Adaptive Reuse as a Tool for Sustainable Urban Development:

The Case Study of Singapore, Southeast Asia

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Abstract

This article aims to explore the application of adaptive reuse as a tool for urban built heritage management through the study of five cases in the city of Singapore, Southeast Asia. At the crossroads of urban strategy, building conservation and heritage management, the cases reveal the complexities of contemporary urban developments in one of the world's leading cities. Five projects are analyzed and compared via thematic and content analysis, drawing from primary and secondary sources. The cases display the potential of adaptive reuse, as well as their connection to the larger context of sustainable urban (re)development, while offering a realistic overview of the possible difficulties associated with this process, such as gentrification and over-commercialization. Ultimately, the authors argue for adaptive reuse as a tool to be considered by built heritage managers and urban developers, as it may strike the right balance between different stakeholders and objectives.

Keywords: *Adaptive Reuse, Built Heritage, Sustainable Urban Development, Singapore, Southeast Asia*

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Introduction, Context and Research Goals

Southeast Asia (SEA) is one of the world's regions which has experienced the shift towards the development of large cities and the centrality of urban life most dramatically, a trend which is expected to continue in the years ahead. Despite the diversity between countries within SEA, all are tending towards this pattern (Lechner et al., 2021). In the 1950s, only about 16% of the population in SEA lived in urban areas, a number which has since more than doubled, and will reach close to 66% in 2050 (Lechner et al., 2021). This represents an additional 70 million people being added to SEA's urban areas by 2025, which will apply increasing pressure on the cities, particularly in terms of land scarcity (ASEAN, 2021; ASEAN, 2022). Given these circumstances, the future of urban built heritage in Southeast Asian cities is uncertain. These cities reflect the region's rich and complex history and their unique urban built heritage sites require proper management, especially in periods of rapid urbanization (UNESCO, 2016). Unfortunately, over the past decades, this heritage has found itself particularly vulnerable to demolition and redevelopment (UNESCO, 2016). The absence of a robust integrated legislative framework, wherein heritage management would fall within the scope of urban planning, combined with a powerful and aggressive real estate market, has led to the destruction of countless structures with many others currently facing imminent threat (Van Mead, 2019; Mahmud, 2023). For example, the 2023 documentary "The Last Breath of Sam Yan" illustrates this complex issue, as students and residents in Bangkok's Sam Yan area came together to try to prevent the demolition of a local shrine to make space for redevelopment projects (Plittapolkranpim, 2023). On the other hand, many urban built heritage sites have been able to be preserved across the region, often guided by regional and international charters (ASEAN, 2000). However, although strict heritage preservation has its benefits and its uses, in a rapidly changing urban context with pressing spatial needs, this strategy might not always be the most sustainable or desirable, cf. Lee, Kummer and DiStefano (2018) discussing these issues from Hong Kong.

Within these cities, a wide variety of built heritage can be found with distinct architectural styles and craftsmanship. This heritage reflects the region's past, interwoven layers of cultures with varied influences, notably from Islamic countries and the Indian subcontinent (UNESCO, 2016). Many cities have built heritage remaining from the colonial era (British, French, Dutch, etc.), particularly port cities who found themselves along trading routes. Religious built heritage is also very common, a testament to the region's coexisting belief systems, from Buddhism and Islam to Christianity and Hinduism (UNESCO, 2016). In this context, the city of Singapore is especially relevant due to its unique urban landscape which combines a rich multi-cultural past with a highly modern and rapidly growing urban context. Over decades, subsequent waves of immigration to the island added diversity to its urban fabric, something that is still very much a core part of Singapore's essence. The current communities present in the city, the three major ones being Chinese, Malay and Indian, have each influenced the urban landscape and continue to do so (National Heritage Board, 2018).

