Nakhara: Journal of Environmental Design and Planning (2026)
Volume 25(1), Article 602
DOI: https://doi.org/10.54028/NJ202625602
Article Type: Research Article

From Tradition to Adaptation: Spatial Transformation of Kyoto Machiya

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Received 2025-05-19; Revised 2025-10-16; Accepted 2025-11-07

ABSTRACT

This study investigates the spatial adaptations of everyday Japanese dwellings in Kyoto, known as *machiya*. Employing Hall's proxemics theory, it analyzes five heritage-conscious *machiya* through field surveys and comparative case analyses. The research focuses on the transformation of the earthen floor space, or *tōriniwa*, its relationship with the raised floor space, and the resultant spatial systems in regenerated *machiya*.

Findings reveal that traditional *machiya* are structured by a clear dichotomy between the raised floor/served space and the earthen floor/service space, reinforced by level changes, materials, spatial boundaries, and socio-cultural practices. This is complemented by a subtle spatial gradient from public working to private living quarters, articulated through linear and compartmentalized layouts. Regenerated *machiya*, however, demonstrate strategic adaptations: dissolving this dichotomy by lowering raised floors, expanding either floor zone, minimizing boundaries, and introducing free-flow layouts to facilitate public, guest-centric use without footwear transitions. Crucially, the nature of the program, i.e. public vs. private, proves more decisive for spatial organization than the number of functions, a significant shift from prior research emphases.

The study concludes that the *tōriniwa* endures as the architectural and cultural spine, enabling spatial integration. A layered approach to adaptation is key: heritage-focused interventions preserve the external skin for townscape harmony while actively modifying internal space plans and infill. This demonstrates *machiya* regeneration as a sustainable model of adaptable architecture, where cultural continuity is achieved through the innovative reinterpretation of spatial principles to extend building lifecycles and enhance community resilience.

Keywords: spatial transformation, tradition, *kyōmachiya, adaptation, tōriniwa*

INTRODUCTION

As global resources grow increasingly scarce, adaptable architecture emerges as a crucial strategy within circular construction. Unlike demolition, which incurs substantial environmental, social, and financial costs (Huuhka & Vestergaard, 2020; Pelsmakers et al., 2022; Schneider & Till, 2005), adaptable buildings extend lifecycle value and foster resilience (Paramita et al., 2025). Conversely, insufficient adaptability can undermine long-term residential stability, diminishing socio-demographic diversity and weakening the social networks that underpin community cohesion and wellbeing (Boonprasong, 2022; Femenias & Geromel, 2019; Luoma-Halkola et al., 2019).

In this context, the regeneration of everyday Japanese dwellings, or *machiya saisei,* has gained recognition not only for preserving cultural heritage but also for promoting sustainability by revitalizing declining communities. However, existing research has primarily focused on architectural features and exterior design, while studies on spatial use remain limited (Brumann, 2009). In practice, while the external appearance of regenerated *machiya* is often preserved to maintain townscape harmony, internal spatial configurations have significantly evolved in response to urbanization, modernization, economic shifts, technological progress, and changing household structures (Tamura, 2024).

This study investigates the spatial characteristics and adaptations of regenerated *machiya in Kyoto,* or *kyōmachiya*, focusing on how they accommodate contemporary needs while preserving cultural identity. The central research question is: How are spatial components (i.e., fixed and semi-fixed features) and spatial systems (i.e., served and service, public and private) of *machiya* adapted for new uses? It aims to identify the spatial components and characteristics of traditional *machiya* and analyze their transformation in regenerated examples.

Given its role as the backbone of the everyday Japanese dwellings, the earthen floor space, or *tōriniwa*, a humble, yet rich site where several vital household activities occur (Kawashima, 1986; Nakagawa, 2005; Spoormans, 2018), is emphasized. The study specifically analyzes the *tōriniwa*, its relationship with the raised floor space, and the resultant spatial system. The ultimate goal is to articulate a framework for adaptable design for future sustainable dwellings, informed by the spatial logic of *machiya*.

LITERATURE REVIEW

Spatial Components and Characteristics of machiya

Machiya, translated as “town house,” is a traditional urban dwelling of commoners in Japan. The term *kyōmachiya*, with the prefix *kyō* referring to Kyoto, denotes a regionally specific adaptation of this dwelling type, including distinct layouts and façade details. Similar to *nōka*, a traditional rural commoner dwelling, *machiya* combines working and living functions within a single building typology. A defining characteristic of *machiya* is its narrow and deep land parcel, which is likened to an “eel’s bedchamber,” or *unagi no nedoko*. The street frontage is typically less than six meters wide, while the depth may extend four to five times that distance. This narrow and deep layout incorporates one or more small courtyards and a continuous earthen floor space, or *tōriniwa*, that connects the front to the rear. It is generally acknowledged that longer plots are associated with a greater number of internal courtyards (Spoormans, 2018). The spatial configuration is organized into three zones along the depth of the site: the street-facing commercial space, or *mise*, the central residential space, or *omoya*, and one or more rear storehouses, called *kura* or *dozō* (Brumann, 2009).

The *machiya* layout is characterized by a clear division between the raised wooden floor/served space and the earthen floor/service space, known as *doma* or *tōriniwa* (Spoormans, 2018). In contrast to the compartmentalized rigidity of modern housing, the raised floor spaces in *machiya* exhibit flexibility through movable partitions, allowing rooms to be reconfigured for varied uses. This adaptability supports multifunctionality and a dynamic use of space, which enables transitions between small, intimate areas and larger, more continuous interiors as required. In terms of spatial perception, Kyomachiya Sakujigumi (2019) describes the

raised floor space as open, horizontally oriented, and naturally lit, whereas the *tōriniwa* is characterized as an enclosed, vertically oriented space with dim lighting. This contrast reinforces the functional and atmospheric duality embedded within the *machiya* layout.

Located at the front of the raised floor section, the *mise* is primarily reserved for business and public activities, including shop displays, business talks, engagement with customers, neighbors, and community festivals. *Daidoko* is situated adjacent to the *mise* and serves as a dining area, tearoom, living room, children's bedroom, and entrance hall. Further inward lies *okunoma*, literally "inner room," which functions as a space for entertaining guests and a bedroom for the couple.

The *tōriniwa* is the architectural spine of the *machiya* that stretches from the front to the rear of the house (Spoormans, 2018). It not only connects exterior and interior, providing access to a succession of rooms, but also contains an entrance, kitchen, toilet, and bathing facilities. Above it, an atrium or an open ceiling space called the *hibukuro* facilitates daylight entry and air circulation (Hanaoka, 2019). The *tōriniwa* is predominantly located on the southern and eastern sides of the building. Since the degree of privacy increases as one moves further along the *tōriniwa*, a few territorial boundaries implicitly indicate different degrees of privacy. For instance, the *yome-kakushi*, or "bride-hiding partition," located in front of the kitchen, serves as a symbolic boundary discouraging non-household members from entering uninvited. Another threshold, the *naka-do, or* inner door, marks the transition from the public *miseniwa* to the private living area, known as *hashiri* (Kyomachiya Sakujigumi, 2019). Although typically two-story, the upper floor of a *machiya* was not designed for daily use but served instead as storage and sleeping quarters for servants (Ueda, 1998). In larger *machiya*, staircases, usually enclosed in alcoves, may be accessed from multiple rooms (Figure 1).

The unified and homogeneous appearance of *machiya* townscapes can be attributed to both regulatory and social forces. During the Tokugawa period, legal restrictions prohibited commoners from constructing ostentatious buildings. This legal framework, combined with merchant-class values emphasizing discretion and propriety, fostered an ethos of architectural modesty (Kyomachiya Sakujigumi, 2019; machiya expert, personal communication, June 8, 2024). Despite their formal regularity, the interior spaces of *machiya* reveal diverse adaptations to evolving external and internal demands.

