



ASLI QoL2015, Annual Serial Landmark International Conferences on Quality of Life
ASEAN-Turkey ASLI QoL2015
AicQoL2015Jakarta, Indonesia. AMER International Conference on Quality of Life
The Akmani Hotel, Jakarta, Indonesia, 25-27 April 2015
“Quality of Life in the Built & Natural Environment 3”

The Green Aspects of Adaptive Reuse of Hotel Penaga

Elma Dewiyana^{*}, Najib Ibrahim, Nur Hidayah Hajar

Centre of Studies for Building Survey, Universiti Teknologi MARA, Shah Alam 40450, Malaysia

Abstract

Heritage provides a commodifiable resource for sale on tourism markets, contributing towards the shaping of unique senses of place for tourists and hotel residents. Hotel Penaga is an adaptive reuse hotel in Penang’s capital, Georgetown, has been accorded a listing under UNESCO. This study is to identify the green aspects that are used in Hotel Penaga. It include the usage of (energy efficiency), Indoor Environmental Quality, material and resources, water efficiency, and innovation. This study is expected to improve the quality of life of people in terms of promoting sustainability by the new sustainable heritage building, and green technology adaptation.

© 2016 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of AMER (Association of Malaysian Environment-Behaviour Researchers) and cE-Bs (Centre for Environment- Behaviour Studies, Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Malaysia).

Keywords: Adaptive reuse; built heritage; green aspects; hotel sustainable

1. Introduction

“Heritage building means and includes any building of one or more premises or any part thereof and/or structure and/or artifact which requires conservation and / or preservation for historical and / or architectural and / or artisanary and / or aesthetic and/or cultural and/or environmental and/or ecological purpose and includes such portion of land adjoining such building or part thereof as may be required for fencing or covering or in any manner preserving the historical and/or architectural and/or aesthetic and/or cultural value of such building.” (India Central Public Works Department, 2013). “Green buildings, often defined as those featuring natural ventilation capabilities,

^{*} Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .

E-mail address: elma@mail81@gmail.com

i.e. low energy or free-running buildings, are now at the forefront of building research and climate change mitigation scenarios.” (Deuble & de Dear, 2012, pp. 21-27). Penaga Hotel was listed as Gold in the GBI rating, no doubt this building has achieved between 76 to 85 points. From 15 pre-war shop lots, it was converted into a boutique hotel which is Green Building Index rated. According to (López & Frontini, 2014), once fronting a retrofitting development which attempts to recover the energy performance of a cultural heritage building it is essential to consider cautiously dissimilar features such as: energy efficiency, innovation and ease. These energy developments are anticipated, but are not constantly conceivable without cooperation. (Fabbri, 2013) said that energy and sustainability are a tough experiment in building heritage, both the practical resolutions in order to resolve influence of energy conservation and aspect of conservation and maintenance of architectural heritage, and also the larger aim: sustainable growth of human action. (Wan Hashimah Wan Ismail, 2013) stated that the practice of using the traditional or heritage buildings can avoid them from being demolished and replaced by new buildings. The practice is one of a way to preserve the building’s identity or values.

2. Aim and objective of study

The aim of this study is to identify green features that were implied to adaptive reuse heritage buildings in order to promote the best practice for the sustainable cultural built heritage that meet present needs without compromising the future generation. The objective of the study is to identify the green aspects that are used in adaptive reuse of Hotel Penaga.

