International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 23s, 2025
https://theaspd.com/index.php

A Study of Adaptive Reuse on Commercial Building Towards Heritage City on Case Study of Kyoto City, Japan

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Abstract: *Adaptive reuse is a conceptual framework rooted in the intention to preserve existing buildings and urban spaces while adapting them to contemporary needs. It reflects a dual recognition of cultural-historical value and resource efficiency looking to keep the embedded narratives of a place while minimizing waste associated with demolition and reconstruction. This approach encompasses both tangible and intangible aspects, ranging from public space to individual architectural units. Kyoto is one of the significant historic and cultural city in the world. A study of Adaptive Reuse on Machiya, it is a way to understand and elevate heritage city by learning on selective case. This study focuses on urban area and commercial row house in Kyoto old city, this research initiative aimed at consolidating knowledge related to contemporary architectural practices. Research aim is to explain Heritage city and contemporary architecture with a concept of Adaptive reuse in 21st century. Research units are selective 4 streets and 9 building case studies to on-site survey and collect data. Research Method is to analyze building form, structural systems, and contemporary activities with mapping, 3D digital model, and architectural drawing (plan and sections). Examples of adaptive reuse include the transformation of old Machiya into café, coffee shop, and also restaurants. This practice has evolved with shifting perspectives on architecture and urban conservation sustainably. Adaptive reuse in 21st century is conceptually a study on architecture in urban & building scale, which towards sustainable development and architectural heritage. Outcome is to understand and be completed as future purpose according to new practices in heritage city.*

Keywords: *Adaptive reuse, Machiya, old shophouse, traditional building, sustainable city and community.*

1. INTRODUCTION

This research article is a part of the collaboration fieldwork between Chiang Mai University & Kyoto Tachibana University. With studio partnership between Assoc. Prof. Dr. Chiranthanin Kitika and Dr. Tetsuya Masaki, there was 3 inter-institutional workshops under the theme "Adaptive Reuse" conducted between 2023 and 2024. The focus of these workshops was on the study of urban contexts and contemporary architecture along four historical community streets in Kyoto: Nijo Street, Sanjo Street, Rokkakudo Street, and Nishiki Street. Through collaborative learning with Japanese students, nine selective contemporary buildings that embody adaptive reuse strategies were documented as design references. These examples provide lessons for creating contemporary urban spaces while aligning with Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities, emphasizing urban resilience and sustainable settlement planning.

Urban settlement and planning in Kyoto old city, it is based on the palace-city model, inspired by the ancient Chinese capital of Chang'an during the Tang Dynasty. This model adopts a rectangular grid layout centered around the imperial palace, with land parcels allocated according to an orthogonal system of streets aligned along north-south and east-west axes. Areas beyond the central palace grounds were designated for residential and commercial use, most notably through the development of Machiya (Traditional wooden townhouse), which have since become key elements in the city's architectural identity and heritage conservation.

However, modern urban development has necessitated adaptations to this original plan to accommodate both private and public transportation systems. Economic growth also contributed to the evolution of commercial districts, prompting the emergence of arcaded shopping streets as known as shotengai, formed by roofing over two-facing rows of buildings to create covered pedestrian zones. Examples include Teramachi Street, Shinkyogoku Street, and the Sanjo Market District (Osaka Prefectural Government, 2012).

2. LITERATURE REVIEW

Understanding on City Transformations between Heritage city and Modern Urban Development.

Modern urban planning in Kyoto has led to changes in both the physical configuration and the functional use of city spaces. The strategic focus of development has been to support mass transit while maintaining the historical city layout. Notably, the city has avoided widespread road expansion in the historic core,

instead emphasizing transportation infrastructure that enhances connectivity. East-west arterial roads such as Imadegawa, Nijo, Oike, Sanjo, Shijo, Gojo, and Rokujō have been expanded, alongside north-south roads like Kawaramachi, Karasuma, and Horikawa. Kyoto's underground rail system includes three major lines: the Kyoto City Subway, consisting of the Karasuma Line (north-south) and the Tōzai Line (east-west), and the Keihan Line, which connects Kyoto to Osaka. These railways operate underground in the urban center. Japan Railway lines provide intercity connectivity. In 1991, the Kyoto City Council defined a three-pronged urban strategy: preservation, revitalization, and creativity, resulting in a systematic urban plan (Osaka Prefectural Government, 2012). This has led to the conservation of natural and architectural heritage in the northern areas, the integration of historic and commercial zones in the city center, and the development of new growth areas in the southern urban fringe.

Community-Scale Analysis: The Case of Koiyama community in Kyoto old city, this study investigates the spatial behavior of residents within historically defined urban environments, using the Koyama neighborhood in Kyoto as a case study. Koiyama is named and derives from Koiyama Shrine, located along Muromachi Street in Nakagyō Ward (Suzuki, 2016). The neighborhood is situated within the original grid-based layout of Kyoto, where land was historically allocated in rectangular lots. In earlier periods, the area was composed of palatial structures and Machiya townhouses, many of which now survive only in small numbers and are considered heritage buildings. Currently, the Koiyama village is a mixed-use commercial and residential area characterized by mid-rise buildings. Although the architectural fabric has changed, the grid-based land parceling remains intact. The community's cohesion is maintained through the cultural and religious significance of the shrine, particularly in its role within the Gion Festival, which is actively promoted by Kyoto's municipal government. The shrine-centered community structure continues to function as a social network, despite functional changes in individual buildings. All buildings within this district, whether heritage, commercial, or residential, are formally integrated into the Koiyama community network. This integration is recognized under Kyoto's community development plan, which grants rights and responsibilities to each participating property. The local governance of this network is anchored at Koiyama Shrine and overseen by the community council (Masato, 2015). Gion matsuri is shrine celebration as Biggest festival of Kyoto city. This festival represents an action for engage present community network between old and new residents. Also, they are networked and build up sense of belonging following annual city festival.