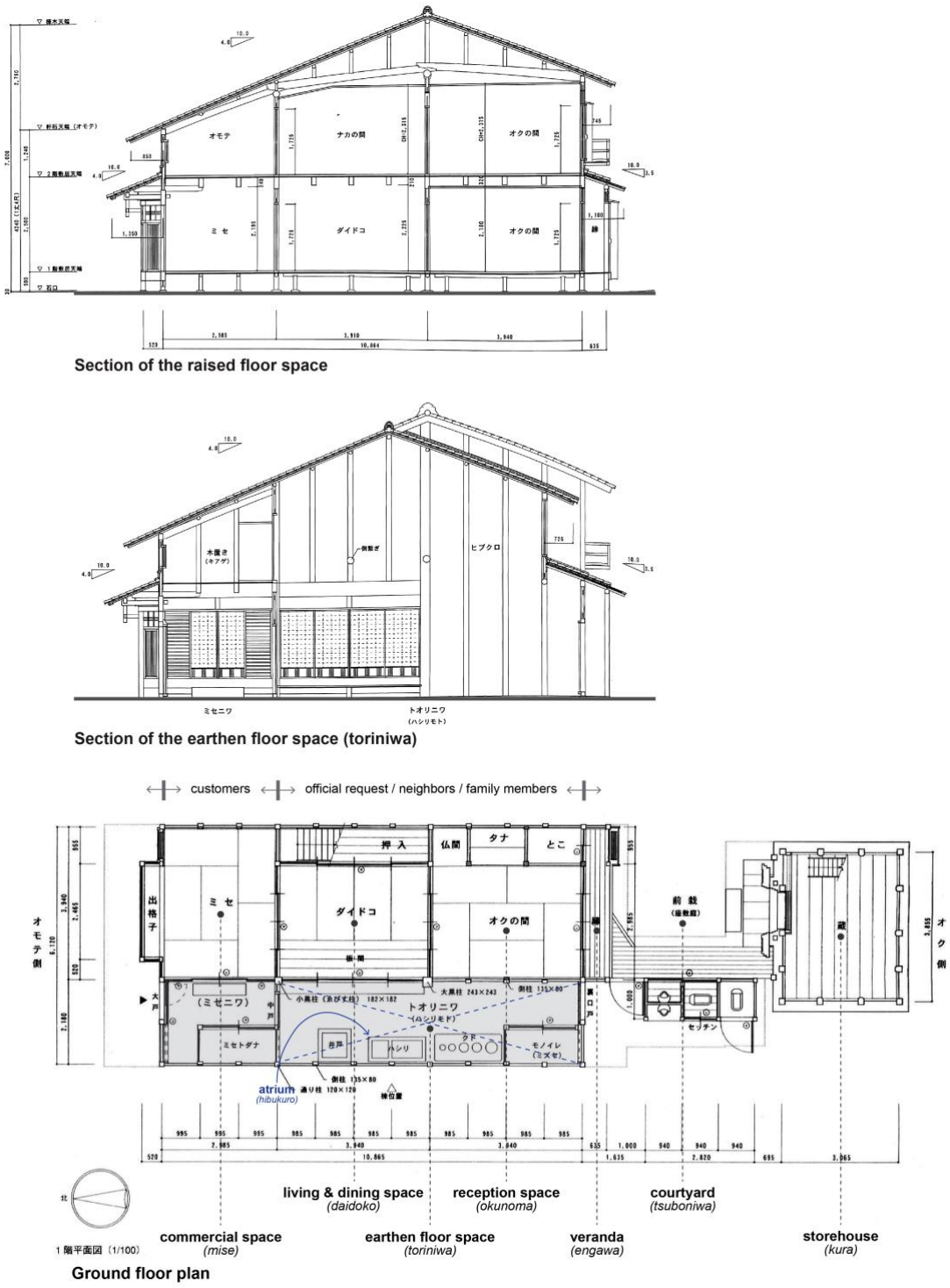
Evolution of machiya

The architectural typology of *machiya* in Kyoto originated during the Heian period (794–1185) and was further developed in the Edo period (1603–1867). However, a significant portion of extant *machiya* structures date to the Meiji era (1868–1912), following the catastrophic Great Fire of 1864, which caused significant damage throughout the urban area (Löfgren, 2003; Spoormans, 2018). Aside from the widespread introduction of second-storied additions, changes to the external appearance of *machiya* were relatively limited up until the Meiji period. The traditional townscape of Kyoto remained dominated by wooden *machiya* (Figure 2). Nonetheless, structural innovations marked a shift in construction practices in the Taishō period (1912–1926). Foundations transitioned from traditional earth-based platforms to more durable materials such as brick and concrete. Key architectural elements were modernized; paper sliding panels, or *shōji*, were replaced by glass *shōji, or azuma shōji* (Kyomachiya Sakujigumi, 2019).

Although a large portion of Kyoto's historic layout, timber architecture, and urban fabric remained intact during the World War II, *machiya* entered a period of decline in the postwar era. The enactment of the Building Standards Act in 1955 introduced stringent regulations targeting flammable structures, which effectively halted the construction of traditional wooden buildings. Coupled with shifting modern expectations, such as the desire for enhanced lighting, heating, air conditioning, acoustic privacy, and sanitary facilities, *machiya* were increasingly considered unsuited to contemporary living. Other factors contributing to the decline of *machiya* included high maintenance costs, the shift to nuclear family, the dissolution of the patriarchal

Figure 1

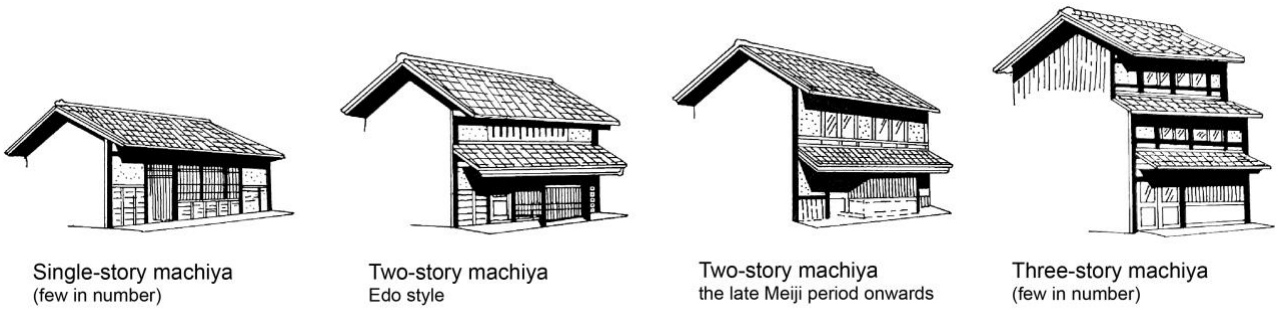
Typical Machiya Layout and Sections



Note. Adapted from Machiya saisei no waza to chie [Technique and wisdom for regenerating townhouses] (pp. 20, 136, 138), by Kyomachiya Sakujigumi, 2019, Gakugei Publishing. Copyright 2002 by Kyomachiya Sakujigumi, and Adapting traditional machiya to a contemporary lifestyle. In M.-T. van Thoor, & S. Stroux (Eds.), *Heritage, history and design between East and West: a close-up on Kyoto's urban fabric* (p. 86), 2018, by L. Spoormans, Delft University of Technology (https://pure.tudelft.nl/ws/portalfiles/portal/51446993/Chapter_Kyoto_book_TUD_2018_3.pdf). Copyright 2018 by TU Delft)

Figure 2

Evolution of Machiya



Note. Adapted from Machiya saisei no waza to chie [Technique and wisdom for regenerating townhouses] (p. 9), by Kyomachiya Sakujigumi, 2019, Gakugei Publishing. Copyright 2002 Kyomachiya Sakujigumi.

household system, and a new tax system that diminished the sense of inheritance and introduced a new type of ownership of leased dwellings (Brumann, 2009; Kyomachiya Sakujigumi, 2019).

Beginning in the late 1950s, Kyoto's pursuit of modernization led to the dismantling of its traditional townscape. Buildings were demolished or altered to accommodate Western-style appearances and amenities. Renovations often involved overlaying earthen floors with concrete slabs to install modern kitchens and plumbing systems. By the 1980s, the widespread replacement of *machiya* with high-rise apartments, prefabricated homes, and parking lots became common (Brumann, 2009; Kyomachiya Sakujigumi, 2019). The economic bubble of the 1990s accelerated demolition trends, as rising land values and speculative real estate development led to the destruction of several *machiya*.

In response to this rapid loss, the Kyōmachiya Revitalization Study Group was established in 1992 by concerned citizens aiming to preserve Kyoto's everyday heritage. This grassroots initiative led to a *machiya* survey in 1999, followed by the launch of the Kyoto Machiya Revitalization Plan in 2001. By the late 1990s and early 2000s, growing public interest and private investment triggered what became known as a "*machiya boom*." (Kyomachiya Sakujigumi, 2019). Several *machiya* were adaptively reused for commercial purposes, including cafés, galleries, shops, and restaurants, as well as for community-based and social functions.

