guidelines requirement (Ali & Zakaria, 2012; Baroldin & Din, 2012; Dian & Abdullah, 2013), success story (Ab Wahab *et al*., 2016) and maintenance (Idrus *et al*., 2010; Sodangi *et al.*, 2011; Kayan *et al*., 2017). In the other countries however, the importance of integrating sustainable design into conserving historic building have been highlighted by various scholars such as López & Frontini, 2014; Todorović *et al*., 2015; Vieites *et al*., 2015; Martínez-Molina *et al*., 2016; *Galatioto et al*., 2017; Joppolo *et al*., 2017; Tomšič *et al.,* 2017; Webb, 2017; Cabeza *et al*., 2018; Lidelöw , 2019 and Caro & Sandra, 2020.

In Malaysia, however, the incorporation of SDEs and Practices into building conservation work is unclear as they are yet to be included in the Malaysian conservation guideline. There is a clear lack of formal direction in the process of integrating SDEs and Practices into its building conservation policies and guidelines. The 'Guidelines on Heritage Building Conservation' (JWN, 2017) issued by Jabatan Warisan Negara (JWN) outlines the principles, processes, methods and techniques of building conservation works in a structured and detailed manner but does not directly mention or clearly specifies any integration of SDEs and Practices into the building conservation works. Direct emphasis on environmental sustainability approaches and inclusion of SDEs and Practices are almost, if not completely, silenced. The emphasis on energy and water conservation and efficiency and other SDEs and Practices to address the contemporary use and sustainable development is almost non-existence. Direct acknowledgment of sustainability is only on the recognition that the conservation works would enhance and extend the building's lifespan so it may be

continuously known and appreciated by future generations. This is in page seventy-four under Part II of its English version only. Therefore, there is an urgent need for the JWN's building conservation guidelines to adapt and adopt the SDEs and Practices in order to improve and enhance its sustainable performances.

1.4 Research Objectives

This research aims to propose the Sustainable Design Elements (SDEs) and Practices suitable to be integrated into the JWN's guidelines on building conservation works. The objectives of this research are:

i. to identify the relevant SDEs and Practices for building conservation works,
ii. to analyse the current level of implementation of SDEs and Practices in the building conservation in Malaysia,
iii. to recommend action on how to integrate the SDEs and Practices into the practice of building conservation in Malaysia.

1.5 Research Scope

This research focuses on identifying SDEs and Practices, which are relevant for building conservation practices. The SDEs and Practices are identified through extensive literature reviews and documentary analysis to some of the established building conservation guidelines and rating tools for sustainable design and building performance in refurbishment and rehabilitation works from the UK, USA and Australia. These countries were chosen because on their longer established and strong policies in approach to building conservation works. The research also focuses on the practice of conserving historic buildings in Malaysia, under the guideline of JWN. This

structured qualitative research uses interview session to analyse the application of SDEs in the current conservation practices. The respondents are registered conservators under JWM and also well-versed with design requirements. These two criteria are crucial in ensuring the respondents have both knowledge and experience in sustainable design and conservation practices.

1.6 Research Methodology

To achieve the research's aim and objectives, the Principles of Sustainable Design is reviewed and investigated, in order to identify its elements and components for integration into the building conservation practice. Documentary analysis was conducted on some of the established building conservation guidelines and a few existing sustainable design and building performance rating tools for refurbishment works from the USA, UK and Australia. This is to identity the SDEs and Practices implemented and / or suitable to be implemented and / or adaptable for implementation in the building conservation in Malaysia.

These identified SDEs and Practices are devised into interview questionnaires where registered conservators with architectural practice and / or with built environment design background are interviewed to analyse the level of its implementation in the present building conservation works in Malaysia. These respondents were interviewed about the present integration of SDEs and Practices in Malaysia's own building conservation guidelines. With the input from the above respondents, data analysis is carried-out in order to analyse the level of implementation of these SDEs and Practices in the present building conservation works in Malaysia. A framework to integrate these identified SDEs and Practices is then formed as a

recommendation for it to be adapted and adopted into the current JWN's Guidelines on Heritage Building Conservation.

