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Historical Drivers and Impacts of Adaptive Reuse of Buildings in South Africa

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Abstract

The construction sector exerts pressure on natural resources, contributing to resource depletion. With a projected increase in the South African housing market, sustainable solutions to housing delivery become crucial. The housing sector is responsible for approximately 40% of global energy consumption and nearly 30% of total carbon emissions, posing a critical challenge to sustainable development efforts worldwide. As urban populations continue to grow, the demand for new housing and infrastructure intensifies, further exacerbating the strain on natural resources and the environment. Housing scarcity and the need to address inequalities demand innovative strategies for sustainable housing delivery. Initiatives like the adaptive reuse (AR) of buildings aim to reduce the environmental impacts of construction activities. Therefore, the study examined the historical application of AR to identify the driving factors and impacts in South Africa's housing landscape. Through a case study approach utilising secondary data analysis, the research examines the historical application of AR in South Africa to identify its driving factors and impacts. Secondary data was systematically analysed through thematic content analysis to interpret the factors influencing AR. Key findings indicate that the drivers for AR include, revitalisation, economic development, environmental sustainability, and the need to address social inequalities and urban decay. The impacts of building reuse were found to include the preservation of cultural heritage, and revitalisation of the built environment, increased neighbourhood cohesion, and sustainable development. The study concludes that adaptive reuse of existing buildings presents a viable and practical solution for sustainable housing delivery in South Africa.

Keywords
Adaptive reuse, built environment, housing delivery, sustainable development

1. Introduction

Rapid urbanisation and population growth have led to overcrowding, inadequate infrastructure, service delivery constraints and resource conservation problems, especially in the Global South (Oluleye et al., 2021). This has constrained efforts to contribute to the realisation of climate change reduction (Sustainable Development Goal (SDG 13) and sustainable cities and communities (SDG 11). Within the real estate industry, the commitment and research into housing delivery and urban sustainability have grown exponentially. This is critical given that achieving sustainable housing delivery is critical to long-term economic growth. Emerging countries have seen a rapid increase in urbanisation, leading to a significant demand for real estate assets such as housing and infrastructure from the growing population (Oluleye et al., 2021). Urbanisation leads to overcrowding, a dismal environment, and inadequate infrastructural services (Kallergis et al., 2019). One of the ways to improve the status quo is through sustainable housing delivery.

Sustainable housing developments have efficient energy and waste management systems, are affordable and liveable (Kallergis et al., 2019). AR is implied in this study as a sustainable method of changing the original use of an existing building while retaining the building's original structure and fabric to extend the building's useful life (Aigwi et al., 2020). Globally, adaptive reuse has been successfully implemented in various contexts, including the transformation of industrial buildings into residential complexes, offices, and cultural spaces (Owojori et al., 2023). In Europe and North America, for example, adaptive reuse has been a key strategy in urban regeneration, providing sustainable solutions to address urban decay and meet the changing needs of cities (European Environment Agency, 2019). Asian countries like Japan and Singapore have also embraced adaptive reuse to enhance urban sustainability and promote

economic development. However, countries in the Global South, particularly in South Africa are yet to apply the concept for sustainable housing (Owojori et al., 2021).

Housing in South Africa is daunting, as observed by the population living in slums and informal settlements and the rising demand for affordable housing (Mkuzo et al., 2019). The effects of colonialism and apartheid are still evident in South Africa's society, economy, landscape, culture, and entire built environment. One of the challenges facing the government is addressing racial and social inequality and injustices in the provision of adequate housing. Sustainable housing delivery requires strategies to reduce the incidence of building demolitions and increase resource conservation (Sobantu et al., 2019). One of those strategies is through AR.

The government's efforts to provide sustainable housing have been evident in various policies. The focus of policy has shifted from quantity to quality, with an emphasis on the housing delivery process, including planning, involvement, and long-term housing sustainability (Manomano et al., 2016). The main goal is to eliminate all informal settlements; however, the problem persists (Mkuzo et al., 2019). Despite different measures, the government has not kept up with the growing demand for sufficient housing from the growing population, and informal settlements are on the rise (Marutlulle, 2017). The World Bank predicts that by 2030, more than 70% of South Africa's population would reside in urban areas, up from more than 67 percent in 2021 (World Bank, 2021).