Nevertheless, decisions regarding the preservation or replacement of *machiya* remain influenced by multiple factors, such as earthquake resistance, fire safety, proximity to high-rise developments, the financial burden of maintenance and renovation, and inheritance tax liabilities (Spoormans, 2018). In addition, several organizations, including Kyōmachiya Architects, Friends of Kyōmachiya, and Kyōmachiya Real Estate, have fostered networks for inhabitants to preserve and pass on their dwellings to future generations. Since 2010, the Kyōmachiya Revitalization Project has coordinated conservation campaigns and public events to re-establish *machiya* as vital community assets.

Recent estimates suggest that there are between 25,000 and 28,000 *machiya* in central Kyoto and approximately 48,000 in the greater metropolitan area. Despite these numbers, *machiya* continue to disappear at an annual rate of approximately 1.6% (Brumann, 2009; World Monument Fund, n.d.). This figure highlights the urgency for continued preservation efforts amid increasing developmental pressures.

Adaptive Reuse of Everyday Japanese Heritage

In the global context, the conservation discourse has gradually shifted from material-based strategies towards value-based frameworks, emphasizing a living heritage approach. This perspective redefines conservation not as static preservation, but as a dynamic process grounded

in continuity, in which communities and built environments are understood as inseparable entities (Poulios, 2014). As Orbasli (2000) argues, conservation encompasses not only the physical attributes of buildings and urban fabric, but also their spatial configurations and social dimensions. Given the evolving nature of urban heritage, new values may emerge and new traditions may be formed through everyday use. In this context, change is not perceived as detrimental but as part of the process that creates heritage (Jhearmaneechotechai, 2022; Khalaf, 2016;).

In Japan, there are various types of heritage with a wide range of historical and cultural significance. As of June 2023, the Agency for Cultural Affairs lists 2,557 nationally designated Important Cultural Properties, encompassing 5,373 built structures. Prefectural and municipal entities have designated approximately 12,000 Tangible Cultural Properties within their jurisdictions (Statistics Bureau, Ministry of Internal Affairs and Communications, 2024). That timber construction constitutes approximately 90% of these heritage structures (Tienthavorn, 2024) underscores the significance of wood and its implications for adaptive reuse practices.

Adaptability refers to a building's capacity to effectively respond to the evolving demands of its context, thus maximizing value throughout its life (Dhanakoses et al., 2023; Schmidt III et al., 2010). The theoretical basis for adaptability is rooted in the concept of building layers (Schmidt III & Austin, 2016). Duffy (1990) and Brand (1995) proposed that each layer possesses a different lifespan and therefore should be constructed distinctly; without this separation, adaptation may become more technically and economically unviable. Another study by Black et al. (2019) classified Ross et al. (2016) design-based enablers into four categories, including long life, loose fit, layer separation, and reduced uncertainty. Within this framework, it is noteworthy that the studies shared the notion of "layer separation" as a key factor enabling adaptability.

This concept parallels Habraken's Open Building theory (Nascimento, 2012), which distinguishes between "support," or long-life structural elements, and "infill," or shorter-life interior elements. Saarimaa and Pelsmakers (2020) further aligned this distinction with Brand's "shearing layers of change," mapping support to the structure, skin, and service layers, and infill to the space plan and furniture. Therefore, it can be inferred in proxemics terms (Hall, 1969) that "support" acts as a fixed-feature space, while "infill" functions as a semi-fixed feature space, with each differently contributing to adaptive potential.

While research on the internal spatial adaptations of *machiya* remains limited, several key studies offer valuable insights. Mizuta and Kanemoto (2021) examined the evolving spatial relationships among the *mise*, *tōriniwa*, and street façade in relation to socio-economic shifts during the seventeenth century, focusing on changes in architectural fittings. In early to mid-seventeenth century *machiya*, the *mise* was a closed unit, separated from the street by double low-height fittings and from the *tōriniwa* by fixed *tsukidome-mizo* fittings and differentiated ceiling heights. By the late seventeenth century, it had transformed into an open, accessible space through the adoption of single fittings with high raised lintels at the street front and moveable *hikichigai-mizo* fittings connecting to the *tōriniwa*, thus facilitating integration between the two zones.

Focusing on commercially-oriented adaptive reuse of Kyoto *machiya*, Intaraksa and Ongsavangchai (2022) analyzed the interplay between interior spatial organization, product display, and contextual integration. Their study identified three predominant spatial layouts in regenerated *machiya*: straight, free-flow, and loop layouts. Each layout type is linked to access patterns and the strategic placement of window displays and payment counters. The research highlighted the juxtaposition of old and new: The imperfections and patina of original materials coexist with modern spatial clarity and orderliness.

Spoormans (2018) explored adaptive reuse strategies, emphasizing the circulation system, particularly the *tōriniwa* and staircases. The study suggested spatial adaptations (e.g., modifying the *tōriniwa*, repurposing the *kura*, and installing new stairs) as a means to enhance the connectivity and functionality of regenerated *machiya*. However, it also noted that the number of functional requirements plays a key role in determining the spatial arrangement of regenerated *machiya* and that

compartmentalization is crucial in mixed programs, which warrants further investigation.

METHODOLOGY

The study employed qualitative research to investigate the spatial adaptability of *machiya*. Three data collection methods were utilized: a literature review on the spatial components and characteristics of *machiya*, their evolution, and adaptive reuse of everyday Japanese heritage; field surveys; and comparative analyses of case studies. Purposive sampling was adopted, with five *machiya* selected based on their cultural inheritance and recognition (e.g., as Important Cultural Property, an Important Building, or a Historical Scenic Building) as well as their relevance to local communities, e.g., the Gion Festival. As Brumann (2009) emphasizes, the sustainable continuity of *machiya* relies on original measures, which may involve their physical structure, uses, or both, to make their continued existence viable and meaningful. Therefore, the case studies were divided into three categories—old tradition, tradition in transition, and new tradition—representing diverse degrees of spatial and functional adaptations.

Old tradition represents cases that preserve the original layout and use of a traditional *machiya*. Tradition in transition refers to cases with slight modifications in spatial organization and function that nevertheless maintain the integrated public working and private living purposes of the past. New tradition, on the other hand, constitutes cases undergoing substantial modifications in space and usage to serve solely for public functions.

Socio-cultural context fundamentally structures spatial practices (Wongphyat, 2019). The study applied Hall's proxemics, particularly the fixed feature components (i.e., solid walls and built-in furniture) and the semi-fixed feature components (i.e., paper and glass *shoji*) as a theoretical framework for the spatial analysis of the case studies. Given the central role of the *tōriniwa* in *machiya* spatial organization, the research began with the analysis of the *tōriniwa* and its relationship to the raised floor space. Accordingly, the research examined the transformation of the overall spatial system of the *machiya*, with particular attention to the ground floor layout.

RESULTS

The five case studies are located in the Shimogyo, Nakagyo, and Higashiyama wards of Kyoto, which are recognized for their well-preserved wooden *machiya* heritage (Figure 3). Constructed between the early nineteenth and early twentieth centuries, these cases are categorized into three typologies: old tradition, tradition in transition, and new tradition.

