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Experimental Study of Adaptive Reuse on Bali Festival Park Building using Adaptive Reuse Potential Analysis (ARP) Method

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ABSTRACT

This study aims to develop a set of a strategic framework for the successful implementation of Adaptive Reuse in Bali's Taman Festival. As rapid urbanization and tourism growth in Bali pose challenges to cultural and environmental preservation, Adaptive Reuse has emerged as a promising approach to transform existing structures while minimizing ecological footprint. This study employs a multidisciplinary research methodology, integrating architectural, environmental, cultural, and structural perspectives. Through a thorough analysis of historical context, existing conditions, and stakeholder engagement, this study identifies key challenges and opportunities in implementing Adaptive Reuse in the unique context of Bali's Taman Festival. This study also explores case studies of successful Adaptive Reuse projects around the world, gaining insight and understanding into appropriate intervention strategies for the retrofitting of buildings in Bali's Taman Festival. These case studies contribute to the development of a set of best practices tailored to the specific cultural and environmental context of Bali's Taman Festival. In conclusion, this study provides a comprehensive review and strategic framework of sustainable design criteria in the implementation of Adaptive Reuse in Bali's Taman Festival. Taking into account environmental, cultural and economic considerations, this proposed framework serves as a guide for stakeholders involved in the revitalization of structures as well as the restoration of buildings, thereby contributing to the sustainability and resilience of the area.

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1. INTRODUCTION

In Indonesia, the phenomenon of Adaptive Reuse is gaining attention, especially in major cities like Jakarta, Bandung, and Surabaya, which have many colonial and historic buildings. The main challenge is how to balance heritage preservation with modern infrastructure needs. Amid rapid urbanization and the increasing demand for public spaces, this concept is increasingly accepted as a sustainable architectural solution. This is supported by the 2009 report from the United Nations Environment Programme (UNEP), which showed that the construction sector is one of the main contributors to global warming, with around 45 percent of global carbon dioxide emissions being directly or indirectly related to construction activities and building operations.

According to Cantell (2005), Adaptive Reuse plays a crucial role in sustainable development as it can prevent the demolition of historic buildings. This approach has become a topic of discussion in many countries, with attention focused on the challenge of maintaining a balance between preserving historical value and meeting new functional needs. This process often involves physical changes that can affect the historical integrity of the building. Adaptive Reuse not only helps protect and preserve old buildings and their interiors but also provides economic, social, and cultural benefits. It serves as a solution for revitalizing historic areas while enhancing a sense of ownership among urban communities (Saputra & Purwantiasning, 2013; Soewarno et al., 2017). In addition to preserving the physical value of buildings or sites, another important aspect is maintaining the intangible values that accompany them, such as symbolic meanings related to social, political, memorial, or religious contexts, which must be aligned with the form, function, and spiritual essence of the place (Musso, Kealy, and Fiorani, 2017).

In Bali, known as an international tourist destination with a rich cultural heritage, Adaptive Reuse has become an effective way to maintain historical appeal while meeting the needs of modern tourists. Historic buildings, whether associated with local traditions or modern eras, have great potential to be revived through this process. One area in Bali that holds significant potential for the application of Adaptive Reuse is Taman Festival Bali, a once grand but now abandoned amusement park. By using Adaptive Reuse Potential (ARP) analysis and case studies, it is hoped that accurate data and understanding can be obtained for conducting in-depth studies regarding the potential adaptation of this area.

2. RESEARCH METHOD

The research approach used in this study is a quantitative research method accompanied by descriptive qualitative explanations. The qualitative descriptive explanation aims to understand the phenomena experienced by the research subjects, such as behaviour and perceptions (Moleong, 2008 in Desy, 2015). According to Creswell (2014), quantitative research is an approach used to objectively test theories by analysing the relationships between variables. These variables can be measured using specific instruments, allowing the numerical data obtained to be analysed through statistical procedures. By combining quantitative and qualitative methods, researchers can gain a more holistic view of the phenomena being studied. Quantitative data provides statistical insights, while qualitative data offers in-depth insights and context that enrich understanding of the numerical data (Johnson & Onwuegbuzie, 2004).

The quantitative research method with descriptive qualitative explanations in this study is used to describe various patterns and strategies that can be applied in the restoration of

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buildings in Taman Festival Bali. The research variables to be used are (1) environmental context; (2) Physical and Non-Physical Conditions; (3) User Profile; (4) Structure. These variables will be obtained through literature review and comparative studies.