1.7 Contribution of the Research

By identifying SDEs and Practices that are suitable to be implemented in the building conservation works, a framework guideline is recommended for these SDEs and Practices to be adapted and integrated into JWN's present guidelines on building conservation. By integrating these SDEs and Practices into the conservation guidelines for all future building conservation works in Malaysia, it will provide guidance to architects, building conservators and other stakeholders, such as Jabatan Kerja Raya (JKR) and all the involved local authorities in promoting a more sustainable and greener practice of historic building conservation in Malaysia.

1.8 Structure of Thesis

This thesis is structured into six chapters. Each chapter is summarised as follows: -

Chapter 1 : Introduction

This chapter forms an introduction to the research by providing the background of the research, the problem statement, the research's aim and objectives, the scope as well as the brief of research methodology employed for this research and followed by the research's contribution. This chapter ends with the explanation of the overall structure of thesis.

Chapter 2 : Literature Review

This chapter presents the literature review. There are six main parts in this chapter. The first part explains and elaborate on Sustainable Design and Sustainable Design Principles in building design. The second part discusses on the practice of building conservation. The third part elaborates on the SDEs and Practices in the building conservation. The fourth part discusses on the challenges in integrating SDEs and Practices with the building conservation. The fifth part examines the current integration of SDEs and Practices in the building conservation guidelines of some countries. The sixth part discusses on the extend of JWN's building conservation guidelines integrating SDEs and Practices.

Chapter 3 : Research Methodology

This chapter discusses the research methodology and research design adopted to achieve the aim and objectives of this research and deliberates on the validity and reliability of the research data obtained.

Chapter 4 : Sustainable Design Elements

This chapter discusses on the process of documentary analysis in order to identify all the SDEs and Practices, directly and indirectly been practiced mainly from a few building conservation guidelines and sustainable design and building performance rating tools. These identified SDEs and Practices were designed into interview questionnaires with the selected respondents to obtain qualitative data which were then analysed.

Chapter 5 : Analysis and Findings

This chapter elaborates on the findings from the data analysis and discusses on the research's outcome. It is then reconciled with this research's aim.

Chapter 6 : Conclusion.

This final chapter concludes the thesis by presenting the summaries of the research's outcome, its' limitation, the research's contribution and implication and lastly recommendation for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review. There are five main parts in this chapter. The first part explains and elaborates the concepts of Sustainable Design and Sustainable Design Principles, and Building Conservation and Building Conservation Principles. The second part elaborates on the Building Conservation practice from the perspective of Sustainable Design. The third part discusses on the challenges in integrating Sustainable Design with the Building Conservation works. The fourth part examines the extend of Sustainable Design's integration into Building Conservation. The fifth part examines the extend of Sustainable Design integration with JWN's 'Guidelines on Heritage Building Conservation'.

2.2 Definitions and Concepts

The following sub-chapters discusses on the definition and concepts of both sustainable design and building conservation. The approaches of building conservation, the history of building conservation, the implementation of building conservation in Malaysia and the building conservation principles are also elaborated in these sub-chapters.

2.2.1 Sustainable Design

Sustainable Development is defined by the Brundtland Commission as the type of development that meets the needs of the present generation without compromising the future generations' ability to meet their own needs (Brundtland, 1987). The sustainable development approach recognises the interlink between the environment,

society and the economy (Judson & Wilkinson, 2012; Miller & Doh 2015), which are its three main dimensions (Michael *et al.*, 2014; Ibrahim *et al.*, 2015). It emphasises on these common criteria, which are the protection of natural environment, the use of renewable resources, economic vitality and diversification, ensuring resources are not wasted for generational equity, self-reliance of the community, individual well-being and satisfaction of basic human needs (Yung & Chan, 2012; Soflaei *et al.*, 2017).

