Impacts of Adaptive Reuse in the UNESCO Listed Heritage Buildings, George Town, Penang

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Introduction

Heritage is legacy from the past, once lost it cannot be replaced and valuable evidence from the yesteryears will disappear. One of the important heritage objects which must be preserved for our future generations is heritage building. The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2007) considered heritage building as a tangible man made environment with its cultural (heritage) significance. This significance lies in the aesthetic, historic, scientific and social which are embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places as well as its related objects (Australian ICOMOS, 1999). Moreover, according to Malaysian National Heritage Act (Act 645), building is considered heritage if it is reasonably believed more than 50 years of age. It is no doubt that the older the building, the greater the number of defects that potentially threaten its continued existence. The heritage building can also be decayed or destroyed by social and economic changes (UNESCO, 1972). Threats in heritage buildings are known to occur due to population growth, environmental degradation, rural-to-urban migration, urban redevelopment, industrialization and globalization of both the economies of the region and the traditional socio-cultural fabric (Engelhardt & Rogers, 2009). This has also been emphasized by research to analyze threats in Asia Pacific World Heritage Sites carried out by the International Council on Monuments and Sites (ICOMOS) which revealed that 46 per cent of degradation at sites surveyed could be attributed to inadequate conservation management strategies (including the conservation plan and monitoring) while 31 per cent of the sites surveyed deteriorated due to urban pressure. It was also found that 25 per cent of the sites deteriorated naturally, 22 per cent sites were threatened through lack of maintenance, and 20 per cent of the sites were threatened due to insufficient conservation material and techniques knowhow. This scenario is also an issue with heritage buildings in Malaysia, because these buildings are not well maintained due to insufficient knowledge and the high cost of repair and maintenance. As such, buildings which have already been gazetted
by the government according to the Antiquities Act 1976, should be earmarked preservation and conservation in order to protect these buildings and to halt further deterioration (Kamarul et al., 2007).

**Heritage Building Conservation**

There are several methods of conservation to preserve heritage properties. Based on National Heritage Act 2005 (Act 645) and ICOMOS Burra Charter (1999), conservation can be defined as the process of looking after the properties to retain their cultural significances; this includes preservation, repair and maintenance, restoration, reconstruction, rehabilitation, adaptation and adaptive reuse or any combination of those processes. Morris and Ruskin emphasize that conservation should be done with minimum intervention and honesty (Worthing & Bond, 2008). Consequently, the process of conservation is based upon the existing building fabric, involves minimal intervention and should not change the originality of the building. Authenticity of the design, materials, workmanship, setting and socio-culture should be fully considered in conserving heritage building in World Heritage Sites. It should retain or recover the cultural significance of the building, making provision for its security, maintenance and for its future.

**Adaptive Reuse of Heritage Buildings**

Adaptive reuse is one of the methods for conserving heritage buildings by changing the physical components of the building with the least impact to the building. It is however a form of refurbishment with entails many challenges. Globalization and rapid economic growth has resulted in demands to fulfil the needs of occupants, information technology, global competition, environmental concerns, new organizational structures, flexible employment arrangements, and variety of working practices (Kincaid, 2002). These emerging demands have resulted in heritage buildings which had been abandoned or were no longer occupied to be refurbished and adapted to new uses. However, the inappropriate functionality of buildings before and after refurbishment can possibly generate new problems to the occupants or to the building itself, such as lack of daylight resulting from improper spatial planning.

There are several advantages to be gained from the adaptive reuse of heritage buildings. From the economic perspective, it helps to make the buildings viable and adds the economic value of the building, including its surroundings, whereby historic and artistic value is sometimes insufficient to convince the decision maker. This option is useful to attract developers with its transparent economic,
environmental and social benefits. By revitalizing redundant heritage buildings, the potential is created to relieve memories of days gone by, as well as revitalize the surrounding vicinity. Henehan and Woodson (2004) also state that there are several benefits to adaptive reuse of a building. First, it can be a source of historic, cultural and visual fabric; second, it will keep the entire area occupied and vital; and the last is the prospect for increasing the value of the property. Adaptive reuse heritage buildings, moreover, will attract tenants to occupy such designated premises. In other word, adaptive reuse can prolong the lifespan of the building, and preserve it from obsolescence, dilapidation and demolition. Buildings which are newly vacant are also more likely to be reused than buildings that have stood vacant for long periods of time; this is another factor that will have an impact on the adaptive reuse value of the designated building.

In terms of sustainability, principles of adaptive reuse of heritage buildings are supported by those who concerned about environmental issues. By the means of 3R (reduce, reuse, recycle), adaptive reuse is therefore a process that changes a disused or ineffective item into a new item that can be used for a different purpose not only in terms of the building’s function, but also in the resources used. Since new construction is not required and the demand for virgin materials is reduced, adaptive reuse also contributes towards the reduction of waste from building refurbishments (Malaysia Green Building Index, 2010).