3. Literature review

(Yıldırım & Turan, 2012) said that the adaptive re-use of buildings is a method for emerging historical areas, and it spreads the life of historical configurations. However, adaptive re-use is practical to development projects in dissimilar means comprising compatible re-use and most appropriate re-use, both of which subsidize to the sustainability of historic areas. (Dian & Abdullah, 2013) stated that there are accelerating records of deterioration and abandonment in most heritage locations cases in Malaysia. Although Malaysia has brought together the heritage and planning legislation to cope with heritage sites conservation, it is appropriate that the public joins and consensuses full protection of the heritage sites. Based on (Yung & Chan, 2012), the adaptive reuse of old buildings is a new kind of maintainable rebirth of city, as it covers the building’s lifetime and evades destruction waste, encourages recycles of the embodied dynamism and also delivers substantial social and economic profits to the world. Hence, it grips the different scopes of sustainability. Yet, the disputes over which sustainability features are the key, and how to address them all in practice, continue uncertain. (Yung, Langston, & Chan, 2014) said that conservation experts and government authorities admit that adaptive reuse of historic buildings contributes to city sustainability. As example, Traditional Chinese shop houses are a foremost historic building typology establish in the ancient regions of Asian towns. In Hong Kong, the small numbers of remaining shophouses are commonly deteriorating and are gradually beneath risk of demolition for urban regeneration. Nevertheless, adaptive reuse of these buildings has made numerous public alarms. In light of these concerns, valuing adaptive reuse potential needs to incorporate a much wider sustainability context than simply physical building circumstances. Based on (Abe Kruger, 2012), there are eight (8) principles of green building comprises of energy efficiency, resource efficiency, durability, water efficiency, indoor environmental quality, reduced community impact, homeowner education and maintenance and sustainable site development. However, according to (Adler, 2006), the green aspects in building basically have ten rules which is cultivate design plans for the building itself, which is position and design building to site desires, climate and weather, and local circumstances, maximize the usage of natural daylight, inspect building resources, reuse present materials, use less materials, and use building materials that are considered to be environmentally friendly, design for fit indoor air quality, set high lighting-efficiency standards, select machines that are energy efficient and water efficient, design for ease of maintenance and use of environmentally friendly cleaning products and sustain structural and building methods for maximum energy and environmental efficiency. According to López and Frontini (2014), there are several examples of building integrated Photovoltaic system (green technology) on historical buildings that is Hotel Industrial, Paris (France), tourist office, city of Alès (France), and Sala “Nervi”, Vatican City (Italy), and Reichstags building. Hammam buildings which are a heritage building at

North Africa applied hybrid green technology combining natural lighting and glass bulbs as poor natural lighting and ventilation as well as insufficient electric lighting problem was recognized and identified. (Magda Sibley, 2013). According to TASMANIAN HERITAGE COUNCIL (n.d.), the best method to realm momentous heritage places is to guarantee their sustained usage. Installing new or innovative services and technologies in heritage residences might raise chances for the continuing usage of the place.

3.1. History background of Penang

Penang, one of the northernmost states in Malaysia, is located at the northwest coast of Peninsular Malaysia. Penang is the second smallest state in area after Perlis. The 1048 km² state is divided into two parts, Penang Island which has Georgetown as its administrative city and Seberang Perai as mainland region. In the early 16th century, the minor unoccupied island was visited by Portugese traders who were observing for fresh water supplies. The island then was recognized as “Pulo Pinaom”. During that time, the island was part of the Kedah Sultanate. Since the 17th century, Kedah have been sending “Bunga Emas” (Gold Flowers) to Siam (Thailand) as a greeting of the Siam King’s sovereignty. The Dutch conquered the Far East spice trade and the British too needed to establish themselves in the area and create better trade relations with this part of the world. In 1771, the Sultan of Kedah offered Captain Francis Light the island of Penang in return for security from the Siamese and Burmese armed forces who were continually intimidating Kedah. Light was asked by the East India Company based in Madras to acquire Pulau Pinang to set up a base to mend British navy ships and as a trading post for trade between China, India and the archipelago. In 1786, Francis Light acted as middleman in securing Penang from Sultan Abdullah of Kedah in return for a promise of British protection from his enemies. The Sultan of Kedah was not aware that Light had proceeded without the endorsement of his chiefs when making the proposition. In 1790, Sultan Abdullah formed an army to get rid of the Dutch and the English after the Company had unsuccessful to deliver military defence when Kedah was attacked by Siam. The first settlement in Penang was at the present Esplanade area which was a swampy, malaria infected area at that time. Fort Cornwallis, the island’s main defence was located at the same area. The township was named George Town after the King George III of Britain. Four original streets of George Town were Beach Street, Light Street, Pitt Street (now Masjid Kapitan Keling Street) and Chulia Street, all of which still form the main thoroughfares of the modern city. In 1805, Penang was elevated from a colonial status to that of a Residency. A new Governor, the honourable Philip Dundas was appointed into office. His assistant secretary was Thomas Stamford Raffles, the future founder of Singapore in 1819. In 1832, under the British administration in India, the Straits Settlements comprising the states of Malacca, Singapore and Penang was formed. Penang became its capital but in 1935 Singapore took over as capital of the Straits Settlements. In 1905 the first hydro-electric scheme in Penang was completed, giving the island her first electricity. Penang got its first electric tramway in 1906. By mid-20th century, other modes of transport such as rickshaws, bullock carts and horse-carts gradually disappeared from the roads of Penang. The Second World War broke out on December 8, 1941. Penang was attacked by the Japanese and the British fled to Singapore leaving the island defenceless. The people of Penang live in fear and fled to the interior to spurt from ruthless Japanese army. Fortunately, many of Georgetown’s historic building were fundamentally untouched by the joined bombings. After World War II, the Straight Settlements were dissolved and Penang became part of Malayan Union, before it became part of Federation of Malaya in 1948. Malaya gained independence in August 31, 1957 and Penang was one of its 13 part states. Penang was officially known as Negeri Pulau Pinang. Georgetown, which has the oldest municipal history in the country, was accorded City status by Queen Elizabeth II on 1st January 1957. (Visit Penang, 2010)