A study of Adaptive Reuse in 21st century

Researcher combines adaptive reuse concept with latest multiply literature. Considering on adaptive reuse, it is very difference from old concept during late 20th century. Appearance on building is not a main idea to keep heritage city as livable and sustainable city. (Plevoets, B., & Van Cleempoel, K., 2019) The study is to sustain architecture and city with community and ways of living. Lewi and Logan emphasize it as "designing new lives" rather than simply extending existing ones. This reframing positions adaptive reuse as an agent of urban regeneration, wherein the building becomes a catalyst for social, cultural, and ecological renewal. (Lewi & Logan, 2025). This perspective moves beyond the static notion of preservation toward adaptive reuse as an active generator of new narratives in place-making. Furthermore, Life-Cycle Integration is an issue to consider with. Wong expands on life-cycle thinking, urging designers to integrate material reuse, embodied energy accounting, and flexible spatial planning into every reuse project. She positions adaptive reuse not as the "afterlife" of a building but as a continuous process embedded in a building's full material and cultural timeline. (Wong, 2025) This echoes broader sustainable architecture discourses that connect past heritage with future adaptability. Then, the outcome might not more important than processing. Design Compass for Heritage Futures Reinventing Heritage (Park Associati, 2025) introduces the concept of a "design compass" is a guiding tool for balancing authenticity with innovation. Their case studies advocate for selective transformation, where elements are kept or altered according to a project's cultural, environmental, and social priorities. This nuanced approach acknowledges that not all heritage must be preserved equally, and that adaptation can itself be an act of heritage creation. So, each city has its own social issue and condition. Reflection on case studies is a way to understand current situations and consider future scenarios.

The United Nations' Sustainable Development Goal (SDG) 11, Sustainable Cities and Communities, highlights the need to "make cities and human settlements inclusive, safe, resilient and sustainable" (United Nations, 2015). This refers to an urban environment that is designed, developed, and managed in a way that balances environmental, social, cultural, and economic sustainability to improve the quality of life for present and future generations. Sustainable Resource Management needs Social Inclusion and Community Empowerment. In 21st century, Local wisdom fosters community-based problem solving and

strengthens social networks, which are crucial for resilience to social transition and urban challenges. Moreover, Cultural festivals, rituals, and crafts support social cohesion and empower vulnerable groups in urban planning. (Bullen, P. A., & Love, P. E. D., 2011)

With sustainable city and community, each city and each urban area usage have their own situations and challenges. (Goel, S., Wankar, M., & Ashtt, R., 2025) Then, this research needs to select area of study and also on-site study. It is to summarize and contribute a study of Adaptive reuse for specifical future purposes. They will include 2 topics; architectural design & programing in Heritage – commercial area.

3. METHODOLOGY

Following literature review, this research sets definition of Adaptive reuse as 2 scales of study unit; urban area & architecture. Firstly, Urban study is to present city situation on the site, researcher use photography and mapping to understand area usages in the city. Secondly, Architectural study is to understand material and construction in each selective case with an analysis on 3D model and Architectural drawing.

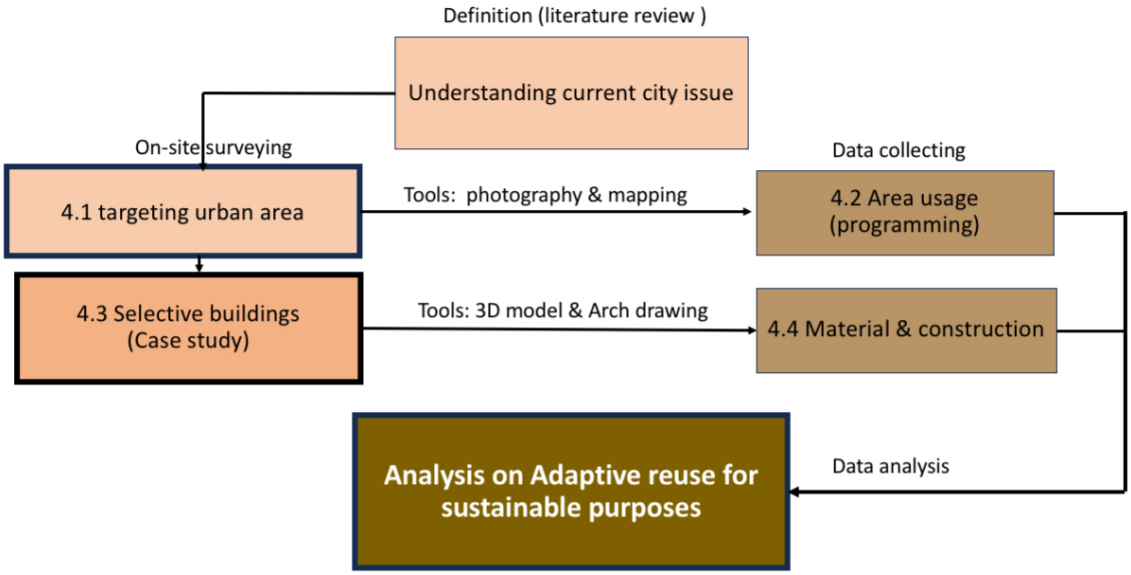

Fig. 1. Research Method for Adaptive reuse for Sustainability

As on-site survey provides with targeting urban area and selective building, researcher selects potential streets & building cases following city development in Kyoto old city. Area of study is selected between 2 Main North-south streets; Kawaramachi and Karasuma streets where serve examples of urban usage that extends beyond mere heritage conservation, encompassing broader infrastructure and economic dimensions.