**Possibilities of Physical Change in Adaptively Reused Heritage Buildings**

In the process of changing the physical aspects of the building, the significance of the external and internal qualities of the fabric must be taken into account. There are seven main points to consider when converting buildings for new uses. These include the size, height and depth of a building, the type of building structure, the building’s envelope and cladding, the internal space, layout and access, the building’s facilities, the provision for acoustic separation, the fire safety measures and means of escape. Additionally, there are four basic characteristics for adaptation: low, low-medium, medium-high and high in physical changes. Low change is when the building still maintains the existing external fabric albeit with minor modification on the internal space. Low-medium change can be defined as replacing the external fabric and modifying the internal space but without any structural changes. Medium-high change building is maintaining the external fabric and reconfiguring the internal space, with some modification of the building’s structure whereas the last, high change is where the building undergoes a complete replacement of the external fabric, modifying the building’s structure and reconfiguring its spatial needs in its internal space. When a building has cultural significance and has been unoccupied or abandoned for a period of
time, a decision to undertake adaptive reuse of the building is recommended. Typically, there are five broad categories of adaptive reusing: retail and/or office, industrial and warehouse, residential, institutional and leisure (Kincaid, 2002).

**Condition of Heritage Buildings in George Town, Penang**

As one of the ports along the straits of Malacca strait, George Town has attained fame as a city with multi cultural diversities, both tangible and intangible. This was one of the qualities that enabled George Town to be inscribed as a UNESCO World Heritage City in 2008. The UNESCO World Heritage Site of George Town, Penang, is located in the north-eastern cape of the Penang island, surrounded by Straits of Malacca. It is divided into core and buffer zone (Figure 1). The core zone area is 109.38 hectares and the buffer zone area is 150.04 hectares, bringing the total area to 259.42 hectares. Within the World Heritage Sites there are 2,344 buildings located in the core zone and 2,321 in the buffer zone. The inscription for George Town as one of the World Heritage Sites was according to the Outstanding Universal Value (OUV) category II, III, and IV. The diversity of built heritage in George Town is an outstanding example that illustrates the significant stages in human history (OUV category IV). As a consequence, George Town should retain their designation by conserving their heritage properties. To avoid jeopardizing the status, the OUV should be respected in doing any heritage conservation project, both physically and non-physically. This chapter will therefore review and critique George Town's efforts in conserving its heritage buildings.

In George Town, adaptive reuse of heritage building is recommended and encouraged in order to generate new life to such buildings in keeping the “Living Heritage City”. For that reason, no building or structure is allowed to be altered or demolished as long as there is any conceivable way of preserving it in its original or current condition. This is also emphasized in ICOMOS Burra Charter article 2 which states that the essence of heritage conservation in Penang is maximum retention with minimum intervention. According to the Regulations for Conservation Areas and Heritage Buildings gazetted by Municipal Council of Penang Island, classifications of heritage properties in George Town is based on several criteria namely historic interest, architectural interest, close historical association, townscape value, group value, age and rarity, and physical features of the building, layout, material or location that reflects the original design. Heritage buildings are classified under two categories, category I and II. Heritage buildings in category I are buildings and monuments declared as ancient buildings as they have been gazetted under the Antiquities Act 1976 and are of exceptional interest, such as the City Hall, the Town Hall, the Penang State Museum, the
Figure 1 Map of Penang island, core and buffer zone of UNESCO World Heritage Site in George Town, Penang

Source: Cultural Heritage Action Team

Supreme Court and many others. Category II buildings are buildings which have special interest and hence, deserve to be preserved and examples include the Penang Custom and Excise department (Wisma Kastam), the Penang Immigration building, the Islamic Religious Council, and other buildings that are allowed to make internal alteration.

The hot and humid climate of George Town has resulted in various forms of building decay, such as moisture problems which lead to the emergence of fungal growth and salt attack. Moisture is the greatest enemy to the building envelope, exterior and interior which causes dampness on building fabrics, particularly in

Figure 2 Dampness on building fabric
tropical climates. A high content of moisture can damage the building's structure, finishing, as well as furnishings materials. Besides causing the degradation of building materials and furnishings, dampness can also result in increased emissions as pollutants.

Dampness is the possible trigger for the emergence of fungal growth. Fungal stains, as seen in Figure 2, indicate the growth and proliferation of dust mites, mould, mildew and bacteria which can result in allergy, infectious health outcomes and other adverse health effects like Sick Building Syndrome and Building Related Illness (Mudarri & Fisk, 2007).