Primary Data

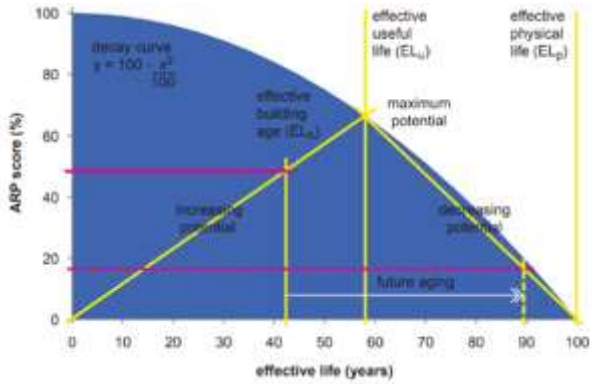
Primary data is obtained through field surveys to record the building's structural details and measurements.

Secondary Data

Secondary data is data obtained or collected by researchers from existing sources. In this study, data is obtained from journal reviews, supporting reference books, and electronic media articles.

ARP (Adaptive Reuse Potential) Analysis Method

Adaptive Reuse Potential is a conceptual framework for assessing key factors that influence the likelihood of adapting a building. These factors include the physical aspects of the building, function, economics, technology, and social aspects (Langston and Shen, 2007). Although often applied in the context of real estate, this approach can also be used to evaluate the feasibility and condition of buildings in general.



$$ARP\ (decreasing) = \frac{100 - \frac{EL_u^2}{100}}{100 - EL_u} \cdot (100 - EL_b)$$

$$ARP\ (increasing) = \frac{100 - \frac{EL_u^2}{100} \cdot EL_b}{EL_u}$$

Figure 1. *Adaptive Reuse* Potential Model
Source: Langston, C. (2012)

3. RESULT AND DISCUSSION

3.1. Case Study Review

1. Case Study 1: Tea OZ

Tea OZ is located in Moganshan City, Zhejiang Province, China, in an area known for its cultural heritage and traditional architecture. The original building was a typical Jiangnan residence, featuring a five-room design with an elevated beam structure and a double-pitched roof. To ensure the effective preservation of the building's historical values, a detailed survey and structural integrity test were conducted.

Figure 2. Exterior and Interior of Tea OZ
Source: https://www.archdaily.com/1020731/

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The preservation process involved the maintenance of the Wooden Structure: all beams and wooden columns were retained and preserved through insecticide treatment, ensuring the original structural system remained intact. Additionally, restoration work included the replacement and repair of purlins, floors, solid earth facades, and damaged tiles using local traditional techniques and materials. All decorative elements, such as wall paintings, carvings on beams, window lattices, and roof supports, were also preserved.

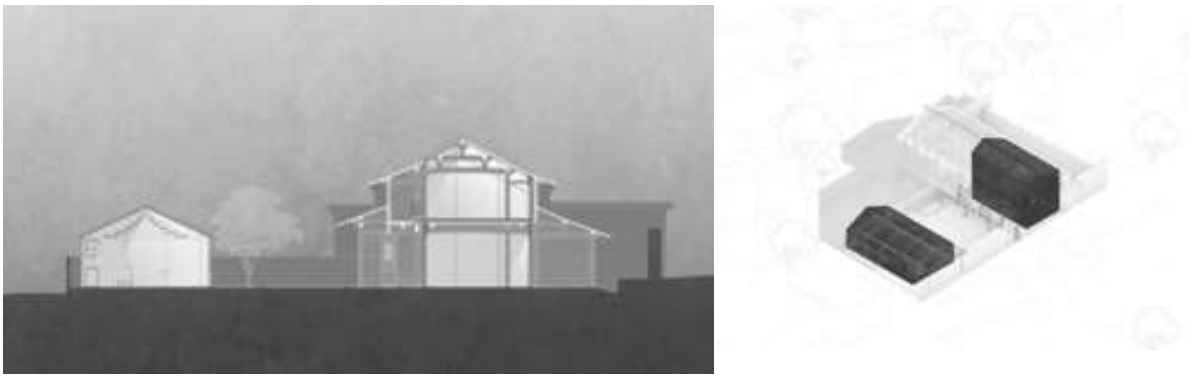

Figure 3. Eksterior dan Interior Tea OZ
Source: https://www.archdaily.com/1020731/

The spatial quality of this building enhances a more dynamic experience through several strategies, including. The addition of structures with distinct yet complementary characteristics, such as removing parts of the ground floor façade and sections of the roof to allow natural light and air to flow into the space. The partial removal of the front and rear façades creates two verandas that face the courtyard and a small Zen garden in the front and back. This also results in a north-south ventilation corridor and a double-height space beneath the large roof, softening the boundary between indoor and outdoor spaces.