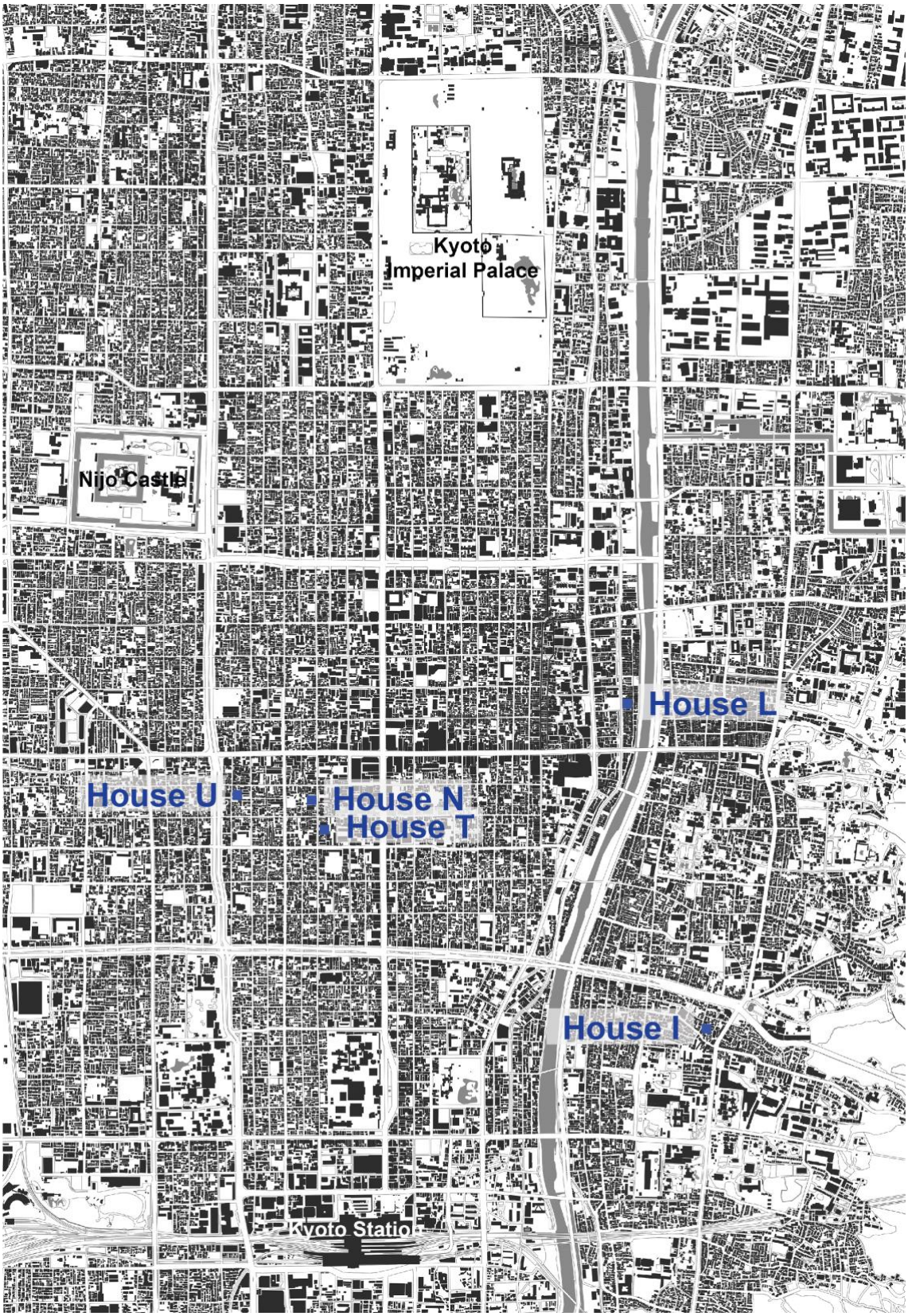
House N exemplifies old tradition, maintaining the original layout and function of a traditional *machiya*. House U depicts tradition in transition, displaying slight spatial and functional modifications. Serving for public uses with no living functions, House I, House L, and House T reflect new tradition where substantial transformations in space and usage have occurred. An overview of these case studies is outlined below (Table 1).

Old Tradition

House N is a kimono wholesaler-turned-museum of living history. It consists of two buildings: the northern building, built in 1822 and rebuilt in 1868, and the southern building, constructed in 1906, with a dressing room and toilets added in 1915. Registered as an Important Cultural Property of Kyoto in 2005, it received the Good Design Award and the Kyoto Landscape Award in 2019. During the Gion Festival, a large boat-shaped *Yamahoko* float, called *Fune Hoko*, is displayed at the front of the house, anchoring its role as a communal site.

Figure 3

Location of the Case Studies



Note. Adapted from Kyoto figure-ground diagram & city map, by OpenStreetMap, 2025 (https://www.figuregrounds.com). Copyright 2025 by FIGUREGROUNDS.com

Table 1

Overview of the case studies

Categories	Case studies	Construction year	Site area	Ground floor area (main building)	Original function	Current function	Function of machiya		Configuration of tōriniwa				Function of tōriniwa			Boundary between tōriniwa & raised floor area		Height of raised floor area			Spatial behavior	
							Public / working	Private / living	Original configuration	Expanded slightly towards the raised floor area	Expanded throughout the ground floor area	Reconfigured & relocated	Circulation space	Utility	Functional space	Fixed feature components	Semi-fixed feature components	Original height	Lowered height	None	Footwear removal required	Footwear removal not required
Old Tradition	**House N** Funebokocho, Shimogyo Ward	1822 (north) 1906 (south)	340 sq m	120 sq m (south)	Kimono wholesaler	Museum of living history	O	O	O				O	O		O	O	O			O	
Tradition in Transition	**House U** Yohojicho, Shimogyo Ward	1897	130 sq m	60 sq m	Carpenter studio and stationery wholesaler	Guesthouse with a tea ceremony space	O	O	O				O	O		O	O	O			O	
New Tradition	**House I** Kaneicho, Higashiyama Ward	Early 19th century	130 sq m	85 sq m	Ceramic studio	Family-operated café	O			O			O		O	O			O			O
	House L Shimokorikicho, Nakagyo Ward	1879	135 sq m	70 sq m	Sake brewery	Fragrance store, atelier, and café	O				O		O		O	O				O		O
	House T Iwatoyacho, Shimogyo Ward	1932	410 sq m	215 sq m	Kimono wholesaler	Art gallery and café	O					O	O	O	O		O	O				O

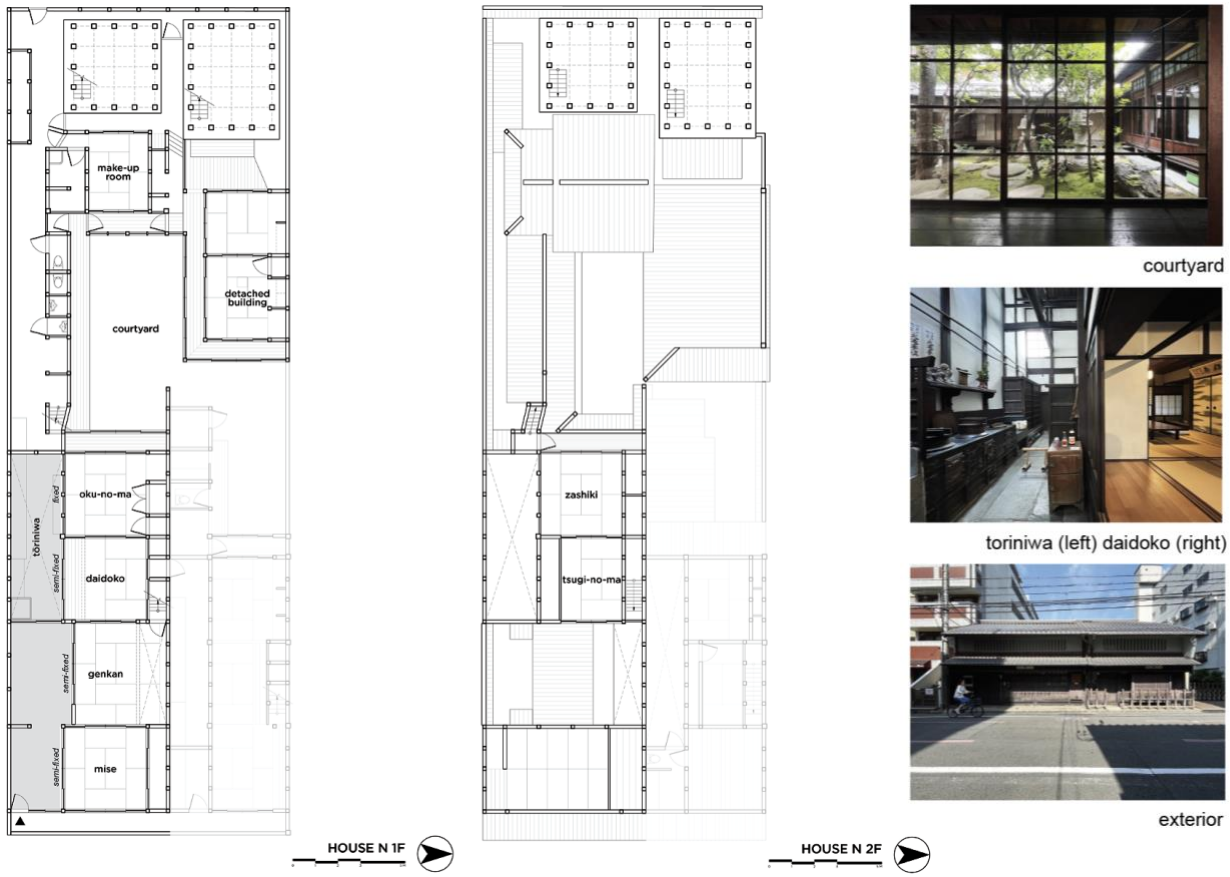
The *tōriniwa* of House N is long and narrow, distinctly demarcated from the *tatami*-matted raised floor quarter not only by different floor levels and materials, but also by semi-fixed fittings and fixed partitions installed along its periphery. Sequential layers of thresholds along the *tōriniwa*, i.e., wooden lattice doors, inner doors with fabric curtains, and wooden sliding doors, structure a graduated spatial transition from the entrance to the rear of the house. The perimeter of the *mise*, *genkan*, and *daidoko* is defined by moveable partitions, i.e., glass and paper *shōji*; however, the perimeter of the *oku-no-ma* is enclosed by a fixed solid wall. In addition, while the area opposite to the *mise* and the *genkan* has no fixtures, the area facing the *daidoko* and the *oku-no-ma* contains a well, kitchen fixtures, and a *hibukuro* that introduces natural light. As is typical in traditional *machiya*, the staircases in House N are discreetly integrated into the design: one is concealed behind the *daidoko*, and another is located at the far end of the *tōriniwa*, offering independent access to the upper floor (Figure 4).