It is from this panorama that emerges adaptive reuse (AR), a tool for urban built heritage management that offers an alternative option as it aims to achieve a balance between the demolition and the strict preservation of heritage (Li et al., 2021; Hasnain and Mohseni, 2018; Niu et al., 2018). Simply put, adaptive reuse is the process of reusing a pre-existing structure by adapting its use to contemporary needs. It is unique and innovative in its abil-

ity to frame urban built heritage as a sustainable resource to be utilized by cities in their development (Taylor, 2015). Furthermore, it supports the idea that urban areas are more than only the source of challenges (poverty, pollution, etc.) but also intrinsically have potential for transformational change (Bouteligier, 2012; Revi et al., 2013).

Following the above, this research delves into the AR framework, exploring its relevance in the context of urban sustainable development and applies it to Southeast Asia, with a specific focus on Singapore.

Conceptual and Literature Review

Urban Built Heritage and Intangibility

When researching built heritage, especially in urban contexts, it is important to keep in mind both its tangible and intangible aspects. While tangibility is a crucial part of built heritage, especially in the context of land scarcity and city planning, such as in Singapore, its intangible dimensions should not be overlooked. Indeed, built heritage can often be seen as a manifestation of many forms of intangible heritage (craftsmanship, story-telling, art, etc.) (Jigyasu, 2015; Taylor, 2015). It is a way for immaterial knowledge and values to be represented in a physical manner. Spiritual and religious urban built heritage is a clear example of this idea, as such spaces truly come to life through the interaction of tangible and intangible features (Jigyasu, 2015; Taylor, 2015) eventually including 'creative cities' initiatives (Tayebeh et al., 2023). Likewise, built heritage often defines its character and derives its significance from features beyond its physical structure, such as the events which took place at a site. This connection between the tangible and intangible qualities of built heritage is particularly important in cities, where people live in very close proximity with the built environment (Oers, 2015). Urban built heritage is often inseparable from daily life and is deeply entrenched in the fabric of communities and their collective identity. In recent times, intangible urban heritage has also been connected to resilience and recovery processes.

Adaptive Reuse (AR)

Remodeling, adapting, and repurposing structures is an age-old practice; because of the speed at which societies change and develop, structures tend to outlive their original function (Stone, 2019; Plevoets and Cleempoel, 2019). Due to this dissonance in lifespans, throughout history, structures have been adapted pragmatically, cf. Turner (2021) for a theoretical approach to AR and Pérez and Bassols (2023:410), who touch on several aspects of fortresses' adaptation in colonial Hispanic America. However, the term "Adaptive Reuse" itself emerged in the 1970s and has only gained traction since then, particularly in the last decade with the rise of sustainability discourses in the fields of architecture, design, engineering and planning (Stone, 2019; Plevoets and Cleempoel, 2019). Its adoption as a heritage management tool is also recent (Li et al., 2021).

The essence of AR lies in its ability to infuse new life into an existing structure to meet the needs and wants of the current society. It implies a change in function, a common denominator between all AR projects (Stone, 2019; Hasnain and Mohseni, 2018). A wide variety of different projects can fit under the label of adaptive reuse and the degree to which a structure is adapted varies. Many different types of sites can be altered (industrial, residential, religious, cultural, military, etc.) as well as on different scales (Plevoets and Cleempoel,

2019). When it comes to the adaptive reuse of heritage in particular, a layer of complexity is added due to the meaning and history that the built structures embody (Arfa et al., 2022). In those cases, the goal of the project goes beyond just repurposing the structures through finding new useful functions by also aiming to find a balance between historic preservation and development, paving the way in some cases for community participation (Purwantiasning, 2021)

On a theoretical level, AR as an approach embraces a discourse of heritage where it is seen as a process rather than a static and unchangeable entity which is frozen in time (Smith, 2006). Many argue that the "conserve as found" attitude towards heritage, which is often associated with early Eurocentric approaches to conservation, goes against the nature of heritage itself by only focusing on its tangible qualities. Thus, an emphasis is put on aestheticization and monumentality (Smith, 2012; Jigyasu, 2015), often creating "icons" whose management is not easy in tourist places (Bassols, 2019). Instead, they promote a discourse wherein heritage is seen a process of remembering and creation, where values, memories and knowledge are not only being passed on but modified and added onto at every step of the way (Wollentz and Kuhlefelt, 2021; Smith, 2006). This organic and cumulative progression occurs as heritage moves through generations (Taylor, 2015). This discourse is reflected in AR as it is a tool for heritage management that has change and transformation at its core. This gives AR the ability to not only embrace the dynamic and evolving nature of intangible heritage but also allow it to be reflected in the tangible heritage through its adaptation of the structures to the current context (Jigyasu, 2015).