On architecture scale, Machiya, a traditional wooden townhouse, presents for the transformation of cultural and architectural value into contemporary urban assets. The renovation of Machiya is a distinctive architectural typology commonly found throughout Japan, particularly prevalent in Kyoto. These dwellings embody the cultural and economic evolution of Japanese cities over centuries. Research unit is selected with a condition of renovated building which keeps old materials and creates new program.

Finally, data analysis is to summarize urban phenomenon towards sustainability. Outcome is to explain city conditions and give suggestion in terms of sustainable architectural design &city area. (See figure 1)

4. Data collecting & Analysis

4.1On-site surveying - Targeting urban area

Topic of study in urban scale is to understand zoning and urban spatial. A study of Machiya, traditional wooden townhouses, was categorized into three levels of physical transformation, represented by three color codes to indicate the condition and typology of each building as follows:

Brown: Traditional Machiya structures built prior to 1945, in which timber remains the primary construction material and the architectural form is largely preserved. (See figure 2)

Blue: Newly constructed row houses that do not incorporate any elements of the original structure. These buildings are entirely built using modern materials and methods. (See figure 3)

Red: Adaptively reused Machiya buildings that show a hybrid form, combining elements of the original wooden structure with modern materials. In these cases, the retained traditional features less than 50% of the overall structure. This category forms the primary sample set for further study in the research. (See figure 4)

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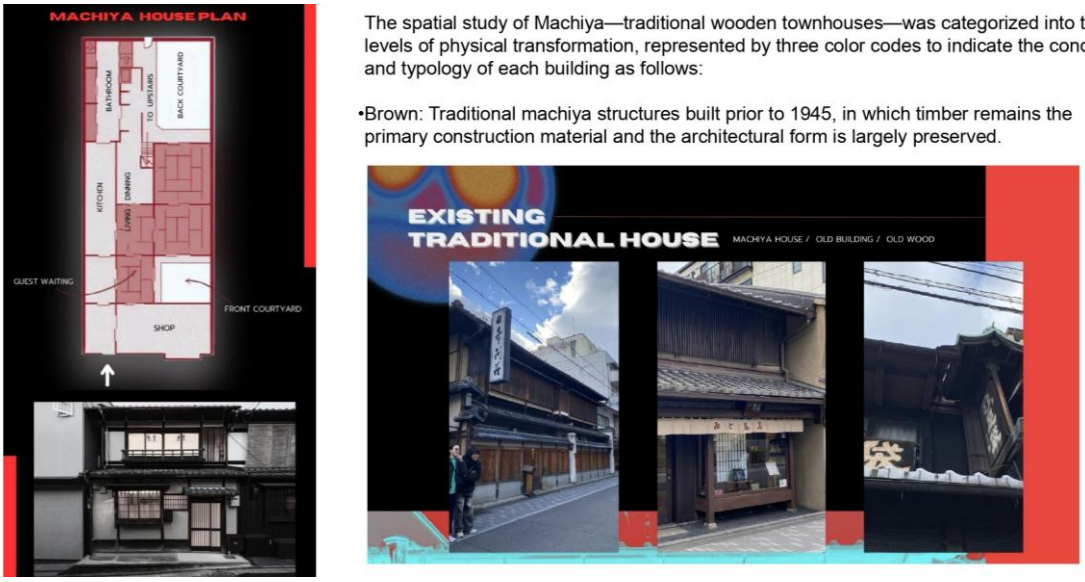

Fig. 2. Traditional shophouse which colors on the maps as Brown

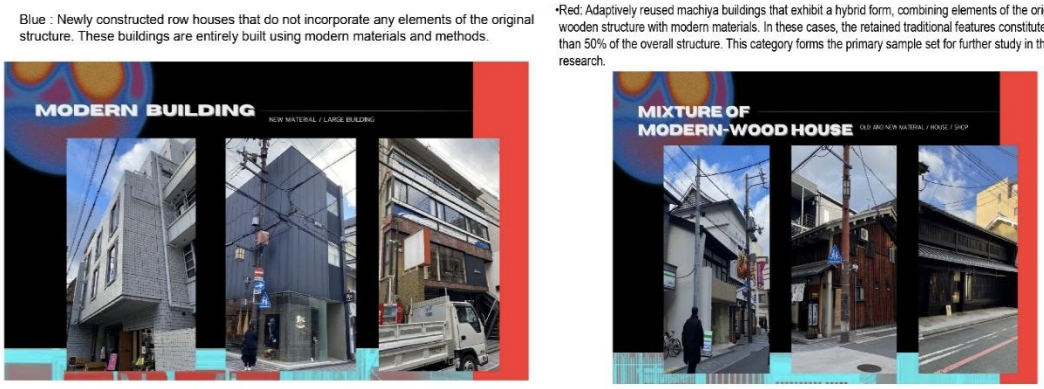

Fig. 3. modern shophouse which colors on the maps as Blue color

Fig. 4. Mixture of modern & wood shophouse which colors on the maps as Red color

Site Criteria is to select heritage area with creative program. With percentage of commercial buildings, there appears four historical-commercial streets in Kyoto; Nijo, Sanjo, Rokkaku, and Nishiki streets. Then these 4 west-east streets are selected for urban study. (See figure 5) Thus, A study on architecture scale is to select 9 buildings where are set to collect data: material and construction. This study process involves an analytical interpretation of architectural interventions through the lens of Adaptive Reuse.