Figure 4. Eksterior dan Interior Tea OZ
Source: https://www.archdaily.com/1020731/

The interplay between modern and traditional elements is showcased through the seamless integration of the old and new structures, creating a compelling architectural dialogue. The two building masses complement one another, blending the richness of traditional architecture with modern design principles. This transition preserves the tectonic qualities, composition, and spatial experience, resulting in a space that beautifully contrasts while maintaining a harmonious balance between the past and the present.

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2. Case Study 2: GOH Conversion Gösserhalle Building

Figure 5. GOH Conversion Gösserhalle building before the intervention
Source: https://www.wienschauen.at/

Gösserhalle, located in Graz, Austria, is a historic building constructed in the early 20th century. It was built in 1929 as part of the Gösser brewery complex, one of the oldest and most famous breweries in Austria. Designed by a prominent architect of the period, Gösserhalle features a design that reflects the industrial architectural style of the early 20th century. Originally, it served as a storage and distribution facility for beer and related operations, playing a crucial role in the brewery's functioning. Over time, however, changes in the brewing industry and operational needs led to Gösserhalle no longer being used for its original purpose. The building went through several phases of decline and closure before plans for conversion were initiated.

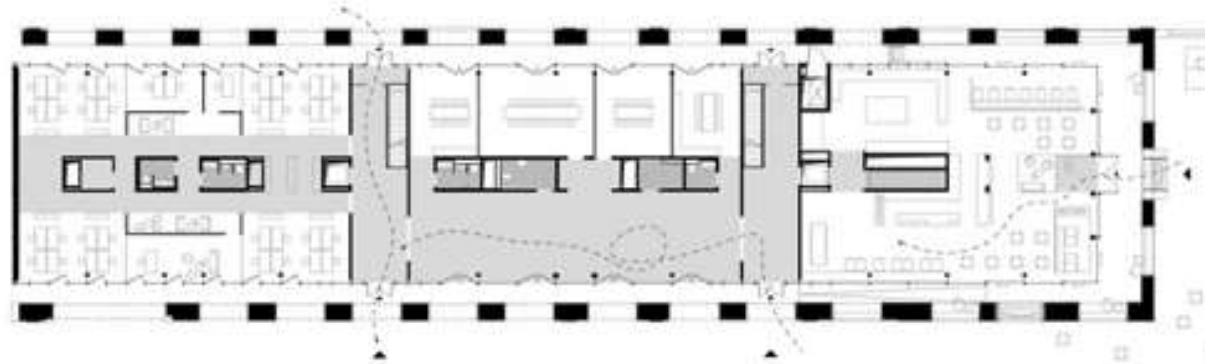

Figure 6. Building Plan
Source: https://www.archdaily.com/1016174

In the early 2000s, plans emerged to convert Gösserhalle into a multifunctional space. The project included renovations aimed at preserving the building's historical character while transforming its function for modern use. This conversion was undertaken to revitalize the building and adapt it for various events such as exhibitions, concerts, and social gatherings. Throughout the conversion process, special attention was given to preserving historical architectural elements, such as the steel structure and ornamental details, while incorporating modern facilities to meet the needs of new users. The building was transformed into a versatile space capable of hosting a wide range of events and public activities, establishing it as a cultural and social hub in Graz.

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Figure 7. GOH Conversion Gösserhalle building after the intervention
Source: https://archello.com/project/goh-conversion-gosserhalle-vienna-at

The conversion of Gösserhalle not only breathed new life into a historic building but also contributed to the revitalization of its surrounding area. The building has now become an important cultural and architectural landmark in Graz, attracting the attention of both local and international visitors. Gösserhalle exemplifies how architecture with historical value can be adapted to meet contemporary needs while honoring and preserving its historical and architectural significance.

