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Adaptive Transformation of Traditional Residences into Sustainable Contemporary Residences - A Case Study in Karnataka, India

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Abstract: ***Shelter is a fundamental need of the human race. Throughout the history of human settlements, shelter has undergone various adaptive transformations as a part of amalgamation. Architecture is evolving with respect to time, people, and place. Trends in the built environment and the transformation of residential typology topics are significant today. Addressing the sociocultural, economic, and environmental aspects of traditional residences while transforming them into modern residences with a sustainable design approach is a challenge for architects.***
This paper discusses the adaptive transformation of traditional residences into contemporary residences with sustainable approaches in the Indian state of Karnataka. The methodology contains various case studies and literature studies from the relevant research database. Through a comparative analysis of case studies, this research uncovers successful transformation strategies, emphasizing challenges faced, innovative design solutions, and achieved outcomes. This study contributes to the ongoing discourse surrounding the preservation and rejuvenation of architectural residential typology in contemporary living, offering valuable insights for architects, preservationists, and policymakers seeking to balance tradition and innovation in the built environment with a sustainable approach.
Keywords: Adaptation, Sustainability, traditional residence, contemporary residence

I. INTRODUCTION

The architectural landscape is in a perpetual state of evolution, with historical typology houses serving as remarkable testaments to the traditions and cultures that have shaped them. In the face of urbanization and changing societal needs, there arises an intriguing challenge: how can we breathe new life into these age-old structures while embracing the demands of contemporary living? This research embarks on a compelling journey to explore the adaptive transformation of traditional typology houses into sustainable and functional contemporary homes.

Traditional typology houses, often characterized by unique regional designs and cultural significance, stand as relics of the past. They bear witness to the architectural ingenuity and cultural practices of their times. However, as urbanization accelerates, many of these structures have become obsolete, facingneglect and abandonment. Yet, they hold immense potential for rejuvenation, blending the cherishedelements of heritage with the necessities of modern life.

This study is not merely an exploration of architectural form; it is a quest to strike a harmonious balance between preserving historical identity and meeting the evolving needs of today's society. It seeks to answer pressing questions: How can these aged structures be creatively adapted to serve contemporary functions? How can sustainability be integrated into the transformation process to reduce environmental impact? What role does cultural preservation play in ensuring that these transformations remain respectful of their origins? And, equally importantly, what are the social implications of these adaptive conversions on communities and individuals?

In this comparative study, we delve into the intricacies of adaptive reuse by analyzing a range of case studies, each offering unique insights and challenges. By examining the architectural modifications, sustainability strategies, cultural considerations, and social dimensions of these transformations, we aim to contribute to the discourse on architectural heritage preservation in the context of a rapidly changing world. Through this research, we aspire to provide a roadmap for architects, urban planners, and policymakers seeking to breathe new life into the past while building a more sustainable future.

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II. METHODOLOGY

This research adopts a case study methodology to examine the adaptive transformation of traditional typology houses into sustainable contemporary homes. The selection of case study houses is based on specific criteria, including historical significance, geographic diversity, and the extent of sustainability measures implemented. In-depth analysis of these cases allows for a comprehensive understanding of the subject.

III. LITERATURE REVIEW

Due to population increase and urbanization, the quantitative components of residential buildings have surpassed the qualitative aspects, prompting several endeavors to construct a modern environmental framework for attaining sustainable building design. The province's vast collection of traditional Vojvodina homes, with all of its varieties and subtypes, is in comparatively bad shape.

The research explores how traditional homes can be transformed to meet modern living needs while also improving energy efficiency. With a vast number of existing homes, renovating and adapting them holds immense potential nationwide. Rather than demolishing and rebuilding, reimagining these homes offers a sustainable path forward. By carefully selecting materials and considering the full life cycle of buildings, reconstruction emerges as the most responsible and forward-thinking choice.(Salkini, Greco and Lucente, 2017)

In traditional homes in Aleppo, the courtyard plays a vital rolenot just in the building's design but in daily life. It provides natural light and ventilation, creating a comfortable and refreshing living environment. Many researchers, including Fathy (1986) and Bahadori (1978), have explored how courtyards function as climate-responsive spaces in urban settings. Studies show that greenery in courtyards can improve thermal comfort, with larger courtyards benefiting the mostoffering up to 40% more cooling effects. This is because smaller courtyards often struggle to accommodate trees with thick foliage, limiting their shading potential.(Lovec and Popović, 2014)

A home is more than just a shelterit's a place that shapes identity, fosters a sense of belonging, and carries deep emotional connections. It reflects memories, relationships, and the quality of life experienced within its walls. Beyond personal meaning, dwellings also tell the story of a societyits values, technological progress, and ability to adapt to its environment.

