

Received Date: 14th November, 2025
 Revision Date: 15th December 2025
 Accepted Date: 20th January, 2026

Adaptive Reuse: The Cases of Kathmandu Valley

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Abstract — *In the time of environment urgency and cultural loss, adaptive reuse has emerged as an important sustainable architecture. This research explores how innovative materials and design techniques supports adaptive reuse that not only addresses ecological concerns but also respects and preserves the historical and cultural identity focusing on adaptive reuse in Kathmandu valley. The study evaluates adaptive reuse in two cases: Hotel Shanker and Babar Mahal Revisited. Through these case studies, it examines how context specific materials and design strategies have been applied and what outcomes they produced. Overall, it was found that constructing a new building of similar size would use 2.15 to 3 times more embodied energy and emit 2.62 to 3.7 times more carbon.*

Keywords — *Adaptive Reuse, Design Materials, Design Techniques, Sustainability, Historical and Cultural Significance*

I. Introduction

As urban populations grow and development accelerates, the construction sector has become one of the most resource-intensive and environmentally damaging industries in the world. According to global statistics, the building and construction sector accounts for around 36% of total energy use and nearly 40% of CO₂ emissions, while also producing large amounts of waste and consuming vast water resources [1]. The Kathmandu valley, home to seven UNESCO World heritage monument zone, reflects over 2000 years of cultural history [2]. However, rapid urbanization, population growth and the devastating 2015 earthquake have created major challenges for conserving heritage and promoting sustainable growth. The concept of adaptive reuse has emerged as a key strategy to face these issues, offering a means to preserve architectural heritage while meeting the modern functional needs. Defined as repurposing existing buildings for new

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uses while keeping their original features, adaptive reuse is now seen as a sustainable alternative to demolition and reconstruction [3]. In the context of Kathmandu Valley, this practice includes the transformation of traditional Newari residences, palaces, and institutional buildings into hotels, restaurants, cultural centres, and commercial spaces. The importance of adaptive reuse extends beyond mere preservation. Adaptive reuse brings together sustainability goals environmental protection, economic value, and social inclusion [4]. However, despite its potential, adaptive reuse is often seen as a complex or expensive compared to new construction. As a result, its adoption remains limited, especially in local context like Kathmandu Valley. This research explores the potential of adaptive reuse in Nepal's urban heritage landscape, particularly through the materials and design techniques. By studying the cases of Dwarika's Hotel and Babar Mahal Revisited, it can be seen how modern interventions can blend with traditional forms and materials to create spaces that are both functional and culturally rich. These examples offer a pathway for future development that honors the past while meeting the needs of the present.

II. Methodology

A. Research Design

This study uses a mixed method research design combining both qualitative and quantitative approaches to provide comprehensive analysis of adaptive reuse practices in Kathmandu valley.

B. Research Objectives

- The main objectives are to understand the design techniques, strategies, and materials used in adaptive reuse, and to examine their impact in the context of Kathmandu Valley.
- It also aims to identify how materials and design

methods have changed in these projects and evaluate the results of these changes.

C. *Methods of data collection*

Primary methods include direct observation, photography, and semi-structured interviews. Secondary sources include books, publications, reports, websites, drawings, and historical photographs.

D. *Research limitation*

This research has several limitations. It focuses on two case studies, which may not represent the full range of reuse practices across Kathmandu Valley or other cultural contexts. Most examples are commercial, reflecting current market trends but not the full potential of heritage reuse. Also, since some projects were completed recently, it is difficult to assess their long-term sustainability and performance.

III. Literature Review

A. *Adaptive Reuse and its principles*

Adaptive reuse means the process of repurposing existing buildings for new uses that differ from their original function while keeping much of the building's structure and character. Instead of demolishing old or unused buildings, adaptive reuse gives them a new life [3]. This approach helps reduce construction waste and the environmental impact in a new construction [1]. The main principles of adaptive reuse focus on sustainability, preserving history, and benefiting the community [4]. It focuses on conserving existing buildings, especially those that are vacant or underused, to reduce resource use and carbon emissions. This method helps reduce demolition waste and keeps the energy stored in materials. Adaptive reuse should benefit the community by engaging fairly and openly with stakeholders, including building owners, developers, and local residents, to ensure that projects meet social and cultural needs [5]. Changes must respect building's history and architectural value, avoiding modifications that reduces their historic significance and context. Adaptive reuse projects must follow modern safety, accessibility, and energy efficiency standards to stay functional and sustainable [6]. Common techniques that are used in adaptive reuse includes preserving facades, combining new structures with old frameworks, making minor upgrades during historic preservation, and renovating outdated elements while maintaining their original appearance [7]. Overall, adaptive reuse is a sustainable design strategy that balances environmental benefits, preserving history, and engaging the community. By reusing

old buildings for new uses, it creates lively and efficient urban spaces while maintaining cultural identity intact.

B. *Adaptive Reuse and Sustainability*

Sustainability in the buildings is often explained through three interdependent pillars: environmental, social, and economic. This framework is also known as the 3Ps model — Planet, People, and Prosperity [8]. Each pillar includes distinct indicators and performance parameters that helps to measure the sustainability of buildings. Studies show that adaptive reuse can reduce embodied energy consumption by 10-50% and carbon emissions by 15-35% depending on the extent of intervention required [9]. Material efficiency benefits include preservation of existing structural systems, reduced transportation requirements for new materials, and minimization of construction waste generation [10].

The sustainability framework for adaptive reuse extends beyond environmental considerations to includes economic and social dimensions. Economic sustainability includes cost-effectiveness analysis, considering both initial investment requirements and long-term operational benefits [11]. Social sustainability addresses community impact, cultural preservation, and heritage value maintenance [12].