Literature on Adaptive Reuse in SEA

Despite the existence of many of adaptive reuse projects on urban built heritage in SEA, a limited amount of academic research has been done on this topic in the region, with the majority of relevant studies found in Europe. When focusing on Asia, most search results displayed studies done in East Asia (Intaraksa and Ongsavangchai, 2022/2023; Yoon & Lee, 2019; Langston et al., 2008; Yin, 2021; Yung et al., 2014; Gao et al., 2020; Hong & Chen, 2017).

When looking at the studies specifically focused on Southeast Asia, Malaysia, Indonesia and Singapore stood out as popular research locations (Al-Obaidi et al., 2017; Abdulhameed et al., 2019; Rahmadina et al., 2019; Pieris, 2018; Fajarwati et al., 2021), with less cases in other countries such as Thailand (Pattananurot, Khongsaktrakun, 2022/2023). Most of the research was qualitative case studies which used a combination of literature reviews, field work (surveys and observations) and interviews (Fajarwati et al., 2021; Permata et al., 2020; Rahmadina et al., 2019; Yusran et al., 2021; Amalina Hanapi et al., 2022; Henderson, 2011a; Thi and Nguyen, 2021). A little more variety could be observed when it came to the different ways the researchers decided to approach the topic and the themes they engaged with.

Some studies focused on the technical aspects, such as building technique and materials (Al-Obaidi et al., 2017; Rahmadina et al., 2019). For example, Al-Obaidi et al. (2017) sought to evaluate the building performance (air quality, ventilation, lighting, acoustic, water use efficiency, etc.) of heritage shophouses which were adapted into budget hotels in Kuala Lumpur (Malaysia). Others focused on tourism, with an emphasis on cultural tourism and accommodation (Thi and Nguyen, 2021; Md Ali et al., 2019; Ariffin et al., 2020; Henderson, 2011b; Pattananurot and Khongsaktrakun, 2022/2023). Another group of researchers ex-

amined the aftermath of adaptive reuse projects, paying particular attention to authenticity (Yusran et al., 2021; Permata et al., 2020). Indeed, Yusran et al. (2021) investigated the visual and spatial changes after the adaptive reuse of Javanese vernacular houses into lodging and cafes in Malang (Indonesia). Some studies took a discussion-style approach, delving into themes like colonial heritage and national identity (Henderson, 2011a; Pieris, 2018). Finally, shophouses, commonly found in Southeast Asian cities, were a popular topic (Al-Obaidi et al., 2017; Fusinpaiboon, 2022; Abdulhameed et al., 2019; Zubir et al., 2018; Othuman Mydin et al., 2014). For example, Fusinpaiboon (2022) developed strategies for the adaptive reuse of shophouses in Bangkok (Thailand), and Zubir et al. (2018) investigated the challenges encountered by building owners trying to apply adaptive reuse on their shophouses in the UNESCO World Heritage Site of George Town (Malaysia).

Overall, among the current research on the adaptive reuse of urban built heritage in SEA, there seems to be a shared recognition of the potential and benefits of AR for the region as well as a common awareness of the challenges associated with this tool. Furthermore, most studies called for more research in this area.

Materials and Methods

Research Design

Our field work consists of five cases, all of them located in the city of Singapore. Singapore was selected as the geographical focus due to its relevant urban context, where a rich cultural history coexists with a rapidly modernizing landscape (see above). Indeed, not only is Singapore experiencing growth in various ways (population size, economy, global influence, etc.) but it is doing so in a context of land scarcity. This interplay provides a compelling backdrop for the exploration of the topic at hand. Additionally, Singapore was chosen for its extensive availability of online documentation on adaptive reuse practices, and the advantage of English being one of its official languages, enabling easy access to information without the need for translation. Therefore, access to primary and secondary sources was guaranteed. As for field work, the authors undertook extensive research into official documents as well as webpages so as to analyze and lay out the critical junctures of the five studied cases and their broad implications.