Fig. 5. Area of study where is selected during workshop in Kyoto 2023

4.2 Data collection: Urban area usage

On 4 targeted streets, many Machiya have been renovated and repurposed for new functions such as restaurants, cafés, boutique hotels, or art galleries. These transformations attract tourism and introduce a new economic role for Machiya within the city. In some cases, the buildings have been adapted into

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modern residential units or small office spaces. The research compares the original spatial configuration of traditional Machiya with their newly developed layouts, highlighting how design adaptations support contemporary lifestyles while preserving spatial memory.

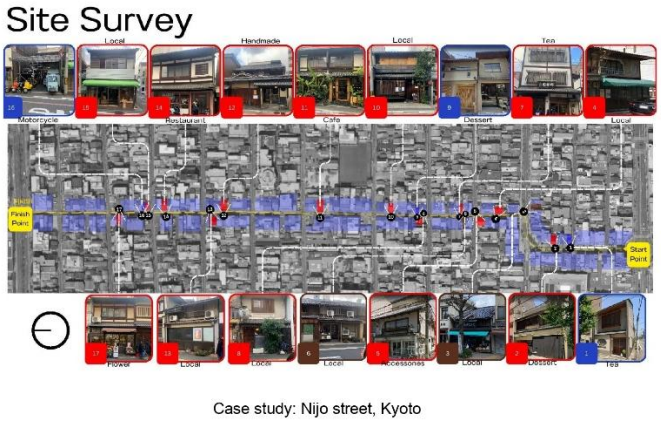

Fig. 6. Data collecting in Nijo street with color mapping (Brown: Old transitional Machiya, Blue: modern shophouse, Red: Mixture modern – wood shophouse)

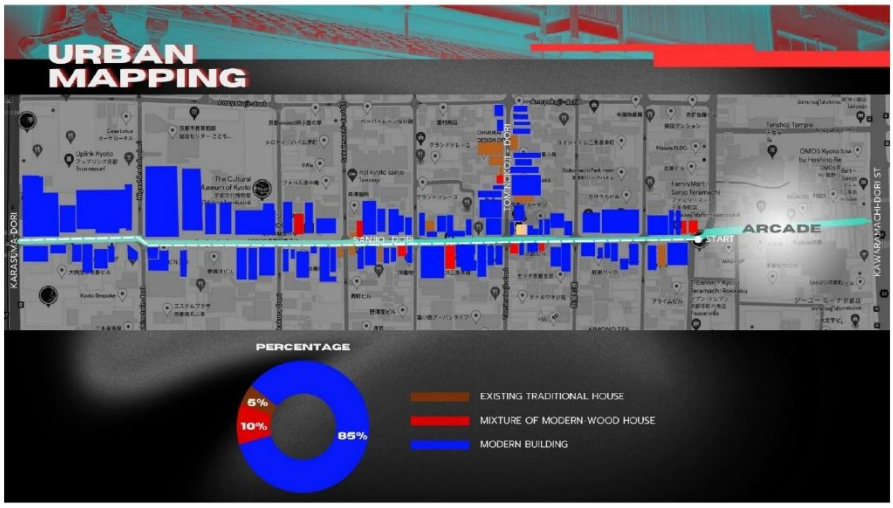

Fig. 7. Data collecting in Sanjo street with color mapping (Brown: Old transitional Machiya, Blue: modern shophouse, Red: Mixture modern – wood shophouse)

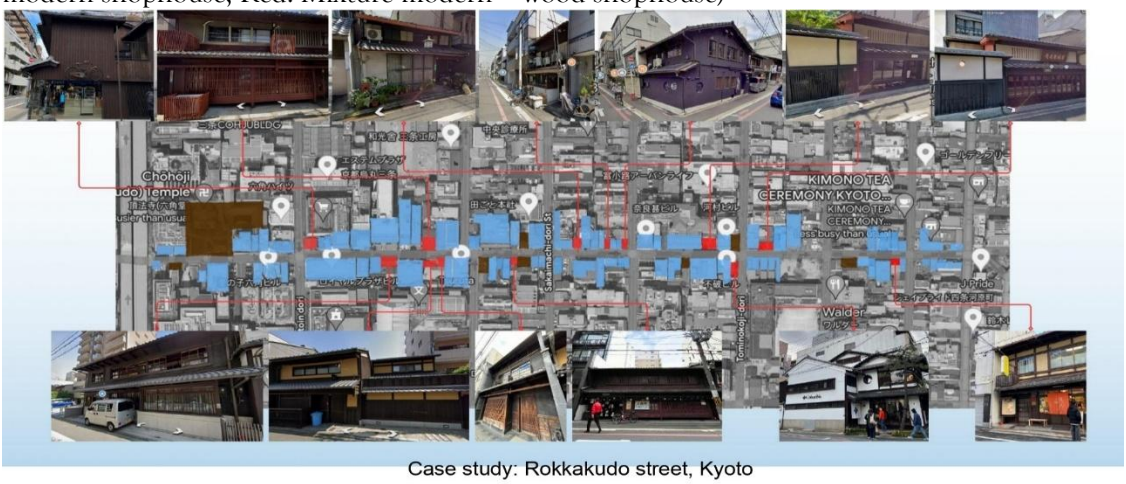

Fig. 8. Data collecting in Rokkakudo street with color mapping (Brown: Old transitional Machiya, Blue: modern shophouse, Red: Mixture modern – wood shophouse)

