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THE APPLICATION OF GREEN ADAPTIVE REUSE OF HISTORICAL BUILDINGS IN UNESCO CITIES

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Abstract

Adaptive reuse can help increase operating efficiency, and "green adaptive reuse" is the best option for historical buildings. There are no specific important environmental elements in the Malaysia Green Building Index (GBI) that are catered for, particularly for the reuse of historical buildings in the Malaysian setting. There is a vital need to identify certain essential environmental aspects that can be used to develop green features in Malaysia's adaptive reuse projects. This study examines the perspectives of adaptive reuse practitioners who have worked on historical building adaptive reuse projects through semi-structured interviews. These findings may assist GBI Malaysia in strengthening by identifying the fundamental environmental aspects for green adaptive reuse and classifying and sorting the elements into major categories in a meaningful sequence compatible with historical connections, sustainable and city planning knowledge.

Keywords: Green Adaptive Reuse, Historical Buildings, UNESCO Cities, Environmental

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INTRODUCTION

The historical culture of many Malaysian states provides unique opportunities for the reuse of historical buildings. The adaptive reuse of historic buildings helps to save energy and resources. The green concept of sustainable techniques and technologies can be incorporated into building planning and modernization, as well as creating a healthy environment for people to live in. The Leadership in Energy & Environmental Design (LEED) accreditation scheme for green buildings, which honours the finest building practises and initiatives, was successfully established by the US Green Building Council (USGBC). This certification programme is currently one of the highest sustainability standards in many construction fields. However, in Malaysia, there are no specific key environmental features in the Malaysian Green Building Index (GBI) that cater specifically to the reuse of historical buildings. This problem leads to a critical need for establishing specific key environmental features that can be used to implement green features in Malaysian adaptive reuse projects. Therefore, this study's aim is to explore the specific elements of green environmental features that are implied in adaptive reuse projects in Malaysia.

The result would be beneficial in implementing green concepts towards historical buildings in Malaysia. An old woolstore may become an apartment building, a university or a hotel. Malaysia's state offers many opportunities to reuse historical buildings. Sekeping projects have so far completely reused historical structures, including Sekeping Kong Heng (Perak), Sekeping Victoria, Sekeping Pinang (Penang), Sekeping Sin Chew Kee, and Sekeping Backland (Kuala Lumpur). The adaptive reuse of existing stocks saves energy and resources. A green concept towards methods and technologies can be incorporated to modernise the building's performance and to generate a healthy space in to live and work. In the United States, they have successfully provided US Green Building Council LEED Platinum for several adaptive reuse projects that capably meet the highest current sustainability standards. The key problem here is that in Malaysia, there are no specific key environmental features in GBI Malaysia that are specifically for the reuse of historical buildings. This problem leads to the critical need to establish specific key environmental features that can be used to rate green concepts in adaptive reuse projects. Thus, this study's aim is to investigate the essential parts of green environmental features that should be included in Malaysian adaptive reuse projects. This study also examines the perspectives and experiences of adaptive reuse practitioners who have worked on historical building adaptive reuse and conservations projects. The end result would be useful in determining a green concept for giving new life to historical buildings.

THE IMPORTANT OF GREEN ADAPIVE REUSE IN CITY PLANNING

Because the majority of adaptive reuse projects are located in older areas of cities and neighbouring towns, they are more centrally located and have easy access to transportation and markets. While increased urban density may result, this is not always a bad thing when compared to other options. The adaptive reuse idea provides the opportunity to integrate new town planning development that blends old or historical buildings with new and modern structures. This is because reusing building stocks may bring character to the adaption plans and provide historical links that can attract visitors and tourists. Aside from that, the combination of old and new may be quite appealing. A large number of completed adaptively adapted building stocks are beloved or historic landmarks. Despite this, the bulk of them are not thought of as outstanding examples of environmental planning. This approach has the greatest promise since it integrates environmental considerations into local and regional planning.

GREEN ADAPTIVE REUSE

The design and construction process of transforming the functions, structures, fabric, or building envelopes of historical buildings into new and contemporary ways is known as adaptive re-use. Multi-project team members who have the vital management skills and work with the historic and contemporary value of the design and construction aspects must be able to handle the tough practise. (Alauddin, K 2014).