Turok (2016) claims that to accommodate the expanding urban population existing structures could be utilized more intensively through sustainable AR (Kotze & Carow, 2019). Such adaptive procedures involve the repurposing of vacant properties, as well as the reuse and recycling of materials. Therefore, the reuse of buildings can offer a sustainable solution to the problem of housing delivery (Wilkinson & Remoy, 2018).
This study therefore focuses on examining instances of building reuse in South Africa and the driving factors. A review of the literature was undertaken to identify instances of AR of buildings in South Africa, the factors that influenced these and the impacts. The rest of the paper presents the methods adopted to conduct the study, the findings and discussion, and the conclusions drawn from the study.

2. Significance of AR in Sustainable Development

The practice of reuse of buildings became more widespread in the 19th and 20th centuries, as cities began to industrialize and grow rapidly. This led to the construction of many large, industrial buildings that were no longer needed as the economy changed (Plevoets & Cleempoel, 2011). Many of these buildings were converted to new uses, such as offices, lofts, and retail spaces. AR is frequently used to produce profitable renovations in popular inner-city areas and city centres. Kurul (2007) highlights the significance of building reuse strategies in this context. According to their definition, AR is "the process of developing structurally sound structures for new, economically viable applications. Sustainable development, as defined by the Brundtland Report, is characterised by socio-economic progress that encompasses a harmonious integration of political, economic, and social activities (Mensah, 2019).

It aims to strike a balance between environmental protection and the preservation of fundamental natural processes to ensure the fulfillment of basic needs for both present and future generations within individual communities or among citizens. In this context, the AR of structures transcends mere building rehabilitation by incorporating recyclable components, making it a fundamental aspect of sustainable urban regeneration (Owojori et al., 2023). Sustainable development and AR share a profound interconnectedness, encompassing economic, cultural, and environmental dimensions. At the heart of sustainable development lies the conservation of natural and cultural resources. Reuse of buildings extends the life cycle of a building, resulting in reduced material consumption, energy utilization, and pollution, all of which wield a substantial influence on sustainability (Othman & Elsay, 2018). As a strategy for urban regeneration and heritage preservation, AR of buildings has garnered increased popularity and support in recent years.

3. Methods

This study employed a case study research approach using secondary data. This method was suitable to study the historical application of AR and the reasons for the changes, as was done by Awasthi and Gopakumar (2023). The main interest was on the events that occurred in the past and the representative sources were available on the existing websites, government reports and articles. Hand searching was used to purposively identify materials from Google. Representative materials that captured varied perspectives and provided a rich account of building reuse events were identified. A narrative approach was used to analysis the contents to extract the relevant information to achieve the study's objectives (Awasthi & Gopakumar, 2023). A similar approach was used by Sonday et al. (2020) to examine a

phenomenon in post-apartheid South Africa. Bounded in time, the AR application cases were examined in relation to the changes, driving factors and impacts.
Each case study was chosen because it exemplifies key aspects of AR in the South African context, particularly in relation to urban decay, social equity, and economic revitalization. These cases were selected to illustrate how AR has been used to address these challenges historically.
While secondary data provides valuable insights into the historical aspects, this may not entirely reflect the realities and localized impacts of AR in different contexts within South Africa. Recognizing this limitation, this study used secondary data analysis as a preliminary step to identify key trends and historical drivers before actual data collection. This approach helped to frame the research context and inform the development of a more targeted and comprehensive primary data collection.

4. Findings and Discussion

4.1 Significance of AR on social equity and community integration

The legacy of apartheid has resulted in a highly segregated urban landscape in South Africa, with distinct divisions between affluent and disadvantaged areas. Adaptive reuse contributed to reducing this spatial segregation by revitalising underutilised buildings in historically marginalised neighborhoods. Owojori et al (2023) found that AR projects can help integrate these areas into the broader urban fabric, providing residents with better access to services, infrastructure, and employment opportunities.

By repurposing existing buildings, adaptive reuse strengthened community networks and support local initiatives. One of the key benefits of adaptive reuse is its potential to promote social cohesion by creating mixed-use and mixed-income developments. Aigwi et al (2020) argue that reuse of buildings can facilitate the integration of different social groups by providing shared spaces and amenities, such as community centres, parks, and cultural facilities. This can help break down social barriers and foster a sense of community among residents. As such, AR projects have spurred economic development and investment in urban areas that were previously characterized by neglect and decay. The revitalization of the *Newtown Cultural Precinct* in Johannesburg, for example, has attracted businesses, cultural institutions, and residents back into the city centre, contributing to the economic regeneration of the area and promoting a more inclusive urban environment (Krige, 2010).