3.2. Timeline of Georgetown City

16th century: Portuguese cruised to small island named as “Pulo Pinaom”.

17th century: Sultan Kedah presented British of Penang as in return to protect Kedah from Siamese and township was named Georgetown after King George the Third.

18th century: After Francis Light incapable to protect Kedah and died because of Malaria, Penang was run by Philips Dundas.

20th century: During 1942, Penang was attacked by Japanese and it became part of Malayan Union and during 1st January 1957 Penang was officially known as Negeri Pulau Pinang.

21th century: Penang is one of the famed islands in South-East Asia and also known as “Pearl of the Orient”. It is well-known for its culture, food and heritage

3.3. History of Pre-war terraces and Shophouses in Georgetown

The shop houses terms were already mentioned during early 1884 and during 1793. Francis Light also mentioned shop houses as it belonging to Chee Ean Chinaman. Shop house is a modern terrace house characteristic of Asian towns from the 18th – 20th century. The shop house usually incorporates a shop or business premise on the ground floor while the family resides on the top floor, providing both convenience and security. The shophouse may also be used totally as dwelling quarters.

Shophouses are built in rows and each row is arranged in blocks contained within a grid of main roads, backlanes and side roads. A shophouse is usually two or three storeys high and is long and narrow, sharing a ‘party’ wall with neighbours on either side. Each row of shophouses is adjoined by a continuous sheltered five-foot way and a decorative façade which reveals a historical style. The Penang shophouse is a perfect example of a green building, using materials that are locally available (lime, clay stone and timber) and suited to local geology and weather conditions. A shophouse also possesses architectural features such as air vents and air well that help with natural ventilation and cooling. (Jeffrey Chan, 2013)

3.4. Georgetown recognised as World Heritage Site by UNESCO

On 7 July 2008, Melaka and George Town were notable as Malaysia's newest UNESCO World Heritage Sites. This is the first time that cultural sites in Malaysia have been emblazoned into UNESCO'S impressive World Heritage Listing. The recognition by UNESCO to acknowledge George Town as a heritage city means that the original heritage core zone and buffer zone should be preserved from advance development that would change the skyline of Penang Heritage City. The Historic City of George Town, as nominated by the Malaysian Government for World Heritage Listing, covers a 109.38 hectare site on the north-east of Penang Island. This is what is regarded as the core zone. Surrounding the core zone is a 150.04-hectare band called the buffer zone. Only land area is counted - the sea is excluded. (Jeffrey Chan, 2012)

4. Methodology

Methodologies used for this research is studying the literature review from previous research regarding adaptive reuse of building and studying the available diagrams, sketches, and photographs that provided from official Penaga Hotel webpage, site observation and by having an interview with Ar. Azzaidy Abdullah the architect of the Penaga Hotel from Hijjas Kasturi Associates Sdn.