Previous research in adaptive reuse projects has determined on project team knowledge and skills, such as an individual's ability to do common adaptive reuse tasks. according to Langston (2011), green adaptive reuse, is an ideal technique that integrates expressed and active benefits in a synchronizing scheme that leads to green adaptive reuse. Langston (2011) used the iconCUR assessment to evaluate certain adaptive reuse efforts in Australia. By adding new capabilities to old structures, this is the most effective approach to green them. Many researchers agreed that skills and knowledge are acute to the success of adaptive reuse projects (Watson 2009a, 2009b). on the other hand, the concept of "green," draws merely a smidgeon of the researcher's attention. There is a scarcity of green adaptive reuse research. In recent years, the use of green building concepts has become increasingly widespread. The green index of most buildings in the United Kingdom has been determined. The idealised interpretation of the green concept for building, according to the Governor's Green Government Council, is to ensure the healthiest possible environment with the effective design solution that effectively emulates all natural processes and the condition of the existing building. The majority of developed countries have well-established green building evaluation tools for historical buildings.

It is critical to integrate well with green and adaptive reuse concepts because the results can be spectacular. They have successfully provided US Green Building Council LEED Platinum for several adaptive reuse projects in the United States, which meet the highest current sustainability standards. The former Bushels Team Company Building has received a 5-star Green Star rating from the Green Building Council of Australia, which is equivalent to Gold LEED certification. Currently, Malaysia has only one green initiative: green building for new and existing buildings separately (Greenbuildingindex2011). Malaysia's GBI must support the green concept by reusing historic buildings as part of the overall life-cycle of the city and district. Green Buildings should be designed and operated with the protection of Malaysian built heritage and the preservation of a distinct cultural identity in thought, by promoting locally owned businesses and flexible new uses.

KEY ENVIRONMENTAL FEATURES

The sustainability of historical buildings is the main focus of this review. The main factors to achieve the green idea in the adaptive reuse of historical buildings are energy efficiency, indoor environmental quality, sustainable site planning and management, material and resource efficiency, and water efficiency.

Energy Efficiencies Such as Performance of The Historical Buildings, Renewable Energy and Sustainable Maintenance

Energy efficiency of a historic building refers to the energy needed or utilised for the building to function (Asman et al., 2019). According to Asman et al. (2019), passive heating and cooling as well as insulation of the building envelope also help by the conservation of energy as heat transfer will be reduced. In France, the sustainability approaches of the majority of buildings include renewing the building envelope's insulation, replacing windows with double-glazed ones, and fixing HVAC systems (Shahi et al., 2020). Therefore, the improvement of the energy efficiency and energy conservation of a building will reduce the emissions of carbon dioxide (Zhou et al., 2019; Calise et al., 2020).

Indoor Environmental Quality Including Indoor Air Quality, Thermal Comfort, Lighting Visual and Acoustic Comfort of The Historical Buildings

Indoor Environmental Quality (IEQ) comprises indoor air quality, thermal comfort, lighting, visual and acoustic comfort (Al-Obaidi et al., 2017; Karaca et al., 2020; Vladioiu et al., 2021). According to Martinez-Molina et al. (2018), providing thermal comfort is one component of a comprehensive approach to historic building preservation and adequate indoor conditions. The crucial criteria, such as fully natural ventilated spaces, providing mechanical ventilation and air conditioners, providing an auto-controlled indoor temperature system, and

controlling moisture and humidity, were selected to assess the actual conditions for adaptive reuse of historical buildings (Al-Obaidi et al., 2017). Besides indoor air quality and thermal comfort, lighting and visual comfort are two important factors for adaptive reuse of historic buildings (Marzouk et al., 2020; Shahi et al., 2020; Asman et al., 2019). For example, the use of lighting lux levels. LED lights are used extensively in Penaga Hotel, Penang (Dewiyana et al., 2016) and Colonial Shophouses, Kuala Lumpur (Al-Obaidi et al., 2017) to promote light efficiency and energy saving. Furthermore, some of the strategies to achieve great natural lighting and visual comfort, such as blind and tinted glass windows, were used, and the wide opening of windows gives the maximum external view and day lighting for occupying the building (Kilian et al., 2018; Marzouk et al., 2021; Mehr et al., 2018). Acoustic comfort also plays a major role in the adaptive reuse of historic structures that enhance the comfort of those who use their inner spaces (Khalil et al., 2021; D'Orazio et al., 2020). According to D'Orazio et al. (2020), controlling individual noise is the only way to cope acoustic contentment in historic buildings. Acoustic materials such as polyester and hybrid jute-polyester composites have been recognised to have high density and act as an insulation to reduce noise and sound impacts when installed in buildings (Mehr & Wilkinson, S., 2018; Aly et al., 2021).