Sustainable development delivers appropriate development that considers the deliverance of economic and social benefits which minimise the impact to the environment (Miller & Doh, 2015). It is well recognised that, despite of its three main dimensions, almost every model of sustainable development refers to the environmental performance and energy use, which are very relevant to the present critical world issue of reducing the energy consumption and greenhouse gas emission, and enhancing environmental performance (Judson & Wilkinson, 2012; Baek *et al.*, 2013). With reference to the environmental dimension, sustainable development is referred by Rodwell (2003) as a symbiotic relationship between man with its natural and manmade environment, in protecting their common interest of the planets and the continuation of activity or development in a long term without compromising the environment that sustains it (Ross *et al.*, 1995). In general, these definitions would relay a message that whatever physical development to be carried-out, the impact to the physical environment should be minimised, managed and mitigated.

With that emphasis of sustainable development on environment, sustainable design comes into the picture that further addresses the environmental components of it. Sustainable design could be termed as the intelligent application of the principles of sustainability (Ruggles & Linder, 2012). McLennan (2004) defines sustainable design as the design philosophy that seeks to maximise the quality of the built environment,

while minimising or eliminating the negative impacts to the natural environment and underlined its six principles (refer Table 2.1). McDonough and Braungart (1992) had earlier elaborated sustainable design principles through its 'Hannover Principles: Design for Sustainability' (refer Table 2.1).

Table 2.1 The Principles of Sustainable Design

Principles of Sustainable Design, defined by:-		
	McDonough and Braungart (1992)	McLennan (2004)
1	Insist on rights of humanity and nature to co-exist.	Respect for the wisdom of natural system.
2	Recognise interdependence.	Respect for the people.
3	Respect relationships between spirit and matter.	Respect for the place.
4	Accept responsibility for the consequences of design.	Respect for the cycle of life.
5	Create safe objects of long-term value.	Respect for energy and natural resources.
6	Eliminate the concept of waste.	Respect for process.
7	Rely on natural energy flows.	
8	Understand the limitations of design.	
9	Seek constant improvement by the sharing of knowledge.	

Sustainable design could be applied to all design disciplines, i.e. architecture, landscape design, urban planning, product design etc as they more or less share the common principles. Its realisation subscribes to renewable resources, minimal impact to the environment and connecting the people with it (Iwaro & Mwasha, 2013; Soflaei, 2017). The US's General Services Administration, (GSA) stated sustainable design seeks to minimise the negative impacts on the environment and the health and comfort of building occupants, hence improving the building performance (GSA, 2018). Its design approach takes the concerns on the ecological, social and economic aspects which meets the need of the present generation without jeopardising the future generation's ability to meet their needs (Keitsch, 2012).

The sustainable design's elements and practices for a building are seen through as implementing good maintenance strategies and performing effective repair works

(Sodangi *et al*., 2013, Misirlisoy & Gunce, 2016; Kayan, 2017), adapting energy efficiency and management (Wilkinson, 2012; Balson *et al.*, 2014; Tokede *et al.*, 2018), adapting water efficiency and management (Love & Bullen, 2009; Wilkinson, 2012; Balson *et al.*, 2014), implementing waste management and reduction policy and using low environmental impact materials (Wilkinson, 2012; Balson *et al.*, 2014), using renewable and cleaner energy (Akande *et al.*, 2014), delivering and improving a good indoor environment quality (Webb, 2017) at minimum impact to the environment (Iwaro & Mwasha, 2013, Soflaei *et al*., 2017). A sustainable building incorporates environmentally sensitive site planning, uses resource efficient building materials and instil good quality of indoor air as well as thermal comfort (Ahmad, 2012). It's a practice that creates and use a healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition (Elshimy & Samir, 2017). It comprises and embodies the holistic approach from its design process that considers and delivers social, economic and ecological dimensions of solutions, and maximising the success of future developments (Keitsch, 2012).

From the above, the principles of sustainable design for building are to minimise the overall physical and ecological impact to the environment during the production of building components, the construction process and when operational while at the same time improving the indoor comfort, performance and overall quality. The approaches adopted are to increase the energy and water conservation and efficiency, to increase the utilisation of cleaner and renewable energy sources, to minimise the production of waste during design, construction and operational by increasing recycling of building materials, generated waste and used natural resources, to minimise the physical impact to the surrounding environment, local ecology and

community, to provide a safe, healthy and productive indoor environment, and lastly to manage and maintain the building in a holistic manner.