5. History of Penaga Hotel

Hotel Penaga gets its name from Tanjong Penaga, the previous name of Penang, meaning the cape where the penaga trees grow. This was the original Malay name for the first settlement on Penang Island, where Georgetown stands today. It is not unusual for Malay places to be named for the plants that were found there. Penaga trees (*Calophyllum inophyllum*) grow on the seashore, produce excellent wood and have traditional medicinal qualities. While there are no Penaga trees left in GeorgeTown, the name is an echo of the original place that worth commemorating and Penaga trees was planted in Hotel Penaga’s garden. Hotel Penaga was originally three rows of double storey terraced houses and shop houses, built probably in the 1920s and renovated post war. The overall concept for Penaga Hotel was to convert the terraces into a boutique hotel with financially and commercially viable option. The original buildings were utilitarian and simple. This was the challenge to the designer, how to preserve its heritage character. The main aim for Penaga Hotel designers was to convert the cluster of 15 pre-war terraces and

shophouses, facing Hutton Lane, Transfer Road and Clarke Street, into a heritage boutique hotel that maintains the character of the heritage zone, while meeting the highest modern expectations. (Hotel Penaga, 2014).



Fig.1(a)Calophyllum inophyllum; (b)also known as Penaga tree



Fig.2(a-f) Penaga Hotel before and after adaptive-reuse

6. Green Building Index

“The Green Building Index (GBI) is Malaysia’s industry recognised green rating tool for buildings to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and our responsibility to the future generations. The GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce our impact on the environment. GBI is developed specifically for the Malaysian-tropical climate, environmental and developmental context, cultural and social needs. The GBI Non-Residential Rating tool assesses the sustainable features of buildings that are commercial, institutional and industrial in nature. This includes factories, offices, hospitals, universities, colleges, hotels and shopping complexes.” (Green Building Index, 2013).

Table 1. Maximum points achieved by Penaga hotel in Green Building Index (GBI) Non-residential category

Summary of Point presented	Points
Part 1: Energy Efficiency	28/35
Part 2: Indoor Environmental Quality	19/21
Part 3: Sustainable Site Planning and Management	13/16
Part 4: Material and Resource	7/11
Part 5: Water Efficiency	3/10
Part 6: Innovations	6/7
Total score:	76/100

7. Energy efficiency

Penaga Hotel used solar panel that is installed at the roof top. The example of solar panel that been used is HIT double bifacial photovoltaic module which generates (Fig. 3) additional electricity from reflected ambient light.



Fig.3(a&b)HIT double bifacial photovoltaic module

The electricity that is produced is used to heat the water for shower and day lighting, especially since the hotel needs extra light at the lobby and corridor. The use of solar panel has been proved to have positive impact on both physical and mental condition of the people; therefore, it’s a way of both saving on electricity bills and staying positive and healthy. Penaga Hotel also used the photometric sensor at the corridor to minimise the usage of electricity. (Fig. 4)



Fig.4(a,b,&c)Photometric sensor and Individual Switch

The type of air conditional that had been installed in Hotel Penaga is also energy efficient. Comfort level conditions complies to ASHRAE 55 and MS 1525: 2007- VRV/ Inverter units with dedicated controls and temperature sensors. An inverter unit reaches the desired room temperature faster and continuously regulate its thermal transfer flow in response to cooling demand. R-410A refrigerant used in these inverter units does not contribute to ozone depletion.

The advantages of using this kind of inverters unit are that it is less prone to breakdowns, cheaper to run, a quieter outdoor compressor, 60% more energy savings and it work as moisture removal. Other than that, the individual lighting control that was used in this building saves electricity and energy.

8. Indoor environmental quality

Penaga Hotel focuses on the use of lighting lux level. LED lights are used extensively. Besides, to control the daylight glare, blind and coloured glass window were used and the wide opening of window give the maximum external view and day lighting for occupying the building (Fig.5). In order to avoid indoor air pollutants, the Low VOC products such as paint, coating, carpets, sealants and adhesives are used throughout the building. Mould prevention is also important in green building, in Penaga Hotel, air conditioned areas are pressurised 2% -5% against external pressure and indoor relative humidity is lower than 70%. It is important to make sure that excessive moisture in building is controlled during the retrofit Design, Construction and Operation stages.



Fig.5(a)Atrium spaces; (b)wide opening

In the middle of three blocks, the architects had designed a new landscape was that previously back lane of shoplots. The design of the landscape is in accordance to sustainable site planning management, where the tree canopy provides shed to backlane (Fig. 6). Besides, the paving material has a minimum Solar Reflectance Index of 29 and the selected creepers at the blank wall work as decoration. (Fig.7 (a,b and c).