Since humans first built permanent shelters, homes have continuously evolved, shaped by the needs of their occupants, social structures, climate, and available materials. The history of architecture is, in many ways, a record of these transitionsfrom traditional to contemporary, vernacular to modern, or rural to urban. These shifts reflect not just changing styles but also deeper transformations in how we live, build, and interact with our surroundings.(Henna and Mani, 2021)

Housing is a fundamental part of human life, just like foodit provides not just shelter but also a space for work, rest, and recreation. A well-designed home influences health, happiness, and productivity, making it one of the most essential aspects of a thriving society.

Beyond just the physical structure, the way homes are designed impacts daily life. Factors like space, noise, and layout can shape well-being and comfort. In every society, homes reflect the lifestyles of the people who live in them, shaped by cultural traditions, economic conditions, and social values. The unique character of a home is more than just architectureit's a reflection of the way people live and connect with their surroundings. (Amiryar and Asano, 2022)

Housing changes can be small, like repainting a room, or major, like adding a space or rebuilding. While scholars have studied housing transformations widely, Kabul's rapid changes were more about replacement than adaptation, reflecting broader urban shifts in Afghanistan and beyond.(Shao *et al.*, 2018)

As cities grow and develop rapidly, nations strive to preserve historic sites that reflect their heritage. Adaptive reuse helps communities maintain their cultural identity by giving old buildings new purpose while respecting their history. Though often used interchangeably with renovation, refurbishment, and rehabilitation, this study will clarify these terms based on existing research. It will also explore how adaptive reuse adds value when sustainability's three pillarsenvironmental, social, and economicare considered in revitalizing heritage buildings.(Ibrahim and Eltarabishi, 2021)

Courtyard buildings are a time-tested way to create comfortable living spaces while reducing energy use. With an open space enclosed by rooms or walls, courtyards bring in natural light, fresh air, and warmth, making homes more sustainable and inviting.

Across different cultures, courtyards serve as more than just architectural featuresthey are spaces for relaxation, play, meditation, social gatherings, and daily activities. Whether for quiet reflection or family time, courtyards remain an essential part of home life, blending practicality with a sense of community and tradition.(Taleghani, Tenpierik and van den Dobbelsteen, 2012)

Preserving heritage buildings is a delicate process that balances maintaining their historical value while adapting them for modern use and ensuring their longevity for future generations. This paper aims to outline key steps in this process and propose a structured model to guide preservation efforts.

While the model is theoretical and requires real-world validation, it offers a framework that can support the conservation of heritage buildings. To develop this approach, an international literature review was conducted. The findings highlight that the overall process of adaptive reuse for heritage buildings remains an underexplored area in research, emphasizing the need for further study and practical application.(Arfa *et al.*, 2022)

This research explores the transformation of traditional house forms in Nagpur, examining changes across three different settlement scales. By analyzing the relationship between house design and its surroundings, the study identifies which elements have remained unchanged and which have evolved due to modernization.

Taking an interdisciplinary approachblending anthropology, history, archaeology, geography, and architecturethe research emphasizes that understanding change isn't just about studying building forms but also the way people live. As modernization continues to shape living patterns, mapping these changes can help anticipate future trends in contemporary settlements and architecture.(Kotharkar and Deshpande , 2012)

This study examines the evolving role of building conservation, moving beyond mere preservation to become a vital strategy for urban regeneration and sustainability. Focusing on Amman, Jordan, it explores how restoring heritage buildingsspecifically the adaptive reuse of Jasmine House into a cultural centersupports a more sustainable urban environment.