Due to its compiling and comparative nature, and the relatively recent completion of the projects, this work is also a chance to reflect on the transformative power of AR at a local scale. The criterion to select cases was their variety in original uses, adapted uses and locations.

For the sake of an easy comparison among projects, each one will be presented under three headings: background, restoration process and current use.

Context: Singapore as a Case Study

Located at the tip of the Malay Peninsula, Singapore consists of a main island spanning 710 km² and 64 islets, with a population of nearly 6 million people (Singapore Ministry of Foreign Affairs, n.d.; Leinbach et al., 2023), see Figure 1. The Urban Redevelopment Authority (URA), established in 1974, oversees and manages the development of Singapore's urban landscape, including land use planning, design, and sales (Urban Redevelopment Authority, n.d. - a).

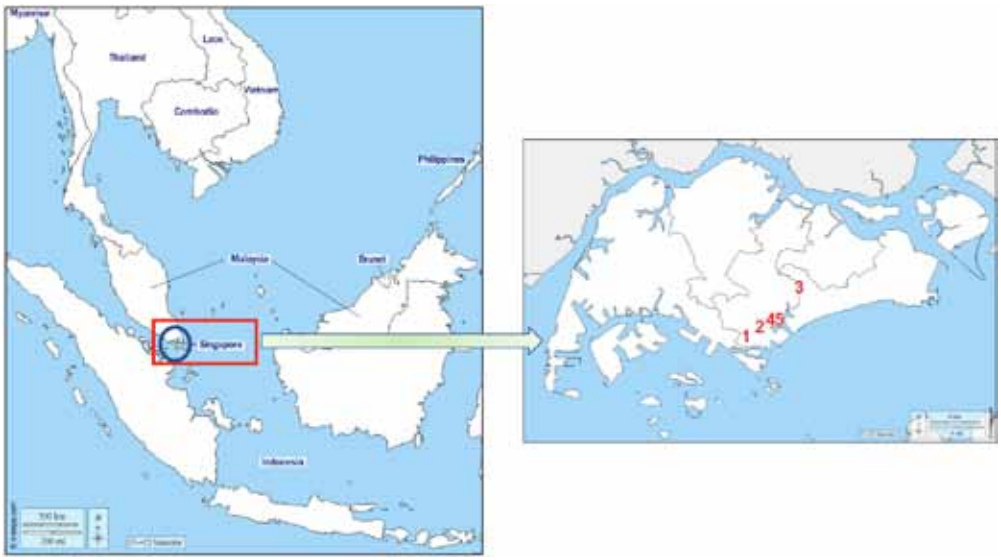

Figure 1. A map locating Singapore in Southeast Asia and the five studied cases within the city of Singapore. Source: Authors of a free map by D-Maps.

Singapore's built fabric reflects not only its history as a maritime trade hub and a British colony, but also embodies the multicultural community which emerged from centuries of exchanges (Ken, 2020). Juxtaposed with modern structures, this heritage contributes to Singapore's unique urban landscape and plays a key role in shaping the city's character and defining the nation's identity (National Heritage Board, 2018). Singapore separates its urban built heritage into three categories: UNESCO World Heritage Site, National Monuments and conserved buildings (National Heritage Board, 2018).

Urban built heritage preservation, conservation and management is overseen by two bodies, the National Heritage Board (Preservation of Sites and Monuments Division) and the Urban Redevelopment Authority (URA). Across websites and documentation, these organizations outline strict guidelines on the appropriate usage of the tool and highlight best practices. For example, Volume 1 of the Conservation Technical Handbooks has a section defining and describing adaptive reuse as well as its purpose, its opportunities, and its challenges, and labels it as a "key conservation planning strategy" (Urban Redevelopment Authority, 2017, 109) when trying to rejuvenate a structure whose original use is now obsolete. Similarly, adaptive reuse is mentioned in the strategic document Our SG Heritage Plan as a tool which has been used in the city. The document acknowledges "that there will always be a need to balance heritage preservation with future developments, especially given Singapore's land constraints" (National Heritage Board, 2018, 25).