3. Case Study 3: Intervention / MSRAA - Martin

The heritage intervention on the Republica Building by Martin Schmidt Radic Arquitectos Asociados (MSRAA) is an Adaptive Reuse project aimed at revitalizing a historic property that suffered significant damage due to a fire in 2016. This project serves as an intriguing case study in balancing the preservation of architectural and historical elements with the functional needs of the surrounding area.

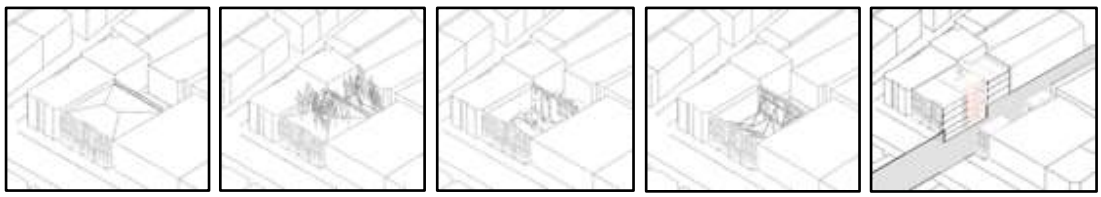

Figure 8. Disaster chronology diagram and intervention approach
Source : https://www.archdaily.com/971107

The project focuses on restoring the main façade and three remaining walls of the original building, reinforcing these elements to maintain their character and historical value in accordance with local conservation regulations. The historical integrity evident in the front and back façades, as well as the boundary walls, is preserved to uphold the building's character. The original layout, which consisted of a single building, has been transformed into two separate buildings with a courtyard in between. This design considers the need for open space mandated by regulations, with the central courtyard providing natural light and ventilation, while also serving as a central axis for circulation and activities within the buildings. Structural considerations are critical due to the vulnerability of the old structure's stability, so the construction process is carried out with great care. In addition to the structural aspects, the variation in materials used in the design creates a contrast between the historic brickwork and the new contemporary materials, resulting in an aesthetic blend of the old and new elements of the building.

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Figure 9. Post fire disaster photo and photos after project completion
Source: https://www.archdaily.com/971107

The approach of Martin Schmidt Radic Arquitectos Asociados to the Republica Building serves as an example of Adaptive Reuse that prioritizes respect for the historical architectural values and the original structure. Additionally, this approach is exploratory in its planning, blending modern functionality with an appealing aesthetic. As a result, this intervention successfully keeps the building relevant within the context of contemporary civilization.

3.2. Characteristics of the Bali Festival Park Building

Figure 10. Photo of the Lumbung Building in the Bali Festival Park Area
Source: Author

Taman Festival Bali, located on Padang Galak Beach in Sanur, has several unique characteristics that reflect its historical background as a large amusement park that is now abandoned. Here are some features of the Taman Festival Bali buildings:

1. Large Rice Barn (Lumbung) Architecture: The buildings in Taman Festival Bali were designed to support a large amusement park with extensive attractions, such as theaters and various entertainment facilities. The architectural style resembles traditional Balinese lumbung building, which have historically been used for storing rice. Traditional lumbung buildings in Bali represent a form of vernacular architecture rich in cultural value and

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function. Historically, they served as storage for rice, reflecting the agrarian community's dependence on agricultural products.

2. Architectural Style: Overall, the buildings exhibit an architectural style influenced by traditional Balinese aesthetics, featuring local ornaments and a mix of modern materials such as concrete, iron, and glass.
3. Abandoned Structural Condition: Since being left vacant in 2000, many buildings in Taman Festival Bali have suffered significant deterioration. Abandoned walls, collapsed roofs, and structures overrun by vegetation contribute to the site's character. Corrosion on metal elements and material degradation due to exposure to weather elements are also clearly visible.
4. Environmental Influences: The proximity of Taman Festival Bali to the beach makes the buildings vulnerable to damage from salt-laden air, which accelerates corrosion of metal elements. Additionally, the tropical environment with high humidity and intense rainfall contributes to material decay.
5. Urban Exploration Atmosphere: With its abandoned state, Taman Festival Bali has become an attraction for "urban exploration" enthusiasts. The graffiti scattered throughout various parts of the buildings, wild plants growing around and within the structures, and the mysterious, eerie ambiance make this place visually unique.
6. Open Space and Landscape: Besides the main buildings, Taman Festival Bali also features expansive open areas that were originally designed for outdoor attractions and recreational gardens. This landscape is now filled with long-established vegetation, with nature reclaiming the space.