The practices adopted in adapting an old building into a new purpose sometimes are inappropriate. Many of them do not conform to the standard building codes such as Uniform Building By-Law in attempting to maintain the indoor environment comfort. The most common mistake is the blocking of windows, doors and other openings as a means of creating new spaces (Figure 3). By obstructing openings, there will be minimum air exchange into and from the building, resulting in stagnant and stuffy air that could induce the growth of microbial agents.

As one of the negative impact of dampness in old buildings, salt attack needs to be tackled. Salt attack, also known as salt weathering, is the decay of masonry materials such as stone, brick and mortar by soluble salts forming crystals within the pores of the masonry. This syndrome correlates with moisture problems occurring in building and salinity of the soil that surrounds it. Salt remains intact on the wall when moisture evaporates and slowly decays by fretting, crumbling and degrading the surface of materials (Figure 4). A building's age is one of the important factors that influence salt attack. Accumulated salt will eventually cause major decay. Other major determinants of salt attack are the local climate, quality of the building materials, construction and subsequent maintenance and soil condition (Young, 2008).

![Figure 3 Blocked openings](image-url)
Research Methods

This research focuses on the impacts of adaptive reuse in heritage buildings which have been conserved to retain their heritage significance and to prevent being abandoned. The aim of the research is to carry out preliminary building site inspections for defects and deterioration which may give adversely impact the occupants of each building. A set of questionnaires was distributed to the occupants of the designated buildings to capture their satisfaction in term of their indoor working environment. Questions items were related to the demography of the respondents and the indoor environment elements (lighting level, noise level, air quality, building cleanliness as well as the general condition of their workspace). The population of this survey was 101 respondents, all full-time employees at the five identified buildings. The measured parameter for determining the quality of the indoor environment in the identified buildings was based on the Malaysia Green Building Index-Non Residential Existing Building (MGBI-NREB) as the applicable green building assessment tool in Malaysia, i.e. indoor climate, light and noise level, and indoor air quality. Indoor lighting and noise level were measured evenly around the workstation area by using direct-reading probes. In order to measure the quality of indoor air, air quality tests were also conducted to determine the quantity of microbes in the air. Some air was withdrawn with an air sampler directly to the growth media. Afterwards, the growth media was incubated for three to four days at room temperature and this was followed by enumerating the mould and bacteria. Room temperature, relative humidity and air velocity were also recorded to determine the whole indoor climate. Additionally, hazardous airborne chemicals and dust were also measured at a time. The measured airborne chemicals were carbon monoxide, carbon dioxide, and formaldehyde, the most common airborne pollutants in an office environment. Results obtained were then compared with the Industry Code of Practice on Indoor Air Quality (Ministry of Human Resources, 2010) as well as the Malaysian Green Building Index (2010).
Research Fieldworks

This research was conducted in five heritage buildings currently occupied by government agencies located within the UNESCO World Heritage Sites in George Town. Government offices were chosen as these buildings were expected to exemplify of heritage building conservation in George Town, and also to ensure ease of authorization for data collection. Based on the Penang State Regulations for Conservation Areas and Heritage Buildings, these five buildings are categorized under category I or II (Figures 5–9):

![Figure 5 Penang City Hall](image1)

![Figure 6 Fire and Rescue Station](image2)

![Figure 7 Jabatan Hal Ehwal Agama Islam Pulau Pinang (Islamic Religious Department)](image3)

![Figure 8 Penang Immigration Department](image4)
1. Penang City Hall

This category I building is located at the Esplanade and currently occupied by Penang Municipal Council or Majlis Perbandaran Pulau Pinang (MPPP). It was constructed between the years 1900–1903 and was originally used as a government office during the British settlement period. Because of its cultural significances, artistic and historical value as well as its setting and townscape, this building has been gazetted under the Antiquities Act 1976 as a national monument since 1982. The monumental size of this building and its highly decorated Victorian style white façade is symbolic for the majesty of British Empire architecture in Penang.

2. Fire and Rescue Station

In the past, this neo-classical building served as a fire fighters’ station. Built in 1909, it was named Central Fire Station and is located at the junction of Beach Street and Chulia Street Ghaut. Currently this category 1 building still retains its original purpose and remains intact in terms of architecture in order to preserve the early streetscape of George Town. Similar to the City Hall, this building is also gazetted as a national heritage according to the Antiquities Act 1976.