Tradition in Transition

House U is a carpenter studio and stationery wholesaler-turned-guesthouse with a tea ceremony space for culturally engaged individuals. Constructed in 1897, it was renovated in 2003 by the owners and collaborators, including designers and students affiliated with *Sakujigumi*, a local craftsperson network offering practical training. The house was designated an Important Building by Kyoto City in 2008 and continues to function as a node for the community of *machiya* enthusiasts.

Figure 4

Plan and Images of House N

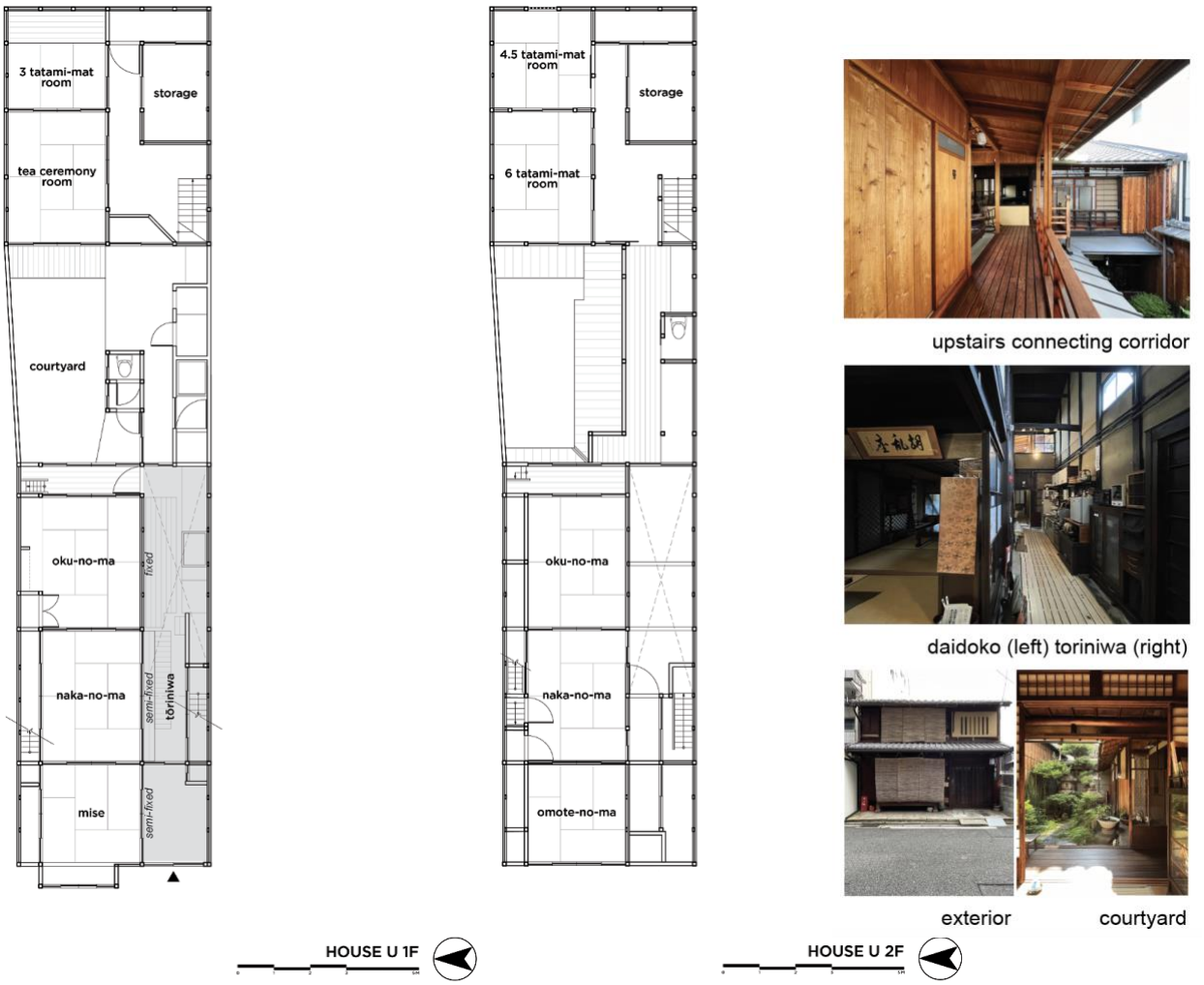


Similar to House N, its elongated *tōriniwa* is divided from the *tatami*-matted raised floor quarter by different floor levels and materials as well as moveable and fixed panels installed along its boundary. From the entrance to the end of *tōriniwa*, it is partitioned by wooden lattice doors, fabric curtains, and glass sliding doors. The perimeter of the *mise* and *daidoko* is defined by moveable partitions, while the perimeter of the *oku-no-ma* is enclosed by a fixed solid wall. Besides an existing well, the area facing the *oku-no-ma* is equipped with kitchen hardware and utilities. A *hibukuro* at the rear section brings natural light into the interior. Since most functions are distributed in a floor-oriented manner, unfixed wooden panels are laid over the earthen *tōriniwa* to facilitate movement between the raised floor quarter and the rear section of the building without necessitating shoe removal.

Focusing on pragmatic change in circulation, modifications of House U included the installation of a new staircase within an enclosed cabinet of the main building to ensure access to the front room on the upper floor, the construction of an upstairs connecting corridor between the main and the rear buildings, the reorientation of a rear open stairway to optimize spatial efficiency, and the construction of new toilet and bath facilities between these buildings. Therefore, it is evident that while the ground floor space of the main building observed minor modifications, concentrating on the semi-fixed feature components, its upper floor space and the rear building underwent noticeable transformations, emphasizing the fixed feature components (Figure 5).

Figure 5

Plan and Images of House U



New Tradition

Built approximately two hundred years ago, House I, originally a ceramic studio, was converted into a family-operated café, serving as a local social space since 2015. Instead of emphasizing on the old tradition, this inherited *machiya* constitutes a fusion of the old and the new.

In contrast to House N and House U, its *tōriniwa* is irregular in shape and expands toward the wooden raised floor quarter where its level is lowered approximately 1/3 – 1/2 of the height of the traditional *machiya*. At the rear section, fixed partitions and furnishings are built along the boundary between the *tōriniwa* and the raised floor area to serve as the café kitchen. Along the *tōriniwa*, there are neither partitions nor fixtures except for an existing well. Tables and chairs are positioned across the raised floor area and the *tōriniwa*, which help facilitate use of both zones. Daylight enters through windows installed within a *hibukuro* located adjacent to the kitchen. In contrast to other cases, no stairs are present in the main building (Figure 6).

House L is a sake brewery-turned-fragrance store, atelier, and café. Constructed in 1879, it was designated a Historical Scenic Building by Kyoto City and its renovation was completed by Schemata Architects in 2024. It is located opposite to Takase river and Rissei Hiroba square, which is a model of urban reuse serving as a multi-generational hub and a center for cultural celebration.