Sustainable Site Planning and Management Such as Facility Management and Reduce Heat of Historical Buildings

A facility management inspection includes an overall inspection as well as a building condition analysis. The facility evaluation examines the building's present structural integrity, as well as the state of its roof, windows, HVAC, plumbing, and utility systems (Miraj et al., 2021). According to Chew et al. (2017), green facility management encompasses waste minimization, energy management, and utility reduction throughout the life cycle of a facility. Furthermore, the green building should use renewable energy sources for heating and cooling (biomass wood pellets, geothermal heating, solar thermal heating, and absorption cooling) (Cabeza et al., 2018).

Material and Resources Including the Reuse and Recycle Material of Historical Buildings, The Specific Sustainable Material That Maintain, Waste Management and Possible of Extra Green Products

The environmental benefits are the use of theory on recycling and reusing for sustainable redevelopment (Tam & Hao, 2019; Mak et al., 2019). Reusing is a technique for extending the life of historic structures and to decrease the consumption of construction material resources (Sharifi & Farahinia, 2020; Lu et al., 2019). When steel is recycled, the main source of avoided environmental burden is reuse (Sanchez et al., 2019). Bricks are another building material that

can be reused and recycled; blab al discovered that 70% of 2500 bricks could be reused, with the remainder destined for recycling (De Gregorio et al., 2020). Therefore, recycling of materials and reuse of structural elements can contribute to the reduction of construction waste in landfills (Sharifi & Farahinia, 2020). Furthermore, the ecological impact, such as greenhouse gas emissions, can also be reduced at the landfill (Tam & Hao, 2019).

Water Efficiency Such Water Recycling and Harvesting in Historical Buildings

Conservation of water is the basic principle of green building (Huo et al., 2017). Water efficiency efforts should be made to ensure that the materials and systems that are used help in the reduction of water consumption in historical buildings (Asman et al., 2019; Oyewole & Komolafe et al., 2018). Efficient use of water will have a direct economic impact on a structure as the water and wastewater systems of buildings are powered by energy (Asman et al., 2019). Hence, the increase in water efficiency adds to the decrease in waste production arising from its treatment, thus improving environmental sustainability (Luthy et al., 2020). Ultimately, by conserving and using water efficiently, there will be energy savings, leading to a reduction in greenhouse gas effects on the environment (Chhipi-Shrestha et al., 2017). Water efficiency focuses on the 5R practises of i) consumption reduction, ii) loss and waste reduction, iii) re-use of water, iv) recycling of water, and v) resorting to alternative sources (Asman et al., 2019; Pradhan et al., 2019).

RESEARCH METHODOLOGY

The problem is that adaptive reuse is one of the greenest approaches. As a result, an interpretative research approach was chosen since it may capture information regarding practitioners' actions and experiences related to adaptive reuse activities. Furthermore, when considering green adaptive reuse, "environmental aspects" of historical buildings must be considered in terms of their impact on natural ecosystems as well as green input.

Since of MCO and Covid-19, interviews were chosen as the primary data gathering strategy because they are an effective approach for learning about issues that cannot be observed directly. Interviews were conducted to learn about person's perspectives and experiences with green approaches in adaptive reuse projects. Although the interviewer has a list of issues to discuss, they are allowed to change the language and sequence of the questions. The interviewer focused on the following general themes:

- Understanding on Green Adaptive Reuse

- Understanding towards Environmental Elements of Green Concept for Adaptive Reuse of Historical Buildings
- The Perceptions on Key Environmental Elements of Green Concepts for Adaptive Reuse Project of Historical Buildings in Heritage City

The interviews with the conservators took place over the course of a month. Interviewees were chosen based on their potential to contribute to the study through tacit and explicit knowledge of adaptive reuse. Using the technique of selective sampling, representatives from six government conservation initiatives in the regional heritage city were chosen and invited to participate in the study. Due to MCO, the interview process was conducted entirely online via Google Meet.

The acquired data was analysed using content analysis as the primary technique. The text generated from the interviews was analysed with word and excel, allowing themes to emerge. The codings can be changed and incorporated as the research and report creation advances, making it easier to distinguish conflicts and contradictions. The major themes that needed to be considered during the green adaptive reuse process were determined through this procedure.

FINDINGS FROM SEMI-STRUCTURED INTERVIEW

The findings of the interviews corroborated up the idea of adaptive reuse as a way to complement the green key elements. The interview was conducted with five significant professionals with over 5 years of expertise in adaptive reuse and conservation projects. The same questions were asked to all interviewees in the same order, allowing for a more accurate comparison of responses between the two inputs. Due to MCO, this set of interviews was conducted online.