Fig.6.Green area is the new 'lanescape'



Fig.7(a)Example of Suitable site planning & Management



Fig.7(b)Tree as shading; (c)Paving material

9. Material and resource

During the restoration and redevelopment process, Penaga Hotel salvaged and reused the existing materials for example Indian clay tile, the doors and windows frame and also the existing structure (Fig. 8). Before reused the Indian clay, there was a cleaning process. Others material, for example tile and fan also reused for the new hotel. 50% timber that was used as purlin and fascia board (Fig. 9) are certified compliant with Forest Stewardship Council and Malaysian Timber Certification Council requirements.



Fig.8(a) and (b) Timber for purlin and fascia



Fig.9(a), (b), (c) and (d) Reused material such as window and door, roof tile, Indian tile, and also timber

10. Water efficiency

For water efficiency, Penaga Hotel applied rain water harvesting method. (Fig. 10). The type of water that has been collected at Penaga Hotel is non-potable water and it is not suitable for cooking and drinking. At Penaga Hotel the non-potable water was used to irrigate the plant and to flush toilet. Other than that, after some treatments the

water is also used for the swimming pool. The water efficiency fittings used also reduce the water usage, for example the 50% reduction of annual potable water consumption.

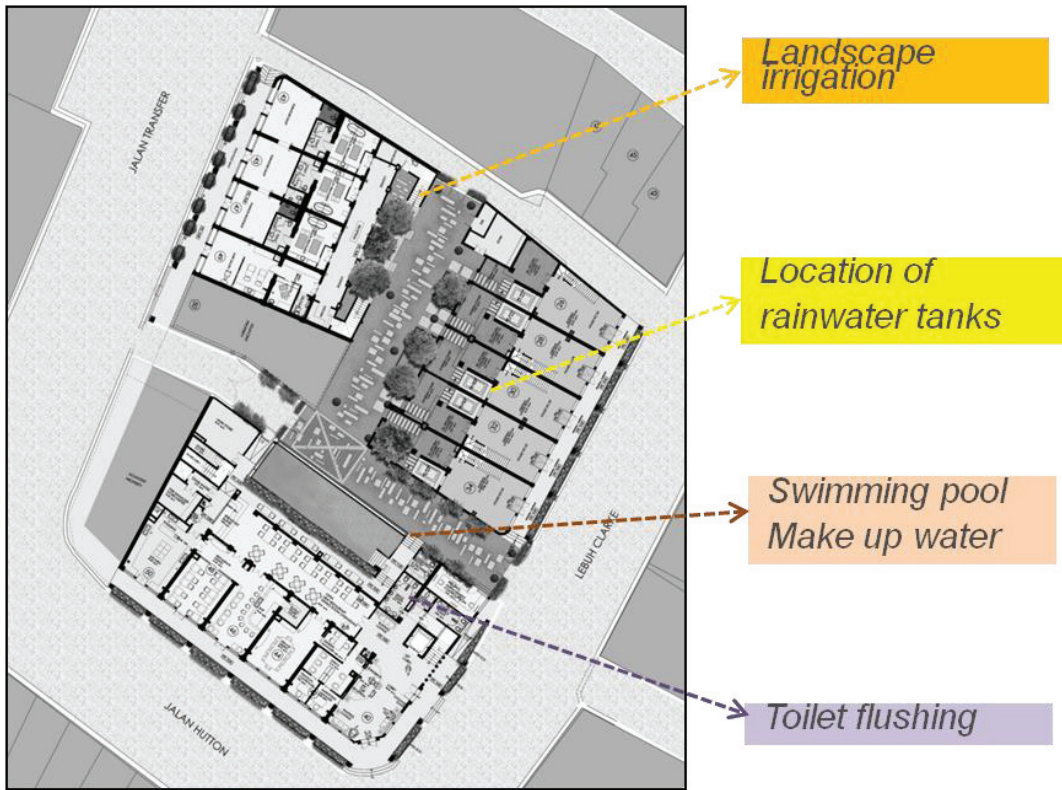


Fig.10.Rainwater harvesting system

11. Innovation

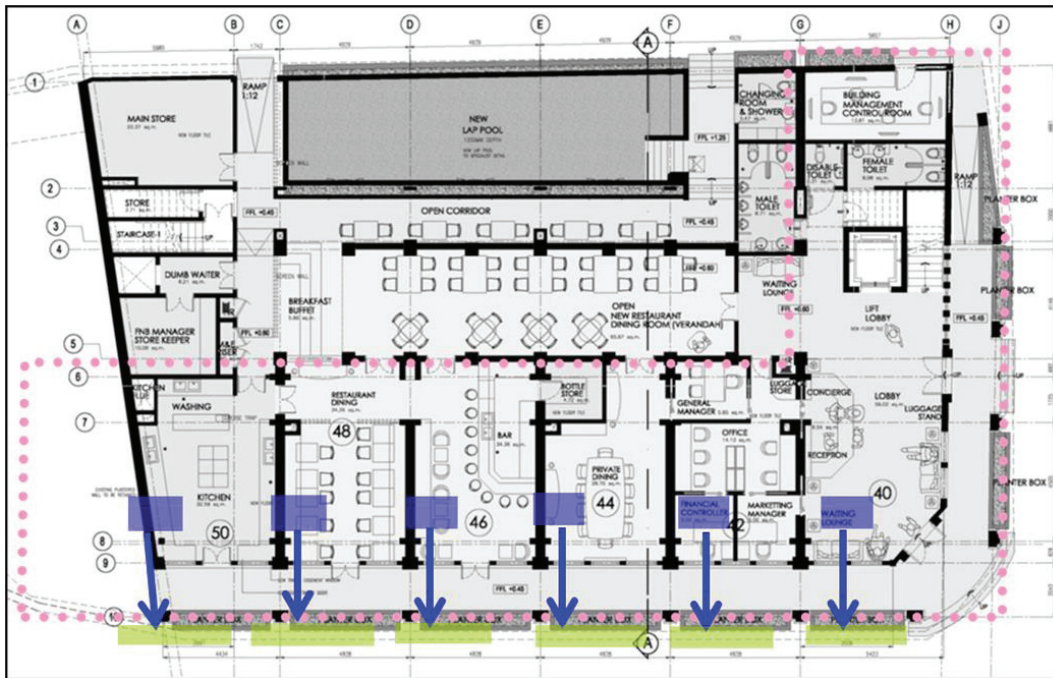


Fig.11. Condensate water system

One of the innovative systems that are applied by Penaga Hotel is that all condensate water from air conditional system are directed to the planter box. This kind of system may reduce the usage of water. (Fig. 11)

12. Conclusion

This paper introduces the Penaga Hotel as an outstanding example of a privately funded, adaptive reuse conservation project, at least from the physical and aesthetics point of view. The resultant architectural and interior design works was simply stunning and beautiful. It was successful in its aim in recreating the heritage ambiance of the old town. One of the unique features of the hotel development is that the architect for the development was also the owner/developer. This rare synergy creates the enthusiasm and commitment that is demanded by such a project. Financial decisions can be made faster as the design comes from the same person/organisation.