Compared to House I, it further redefines the ground floor by extending the *tōriniwa* throughout the main building. Additionally, its interior reflects a blend of Japanese and Western cultures. A few fixed partitions define fragrance store-related areas, i.e. retail space and staff room. Apart from remnants of a well and a kitchen counter, maintained as display features, semi-fixed spatial enclosures and fittings have been removed. The enlarged *hibukuro* spans approximately two-thirds of the depth of the main building, which results in an amply lit interior space. Contrary to the sequential ordering typical of traditional *machiya*, the expansion of the *tōriniwa*, the minimum use of spatial boundary, and the incorporation of an open stairway at the center of the main building account for a free-flow layout without a footwear transition (Figure 7).

Figure 6

Plan and Images of House I

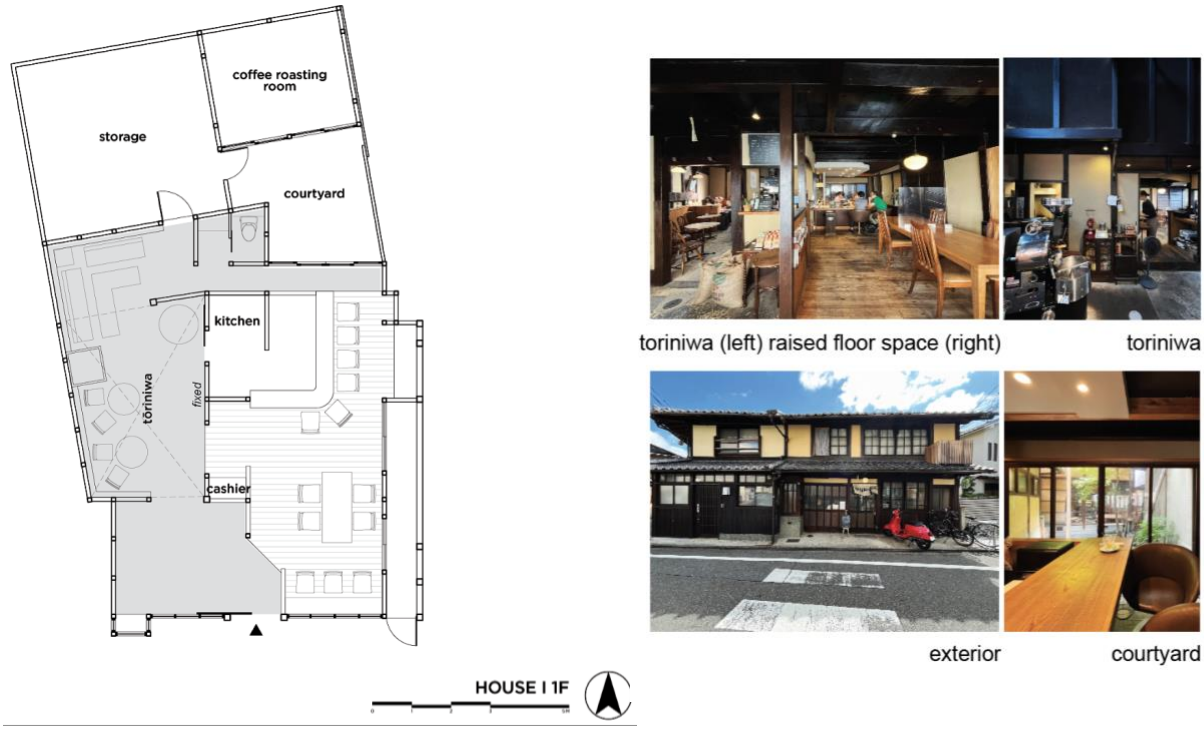


Figure 7

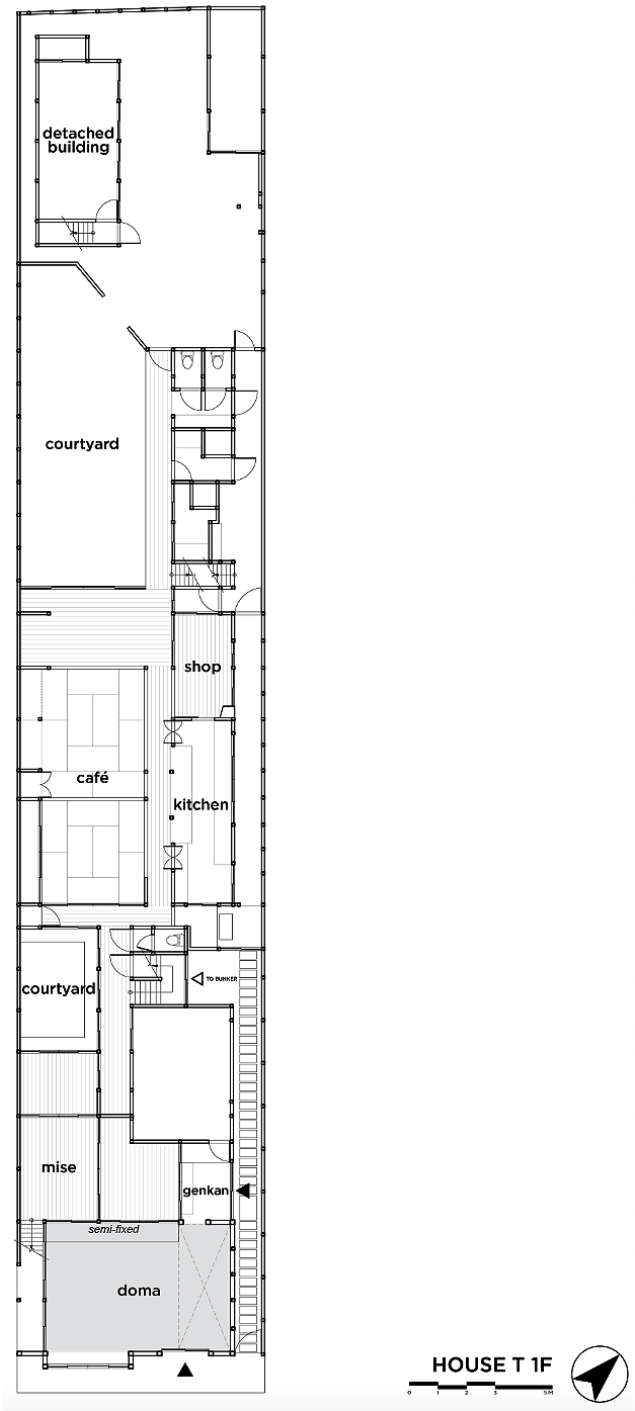
Plan and Images of House L

House T is a kimono wholesaler-turned-art gallery and café. Built in 1932, it was restored in 2013 and reopened in 2014. Nowadays, during the Gion Festival, a large-sized *Yamahoko* float, called *Iwato Yama*, is situated at its front, functioning as a hub for both local residents and art-enthusiasts. In its design, House T demonstrates substantial degrees of modifications. It has two accesses: one from the main street through an earthen floor space that spans the entire width of the building and the other from a narrow alley through the *genkan*, a designated area where guests remove their shoes.

Except for the *genkan* and the kitchen, the former *tōriniwa* is entirely covered with wooden flooring to optimize usable spaces, including a shop display, a toilet, and a stairway. Unlike other cases, the *hibukuro* is located at the front bay of the building. A wooden corridor that runs between the *tatami*-matted café and the former earthen floor space serves as the main circulation from the *genkan* to the rear garden. A connection to the tatami-matted café is preserved by keeping its semi-fixed fittings, e.g., glass and paper *shōji*, open. By contrast, the corridor is segregated from the kitchen by a difference in floor level, materiality, and the presence of fixed partitions and furnishings. In contrast to other cases, the stairways are perpendicularly constructed to the periphery wall. While the majority of space is floor-oriented, it is noteworthy that the incorporation of a *genkan* and the corridor-centered layout as well as the orientation of the stairways resemble circulation systems in modern dwellings (Figure 8).

Figure 8

Plan and Images of House T



courtyard

corridor (left) cafe (right)

doma

exterior

FINDINGS

From Tradition to Adaptation

Traditional *machiya*

The spatial enclosures, fixtures, and fittings of the traditional *machiya*, or the old tradition, as shown in House N, suggest not only a clear division between the raised floor/served space and the earthen floor/service space, but also a subtle division between the public working area and the private living area. While its spatial system of is linear and sequential, the straight layout of the *tōriniwa* allows access to each area in the raised floor quarter uninterrupted. As Kyomachiya Sakujigumi (2019) acknowledges the raised-floor quarter of the traditional *machiya* presents an open, light, and horizontally oriented space, in direct contrast to the *tōriniwa*, which is enclosed and vertically scaled.