3.3. Bali Festival Park Building Documentation

The researchers conducted field measurements and documented Taman Festival Bali, providing crucial insights for the analysis, planning, and restoration of this abandoned site. The use of AutoCAD and SketchUp software supports architectural modelling and visualization, playing an essential role in the design, revitalization, and preservation processes. AutoCAD was utilized to precisely document the building's physical condition, including its actual dimensions and remaining structures, serving as a critical technical reference for restoration and redevelopment efforts. Meanwhile, SketchUp allows for 3D modelling to plan the adaptive reuse of Taman Festival Bali, showcasing how the building can be transformed for relevant interventions.

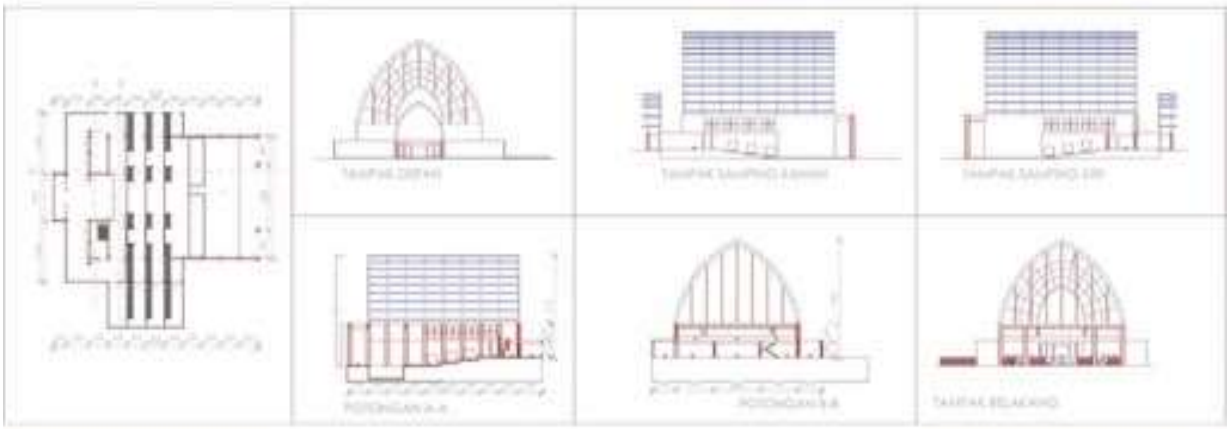

Figure 11. Bali Festival Park Building Documentation
Source: Author

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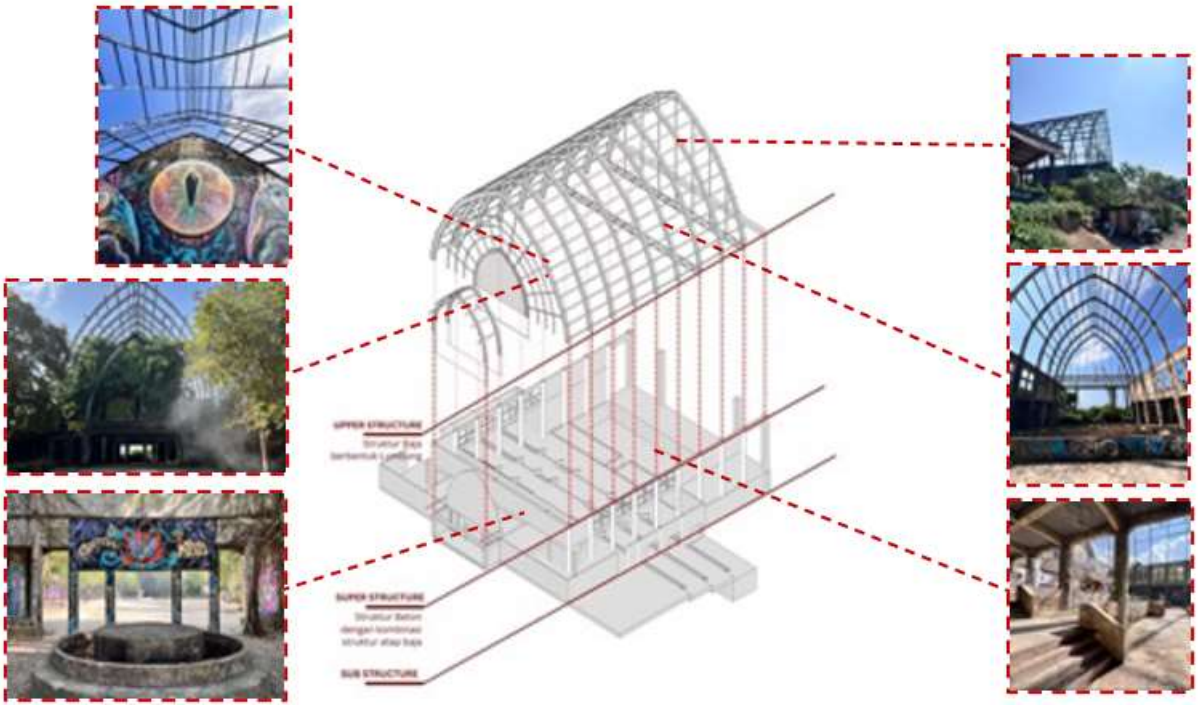
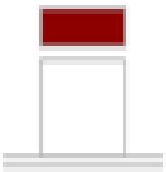