Another unique and outstanding feature of the building is the attainment of the GBI Gold rating. It is commendable that a heritage conservation project aims for a green building index at the same time as each effort in itself is difficult. In fact, we have hardly heard of a project that combines the two aspects and being able to do it successfully. This building has successfully achieved both. The architect/developer is known for their energy efficient buildings and their many years of experience in this field has great influence in the incorporation of sustainable and energy efficient features into the building. The party responsible for the landscape design of this hotel, including the 'Landscape', was also from the same organisation. This resulted in clever landscape solutions and seamless integration of the building and its landscape features.

The green aspects of adaptive reuse of Hotel Penaga achieve gold-rated under Green Building Index which scores 76 points out of 100 which will lead ultimate power in the ranges of energy usage and comfort of the occupants of the building. According to Green Building Index (2013), "achieving points in Green Building Index will mean that the building will possible be more environment-friendly than those that do not address the issues.

Under the GBI assessment framework, points will also be awarded for achieving and incorporating environment-friendly features which are above current industry practice.”

In general the adaptive reuse of the Penaga Hotel can be considered as a success as far as physical architectural heritage is concerned because it is the only historical adaptive reuse Hotel in Malaysia so far that were rated by Green Building Index with gold-rated. Its heritage aspects are well preserved and conserved while maintaining its old town ambiance and charm. Its interiors are well designed and beautifully crafted. Only time and further research will tell if the hotel and its heritage concept is financially successfully too. It is recommended for the future that the study on green aspects on adaptive reuse heritage buildings should be carried out on other heritage buildings in Malaysia in order to save electrical energy usage. Further research on the adapting green technologies on heritage buildings is recommend to come out with standard of green technology applied on heritage buildings as there is no definite standard for old buildings on applying green technology yet in Malaysia.