2.2.2 Building Conservation

Historic buildings are unique and valuable assets due to their historical values and tourism potential. These types of buildings generally older than a specified age threshold, retain its original physical characteristic integrity and holds some significance values (Webb, 2017). There are generally physically characterised by its bioclimatic design, durable construction materials and resilient architectural structure (Todorović *et al*., 2015; Vieites, 2015). Historic buildings imbue a sense of wonder and triggers the sense of enquiry into wanting to know more about the people, their culture and their technical knowledge when constructed it (Fielden, 2007). It has an artistic and human message that both reveal itself directly when looked at and when it is studied in more detail (Kamal et al., 2008). It embodies the cultural expression and identity of that particular people or society and reflects the legacy of their humanitarian activities and innovation of the builders.

Building becomes as an important source of historical materials for the people who constructed it at the time, be it for its economic, cultural or socio-political scene and help to define their character by providing tangible links with the past (Cantell, 2005). As such, retaining and maintaining historic buildings is important to retain the authenticity of its heritage, originality, uniqueness and historical values. Hence it requires special treatment and consideration in their conservation strategy due to their cultural, national and economic significance (Tomšič *et al*., 2017).

Therefore, it is paramount to conserve historic buildings because it provides a sense of identity and pride to the present generation of their historical past and its continuity through the present and in to the future. Historic places from all over the world are unique and diverse for its inhabitant's local cultures, climates and geographical factors. These unique historic building or complex of buildings or monuments such as the Taj Mahal and the Humayun's Tomb in India, the Pyramids of Giza in Egypt, the Temples of Angkor in Cambodia, The Monastery of the Hieronymites and Tower of Belem in Portugal and the Historic Village of Shirakawa-go in Japan are worldly recognised to have embodied outstanding universal values by the UNESCO (World Heritage List, n.d.).

Figure 2.1 The traditional village of Shirakawa-go, Chuku, Japan are listed as a UNESCO World Heritage Site for its unique Gasho-style traditional roof.

Fielden (2007) defines conservation as the acts that prolong the life, prevent decay and manage any change dynamically of natural or cultural heritage so to imbue the sense of wonder on its artistic and human messages these objects possess. In the UK, English Heritage (Drury & MacPherson, 2008) defined conservation as *'the*

process of managing change to a significant place in its setting in ways that will best sustain its heritage values, while recognising opportunities to reveal or reinforce those values for present and future generations' (p.71). The Burra Charter (ICOMOS, 2003) described conservation as *'all the processes of looking after a place so as to retain its cultural significance'* (p.2).

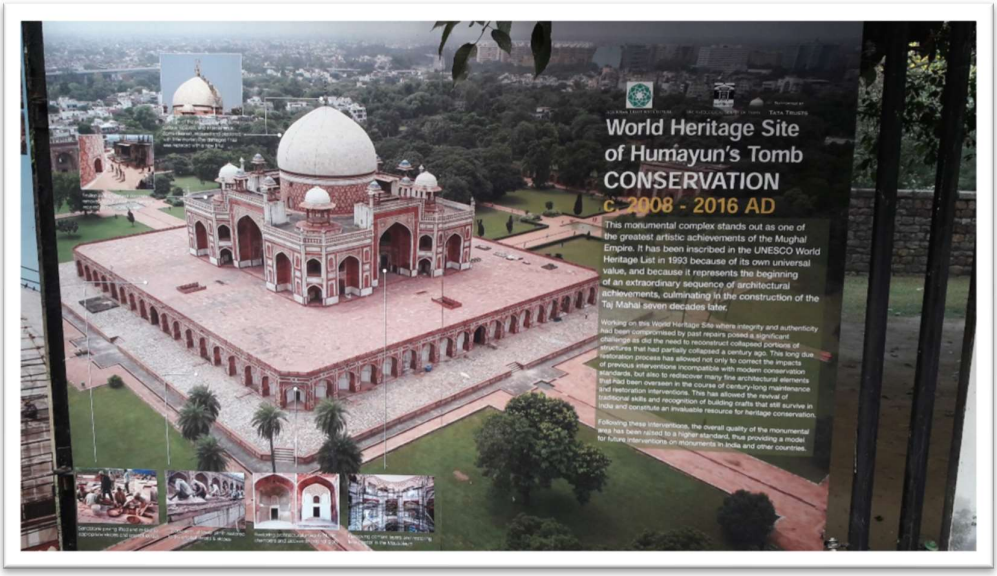

Figure 2.2 The conservation works information board at the site of Humayun's Tomb, New Delhi, India. The site is also listed as a UNESCO World Heritage Site for its exemplary Mughal style garden-mausoleum architecture.