A. *Current Scenario of Adaptive Reuse in Kathmandu*

In Kathmandu Valley, reuse that adapts old buildings is slowly growing but still faces challenges. Historic buildings such as Rana-era palaces are successfully converted into government offices, hotels, banks, and security headquarters. Some Malla period structures are also used as living museums and boutique hotels. Restaurants and also shops do occupy these very structures. However, the government or institutions own these buildings in the main and change them. There are few privately owned customary houses that remain and that could still be saved especially for residential ones which are rarely reused [13] [14].

It is becoming more popular inside the city core to turn old residential buildings into commercial spaces. This is occurring mostly for the reason that it is indeed profitable. Ideally, conservation guidelines should be followed by all adaptive reuse projects, but enforcement is lacking. The problem involves unclear rules and conflicting practices. Political interference is at times a part of that, as well. People lack awareness and comprehension of appropriate methods [15].

Although it can help save resources and preserve culture, weak policies along with a lack of clear guidelines and

limited community involvement obstruct adaptive reuse from reaching its full potential in Kathmandu Valley. Better policies, clearer rules and more public awareness are each needed in order to make adaptive reuse much more effective for reusing heritage buildings [16].

IV. Case study

A. HOTEL SHANKER

Hotel Shanker is a heritage hotel in Kathmandu created through the adaptive reuse of the former Agni Bhawan palace, originally built in 1894 for General Jit Shumsher Rana. The building, designed by architect Kumar Narsingh Rana in a neoclassical style with European-influenced interiors, was converted into a hotel in 1964 by Ram Shanker Shrestha. Instead of demolishing the historic structure, the owners retained the original façade and palace form while adapting the interiors to serve as a luxury hotel [17].

Table 1

Original façade and palace form while adapting the interiors

Aspect	Description
Preservation	Original neoclassical façade and palace structure retained with minimal alteration.
Restoration	Antique elements like carved windows, chandeliers, and mirrors restored and reused.
Adaptation	interiors redesigned for hotel use, integrating modern amenities with heritage character.
Sustainability	Reduced demolition waste, conserved embodied energy, and promoted cultural tourism.

Antique objects and architectural elements such as 200-year-old carved wooden windows, chandeliers, and European mirrors were preserved and displayed within the hotel, maintaining its royal ambiance [18]. The project emphasizes preservation through continued maintenance and careful restoration, particularly after the 2015 earthquake, ensuring both historical integrity and modern comfort. By reusing the existing palace structure, Hotel Shanker demonstrates a sustainable approach to adaptive reuse that conserves cultural heritage, minimizes material waste, and supports tourism and local craftsmanship [20].

B. BABAR MAHAL REVISITED

Babar Mahal Revisited is a heritage complex in Kathmandu, created by adaptively reusing parts of the original Babar Mahal palace built in 1913. Instead of demolishing the old

structures, the owners restored and adapted them, converting the complex into a mixed-use development with restaurants, art galleries, boutiques, and offices [22] [23] [24]. Former cowsheds and guard houses were converted into boutique shops, galleries, restaurants (e.g., Chez Caroline), and offices. Courtyards and open spaces were designed to replicate the grandeur of original Rana palaces, using salvaged architectural elements and period-appropriate replicas [23] [24]. Original brickwork, woodwork, and other heritage features were retained and restored, reducing construction waste and embodied energy [22]. Traditional materials such as mud mortar and lime plaster were used for wall restoration, and metal sheets for roofing, reflecting both cost-effectiveness and respect for original construction methods [25].

V. Discussions

Both Hotel Shanker and Babar Mahal Revisited are exemplary cases of adaptive reuse in Kathmandu, demonstrating how historic architecture can be preserved while accommodating modern functions. Hotel Shanker, originally the 1894 Agni Bhawan palace, was transformed into a heritage hotel in 1964, retaining its neoclassical façade and major structural elements while adapting the interior for hospitality use. Antique features such as carved wooden windows, chandeliers, and mirrors were carefully restored to evoke a sense of living history. Even after the 2015 earthquake, sensitive restoration maintained its original form, proving that adaptive reuse can extend a building's life, preserve embodied energy, and sustain heritage through commercial viability. Similarly, Babar Mahal Revisited revitalized an early 20th-century palace complex by converting former service blocks and outbuildings into restaurants, boutiques, and galleries. Traditional materials like brick, mud mortar, and lime plaster were reused, and the original courtyards and façades were conserved, preserving the site's cultural character. Both projects exemplify how adaptive reuse can balance preservation and progress, conserve architectural identity and craftsmanship while generating social, cultural, and economic value within the evolving urban fabric of Kathmandu.

VI. Conclusions

In Kathmandu, adaptive reuse of buildings shows mixed levels of success in balancing environmental, economic, social, and technical factors. Most projects are effective at saving resources and reducing carbon emissions, but other sustainability aspects are often overlooked. Even small

improvements could improve their overall impact. Many building owners and developers are hesitant to choose adaptive reuse, so people are not very aware of its benefits. As a result, only a few such buildings exist, especially private ones, and many are at risk of being lost. It is important to focus on preserving these buildings now. More research is needed to understand the full potential of adaptive reuse, and government support must increase to make better use of its long-term advantages.

VII. Acknowledgment

We would like to thank our academic advisors, Assoc. Prof. Kailash Shrestha, Assoc. Prof. Moon Singh Dongol, Assoc. Prof. Subash Phuyal, and Assoc. Prof. Suchita Bajracharya, for their guidance and support during our research. Their suggestions and feedback helped us improve our work. We are also thankful to the people who directly and indirectly supported us, which made our research meaningful.

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