Case studies: Examples of Adaptive Reuse Projects in Singapore

Case Study #1: The NUS Baba House

Background

Built in the 1890s, the NUS Baba House is a conserved building located in the residential historic district of Blair Plain. The three-storey townhouse was originally the ancestral home of a prominent Straits Chinese family from Singapore's Peranakan community (a community composed of people with mixed Indonesian/Malay and Chinese heritage, see

Koh, 2013). Strait-Chinese is a sub-group of the Peranakan community referring to those who were born or lived in the Straits Settlements, a group of British colonies (Singapore, Penang, Malacca, etc.) (Koh, 2013). In 2006, the building was acquired by the National University of Singapore (NUS) with the intent of restoring and curating the townhouse and opening it up to the public as a museum. The conservation was an interdisciplinary project involving many departments within the university as well as the URA.

Restoration Process

Before the restoration even began in 2007, researchers and students carried out excavations and surveys (iconography, original paint colors, etc.) to gather information. The project meant to find a balance between preserving the spatial and visual features of the townhouse to safeguard authenticity and modernizing the structure to ensure a safe and usable environment for visitors. It officially opened in 2008. The first and second floors contain over 2 000 artefacts displayed in their original context, allowing the visitors a glimpse into a typical 20th century Peranakan home. These artifacts, known as the Straits Chinese Collection, consist of a variety of objects (furniture, photographs, books, paintings, porcelain, etc.). A large proportion of the original objects which belonged to the Wee family, who owned the house for decades, are found in this collection, along with donations from other individuals within the community. The third floor was transformed into a gallery space welcoming exhibition on topics connecting to built heritage conservation, urban development and Peranakan history. The space is intended to promote and to foster engagement with heritage.

Current Use

Today, in addition to proposing guided visits of the townhouse and neighborhood heritage tours, the NUS Baba House hosts a wide variety of programs open to the public pertaining to local art, history and culture. These include talks, film screening, volunteering, etc. Furthermore, the space still welcomes students and researchers interested in pursuing academic endeavours.

Case Study #2: The Warehouse Hotel

Background

The Warehouse Hotel is a boutique hotel located in the Robertson Quay area, along the Singapore River, born out of the restoration of a conserved building, namely a warehouse complex built in 1895 (Wong, 2021a). Composed of three structures, the warehouse, colloquially referred to as a “godown," was originally used as storehouse along a spice route between Malaysia and Singapore, reflecting the city’s history as a maritime trading hub. For the next decades, the site was used for a variety of activities before closing down in 1995.

Restoration Process

In 2013, The Lo & Behold Group, a Singaporean hospitality firm, was selected to carry out the project of turning the warehouse into a boutique hotel, supported by Asylum, a design agency, and Zarch Collaboratives, an architectural firm (Wong, 2021a). Under the guidance of the URA, the project focused on protecting the site’s legacy while using creativity and innovation to offer a contemporary twist on industrial heritage. Indeed, the aim was to create a space which would actively contribute to the neighborhoods’ vibrant social and dining scene while safeguarding the built urban landscape and managing the heritage associated

with it. The three-peaked silhouette of the warehouse, as well as many other character-defining features (wooden beams, metal roof trusses, louvre windows, moldings, signage, etc.), were conserved and complemented with modern additions (Wong, 2021a).

Current Use

The hotel opened to the public in 2017 and won the URA's Architectural Heritage Award for "Restoration & Innovation" the same year thanks to the project's ability to thoughtfully "celebrate the heritage of the warehouse and the Singapore River while adapting the building to a new use". It is a 5-star luxury hotel with 37 rooms, which aims to offer their guests an insight into local culture and heritage within the setting of modern comforts.