Building conservation is a procedure and action adopted to extend the life of an architectural heritage, be it a monument, building or series or a complex of buildings and other man-made structure. It implies the practice of keeping intact all buildings bearing significant historical and architectural values (Ahmad, 2012). It is a technical activity towards historic buildings that involved preserving the fabric and materials of historic buildings (Harun, 2011) and involve creative use and re-use of historic buildings which utilise the functional and economical values to justify reusing it (Boussaa, 2010) while still maintaining the identity of its traditions (Magrini *et al.*, 2015). In Malaysia, JWN described building conservation as '*the process of*

maintaining and protecting heritage buildings from being damaged, destroyed, changed or even restored without proper planning and management according to the approved guidelines' (JWN, 2017, p.71).

2.2.3 Building Conservation Approaches

Works to building conservation may involve several approaches. Table 2.2 below lists the approaches spelled-out in the United States of America's (USA) 'Secretary of Interior's Standards for Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Building' (Grimmer, 2017), The Burra Charter (ICOMOS, 2003) and as according to Malaysia's National Heritage Act 2005 (JWN, 2017).

Table 2.2 The Building Conservation Approaches

Building Conservation Approaches, defined by:-		
The Secretary of Interior, USA (Grimmer, 2017)	National Heritage Act, Malaysia (JWN, 2017)	Burra Charter (ICOMOS, 2003)
Preservation	Preservation	Preservation
Restoration	Restoration	Restoration
Rehabilitation	Rehabilitation	
Reconstruction	Reconstruction	Reconstruction
	Maintenance	Maintenance
	Adaptation / Adaptive Reuse	Adaptation
	Prevention	
	Consolidation	
	Reproduction	

Although the words of description for each the above approaches or intervention differ slightly, it embodies the same aim and intention. According to JWN's Guidelines on Heritage Building Conservation, preservation involves works to maintain the building or structure in its original form to prevent future damage or deterioration. Restoration involves the works to reinstate the authentic condition or revitalise the original concept of the building. Rehabilitation involve rehabilitating the building to a condition of usability, usefulness and functionality through restoration

and improvement for efficient contemporary use while maintaining authenticity. Adaptation or Adaptive Reuse involve works to change the function and usage of the building but at the same time maintaining the authenticity of original structure (JWN, 2017). These conservation approaches are applied to a historic building depending on its present physical condition and the aim of the conservation works itself. All registered conservation works and approaches undertaken to the historic building in Malaysia would have to strictly abide to the conservation principles and processes, methods and techniques outlined in JWN's guidelines on building conservation, to ensure they are uphold in high standards and practices expected by international standards, such as ICOMOS and the Burra Charter.

Figure 2.3 The historic Masjid Kampung Laut, Kota Bharu, Kelantan, Malaysia. It was among the earliest mosque that was conserved in Malaysia.

2.2.4 History of Building Conservation

Plevoets and Van Cleempoel (2013) summarised that during the Renaissance period in Europe, many buildings from ancient times were transformed to new uses, with materials from one building been reused to construct another. During the French

Revolution, religious buildings were adapted for industrial functions and military uses. Those interventions works were driven by purely functional and practical reasons, not under the present prescribed and recognised conservation practice. The beginning of more theoretical discussion on adaptive reuse or rehabilitation, as a way to preserve historic buildings started in the 19th century and was led by two schools of thought, one is by Eugene Emmanuelle Violet-le-Duc (1814-1879) in France which led the movement called 'restoration movement' and the other by John Ruskin (1819-1900) whom led the 'conservation movement' in England. In general, Viollet-le-Duc espoused for alteration of the original building for reuse in a clear, direct and more practical ways while Ruskin led his pure conservationist philosophy, on the premise that prefer for the protection, conservation and maintenance of buildings. (Plevoets & Van Cleempoel, 2013).