By repurposing buildings that were once symbols of oppression, AR projects have contributed to the healing and rebuilding of communities. The redevelopment of the *Maboneng precinct*, for example, has transformed a historically disadvantaged area into a thriving neighborhood with improved housing, community facilities, and public spaces, addressing the social injustices of the past and fostering a sense of community pride and belonging (Walsh, 2013).
Additionally, it has led to creating inviting public spaces and incorporating community-oriented facilities. AR projects have enhanced social interaction and built social capital. For instance, the transformation of the *Zeitz MOCAA* building in Cape Town into a museum and cultural center has provided a space for artistic expression and community engagement, attracting visitors from diverse backgrounds and encouraging social integration (Chung, 2017).

Furthermore, Several AR projects have involved local communities in their planning and implementation, leading to empowered communities that have a say in their living conditions and urban environment. The *Old Biscuit Mill* in Cape Town is a case where community involvement in the AR process has led to enhanced community ownership and social equity (Ferguson, 2015).

4.2 Historical Application of AR in South Africa

These projects showcase diverse approaches and outcomes in building reuse, spanning from heritage preservation to neighborhood transformation, and encompassing both cultural and commercial applications.

The Old Biscuit Mill, Cape Town

This was an industry constructed in the late 19th century and served as the Pyott's biscuit company's original biscuit mill. The firm was founded by John Pyott in the early 1900s, and it ran until 1946. The abandoned industrial site where the former biscuit factory formerly stood has been transformed into a mixed-use neighbourhood including retail, office, and residential areas. The building's historical identity was retained through the site's AR, which also helped

to revitalize the neighbourhood. The development assisted in reviving the Woodstock neighbourhood, which is now a well-liked tourist destination (Ferguson, 2015). By converting underutilized buildings into housing units, AR has been successful at preserving historical and cultural heritage, lowering environmental impact, and promoting sustainable development. This is illustrated by the conversion of the former biscuit mill into a mixed-use area as shown in Figure 1**.**

Figure 1: The Old Cape Town biscuit mill
(Source: https://theoldbiscuitmill.co.za)

The Workshop17

In 2019, a Johannesburg warehouse was converted into a co-working space and innovation centre (Workshop17, 2019). The Workshop17 is a warehouse-turned-coworking place in Cape Town, South Africa. GASS Architecture Studios in South Africa developed the space, which opened in 2016. The warehouse, which was built in 1928 and used as a storage facility for various items, was repurposed to create a co-working space and innovation hub that would promote and connect entrepreneurs, start-ups, freelancers, and creatives while providing them with various facilities and services, as seen in Figure 2. The primary concern was to convert the warehouse into a flexible and collaborative space that could accommodate a variety of needs and preferences while retaining its industrial charm and character which was successful in fostering Johannesburg's creative and digital economy, as well as to enhance the social and cultural diversity and vibrancy of the area (Workshop17, 2019).

Figure 2: (Source: workshop 17 website)

The Maboneng Precinct

In 2008, an inner-city district of Johannesburg has been revitalized by the AR of abandoned warehouses, factories, and offices into creative and cultural venues, such as art galleries, studios, theatres, and restaurants (Walsh, 2013). The Maboneng inner-city district was known for its criminality, squalor, and deterioration contributing to the social and spatial inequality and exclusion that continued in the neighbourhood. The relevance of preserving the city's industrial legacy while redeveloping its streets and buildings provided the drive for the reconstruction. The complex is made up of five independent structures that were originally separate. According to Jonathan Liebmann, the project's creator, the goal was to revitalize the neighbourhood and create a new arts centre. There was a need to rebuild an identity and develop a good image that would attract and maintain varied and innovative people and activities.

Jonathan Liebmann, a real estate developer, had the entrepreneurial vision to turn a run-down and decaying inner-city neighbourhood into a vibrant and creative centre that draws tourists, businesses, and artists (Cabaret, 2014). This was the fundamental driver for AR. The primary goal was to develop a cultural and economic revival that would revitalize Johannesburg's urban fabric and identity while preserving the area's diversity and heritage. The Johannesburg Development Agency (JDA) and a private development company worked together to transform the old, industrial buildings in the district into art galleries, retail stores, restaurants, offices, and residential spaces. The developer continued to grow, mainly within the residential segment of the market, by the end of 2014, acquiring 42 structures in the nearby vicinity, according to the precinct's urban strategist (Cabaret, 2014).