Acknowledgement

We would like to thank to Zahari Zubir, Mohd Basir Bin Abd Rozak, Nordianti Abd Rahim, Siti Iswarni Mohd Mohidin, Tengku Emilia B.Tengku Ibrahim for their assistance with this research and also Ar. Azzaidy Abdullah the architect of the Penaga Hotel project from Hijjas Kasturi Associates Sdn.

References

- Abe, K., & Carl, S. (2012). *Green building: Principles and practices in residential Construction* L. Main (Ed.) Retrieved from <https://www.cengagebrain.com.au/content/9781285022352.pdf>
- Adler, L. (2006). 10 Basic concepts for green homes. (1).
- Deuble, M. P., & de Dear, R. J. (2012). Green occupants for green buildings: The missing link? *Building and Environment*, 56, 21-27.
- Dian, A. M., & Abdullah, N. C. (2013). Public participation in heritage sites conservation in Malaysia: Issues and Challenges. *Procedia - Social and Behavioral Sciences*, 101, 248-255. doi: <http://dx.doi.org/10.1016/j.sbspro.2013.07.198>
- Fabbri, K. (2013). Energy incidence of historic building: Leaving no stone unturned. *Journal of Cultural Heritage*, 14(3), e25-e27.
- Green Building Index. (2013, 2013). WHAT IS THE GREEN BUILDING INDEX? Retrieved December 15, 2014, from <http://www.greenbuildingindex.org/index.html>
- Hotel Penaga. (2014, 2014). About Us. Retrieved December 15, 2014, from <http://www.hotelpenaga.com/about-hotel-penaga>
- India Central Public Works Department. (2013). *Handbook of conservation of Heritage Buildings*: Directorate General, Central Public Works Department.
- Jeffrey, C. (2012, 15th July 2012). George Town pre-war heritage house for sale. Retrieved Mac 1, 2015, from <http://jeffrey.inlandhousingpg.com/?p=319>
- Jeffrey, C. (2013, 28th march 2013). Nice prewar heritage house at core zone, Georgetown for sale. Retrieved Mac 1, 2015, from <http://jeffrey.inlandhousingpg.com/?cat=9>
- López, Cristina, S. P., & Frontini, F. (2014). Energy efficiency and renewable solar energy integration in heritage historic buildings. *Energy Procedia*, 48, 1493-1502. doi: <http://dx.doi.org/10.1016/j.egypro.2014.02.169>
- Magda, S., & Martin, S. (2013). Hybrid green technologies for retrofitting heritage buildings in north african medinas: combining vernacular and high-tech solutions for an innovative solar powered lighting system for hammam buildings. *Energy Procedia*, 42, 718 – 725. doi: 10.1016/j.egypro.2013.11.074
- TASMANIAN HERITAGE COUNCIL. (n.d.). *Installing modern services on heritage buildings: including measures to enhance environmental sustainability*. Retrieved from www.heritage.tas.gov.au.
- Visit Penang. (2010, 15 december 2010). History of Penang. Retrieved Mac 1, 2015, from <http://www.visitpenang.gov.my/portal3/about-penang/history.pdf>
- Wan Hashimah, W. I. (2013). Preservation and recycling of heritage buildings in Malacca. *Procedia - Social and Behavioral Sciences*, 85, 574-581.
- Yıldırım, M., & Turan, G. (2012). Sustainable development in historic areas: Adaptive re-use challenges in traditional houses in Sanliurfa, Turkey. *Habitat International*, 36(4), 493-503. doi: <http://dx.doi.org/10.1016/j.habitatint.2012.05.005>
- Yung, Esther H. K., & Chan, E. H. W. (2012). Implementation challenges to the adaptive reuse of heritage buildings: Towards the goals of sustainable, low carbon cities. *Habitat International*, 36(3), 352-361. doi: <http://dx.doi.org/10.1016/j.habitatint.2011.11.001>
- Yung, Esther H. K., Langston, C., & Chan, E. H. W. (2014). Adaptive reuse of traditional Chinese shophouses in government-led urban renewal projects in Hong Kong. *Cities*, 39, 87-98. doi: <http://dx.doi.org/10.1016/j.cities.2014.02.012>