By the 19th century, historic buildings were reordered and reconstructed without much reference to the original design and by the end of the 19th century a 'restoration' approach was adopted where areas surrounding these buildings were cleared and the buildings were displayed amidst the large parks or gardens (Orbasli, 2008). By the second half of 19th century, the growing of anti-restoration movement to some poor restoration works led to the establishment of The Society of Protection of Ancient Buildings (SPAB) in 1877 in England. It espoused that real heritage is imbued in the authentic building or monument, and not in modern replicas. The word 'restoration' was changed with the word 'conservation', and the conservation repair philosophy was introduced based upon its manifesto (Sodangi *et al.*, 2013).

Since the Athens Charter in 1931, the first international documents that promote modern conservation policy, other international policies and guidelines were devised and further improved and amended since, like the Venice Charter, the Bura

Charters and the Nara Charter, to name a few. These policies or guidelines, in general provided conservation principles and standard which base on ethical codes. Ethical codes are defined as a 'series of moral principles or value' (Harun, 2011, p.44).

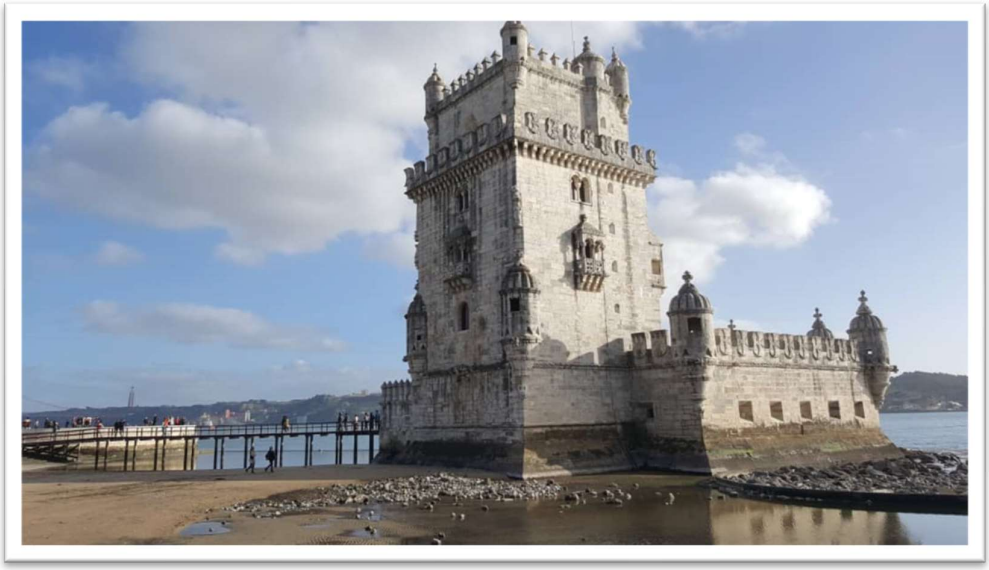

Figure 2.4 The historic Tower of Belem, Lisbon, Portugal (in picture above) were conserved and listed as a UNESCO World Heritage Site for its exemplary examples of Portuguese power during the age of discovery.

2.2.5 Building Conservation in Malaysia

When an Art-Deco styled wet market building in Kuala Lumpur undergone an adaptive reuse process in 1986 and converted into a handicraft and cultural centre called the Central Market, it has opened up the eyes of local Malaysian on the practice of building conservation of heritage building (Ahmad, 2012). Since then, many other building conservation works were carried-out in the country either in small or big scale, especially to the colonial buildings in Kuala Lumpur, George Town and Melaka. The heritage and conservation issues have become more prominent in Malaysia when Melaka and George Town were jointly listed in the UNESCO World Heritage Sites on 7 July 2008 as 'Historic Cities of the Straits of Malacca' (Shamsudin *et al.*, 2012).