Newtown precinct and Jeppe Street power station

A further illustration of successful urban revitalization via the AR of existing structures is the Newtown precinct in Johannesburg. The precinct was originally a run-down industrial neighbourhood, but thanks to the renovation of several buildings, it has been transformed into a thriving cultural centre as in Figure 3. The Jeppe Street P which was constructed in the 1930s and for a long time provided a key component of the city's electrical supply, is one famous example (Krige, 2010). However, the power plant was rendered obsolete in the 1990s and was abandoned, where it deteriorated for years until being deactivated. AngloGold Ashanti, a mining firm, saw an opportunity in 2008 to breathe new life into the power plant by turning it into its global headquarters (Krige, 2010). The Johannesburg Development Agency (JDA) and others worked together to transform the Jeppe Street Power Station into a mixed-use building featuring offices, galleries, and exhibition spaces. The building's prominent landmark in the neighbourhood, the tall brick chimneys, were preserved along with other historic industrial elements. The precinct in Newtown, which is now a well-liked tourism site for both locals and visitors, has been revitalized because of the project, which was completed in 2004 (Heritage portal). The result of the conversion is a stunning example of how the beauty of industrial buildings can be enhanced when given a second life. This extraordinary blend of the old and contemporary is a sought-after site for weddings, conferences, and other events, and it serves as a reminder of Johannesburg's industrial past while contributing to its dynamic present.

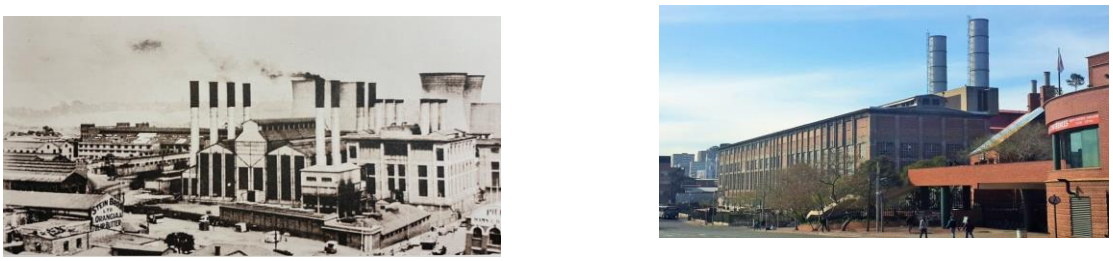

Figure 3: Jeppe Street Power Station (Source: JHB One Hundred Year; The Heritage Portal)

The 1Fox Precinct

In Johannesburg's Ferreirasdorp neighbourhood sits the 1Fox Precinct, a historic precinct. Previously known as the Sheds@1Fox, it was transformed from a group of 12 vacant warehouses and industrial structures into a mixed-use location for gatherings, dining, and entertainment. It was a portion of the first mining settlements that appeared after gold was discovered in the 1880s. During the fast expansion of Johannesburg's transportation industry in the early half of the 20th century, the region evolved into the focal point for the management, maintenance, and storage of trams and buses (1Fox, 2023). This neighbourhood has evolved into a vibrant cultural hub in the present. When sheds were constructed for the housing and maintenance of the first electric trams between 1906 and 1907, the neighbourhood started to expand. These three power plants were constructed to supply the city's expanding population and contemporary transportation systems with the electricity they require. Above the bustle of 1Fox, the M1 highway, built in the 1960s and 1980s, can be seen. Today, it is home to several thriving enterprises. Propertuity, a real estate development business that was also responsible for the successful rehabilitation of the adjoining Maboneng Precinct, oversaw the conversion. The project's objective was to provide a lively, dynamic venue that would act as a centre for creative enterprises and the larger neighbourhood. Since its formal opening in 2015, the 1Fox Precinct has grown to be a well tourist attraction for both locals and visitors, featuring a variety of food establishments, artisanal markets, and entertainment activities (1fox, 2023). Additionally, it is the location of various creative businesses, such as artist studios and co-working spaces as shown in Figure 4.