Case Study #3: The Khong Guan Building

Background

The Khong Guan Building emerged through the rejuvenation of a conserved edifice built in 1952, namely, the Khong Guan Biscuit Factory. The factory was a symbol of local entrepreneurship, being owned by the home-grown biscuit company Khong Guan, which was established in 1947. Located at the tip of MacTaggart Road and Burn Road, the three-story factory, whose architecture strongly reflected the post-WW2 modernist movement, was a landmark in its neighborhood. While the lower floors were used as a shopfront, an office and a storeroom, the upper floors housed members of the Chew family, the owners.

Restoration Process

Led by Lua Architects Associates and META Architecture and completed in 2017, the project consisted of, in addition to restoration work, the integration of an extension to the original building. The extension contained multiple floors with balconies and some greenery. The focus was on enhancing the existing structure and allowing the story of the site to continue by creating a sense of continuity between the old and the new. Many distinctive features of the original building, such as the mosaic tiles and the metal grille gate, were restored and conserved. In 2018, the project won the URA's Architectural Heritage Award for "Restoration & Innovation," highlighting the seamless and respectful incorporation of the extension into the original heritage building (Zaccheus, 2018).

Current Use

Although the biscuits are no longer produced or sold in the building, parts of the building are still used by the biscuit company, now called Khong Guan Limited, as their headquarters. The rest of the building is open to be rented, mostly as office spaces. In 2019, a coffee shop called Alchemist opened on the first floor, where the old biscuit storefront was located.

Case Study #4: The National Gallery Singapore

Background

National Gallery Singapore is a Southeast Asian art and culture museum created from the adaptive reuse of two national monuments, the former Supreme Court and the former City Hall (Wong, 2021b). Built in 1939 on the site of the former Grand Hotel de l'Europe, the Supreme Court was a designed by British architect Frank Dorrington Ward and was one of the last classical buildings constructed in Singapore (Wong, 2021b). It was used as a courthouse until 2005, when the Supreme Court was moved to a new building. Also designed by a Brit-

ish architect, the City Hall was built in 1929 and served as offices for multiple government departments over the years, including colonial administration, until it was vacated in 2006. Many of Singapore's most important historical events took place in this site such as the official surrender of Japan in 1945 and the swearing in of Singapore's founder Lee Kwan Yew as Prime Minister, leading Singapore's first independent government. In 1992, both buildings attained the status of National Monuments.

Restoration Process

The project was announced in 2006 by the government, quickly followed by the launch of an international design competition, eventually won by StudioMilou who led the project supported by CPG Consultants. The focus of the project was finding minimal architectural interventions which would allow for the conservation of as much of the buildings' original structures as possible while adapting to the new uses. This was achieved through the addition of a steel and glass roof structure placed above the monuments and suspended bridges, linking them together, all of which are minimally visible from the outside. To further reduce the changes made to the buildings, underground levels were built to not only facilitate circulation between the galleries, but to also accommodate new features such as parking spaces, auditorium passages and various amenities (bathrooms, lockers, ATMs, elevators, etc.). Naturally, bringing the monuments up to date in terms of construction regulations, which can be quite stringent for large museums due to safety risks (theft, vandalism, fire, terrorism, etc.) and conservation norms (ventilation, lighting, air temperatures, etc.) resulted in some necessary modifications. It officially opened to the public in 2015.

Current Use

Today, the National Gallery Singapore holds the largest public collection of Singaporean and Southeast Asian modern art in the world with more than 8000 artworks from the 19th century to the present (Wong, 2021b). In addition to two long term exhibitions ("Siapa Nama Kamu?" and "Between Declarations and Dreams"), the museum presents a series of new and different exhibitions and is involved in diverse activities (performances, workshops, panel discussion, school programmes, etc.). A rooftop garden was also added to the National Gallery Singapore, where exhibitions and other various projects are occasionally located.