Figure 12. Documentation of Structure in the form of 3-Dimensional Modeling
Source: Author

3.4. Adaptive Reuse Intervention Strategies

The case study conducted has produced various types of interventions that can be applied without compromising the façade characteristics of the buildings. Based on the research by Sung-O Park (2009) in the thesis titled "A Design Strategy for Transforming an Old Power Plant into a Cultural Centre," several transformation strategies for Adaptive Reuse are outlined. The study presents nine relevant intervention strategies that can be utilized in designing interventions for the lumbung building in Taman Festival Bali, Denpasar. The diagram of these strategies is formulated in the following table and can serve as a guide for preserving the cultural heritage of the area while accommodating modern needs.

Table 1. Bali Festival Park Building Intervention Strategy Diagram

	Type of Interventions	Explanation	Diagram	Intervention on existing buildings
1	**Hat**	A hat in the context of intervention represents an architectural feature or structure added on top of an existing building as part of an adaptive reuse project.		
2	**New Interior**	This approach allows a building to retain its historical or architectural significance on the outside, while the interior is transformed to accommodate modern functions, styles and technologies.		

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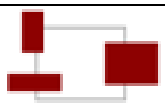
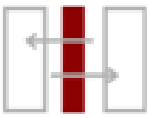
	Type of Interventions	Explanation	Diagram	Intervention on existing buildings
3	**New Face**	Involves transforming the exterior appearance of an existing building, providing a fresh and modern facade while maintaining its structural core.		
4	**Parasite** (parasit)	Parasite Involves the strategic addition of new architectural elements or structures into existing buildings, often in unconventional or underutilized spaces, such as roofs, facades, or gaps between them.		
5	**Bridge**	Involves connecting two or more existing structures with a new architectural element, usually in the form of a bridge or overpass. These interventions create physical and functional connections between buildings, allowing for the sharing of space and resources or improving circulation between previously separate buildings.		
6	**Dialog**	This intervention refers to an approach in which a relationship is established between the existing structure and the new architectural elements in such a way as to create a harmonious relationship between the old and the new.		
7	**Divider**	Partitioning is an approach that divides the interior space of an existing building into smaller functional units or spaces, while maintaining the core structure and outer shell of the building.		

Source: Author

Adaptive intervention types such as Hat, New Interior, New Face, Parasite, Bridge, Dialog, and Divider can serve as strategies in planning the lumbung building at Taman Festival Bali to revive their function and appeal. For example, the Hat can add space above the barns without altering their structure, while New Interior allows for a transformation of the interior spaces to make them more modern. New Face can refresh the external appearance of the barns while retaining their structural core, and Parasite enables the addition of new elements in underutilized areas. Bridge can connect existing barns, creating connectivity between buildings, whereas Dialog and Divider can harmoniously integrate old and new elements while dividing the space for more effective functions. All these strategies can be applied to revitalize the barns, adapting to new needs while preserving their traditional essence.