Figure 4: I Fox precinct (Source: Joburg.co.za)

The Ikhaya Trust Centre

Previously a beer hall, it was damaged by fire in 2002 and purchased by the Greater Stellenbosch Development Trust (GSDT), which was founded the same year. The Greater Stellenbosch Development Trust, a nonprofit organization that promotes sustainable development and opportunities for empowerment in underserved communities, oversaw the project (Stellenbosch heritage, 2023). The GSDT, consisting of a group of concerned individuals, purchased the former beer hall destroyed by fire and converted it into a community centre. Their objective was to assist in bridging the social and cultural divides in Stellenbosch. The project's goal was to make the neighbourhood a safe place to congregate and participate in a range of activities, including after-school programs, skill development, and leisure pursuits. A sewing studio, a computer lab, a library, and a vegetable garden are also located in the centre. From there, the Trust now operates from the iKhaya Trust Centre. The Ikaya Trust Centre in Figure 5, which won the esteemed CIfA Award for Architecture, is a prime example of how radically an AR may change people's everyday lives and social advancement. In their verdict for this award, the judges stated: "*The iKhaya Trust Centre demonstrates how much an architect can transform the daily experience and social development of many people through one well designed building".* The AR of the Ikhaya trust centre shows how a building that was associated with social problems and violence was transformed into a space that promotes education, culture and empowerment for the people of Kayamandi. The AR of this content remains important because it demonstrates how a structure that was once linked to social issues and violence was changed into a location that supports Kayamandi residents' access to education, culture, and empowerment.

Figure 5: The Ikhaya trust (Source: artefacts.co.za)

4.3 Historical Drivers of AR in South Africa

The global application of AR has shifted from primarily a cultural and aesthetic obligation for preserving heritage structures to a critical sustainable strategy with social and environmental benefits. The following were identified as the drivers of AR based on its historical application in South Africa. The driving factors include urban decay and revitalisation, inequalities, economic development, and environmental sustainability.

Urban decay - Many buildings or structures in South African cities were abandoned, neglected, or underutilized for a variety of causes, including economic decline, social instability, crime, violence, or relocation. These facilities or buildings threaten the urban environment and quality of life by being sources of pollution, waste, vandalism, or fire (Krige, 2010). AR provided a solution for revitalizing those existing structures and transforming them into productive and appealing spaces for a variety of applications and services, such as housing, commerce, culture, education, or recreation. As an illustration, the Maboneng Precinct in Johannesburg, which was previously described, is an element

of successful AR of abandoned industrial buildings into a vibrant and dynamic urban neighbourhood that houses art galleries, studios, restaurants, hotels, and flats.

Social exclusion **-** In South Africa, many communities and groups, particularly Black Africans, women, rural residents, and migrants, have been marginalized and deprived of their rights and opportunities to access decent and affordable housing. They have experienced social exclusion and marginalization as a result of a variety of causes, including xenophobia, racism, poverty, and inequality (Everatt & Ebrahim, 2020). These communities or groups frequently don't have access to opportunities, services, or housing that is suitable and affordable. In order to tackle social exclusion and advance social justice in South Africa, AR has shown to be a effective tool. By reusing the existing structure, AR presented an opportunity to include and empower these communities or groups by giving them liveable, decent living and working spaces that are tailored to their needs and preferences as well as by involving them in the design and management of these spaces (Kotze & Carow, 2019). For example, the reuse of the former biscuit factory- Old biscuit mill was converted into a mixed-use development that includes retail, restaurants, and offices. The project created a diverse and inclusive urban space that attracts people from different social and economic backgrounds.

Economic decline **-** Due to a variety of issues, including the economic meltdown, shifting market conditions, and political unrest, many businesses or industries in South Africa are experiencing economic decline and instability (Sobantu, 2019). These businesses or industries often have low productivity, profitability, and competitiveness in addition to low turnover or closure. AR provided an opportunity to revitalize and diversify these sectors or industries by developing new and innovative products, services, and markets that make use of the existing resources and capacities of these sectors or industries, as well as by generating new and alternative sources of income and employment. For example, the Workshop 17 described was a successful case of AR of the historic transformation of the warehouse into a flexible and collaborative space capable of accommodating a wide range of demands and preferences while keeping its industrial beauty and character was successful in boosting Johannesburg's creative and digital economy. Another illustration is the innovative repurposing of former warehouses, as seen in Johannesburg's 1Fox precinct and Victoria Yards, which increased the social and economic activity of the areas while preserving its original design and character.

Environmental degradation **-** Due to pressures from population increase, urbanization, industrialization, consumption, and climate change, many natural and constructed habitats in South Africa are seriously threatened by environmental degradation. These pressures have a negative influence on the biological functions and values of these settings by causing biodiversity loss, water scarcity, soil erosion, air pollution, and other issues. AR offered an opportunity to conserve and restore these environments by reducing the environmental footprint and impact of construction activities on these environments. For instance, the Zeitz Museum of Contemporary Art Africa in Cape Town was built on the site of the former grain silo complex by maintaining the historic building and adding energy-saving technologies and renewable energy sources. Comparing this initiative to the construction of a new development, embodied energy was reduced by up to 80 percent which is an example of preserving the significance of many cultural heritage buildings while improving their environmental efficiency.