Case Study #5: CHIJMES

Background

Located in the downtown area, CHIJMES (pronounced "chimes") is an entertainment and lifestyle complex housed in the former Convent of the Holy Infant Jesus. It was established in 1854 by French Catholic nuns as a girl's school. The site contained three main buildings, namely, the Caldwell House, the chapel and the orphanage. Designed by George Drumgoole Coleman, a colonial architect, the Caldwell house was a two-storey building used by the nuns to receive visitors as well as to perform other daily activities (reading, sewing, writing, etc.) and is characterized by its semi-circle façade and neo-classical architecture. The orphanage, also a two-storey building, welcomed abandoned infants and children, many of whom were left at the Convent's door, nicknamed the "Gate of Hope". Finally, at the center of the complex lies the chapel, a massive neo-gothic structure with Corinthian columns, a cross-vaulted ceiling and stained-glass windows. Many pieces from the buildings, such as the stained glass, were crafted in Europe and brought to Singapore (CHIJMES, n.d.).

Restoration Process

After operating for almost 130 years, the nuns left the site in 1983 to relocate to another area of the city. The convent was handed to the government and both the Caldwell house and the chapel became National Monuments. The rest of the site was gazetted for conservation. Restorations began shortly after and lasted until 1996, when it opened to the public. The project focused on transforming the convent into a functional and successful commercial complex while conserving the heritage through a thorough and sensitive restoration process which focused on the original craftsmanship (UNESCO Bangkok, n.d.). For example, when working on the glass stained windows of the chapel, repairing the broken pieces was favored over replacing them with new materials. Similarly, artisans from France and Italy were consulted to guarantee technical and material authenticity (UNESCO Bangkok, n.d.). Any new elements added for structural stability, such as steel beams, or for its new use, such as exhibition lights, was done in ways to keep them hidden or blend in with the original character of the buildings (UNESCO Bangkok, n.d.). Different landscape features such as open walkways and courtyards were also added. In 2002, the convent received a Merit Award at the UNESCO Asia-Pacific Heritage Awards for Cultural Heritage Conservation. The property was later sold to a private company but kept the same use.

Current Use

Today, CHIJMES is a lifestyle venue which allows the public to engage in contemporary activities within a historical setting. It hosts a variety of restaurants, bars and cafes as well as providing spaces for events (seminars, functions, performances, weddings, etc.).

Discussion

In this section, an analysis and comparison of the AR framework applied to the five cases are conducted. The below table shows the comparative overview.

NAME	TYPE OF HERITAGE	ORIGINAL USE	ADAPTED USE
NUS Baba House	Residential Heritage	Ancestral Home	Museum, Gallery & Research Centre
The Warehouse Hotel	Industrial Heritage	Warehouse	Hotel
Khong Guan Building	Industrial/Commercial Heritage	Factory & Store	Offices & Café
National Gallery Singapore	Political Heritage	Government Buildings	Museum
CHIJMES	Religious & Educational Heritage	Convent, School & Orphanage	Entertainment & Lifestyle Complex

Figure 2. Comparative Overview of the Case Studies in Singapore. Source: Authors.

When comparing the five example projects on Table 1, a few observations can be made. Firstly, it is interesting to notice how each project began with a different type of heritage, as well as different original uses, displaying AR's ability to be utilised for a wide variety of structures. This highlights how diverse urban areas can offer many opportunities for unique creative transformations within the AR framework. Secondly, when looking at the adapted uses, it can be observed that every single heritage structure offers products and services which are compatible with the tourism industry. Due to the challenges that can be brought upon a city through the development of its tourism sector, it is worthwhile to examine whether some heritage structures, after being adapted, should stay spaces whose use is designed for local communities (housing, community center, public library, etc.). By the same token, it is relevant to reflect on the fact that, although these spaces are open to the public, many are still privately owned and their accessibility is limited by the costs associated with the different products and services they offer, which could potentially alienate lower-income groups.