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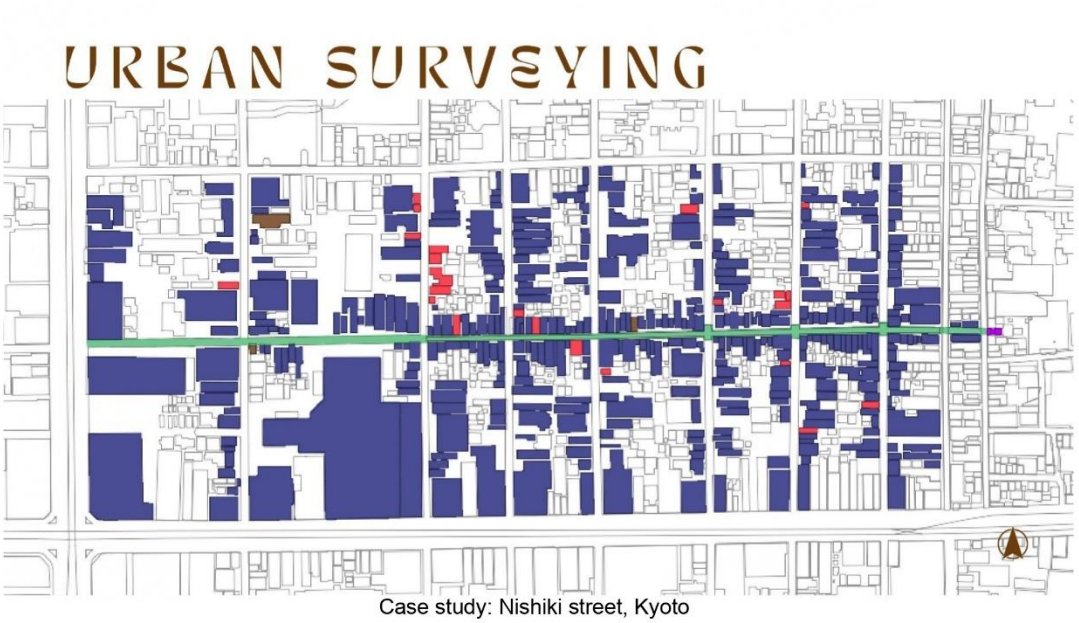

Fig. 9. Data collecting in Nishiki street with color mapping (Brown: Old transitional Machiya, Blue: modern shophouse, Red: Mixture modern – wood shophouse)

This study shows that tradition wooden house (brown) is less in these 4 commercial streets. Surprisingly most of building are commercial and modern material and construction (blue). Researcher really notices that adaptive reuse building, as mixed construction (red) is few number but, they is research target to study and understand how adaptive reuse can be work in commercial area inside the heritage city. (See figure 6, 7, 8 and 9)

4.3On-site surveying - Selective case studies

From onsite surveying, most of Machiya buildings are renovated for commercial purposes. As sustainable community is concerned in terms of networking of people, nowadays commercial area is involved with new residents who live in apartment and business owners who live in the city. As cultural festival is a key to connect and engage community. Gion matsuri is a major event for 33 communities inside Kyoto Old city.