With the inscription, building conservation works within the listed areas and to other historic buildings nationwide have become an important agenda in the government, be it at the local government, state and national level. It has also made the public be more aware on their cultural history and heritage, and put a great demand for professionals and scholars alike to play bigger role in the conservation issues.

Figure 2.5 The Masjid Kampung Dal at Kuala Kangsar, Perak, Malaysia was conserved under the supervision of Jabatan Warian Negara.

Historic buildings are also important assets in promoting heritage tourism and boosting the Malaysia's revenue generation. In 2010, Malaysia had attracted 24.6 million foreign tourist and generated RM56.5 billion to the tourism sector (Sodangi *et al*., 2011). Hence, it could also be viewed that historic buildings in Malaysia serve as important physical cultural elements that also represent and strengthened Malaysia's identity (Sodangi *et al.*, 2013). Justifying the importance of these historic buildings and responding to all of its related arising contemporary issues, the Malaysian Government has established Jabatan Warisan Negara (JWN) in 2006. JWN monitors and ensures all methods and approaches undertaken to historic buildings or structures

strictly adhere and comply to the principles of building conservation and to the procedures as required under the National Heritage Act 2005 spelled-out in JWN's 'Guidelines on Heritage Building Conservation'. JWN since then had monitored and supervised all their sponsored building conservation works in ensuring all the right methods and approaches are adhered throughout its conservation works.

2.2.6 Principles of Building Conservation

Any building conservation works of any selected conservation approach or approaches must ensure that the conserved building's authenticity, integrity and significance are safeguarded, maintained and protected. To ensure that these objectives are achieved, conservation works must strictly adhere to the principles of building conservation through-out the conservation process which are set forth in several international charters by the ICOMOS and UNESCO (Webb, 2017). Historically, the development of these principles and its key concepts such as authenticity and reversibility were initiated by the previous conservation figures like Viollet-le-Duc, John Ruskin, Willian Morris and Camillion Boito (Lidelöw *et al.*, 2019). These principles are laid in the guidelines, instruction and ethics of conservation. Table 2.3 underlined several of those principles.

Table 2.3 The Principles of Building Conservation

Ethics in Building Conservation (Fielden, 2003)	Basic Conservation Principles in International Charters (Harun, 2011)	Principles of Building Conservation (Failey & Yahya, n.d.)	Modern Principles of Intervention in Conservation Works (Sykora *et. al*, 2010)	Principles of Conservation (JWN, 2017)	Principles of Conservation (Webb, 2017)
Record and document the building's existing condition	Careful recording and research before intervention	Maintain the building's historical importance	Minimise intervention with unobtrusiveness and respect the original	Able to extend the lifespan of the building	Reversibility
Record and document all materials and method used	Reversibility of interventions	Continuously doing research	Respect its integrity and avoid method that'll lose its authenticity	Respect the history and its intrinsic quality	Minimum Intervention
Ensure all historical evidences not destroyed, falsified and removed	Retention of a minimum of the original structure	Minimise any physical intervention	Safety of construction works	Prioritise the original form or design, materials and its authentic craftmanship	Authenticity
Minimise intervention and ensure reversibility intervention	Minimum alteration of historic fabrics	Maintain optical environment	Durability and compatibility of materials	Cautious and comprehensive in carrying out investigations and documentation	Compatibility
Ensure intervention governed by respect to aesthetic, historic and physical integrity of cultural identity	Minimal risk of significant loss or damage or uncertainty in performance		Balance between cost and availability of financial cost	Minimise any necessary	Level of Transformality
	Distinctive or distinguishable use of new and additional material			Tolerance in interpreting and usability of the building or structure	
	Sympathy in interpretation and sympathy in use			Minimise risk of losing parts of important and unexpected damages during testing on building materials	
	Respect for the quality of place			Ensure any disturbances or disruption can be corrected or made good	
	Preference for original material and workmanship			Minimise any changes to the building fabric	
	Longevity in the finished work			Able to distinguish between the old and new material	
				Provide maximum reinforcement to the original structure	
				Provide proper documentation through-out the entire conservation works	