Using qualitative research, including architectural documentation and interviews with architects, the study highlights the importance of heritage buildings in shaping a city's identity. It emphasizes that adaptive reuse not only preserves cultural heritage but also provides economic and social benefits, making it a globally recognized approach. The findings suggest that Jordan's urban development should prioritize revitalizing heritage buildings through adaptive reuse, ensuring they continue to serve communities while enhancing their long-term value.(Al- Adayleh ,2021)

IV. PRIMARY CASE STUDY

During my primary case study, I explored few traditional houses that has stood the test of time in Ulsoor and Shivaji Nagar.Ulsoor as we know is one of the oldest neighborhoods in Bangalore. The initial

settlements were probably around Sri Someshwara Swamy Temple. This area still carries elements of its past glory and its historical heritage. Some of the houses in Ulsoor area are around one-hundred and fifty years old,thoughmuch of has been lost in the modern transformation.The transformation was majorly done in interior of the houses.Shivaji Nagar has a rich history, often tracing back to colonial times or earlier. The typology houses were constructed with materials and designs prevalent during their era, reflecting the cultural and social aspects of that time. As urbanization accelerated, these houses faced challenges in terms of space, infrastructure, and modern amenities. In Shivaji Nagar ,the transformation of houses was seen in both exterior and interior aspect.

The first house in Shivaji nagar was an old house which underwent a remarkable transformation into a contemporary office space, showcasing the adaptive evolution of traditional typology. The exterior seamlessly integrated modern materials such as wood veneer, granite, and glass. Inside, a vibrant workspace emerged, replacing worn elements with a harmonious blend of wood rafters, sleek granite countertops, and glass partitions. The original wooden ceiling remained, a nod to the house's history. The architects successfully navigated the delicate balance between preserving heritage and embracing innovation, creating a sustainable and visually striking narrative of architectural evolution.



Acp cladding facade

The next house was a one noteworthy instance involves the conversion of an aging residential structure into a dynamic commercial shop. This transformation was marked by the integration of modern materials, such as ACP (Aluminium Composite Panel) cladding and metal rolling shutters, showcasing a deliberate departure from conventional architectural norms.



Acp cladding façade with metal rolling shutter

Next was a house which had modification observed in the replacement of traditional wooden shutters with innovative sliding windows.



Aluminium sliding window

The fourth house was about six to seven decades old. Despite its age, the dwelling has been meticulously maintained, preserving its authentic charm. The architectural features of this house reflect the traditional typology of the region.

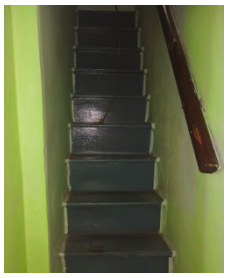
Constructed with mud bricks, the house boasts walls with a thickness of three feet, providing both stability and insulation. The roof structure, a blend of bamboo reinforcement, lime, and sand slurry, showcases traditional craftsmanship. Teak wood doors add a touch of elegance, emphasizing the historical significance of the dwelling. Ascending the staircase to the terrace, one encounters a narrow path, a mere 600mm in width, adding an intimate touch to the vertical journey.

Comprising two houses adjacent to each other, each measuring 10 by 30 feet, the combined structure creates a harmonious living space. Originally, the house featured multiple rooms, but a recent modification involved demolishing a wall to create an inviting hall, measuring 8 by 10 feet.

The internal transformation extended beyond the hall, delineating specific functional zones. An 8 by 8 One noticeable change was the replacement of kadapa stones with red oxide flooring, enhancing the visual appeal of the house while maintaining a link to its traditional roots.

Interestingly, the owner expressed a sentiment often encountered in such studies. Despite the house's rich history and well-preserved condition, there exists a contemplation of the future. The owner envisions demolishing the house to make way for a new contemporary dwelling, reflecting a willingness to adapt to evolving lifestyle preferences.

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Front facade 600 mm width staircase Structural roofing system made with bamboo

Further, I encountered a living piece of history in Ulsoor — a house that has proudly stood for 150 years. This prestigious dwelling not only functions as a residence but also holds the distinction of being the home of a Member of Parliament, imparting an additional layer of importance.

Constructed with stone masonry, the walls exhibit the enduring strength characteristic of a bygone eras craftsmanship. Mud plastering, a traditional technique, contributes to the house's authenticity. The roof structure showcases craftsmanship with rafters supporting slate roofing sheets. Inside, the rooms retain their original red oxide flooring, preserving a sense of continuity.

Approximately 30 years ago, a renovation initiative into this historical dwelling. The most noticeable change was the transformation of the small courtyard into a hall, complete with Mangalore tile roofing. This alteration not only expanded the living space but also introduced touch of regional architectural flair.

As part of the renovation, the red oxide flooring, a characteristic feature, gave way to ceramic tiles. This shift, while modernizing the interior, also reflects a pragmatic approach to maintenance and changing lifestyle preferences.