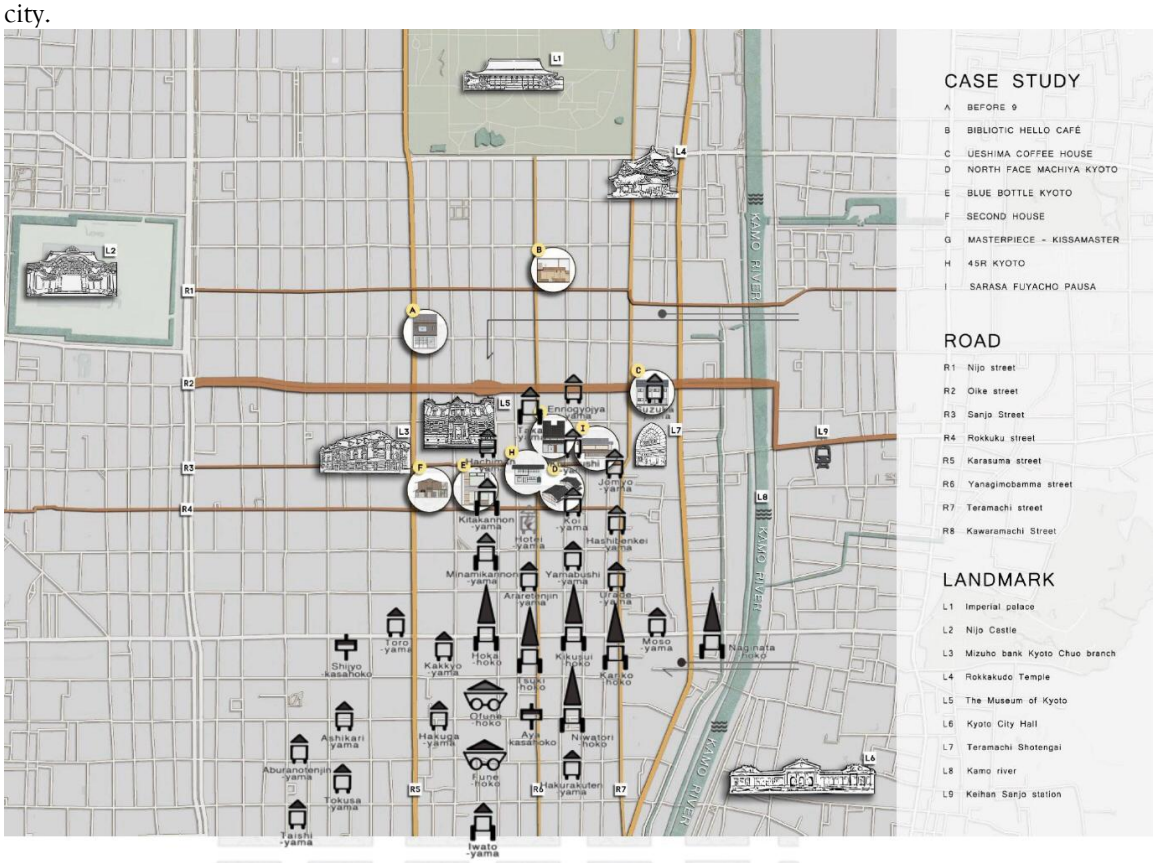

Fig. 10. Nine selected buildings to study on Adaptive reuse

Then, Researcher decides to select 9 buildings with 2 conditions; first, Machiya where is located in 4 selected west-east streets. Second, each Machiya is engaged with different communities following Gion matsuri. (See figure 10)

4.4Data collecting: material and construction

Renovating Machiya presents significant challenges, primarily due to high costs associated with the use of traditional materials and restoration techniques, which are often rare and require specialized artisans. Additionally, strict building regulations in Kyoto—aimed at preserving the city's historic identity—add complexity to renovation projects. These include codes on building height, material use, and structural form, requiring a delicate balance between old and new elements. This study employs material ratio analysis and architectural section drawings as tools to investigate how the integration of traditional and modern elements can enhance the spatial and economic value of reused structures.

Group (A) – These cases are in upper areas above Oike street, where allies in front of Kyoto city hall. They located in narrow old streets; Nijo and Teramachi streets. 3 buildings keep old material and maintain old building sizing and proportions. Inside these renovated Machiya, they keep outline of old building and renovated programming as café and coffee shop. They decorated customer area with old style Machiya but most of material and construction are turned into new materials and steel structures.

Fig. 11. Case studies A – Before 9, B – Café bibliotic Hello! And C – Ueshima coffee

Group (B) – These 3 renovated buildings are located in old locations but most of building structure are changed and attached with steel and concrete structure. 3 buildings choose Machiya elements to decorate and create new façade. Especially function inside these buildings is created for new activities and presented as modern shophouse. Since activity inside the building requires widen space and related to modern furnitures, building plan is more related to modern building. Interesting issue, it is an additional building and elements which are blend with Machiya context but there are no local wisdom involving in core construction.

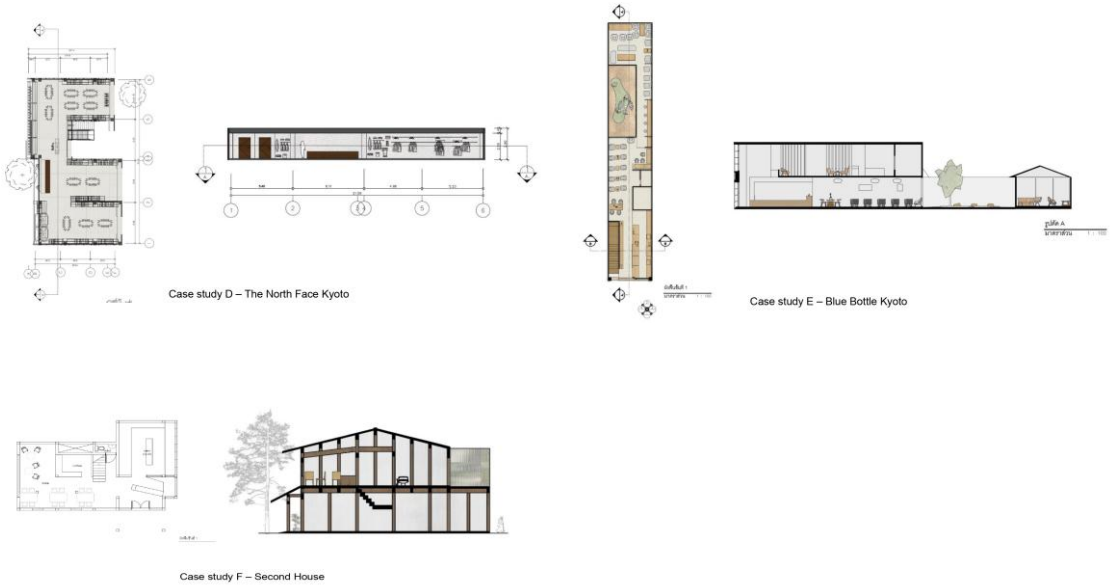

Fig. 12. Case studies D – The north face, E – blue bottle and F – Second house

Group (C) – These 3 cases are located in Sanjo street where is important historical street. The street connects old city with market, bridge and river. Also in the modern period, buildings in this street were developed into early modern style. Old Machiya left with very few numbers. Then 3 buildings need to add more new and commercial function but also keep the character of Old Machiya. Outstandingly these 3 buildings present old style with new technics in terms of material and construction. Most of core structure are mixed between old wood and new steel pillars. Material Furnishing is mostly old materials such as recycled wooden plates, old tatami and also remains old Machiya elements like Engawa (terrace). This adaptive reuse is very good sample for heritage – commercial district.