Regenerated *machiya*

Regenerated *machiya* includes two categories of the case studies. Tradition in transition demonstrates a strong continuity with the traditional *machiya* in both programmatic use and spatial organization. This is evident in House U, which retains a program of private living quarters for the owner and guests alongside a tea ceremony space for a culturally engaged public. Its spatial system remains largely unchanged, maintaining a compartmentalized layout with a sequential order of access. Among the limited number of modifications to the main building is the introduction of semi-fixed components, specifically, movable wooden flooring placed atop the earthen *tōriniwa*. This intervention facilitates movement between the raised-floor areas and other parts of the house without requiring a footwear transition.

Conversely, new tradition exhibits more diverse transformations in both use and spatial configuration. Within this type, regenerated *machiya* primarily accommodate public programs, ranging from single-use, as demonstrated in House I, to mixed-use, as seen in Houses L and T. It is noteworthy that modifications occur at the level of both semi-fixed and fixed architectural features. In all cases studied, semi-fixed components, such as paper and glass *shōji*, are either removed or maintained in a permanently open state. Furthermore, a central corridor is adopted when a floor-oriented approach is employed, as illustrated by House T. Other significant spatial modifications include the reconfiguration and the relocation of the *tōriniwa* together with the reduction in the height of the raised floor. These alterations are directly correlated with the adoption of chair-seated layouts, as shown in House I, and the creation of flexible, unfurnished space, as shown in House L.

Spatial Adaptations of the *Tōriniwa* and its Relationship with the Raised Floor Space

Floor-oriented approach

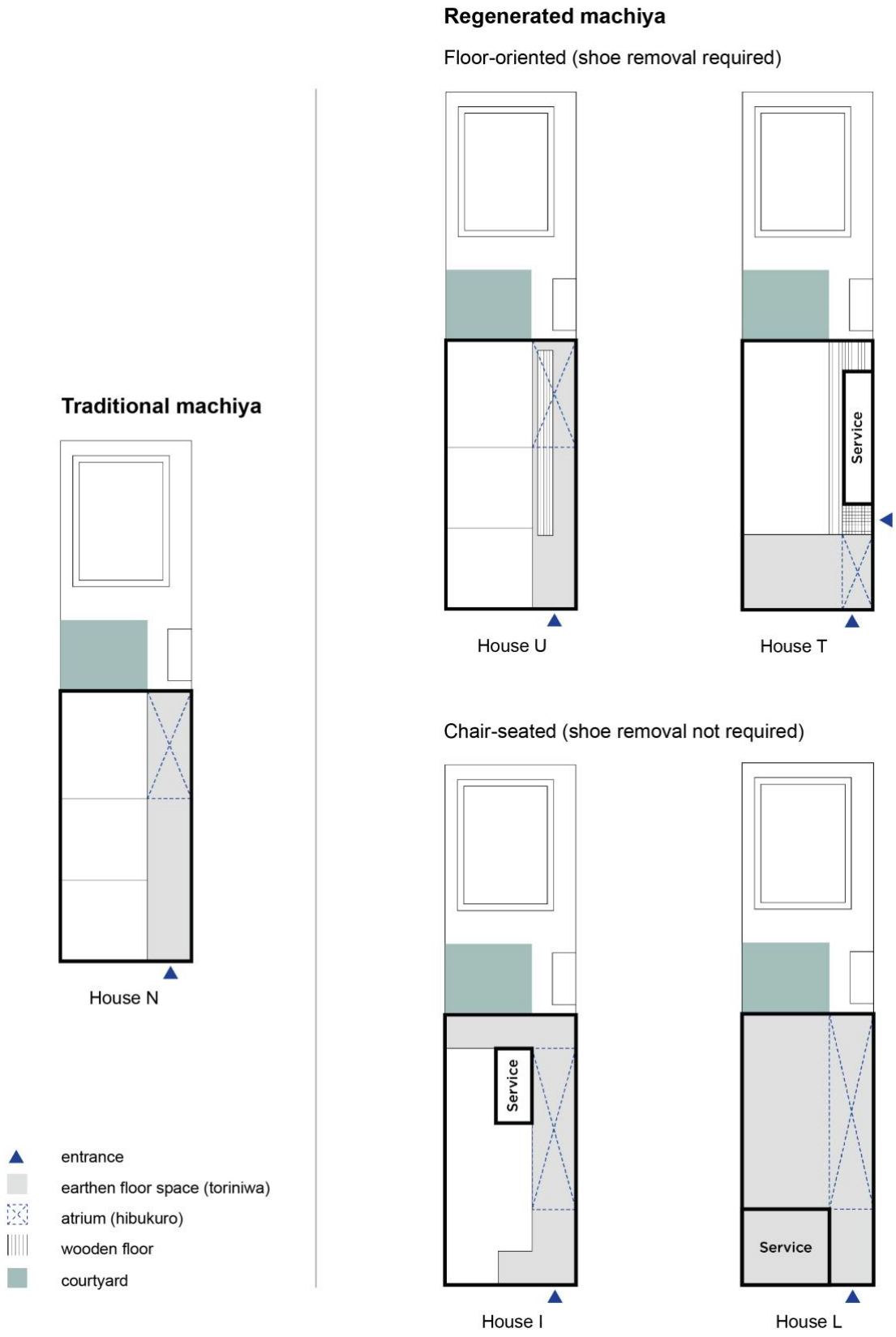
Spatial modifications to the *tōriniwa* and its relationship with the raised floor space reflect evolving patterns of spatial use and behavior. In cases where a floor-oriented approach is prioritized, varying degrees of adaptations were observed to accommodate guest movement without requiring shoe removal. These range from the superimposition of semi-fixed wooden flooring atop the earthen floor of *tōriniwa* in House U, to the complete replacement of the *tōriniwa* with a fixed wooden corridor adjoining the *tatami*-matted space in House T.

Chair-seated approach

Cases exemplifying chair-seated configurations without a footwear transition adopt different spatial strategies. In House I, the raised floor height is reduced, while in House L, the tōriniwa expands across the entire ground space, thus eliminating the need for spatial separation. This analysis reveals a correlation: increased programmatic diversity corresponds to a diminished reliance on, or the complete elimination of, the traditional raised floor (Figure 9).

Figure 9

Spatial Adaptations of the Tōriniwa and its Relationship With Spatial Behavior



Evolving Spatial Systems of *Machiya*

Traditional *machiya*

Traditional *machiya* are structured by a clear dichotomy between the raised floor, which functions as the served space, and the earthen floor, which functions as the service space. This distinction is articulated through differences in floor level and materiality as well as fixed and semi-fixed spatial boundaries. Social practices such as shoe removal reinforce this spatial distinction. Additionally, a subtle gradient exists from public workspaces at the front to private living spaces at the rear, organized through linear and compartmentalized layouts.