4.4 Historical implications of AR in South Africa

Preservation of cultural heritage **-** The preservation and enhancement of South Africa's cultural and historical heritage through preserving and celebrating the many and varied identities, memories, and stories of its people and places, as well as through increasing public and stakeholder understanding of the importance of the built heritage. For instance, Johannesburg's Constitution Hill is a successful example of AR of a former prison complex into a court of justice that highlights the development of democracy and human rights in South Africa as well as the challenges that nation has faced (Desmond & Leah Tutu legacy foundation, 2021).

Enhanced design and functionality of the built environment **-** Improving and innovating the design and functionality of the built environment in South Africa by implementing imaginative and suitable solutions and approaches that address the particular needs and contexts of the built environment's users and beneficiaries, as well as by integrating sustainable and efficient technologies and practices that optimize the use of resources and energy. For instance, the Zeitz Museum of Contemporary Art Africa in Cape Town is a successful example of AR of a former grain silo into a top-tier art museum. The museum has stunning architectural design that preserves and transforms the original structure and a cutting-edge environmental system that reduces the museum's environmental impact (CSI Studio, 2017).

Stakeholder collaboration **-** The contribution and participation of civil society and the community in the development and of the built environment in South Africa, through the promotion of inclusive and collaborative processes and platforms that enable and empower the civil society and community to express their views and interests, as well as

influence and benefit from decisions and actions that affect their built environment. For example, the Ikhaya Trust Centre in Kayamandi is a successful case of AR of a former beer building into an education center that provides a variety of services and facilities to Kayamandi residents, including education, health, culture, and recreation, as well as a space for dialogue and engagement among various stakeholders (Stellenbosch heritage, 2023).

Cost-effectiveness - One factor driving interest in adaptation is a growing belief that converting old buildings to new uses is typically less expensive than demolishing and rebuilding (Gregory, 2004). The cost-effectiveness, advantages, and drawbacks of reuse versus demolition and new construction have been extensively debated. According to Douglas (2006) and Kohler and Yang (2007), repurposing a structure is generally more economical than demolishing it, given that the structural components are already in place, potentially resulting in shorter financing periods (Shipley et al., 2006). As a method of conservation that is physically, economically, and environmentally sustainable and a type of sustainable urban renewal that extends the life of structures while avoiding demolition waste, supports embodied energy reuse, it thus gives considerable social, economic, and societal benefits (Yung & Chan, 2012). This typically finds expression in structures that have been abandoned and faced economic or social challenges. Therefore, finding innovative applications with future potential is essential.

5. Conclusion

This study contextualizes the application of adaptive reuse within the unique socio-economic landscape of South Africa, highlighting its role in addressing historical inequalities and contributing to urban regeneration.

The study assessed the historical application of the reuse of buildings in South Africa to identify the driving factors and impacts. By examining both the drivers and impacts of AR, this research provides a holistic understanding of its application, filling a gap in the existing literature on sustainable housing solutions in South Africa. Findings revealed that the driving factors included urban decay and revitalisation, the need to address inequalities and social injustices, economic development, and environmental sustainability. The impacts included preservation of cultural heritage, enhanced design and functionality of the built environment, stakeholder collaboration and cost effectiveness. The AR of buildings can offer a sustainable solution to the problem of housing delivery. AR incorporates procedures to improve the long-term viability of building structures and housing delivery and reduce backlogs. These projects were used to foster social integration by bringing together different communities and activities within shared spaces. These initiatives promoted social integration by bringing together various communities and activities in shared spaces. They demonstrated different approaches and outcomes of AR, ranging from preservation of heritage to transformation of neighbourhood, and from cultural to commercial uses.

The success of these endeavours, as evident from the reports examined, was attributed to innovative approaches to the reuse of buildings. These initiatives not only addressed societal challenges such as abandonment but also provided cities with crucial infrastructure and facilities. Policies should be enacted to continuously educate the public on the positive impacts of AR on community revitalization and cultural preservation. This will help to enhance resource efficiency, the optimisation of urban infrastructure and reduced environmental and economic consequences. Further, cultural assets associated with these structures can be preserved, leading to a positive influence on community well-being and overall quality of life.

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