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3.5. ARP (Adaptive Reuse Potential) Analysis

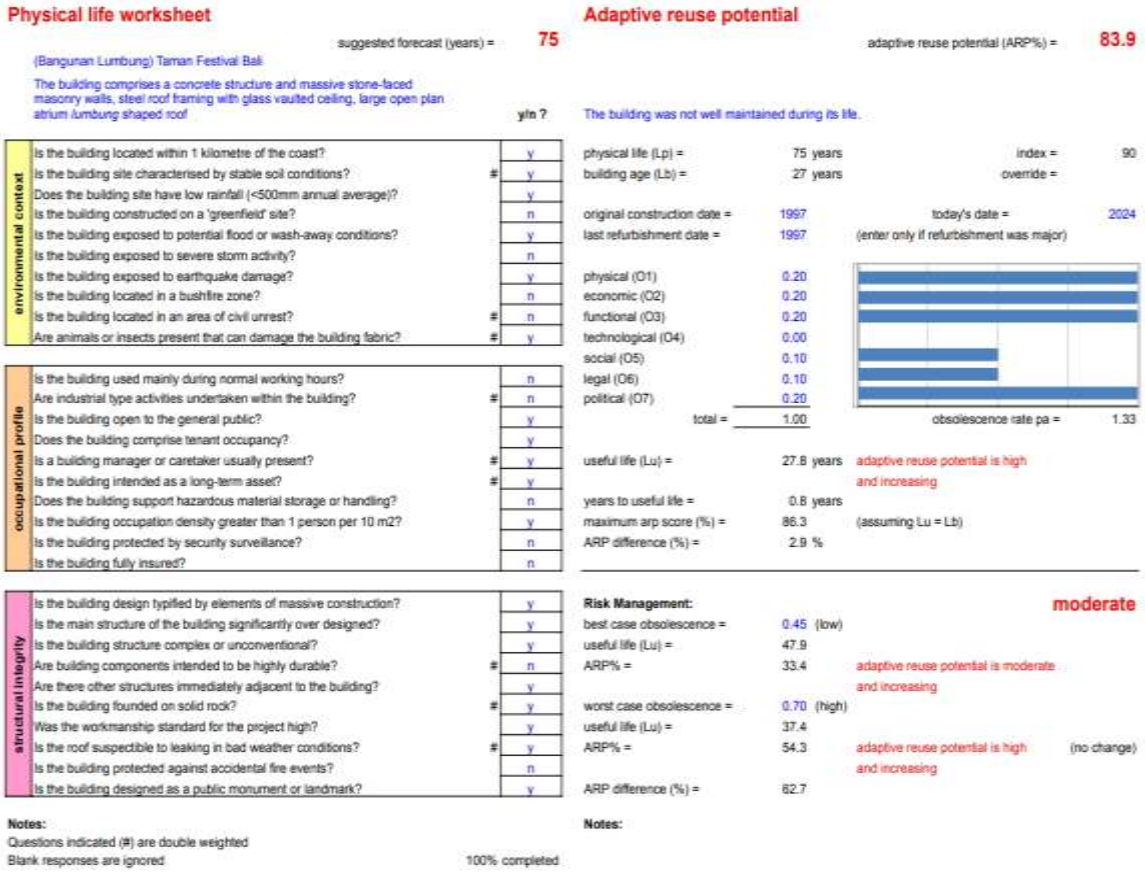

Figure 14. ARP Analysis at Bali Festival Park
Source: Author

Table 5. Adaptive Reuse Potential Worksheet

	Project Name	Lumbung Taman Festival Bali
A.	Date of Last Construction or Renovation	1997
B.	Building Age (2024)	27
C.	Estimated Physical Life	75
D.	Calculated Percentage of Physical Life Utilization	100
E.	Annual Obsolescence Rate (%)	0.60
F.	Estimated Remaining Life (years)	27,8
G.	ARP Score (%)	83,9
H.	Years to End of Life (years)	0,8
I.	ARP Risk Exposure (zero, low, medium, high or Extreme)	*Moderate*

Based on the ARP analysis, several key factors influence the strength of the building, which can be summarized into three main aspects:

Environmental Context: The surrounding environmental conditions, such as climate, topography, and natural disaster potential, significantly impact the durability and structural performance. Buildings located in earthquake-prone areas, flood zones, or regions with extreme temperature fluctuations require appropriate design and materials to ensure long-term resilience. Environmental influences may also include exposure to corrosion, humidity, and strong winds. In the environmental context table, proximity to the beach is a significant factor, as exposure to salt-laden air can affect the building's structure. This exposure can lead

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to corrosion of metal and iron components, ultimately weakening structural elements and triggering long-term degradation of the building. Other considerations include various environmental factors that could potentially cause damage, such as being in fire-prone areas, earthquake zones, regions susceptible to civil unrest, flooding, and experiencing high levels of rainfall.