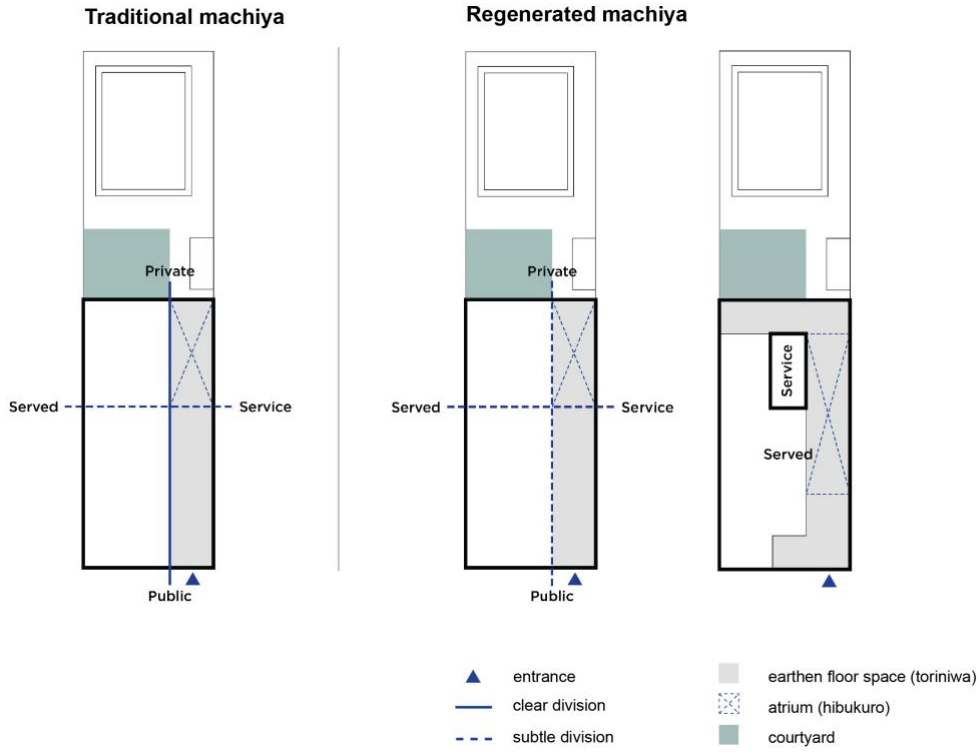
Regenerated *machiya*

Contemporary adaptations, prompted by shifts from living and working to commercial uses, demonstrate a rearticulation of these spatial systems. These include a subtle division between the raised floor space and the earthen floor space through a lowered raised floor level, an expanded area of either raised floor or earthen floor space, and a minimized use of spatial boundaries to facilitate public access without requiring transitional behavior, such as removing shoes. In addition, the regenerated *machiya* have observed a distinct division between confined service space or space for shopkeepers or staffs, defined by fixed partitions and furniture, and interconnected spaces for customers through the adoption of free-flow layouts, which reflects the shift from family-centric to guest-centric spatial planning (Figure 10).

In spite of these transformations, *machiya* emphasizing cultural heritage and community engagement retain key features, including preservation of external design to ensure townscape harmony in adherence to the Kyoto landscape policy, presence of traditional materials as cultural signifiers, and optimization of usable space to enhance their spatial flexibility. Despite alterations in configuration and position, the *tōriniwa* persists as a central spatial device, mediating between exterior and interior, integrating natural elements, and bridging formerly discrete interior zones. In this capacity, its continuity signals the architectural and cultural continuity of the *machiya* itself.

Figure 10

Evolving Spatial Systems in Machiya



DISCUSSION

The tōriniwa: Mediating Between Tradition and Adaptation

The analysis confirms the persistent presence of the *tōriniwa* within regenerated *machiya*, albeit in a reconfigured state that reflects evolving spatial behaviors. While its specific configuration and positioning are contingent upon programmatic requirements, distinguished by floor-oriented versus chair-oriented use, and the requisite removal of footwear, the *tōriniwa* has transitioned from a primarily circulatory and utilitarian zone into a multifunctional space. Beyond its practical utility, it maintains a profound symbolic and cultural role, serving as a tangible link to the spatial grammar of everyday Japanese dwellings. This is exemplified by its adaptation into an earthen-floored gallery space, often centered on a *hibukuro*. It is critical to note, however, a significant functional shift in this element: Whereas the historical *hibukuro* served as a vital source of both natural light and ventilation, its contemporary adaptation in regenerated *machiya* appears primarily optimized for daylight admission, a modification likely responsive to modern climatic controls and changing environmental conditions.

The Dissolution of Boundary: From Open Shopfront to Open Ground Floor

The historical trajectory of the *mise* area, as noted by Mizuta and Kanemoto (2021), reveals a gradual expansion of spatial permeability. Beginning in the late seventeenth century, the formerly enclosed facade opened to accommodate burgeoning commercial activity. This research observes a continuation and intensification of this trend, wherein the condition of openness has progressed from a localized shopfront condition to a comprehensive reconfiguration of the entire ground floor space. The result is an open layout characterized by minimized spatial boundaries. This transformation from a selectively open facade to a fully integrated plan signifies a fundamental shift in spatial perception—from a principle of socially graded access to a principle of free-flow circulation. This shift is directly correlated with programmatic use; layouts without residential units necessitate a lower degree of privacy, thereby enabling a more radical integration of space.

The Primacy of Program: Use-Type Over Use-Number

The findings present a nuanced perspective on spatial organization in relation to mixed-use programs. Contrary to Spoormans' (2018) assertion that such programs inherently necessitate compartmentalized spaces, the case studies indicate that heritage-conscious adaptations, particularly those destined for public use, increasingly prioritize strategies of spatial integration over segregation. This suggests that the resultant spatial layout is not solely a function of the number of programs introduced but is more critically determined by the nature of those programs, specifically, their position on the spectrum between public and private. Programs with a public orientation demonstrate a greater propensity for integrated, flowing spaces that engage with the building's historical volumes.

Strategic Layering: Interventions in Skin, Space Plan, and Infill

A critical dichotomy emerges in the treatment of the building envelope and interior organization, defined by the strategic manipulation of specific architectural layers. While the interior space plan of regenerated *machiya* consistently trends toward openness for public and commercial functions, the treatment of the exterior skin is highly contingent upon design intent. As Intaraksa and Ongsavangchai (2022) acknowledge, commercially driven interventions frequently employ strategies of transparency and openness at the facade to engage the streetscape and attract patronage. By contrast, heritage-focused adaptations meticulously

preserve the traditional enclosed form of the *machiya* facade, prioritizing architectural authenticity and harmony within Kyoto's cultural landscape. This divergence in approach can be systematically framed through the lens of layers of building change (Brand, 1995). In commercial adaptations, modifications aggressively target the skin**,** space plan, and infill layers. Heritage-focused interventions, however, exhibit more subtle alterations, typically confined to the space plan and infill layers to accommodate new uses, while the fundamental structure and skin layers are deliberately conserved to maintain historical integrity.

CONCLUSIONS

This study has examined the spatial transformation of the Kyoto *machiya*, moving beyond preservation to analyze the fundamental architectural negotiations between tradition and adaptation. The research demonstrates that the enduring viability of these structures is achieved through a strategic reworking of their spatial system. The primary finding is that the *machiya*'s adaptability is intrinsically linked to the mutable relationship between its two core components: the raised floor/served space and the earthen floor/service space, the *tōriniwa*.

The investigation confirms that traditional *machiya* are organized by a distinct spatial dichotomy, reinforced by differences in floor level, materiality, and a system of fixed and semi-fixed boundaries. However, for contemporary programs, this dichotomy is being systematically dissolved. Adaptations, such as lowering the raised floor, expanding the *tōriniwa*, minimizing partitions, and introducing free-flow layouts, signify a profound shift from a family-centric to a guest-centric spatial organization. This shift suggests that the nature of the program, i.e., public vs. private, is a more decisive factor in spatial organization than the number of functions it accommodates, offering a revised perspective on the requirements for mixed use layouts.

The *tōriniwa* is central to this transformation. Its evolution from a utilitarian zone into a multifunctional core confirms its role as the architectural and cultural spine of the *machiya*. This finding extends the historical trajectory of the increasing openness of the *mise* by demonstrating that permeability now characterizes the entire ground floor.

The analysis reveals a strategic application of the layers of change theory. A clear distinction exists between the treatment of the external skin and the internal space plan. Heritage-conscious interventions preserve the traditional envelope for cultural legibility, while the interior layers, the space plan and infill, are significantly modified. This layered approach allows the *machiya* to function as a dynamic framework where fixed elements provide continuity and semi-fixed elements grant flexibility.

In conclusion, the regeneration of the Kyoto *machiya* offers an alternative model for sustainable architecture that transcends material conservation. It exemplifies a process of informed adaptation, where cultural continuity is sustained through the innovative reinterpretation of spatial principles. By extending building lifecycles and fostering community resilience, *machiya saisei* aligns with imperatives of circular construction. This study illustrates how a deep understanding of a building's spatial grammar can inform interventions that are both culturally resonant and sustainably performative, offering valuable insights for revitalizing historic urban fabric.

LIMITATIONS

A primary limitation of this study is its synchronic, rather than diachronic, approach. The analysis is based on the present state of the case studies, as historical data on the specific modifications undertaken at each stage of their adaptation was unavailable. Consequently, while the research captures the spatial outcomes of regeneration, it cannot reconstruct the specific adaptation sequence.

DISCLOSURES AND ACKNOWLEDGEMENTS

This research was funded by The Sumitomo Foundation Fiscal 2023 Grant for Japan-related Research Projects .

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