Before delving into the six key elements of environmental adaptive reuse, the interviewer was asked about the application process for adaptive reuse in heritage city. All interviewees mentioned that the application is still under Section 40, Federal Territory (Planning) Act 1982, if the projects are under the Department of National Heritage (DHN). Any proposal needs to be submitted to the DHN, but the only difference is the approach, such as adaptive reuse. The physical conservator will be appointed by DHN to assist and provide a guide during the review process for the proposal to reuse the heritage building in Heritage City. All participants agreed that the adaptive reuse approach is the most popular in conservation practice. This is due to the minimum requirements and regulations in terms of using modern elements while at the same time maintaining the authenticity and originality of the external façade or fabric. They also agreed that adaptive planning is the best approach to achieving environmental development, but focused on historical buildings. The GBI key elements are for any new buildings, but they are also complementary and compatible with the

historical buildings in the heritage city. It is also mentioned that the original design of historical buildings already has elements of natural beauty, such as saving energy, having indoor environmental quality, and natural materials (salvage material), and also allows for any possible innovation to suit the new functions of the historical buildings.

From the literature review, six key elements were used, including energy efficiency, indoor environmental quality, sustainable site planning and management, material and resources, water efficiency, innovation, and environmental impact. Both agree that the adaptive reuse approach is actually a green concept already. The details of perception from both are summarised in Table 1.

Table 1: Interviewees' perspectives on six key environmental elements in adaptive reuse projects of historical buildings in heritage cities.

Main Question	Trigger Question	C1	C2	C3	C4	C5
Main Question Could you share your perceptions on the key environmental elements of the green concept in adaptive reuse projects for heritage buildings?	Question 1a: Energy Efficiency	Yes	Yes	Yes	Yes	Yes
	Question 1b: Indoor Environmental Quality	Yes	Yes	Yes	Yes	Yes
	Question 1c: Sustainable site planning and management	Yes	Yes	Yes	Yes	Yes
	Question 1d: Material and resources	Yes	Yes	Yes	Yes	Yes
	Question 1e: Water Efficiency	No.	No.	No	No	No
	Question 1f: Innovation	Yes	Yes	Yes	Yes	Yes

Source: Authors

DISCUSSION

The adaptive practitioners revealed that the adaptive reuse approach already has green or environmental elements in nature. All five agree that the reuse of the whole structure, from the external façade, interior, and materials, is sustainable and achieves the five key elements of environmental protection, except for the water efficiency or reuse of the water. This is due to the condition of the structure to adapt to these particular elements. Furthermore, the interviewer also mentioned that innovation elements have two impacts: negative and positive. The advantage is that it is compatible with modern contemporary, which is appropriate for the new functions of historical buildings such as hotels or restaurants. But at the same time, they need to consider the negative impacts, such as the waterfall in the buildings in the cold environment, which may reduce the strength of the existing material. Another point is the landscaping. The big tree is not suitable because it

will affect the existing structure due to enlargement of roots. However, innovation in terms of internal design, such as using the natural environment to enhance the indoor quality, is allowed with the small trees in the vast.

As per previous research by Elsorady (2013), sustainable adaptation embodies energy and reduces waste materials. It is supported that the adaptive reuse approach is the best approach with the minimum amount of conservation regulations. The adaptive reuse also allowed for the redesign of the interior of the building with new and modern components that were appropriate for the new functions as long as the main characteristics of the historical buildings, such as the external façade and certain interior parts, were preserved (Rani & Devina, 2017). This implies that green adaptive reuse also supports conservation practise with the flexibility in certain elements but at the same time complements the environmental aspects, especially in heritage cities in Malaysia (Halim and Thambi, 2021). This finding shows that, this could support the strategy of the city and regional planning application.

CONCLUSIONS

The article investigated the perceptions of key adaptive reuse and conservation practitioners in undermining the six key environmental elements compatible with the Green Building Index for new buildings. Clearly, according to perceptions, the adaptive reuse approach preserved cultural identity, promoted environmental awareness, resulted in a more efficient use of underutilised or abandoned historical buildings, and achieved environmental benefits. The lack of water efficiency is not a critical point; rather, it is dependent on the structural strength of historical buildings themselves. As a result, work needs to be done at Green Buildings Index to make the six environmental elements compatible with any historical buildings that may be known as the Green Adaptive Reuse Index (GARi) framework as a starting point (future research). This will serve as a guideline for achieving environmental benefits as well as increasing the number of historical buildings in the heritage city.

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