When looking at the case studies overall, Singapore seems to have been able to capture some of AR's potential. Indeed, in terms of urban regeneration, all the specific projects described in the cases have resulted in the establishment of new businesses and activities, thus contributing to the local economy. The five projects demonstrate the URA's commitment and expertise towards adaptive reuse and display its ability to cultivate urban regeneration opportunities. Next, regarding heritage conservation, although all projects seem to have kept the heritage as a core component of the process, the NUS Baba House stood out through the creation of its gallery space and through its promotion of research activities at the site. This shows a commitment towards, not only fostering contemporary connections with local culture, but also facilitating opportunities for the community to analyze, reflect and discuss the heritage. The National Gallery Singapore also showed commitment towards supporting programmes and activities which allow people to explore and connect with the heritage. These two projects stand out in part due to the new use which was selected for the heritage structure. For all projects, a deeper engagement with the intangible features of the heritage could bring an interesting dimension to the new uses, and could further protect the subtleties of the urban landscape. Similarly, the NUS Baba House and the National Gallery Singapore seem to reflect the ideas of community building and participation the most, especially through NUS Baba House's inclusion of faculty and students into the restoration process itself. Additionally, the creation of a café on the first floor of the Khong Guan Building, where the storefront used to be, can be a good way to continue to allow the community to have access to the heritage building. Overall, finding more ways to include the local community in a manner which gives them agency and empowers them would be beneficial to Singapore's approach to adaptive reuse.

Furthermore, the city seems to have been able to tackle some of the difficulties and obstacles which can arise when using AR as a tool to manage built heritage. Firstly, the challenges surrounding regulatory frameworks and governance are the ones that Singapore has dealt with to the greatest extent. The case studies display how the city's regulations regarding not only adaptive reuse, but also heritage management in general, are very clear, precise and detailed, while still allowing for unique transformations. Moreover, these regulations, in addition to documentation regarding best practices, are readily available online to support heritage owners, project managers, architects, and so on. Having such a struc-

tured framework can offer a lot of guidance and ensure a consistent level of quality across the city. Still, it is interesting to wonder whether such a strict top-down approach in these projects limits community consultation and hinders active community involvement, potentially weakening the gathering of information regarding intangible heritage aspects. The projects described nevertheless showed thorough and extensive research and planning processes, and demonstrated a commitment towards finding conscientious ways to integrate new features into the original structures. This was found in, for example, the roof structure and bridges added to link the two buildings in the National Gallery Singapore or the extension mounted on top of the Khong Guan Building. A lot of attention was also dedicated to the craftsmanship found in all the heritage structures. In the context of these case studies, it can also be relevant mention the challenges of over-commercialization and gentrification that can arise in adaptive reuse projects. Indeed, the case studies consistently revealed a certain degree of heritage commercialization.

Conclusion

This research work has demonstrated the potential that adaptive reuse has in the city of Singapore while presenting a realistic overview of the possible difficulties associated with this process. Although adaptive reuse is not appropriate for every single site, it should still be considered as a key tool for heritage management, especially in rapidly growing and modernizing cities. Not only do the findings of each of the cases in this study contribute to the research gap on this topic in this particular geographical context, but the insights are especially useful for stakeholders beyond academia, particularly those involved in urban planning and heritage management beyond the SEA region.

This study presents two avenues for future research. Firstly, the finding that most of the AR projects studied are geared towards the tourism industry and include some form of commercialization is an interesting trend to be further analyzed: do all Singaporeans have an equal access to adapted buildings, when considering that these structures are part of their identity? Can this trend of monetizing repurposed structures be observed elsewhere in the city or in Southeast Asia? Secondly, other future research topics may include further investigating the potential of AR projects to include climate-adaptive solutions such as nature-based solutions (green roofs, bioswales, raingardens, etc.) or passive green design (ventilation, natural lighting, building orientation, etc.) (Attmann, 2010; World Wildlife Fund, 2021; European Commission, 2021). For the five case studies presented here, this aspect was the one that was capitalised the least on. Although the projects did reflect aspects of urban circularity, which are in part inherent to adaptive reuse, green design techniques and nature-based solutions were not mentioned in most of them, at least not in a manner which made them a core feature of the process.

Ultimately, adaptive reuse gives the possibility to not only rethink the role of heritage in cities, but to also consider its role in the larger context of sustainable urban development. It is through tools such as adaptive reuse that ways can be found to integrate the past with the present to create a better future.

Data and Image Availability

The complete list of primary documents used as well as some images of the five studied cases are located here: https://tinyurl.com/yb9wn3j7.

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