Building Usage Profile: Each building is designed for a specific purpose, which affects the structural loads it must bear. For instance, an office building will have different structural requirements compared to an industrial or residential building. Additionally, changes in use from the original plan, such as renovations or increases in building capacity, can also affect structural strength and must be considered in performance analysis. Another aspect to consider in the ARP study is the user profile, which includes several important questions such as building insurance, purpose of use, safety, usage levels, and additional questions regarding the storage of hazardous materials. From the data, it can be concluded that the Taman Festival building is still operational as a site for visiting abandoned historic buildings, meaning its use is not continuous but occurs during tourism visits. Based on the analysis and initial function of the building as a performance venue, it is not associated with industrial functions. All these questions serve as a checklist that must be adjusted to current conditions.

Structural Integrity: The quality of construction materials, building techniques, and regular maintenance play a crucial role in determining the overall integrity of the structure. Weaknesses in planning, poor workmanship, or neglect of maintenance can reduce the building's lifespan and increase the risk of damage or structural failure. structural integrity encompasses various questions related to construction elements, workmanship quality, soil conditions, building components used, structural complexity, and the potential for leaks during extreme weather. This structural aspect has a significant impact on the overall evaluation of Adaptive Reuse, which is assessed through weighting in the Adaptive Reuse Potential (ARP) table.

All aspects in this table provide an assessment of the building's potential lifespan, ultimately influencing the ARP percentage. Based on the weighting that includes environmental context, building usage, and structural integrity, it is projected that the physical age of the building could reach 75 years with an index of 90. The study location at Taman Festival Bali, which was built in 1997, has a building age of 27 years as of 2024.

4. CONCLUSION

The study on Adaptive Reuse of the Taman Festival Bali building highlights the importance of preserving historical structures while integrating new functions without compromising the original character of the building. This approach aims to revive abandoned areas by leveraging the potential of old buildings and adding functional and aesthetic value relevant to current needs.

Key findings from this study include:

1. The results of the Adaptive Reuse Potential (ARP) provide a valuable framework for assessing the potential of a building, enabling a comprehensive view of key variables in mapping out Adaptive Reuse project planning. The Lumbung building at Taman Festival Bali, with an age of 27 years against an estimated lifespan of 75 years, exhibits a low obsolescence rate (0.60%) and retains nearly 28 years of usable life. The high Adaptive Reuse Potential (ARP) score of 83.9% and moderate exposure to risk indicate that this building is a strong candidate for Adaptive Reuse. However, additional factors must be

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considered as the building approaches the end of its expected lifespan, despite its current suitability for repurposing.

2. Importance of Balancing Preservation and Modernization: The Adaptive Reuse concept allows old buildings to remain relevant by introducing new functions while preserving their architectural integrity. This can be achieved through interventions like Hat to add space or New Interior to adapt the layout within the building.
3. Flexibility in Design Approach in adaptive reuse play an important role. The Parasite and Bridge approaches allow for the utilization of unconventional spaces or connections between buildings, adding value within existing spatial constraints.
4. Preservation of Facade Character including new Face and Dialog emphasize the importance of preserving and respecting the original character of the building while introducing new elements that do not overshadow the identity of the old architecture.

In this process, various types of adaptive interventions such as Hat, New Interior, New Face, Parasite, Bridge, Dialog, and Divider are considered as key strategies for designing harmonious changes between old and new elements. Case study research from Sung-O Park's thesis enriches the understanding of various transformation strategies that can be applied to old buildings without damaging the characteristic facades. This is particularly relevant in the context of Taman Festival Bali, which possesses its own historical and iconic value, especially in the preservation of local architectural heritage. A deeper investigation into how adaptive reuse can be applied to other heritage sites across Bali or Indonesia, with a focus on balancing preservation with modern urban needs, could expand the knowledge base of successful reuse strategies. This would help identify the variables that contribute most effectively to preserving cultural identity while introducing modern functionalities.

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