What makes this house particularly unique is its owner — a Member of Parliament. Despite the scope for further modifications, the owners have chosen to preserve the house in its historical essence. Their stance reflects a deep respect for the heritage embedded in the walls of this 150-year-old residence.





Front facade Converted countyard into living room Use of slate roofing sheets

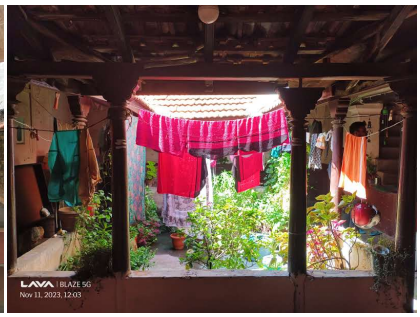
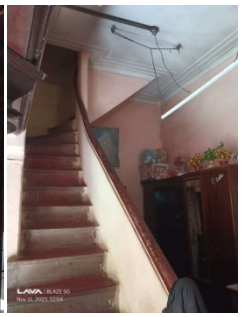
Next it led me to a charming courtyard house, steeped in history, with nearly a century of stories embedded in its walls. This residence, around 90 to 95 years old, embraces the classic design of a courtyard house.

At the heart of this house lies a central courtyard, a design element that has withstood the test of time. The roof structure is a mix of traditional craftsmanship, with bamboo structural roofing system at the entrance porch, while the rest of the house features wood rafters supporting Mangalore tiles. The flooring, a combination of red oxide and kadapa stone, adds character to the periphery of the courtyard.

While the essence of the house remains unchanged, a few subtle modifications have been introduced over the years. Most notably, a staircase was added to provide access to the upper floors. To accommodate this addition, a small portion of the house saw the transformation of its Mangalore tile roofing into a more modern RCC structure, now serving as a welcoming dining hall.

The current owners, tied to the house's heritage, are happy with how it stands now and don't plan any changes. Yet, they're open to renovating if issues come up, showing their dedication to its preservation.

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Front facade Central courtyard Staircase which was added later





Kadapa stone Bamboo roofing at the entrance porch

The Third house I explored was 85 years old house. This vintage dwelling, marked by timeless architecture, revealed a blend of traditional charm and subtle modern adaptations. The house welcomed us with a delightful entrance porch, setting the tone for its character. The exteriorwalls, a robust 1 meter in thickness, spoke of the durability characteristic of the era.

The flooring, adorned with classic red oxide, complemented the wooden beams supporting the roof, crafted with a mix of lime and sand slurry. A small courtyard graced the interior, bringing a touch of nature into the living space.

A small courtyard underwent a transformation, now serving as a skylight with the introduction of fiberglass, infusing the interiors with natural light. The layout saw a thoughtful renovation, with the removal of a wall that previously housed a series of doors, creating a more open and interconnected space. The teak columns which were painted blue are now painted in brown which gives wood look. The wall had lime plastering with red oxide till 3 ft from ground which continued from the floor but they have painted the whole wall.

The owners, deeply appreciative of traditional housing, conveyed their desire to continue living in a home that embodies these timeless characteristics. While open to the prospect of building a new house in the future, their inclination is towards preserving the essence of traditional architecture.