This double storey building was built in 1907 and located at Beach Street opposite the Penang Immigration Department. Formerly it was a part of government offices complex during the British administration. During the World War II, some parts of this building were heavily damaged, what now was left is occupied by the Jabatan Hal Ehwal Agama Islam Pulau Pinang and considered as category II building. This massive building was also built in Victorian style which is characterized by the presence of elaborate classical details on the façade.
4. Penang Immigration Department

This two-storey building built in 1890 now serves as the Penang Immigration Department. It is located opposite the Jabatan Hal Ehwal Agama Islam Pulau Pinang at Beach Street. It was originally intended to be the administrative office of the police force which located adjacent to this building. Because of its cultural significances, history and antiquity, this neo-classical building is listed by the state government as a Category II heritage building.

5. George Town World Heritage Incorporated

To prevent being abandoned, this building has undergone a high change restoration to convert it into an office space. After restoration and refurbishment, George Town World Heritage Incorporated serves as an information centre for tourists and is also responsible for monitoring, managing and enforcing works related to heritage matters. This premise is located in the corner of three streets: Acheen Street, Armenian Street and Carnarvon Street, and consists of two double storey straits eclectic style shophouses which were constructed in 1920. In the past, these buildings were medical clinic, barber shop and a resident.

Findings

The main findings of the survey indicate that inappropriate application of adaptive reuse may give rise to dissatisfaction amongst occupants of the building at the poor quality of their indoor environment. Based on the site observation which has been carried out, four out of five buildings were found to be improperly designed to suit the needs of the occupants. Most of the buildings were lacking in privacy, underexposed to natural daylight and provided minimal view outdoors for its occupants. Assessments of light and noise level conducted during office hours in each building found that the level of light in some of the buildings to be unevenly distributed due to inappropriate spatial planning of the buildings to be evenly distributed due to inappropriate spatial planning of the building to suit to its new purpose. As illustrated in Figure 10, windows, doors and other openings were blocked off for the purpose of creating new workspace. Most of the offices were therefore, underexposed to the natural daylight (Figure 11).
The sound level varied in each office space, depending on the activities of its occupants, nature of business carried out, office layout and location of the building. Open-plan offices with low partition tend to have higher noise level than an enclosed office layout with full height partitions [Figures 12 (a)–(e)]. Offices which deal with the public, such as Penang Immigration Department and the City Hall would obviously experience higher noise levels resulting mainly from office equipment and the occupants’ activity. Nevertheless, there were still within the normal range according to the *Malaysia Green Building Index* (2010). On the whole, 55.4 per cent respondents indicated dissatisfaction with the amount of noise during working hours, particularly over conversations that were audible others. Meanwhile, 44.5 per cent were dissatisfied with the excessive light that caused visual discomfort and 40.6 per cent were dissatisfied with the air.
quality as well as the cleanliness; 38.6 per cent respondents felt the air was stuffy and 35.6 per cent were discontented with their personal workspace conditions.

Figure 12 Open-plan office type: (a) City Hall, (b) Jabatan Hal Ehwal Agama Islam Pulau Pinang, (c) Fire and Rescue Station, (d) Penang Immigration Department, and (e) George Town World Heritage Incorporated
The readings for room temperature and humidity probes indicated that the indoor climate still fell within the acceptable range for Malaysian climate based on the Ministry of Human Resources (1996) and the *Malaysia Green Building Index* (2010), which is between 23°C–26°C with a relative humidity of 40–70 per cent.

The biological air tests also showed that the buildings were all contaminated with mould and bacteria from the air conditioning system, or perhaps even from fungal stains that were clearly seen. Nevertheless, the mould and bacteria count mostly remained around the 'safe' level although some buildings registered readings above the normal limit based on the Ministry of Human Resources (2010). Dust levels in all of the buildings were also found to be high. This situation is closely associated with the regularity of the housekeeping practice in each building.

**Conclusions**

This chapter can be a useful source of information on satisfaction among occupants of adaptively reused heritage buildings. Important findings indicate that the identified buildings are not fully habitable in terms of the condition of the respective indoor environments mainly due to the inappropriate adaptive reuse of heritage buildings which can directly affect the quality of the indoor environment and be linked to occupants’ health complaints. Although indoor environment of heritage buildings may be threatened by poor physical building conditions, their occupants’ health should remain the main priority. Ultimately, this research may prove beneficial for those who are concerned with upkeep of the heritage buildings such as NGOs and local authorities, to increase their awareness on issues related to the sustainability of heritage buildings. Possibilities abound for revising current regulations and/or guidelines to make them adaptable to existing conditions. Moreover, this research also contributes new knowledge on interior design studies in the terms of occupants’ health and satisfaction particularly for those occupying non-residential existing building. In conserving heritage buildings, conservation guidelines must also take into account the welfare of the occupants of the buildings and not focus solely upon the exterior building fabric. A conclusion can therefore be drawn here that heritage building conservation in George Town needs to be carried out comprehensively if the city wishes to sustain its status of World Heritage Sites.
References