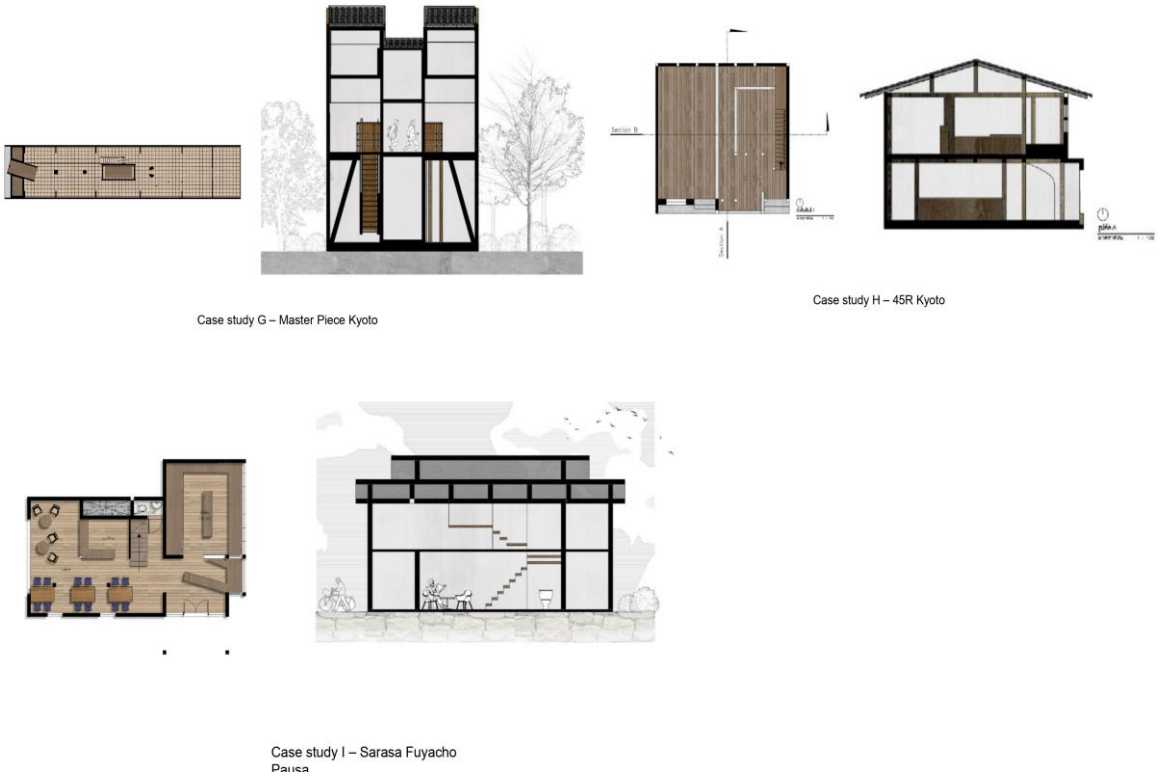

Fig. 13. Case studies G – Master piece, H – 45R and I – Sarasa

5. Conclusion

On a study of Adaptive reuse for Sustainability, Machiya or townhouse in Kyoto, represents the historical and cultural evolution of the city, reflecting centuries-old architectural traditions and patterns of urban development. Despite facing significant challenges to their survival due to modernization, ongoing efforts in preservation and adaptive reuse have enabled these iconic structures to remain integral to Kyoto's urban landscape and cultural heritage.

An architectural-level study of Machiya in Kyoto reveals multiple challenges, arising from rapid economic, social, and urban transformation. In response, the adaptive reuse approach has emerged as a design strategy combining two key concepts:

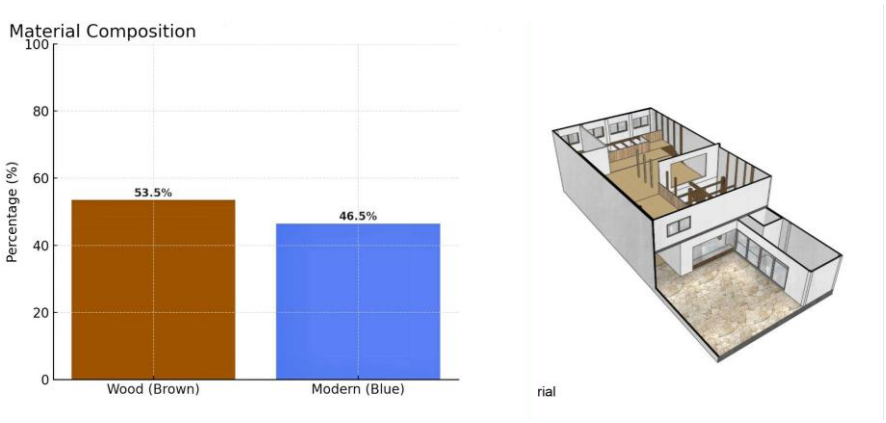

Fig. 14. Analysis of Structure and Material on case studies in 2023

Adaptive reuse for sustainable architectural design

Many old Machiya where remain as residential, are aged and often lack regular maintenance, leading to physical deterioration. Following on our case studies, they are opened as commercial building, they follow heritage city with presenting as physical design with old style decoration but mostly not keep old construction. My study finds out that 9 case studies are renovated with 80% modern construction and only 20% traditional construction. Besides, they oppositional furnish with 53.5% traditional wood and 46.5% modern material. Then this leads to problematic heritage topic which the city just wants to present heritage as image or, represent heritage with local wisdom of old techniques and create living museum where communities and cultures remain into the city. Nowadays both governmental and private sectors have initiated efforts to preserve and restore these buildings as part of a broader attempt to safeguard Kyoto's architectural and cultural legacy. Numerous organizations have contributed to Machiya restoration by supporting their reuse for contemporary functions, such as shops, restaurants, and boutique hotel. But the goal is just to run economically but not profit for social networks. Kyoto city now appears many subcultures where engages network of creative persons such as Coffee culture, Art event & festival and also Cultural tourism.

Adaptive reuse for programing in Heritage – commercial area

Reviving Machiya often entails high financial costs, coupled with the complexities of modern construction codes and safety regulations. As a result, property owners may opt for demolition and new construction rather than restoration. Moreover, contemporary lifestyles have shifted away from traditional housing typologies, as younger generations find Machiya less appealing due to their limited space and outdated amenities. These circumstances have driven a transformation of many Machiya into new functions, particularly within the tourism economy. Numerous buildings have been converted into souvenir shops, tea houses, restaurants, and guesthouses that cater to visitors seeking Kyoto's nostalgic atmosphere. However, such changes sometimes compromise the original architectural features or alter the interior for commercial purposes. This trend has led to a diminished role for Machiya as active components of local communities. With Kyoto's rapid urban development, traditional neighborhoods are disappearing or undergoing significant change, weakening the cultural bonds between residents and their historic dwellings.

Fig. 15. Sample of analysis data in Kyoto workshop 2023

Future Prospect and the Role of Public Engagement

A critical lesson from Kyoto's approach to cultural urban preservation is the importance of accessible public information. The official website of the City of Kyoto offers comprehensive resources on Machiya conservation efforts and available subsidies. Additionally, local initiatives and rehabilitation projects aim to restore and reprogram these traditional townhouses, often in collaboration with national organizations such as the Japan National Tourism Organization (JNTO), which highlights the cultural and historical value of Machiya.

Although the future of Machiya preservation continues to face uncertainties, also support from the public sector and growing interest from heritage advocates suggest that adaptive reuse aligned with tourism and commerce may provide sustainable pathways forward. 4 streets in Kyoto city need to recognize and be promoted as creative heritage area. Creative economy includes cultural and also social entrepreneurship as engaging between old and new business owners. Then the city is not to keep only physical of building but also add more creative business into heritage building to enhance creative community as city networking. Maintaining the relevance of Machiya in modern society hinges on both creative interventions and community involvement. Good sample from this study is to enrich sub culture which includes Coffee - Cafe culture, Art & fashion networks and Gastronomy, enhance them into Machiya. In terms of Architecture issue, there is not only creating old alike façade and interior, but also keep Old wood material and construction into the building. There will present heritage building with old construction and craftsmanship sustainably.

Acknowledgement

The author gratefully acknowledges the generous support and collaboration of Kyoto Tachibana University, Kyoto, Japan, whose institutional resources and academic environment significantly contributed to the advancement of this research. The author also extends sincere appreciation to the Faculty of Architecture, Chiang Mai University, for its continuous academic guidance and scholarly engagement throughout the course of this study. Furthermore, deep gratitude is expressed to the graduate students and research collaborators who actively participated in the field investigations conducted in Japan between 2023 - 2025.

REFERENCES

1. Bullen, P. A., & Love, P. E. D. (2011). Adaptive reuse of buildings: Sustainability, policy and practice. London, UK: Routledge.
2. Goel, S., Wankar, M., & Ashtt, R. (2025). Revitalizing Shahjahanabad: Assessing physical infrastructure challenges and strategies for sustainable urban development. International Journal of Environmental Sciences, 11(4), 1335–1344. https://doi.org/10.64252/5cf4wp36
3. Lewi, H., & Logan, C. (2025). Adapt: Designing new lives for old buildings. Uro Publications.
4. Masato, T. (2015). Community governance in Kyoto: The case of Koiyama neighborhood. Kyoto City Planning Office.
5. Osaka Prefectural Government. (2012). Urban planning and community development in Kyoto. Osaka: Osaka Prefectural Government.
6. Park Associati (Ed.). (2025). Reinventing heritage: A design compass on adaptive reuse. University of Chicago Press / Park Books.
7. Plevoets, B., & Van Cleempoel, K. (2019). Adaptive reuse of the built heritage: Concepts and cases of an emerging discipline. London, UK: Routledge. Powell, K. (1999). Architecture reborn: Converting old buildings for new uses. London, UK: Laurence King Publishing.
8. Suzuki, K. (2016). Historical neighborhoods and cultural heritage in Kyoto. Kyoto: Kyoto University Press
9. United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. United Nations. https://sdgs.un.org/goals/goal11
10. Wong, L. (2025). Adaptive reuse: Extending the lives of buildings (Rev. & expanded ed.). Birkhäuser.