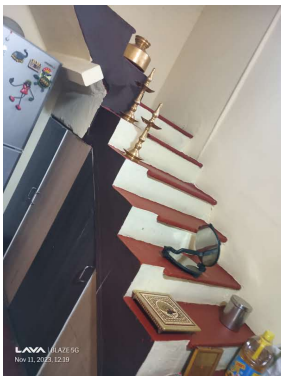




Front façade Entrance porch Ceiling with wooden beams


Courtyard which is now used as skylight


Kadapa stone for waist slab



Wall thickness of 1m

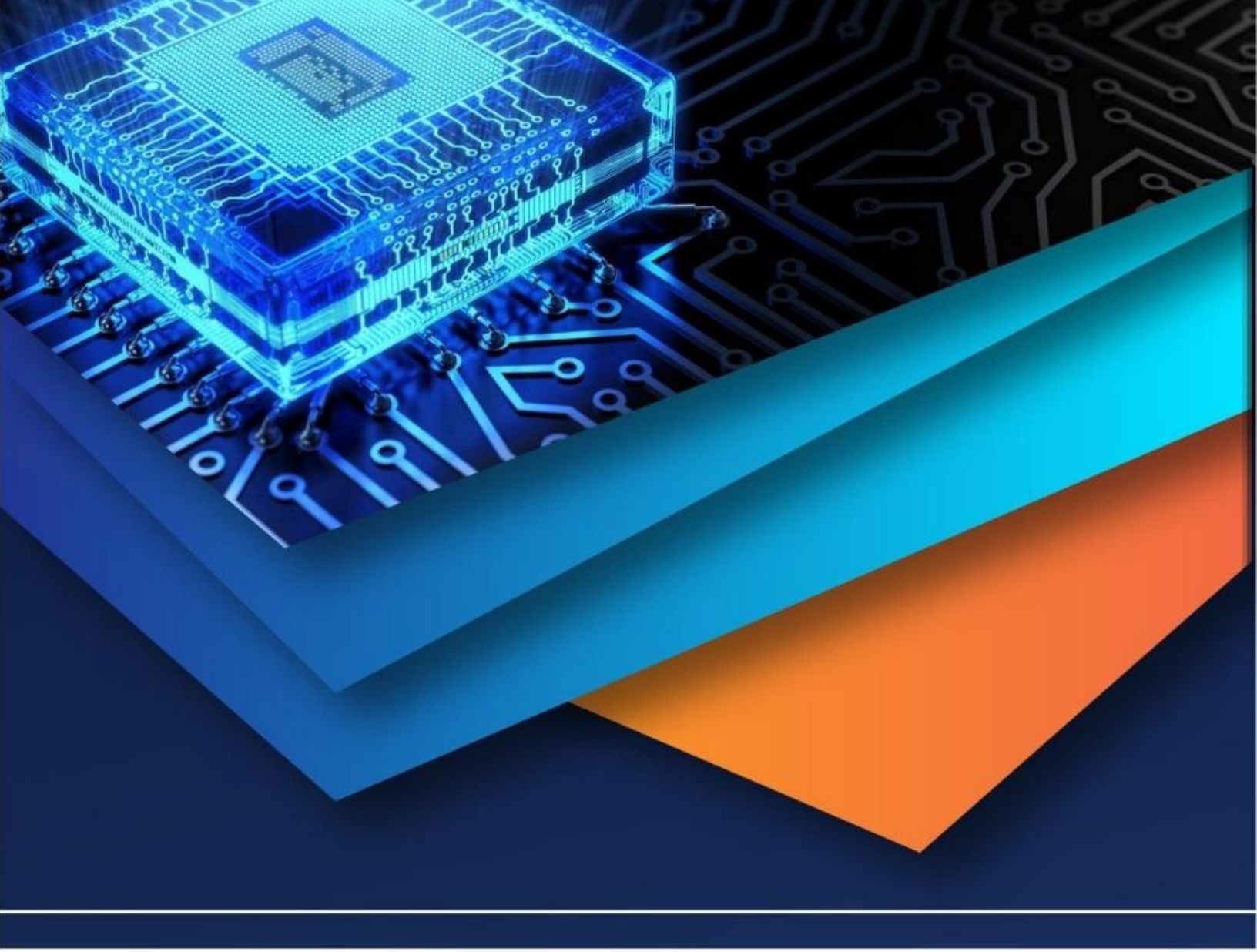
V. CONCLUSION

In conclusion, this research illuminates the intricate interplay between tradition and innovation in the adaptive transformation of traditional typology houses into sustainable contemporary homes. Through a comprehensive exploration of architectural adaptations, sustainable practices, cultural preservation, and societal implications, our findings emphasize that these houses, while evolving to meet modern needs, retain the essential spirit of their heritage. The case studies in Ulsoor and Shivaji Nagar demonstrate that architectural heritage can gracefully adapt to change, striking a harmonious balance between historical preservation and the imperative of creating sustainable, functional spaces. The successful integration of sustainable elements not only bridges the gap between the past and present but also paves the way for a more environmentally conscious future. Our research underscores the significance of recognizing and respecting the embedded heritage in traditional houses, showcasing the dynamic interplay between history and modernity in preserving the essence of the past while embracing the needs of the present and future. In essence, the adaptive transformation of traditional typology houses emerges not merely as a physical process but as a profound cultural dialogue that shapes the narrative of architectural heritage in our rapidly changing world.

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