

## Article

# Building Conversion: Enhancing Sustainability Through Multifunctionality and Movable Interior Systems

Sonia Vuscan<sup>1</sup> and Radu Muntean<sup>2,\*</sup> 

<sup>1</sup> School of Industrial Design, Shandong University of Art and Design, Jinan 250100, China; sonia.vuscan@sdada.edu.cn

<sup>2</sup> Faculty of Civil Engineering, Transilvania University of Brasov, 500036 Brasov, Romania

\* Correspondence: radu.m@unitbv.ro; Tel.: +40-745183892

**Abstract:** As urban expansion faces increasing constraints, adaptive reuse has become a critical strategy for sustainable development. This study examines how multifunctionality and adaptability, facilitated by movable interior systems, can enhance the efficiency and longevity of building conversions while reducing material consumption and construction waste. Through a dual-questionnaire methodology, responses were gathered from over 200 end-users and 100 industry professionals across multiple countries to assess perceptions of adaptability in building reuse. The findings indicate that 89% of end-users prioritize spatial flexibility, while professionals cite financial constraints (67%) and regulatory barriers (54%) as key obstacles to implementation. This study highlights the potential of ADD-rest and similar reconfigurable interior systems to optimize underutilized spaces, aligning sustainability, urban resilience, and design innovation. By bridging theoretical concepts with empirical data, this research offers practical insights for architects, urban planners, and policymakers, reinforcing the role of adaptable interior solutions in the future of sustainable urban transformation.

**Keywords:** building conversion; sustainability; multifunctionality; adaptability; urban regeneration; architectural transformation; creative repurposing



Academic Editor: Antonio Caggiano

Received: 3 March 2025

Revised: 23 March 2025

Accepted: 1 April 2025

Published: 3 April 2025

**Citation:** Vuscan, S.; Muntean, R. Building Conversion: Enhancing Sustainability Through Multifunctionality and Movable Interior Systems. *Sustainability* **2025**, *17*, 3182. <https://doi.org/10.3390/su17073182>

**Copyright:** © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

In the face of constrained urban development, maximizing the potential of existing built environments emerges as both a pragmatic and sustainable solution. Urban landscapes are defined by duality, that is, functional structures that contribute to economic and social life and derelict buildings that have lost their original purpose. Addressing this imbalance requires strategic interventions that prioritize sustainability by reclaiming and reintegrating abandoned spaces while minimizing environmental impact.

### 1.1. Reclaiming Urban Spaces: The Role of Multifunctionality and Adaptability in Sustainable Building Conversion

From an economic and ecological perspective, underutilized buildings represent untapped resources and embodied carbon. These include functionally obsolete but structurally sound spaces—such as vacant office buildings and specialized facilities—as well as derelict structures, such as abandoned warehouses and factories, which suffer from weathering, neglect, or human activity like vandalism and graffiti. Despite their deterioration, these structures retain their vertical integrity, offering significant potential for sustainable repurposing [1–3].

Opting for adaptive reuse over demolition and new construction aligns with core sustainability principles, reducing waste, preserving material investments, and decreasing the carbon footprint associated with new developments. This approach involves stripping away outdated functions, redefining spaces to serve evolving needs, and reintegrating otherwise wasted materiality into the economic system while enhancing urban resilience. As a result, building conversion has become a critical strategy for sustainable urban development [4,5].

While the transformation of disused buildings is not a novel concept, its importance has surged in recent years, particularly in the post-COVID-19 era. The pandemic underscored the need for flexible spatial design, as cities faced sudden shifts in usage patterns, from quarantine facilities to remote work adaptations [6]. However, building conversion lacks a universal methodology; each structure's potential must be evaluated individually. Although ethical development frameworks and quality assurance standards guide these transformations, regulatory and planning frameworks vary across regions. Furthermore, while repurposing buildings inherently supports sustainability, true sustainability can only be achieved if both the conversion process and the final outcome adhere to environmentally responsible principles [7].

The adaptive reuse of office, commercial, and industrial buildings plays a crucial role in urban sustainability strategies, mitigating environmental degradation, reducing urban stress, and preserving architectural heritage [3,8,9].

Beyond its ecological advantages, building conversion addresses contemporary social and economic challenges, including the following [10]:

- Resource scarcity and financial constraints—rising urban land costs and increasing construction expenses necessitate efficient and sustainable spatial solutions.
- The demand for flexibility—changing work patterns (e.g., remote and hybrid work) call for adaptable office and residential spaces [11].
- Resilience and emergency preparedness—cities require multi-functional spaces that can swiftly accommodate crises such as pandemics, climate disasters, or refugee housing needs.
- Evolving urban lifestyles—the rise of co-living, co-working, and shared-use spaces reflects a societal shift toward more fluid and integrated living and working environments [12].

Reconfigurable interior systems present a powerful tool for revitalizing businesses and communities while ensuring long-term adaptability. Addressing the economic stagnation of vacant office or retail spaces requires solutions that prioritize sustainability, multifunctionality, and flexibility to prevent future obsolescence. Emerging interior design innovations—such as ADD-rest [12,13], Ori Living [14], Bumblebee [15], or Space Plus [16]—introduce movable, reconfigurable systems that optimize spatial efficiency, aligning with evolving environmental and economic demands.

Despite these clear advantages, why are adaptable interior systems not more widely implemented? To explore this gap between innovation and application, this study employs a dual-questionnaire approach. One questionnaire targets industry professionals in architecture, design, and urban planning, while the other gathers insights from potential end-users. The objective is to assess perceptions of multifunctional interiors, the feasibility of movable systems, and the barriers to their broader adoption. These findings provide critical insights into the discrepancy between the enthusiasm for sustainable design solutions and the limitations preventing their widespread integration.

Furthermore, beyond addressing vacant buildings, adaptable interior systems offer a sustainable solution for affordable housing. As urbanization accelerates and housing prices soar, smaller yet highly functional living spaces—enabled by movable interior designs—can

enhance urban livability without requiring excessive square footage. Concepts such as modular micro-apartments and adaptive residential units align with the growing demand for affordability while ensuring resource efficiency and quality of life [17].

As centers of economic, social, and environmental activity, cities must prioritize reintegration, diversity, and adaptability. Moving beyond mono-functionalism toward mixed-use, resource-efficient designs provide multiple pathways for revitalization. These principles go beyond aesthetics; they drive both structural and functional reinvention, ensuring urban sustainability.

New paradigms in architecture, including mixed-use development, spatial diversity, and circular economy principles, have become foundational in addressing contemporary urban challenges. Together, these concepts shape a flexible and resilient architectural framework that fosters sustainable growth while accommodating the evolving demands of modern society.

While much attention has been given to the repurposing of vacant factories—often valued for their historical and architectural significance—an equally pressing yet less explored need is the conversion of vacant office buildings into affordable housing. Unlike industrial spaces, which require extensive restoration and are frequently associated with high-profile regeneration projects, office buildings present a more immediate and scalable solution to urban housing shortages. Their existing infrastructure allows for cost-effective adaptation, making them a viable alternative to new construction.

This transformation is guided by two interrelated theoretical frameworks with direct practical relevance: multifunctionality and adaptability. These concepts have evolved significantly, as discussed in recent critical reviews [18]. These concepts not only inform innovative spatial solutions but also offer a strategic approach to ensuring long-term sustainability in urban environments.

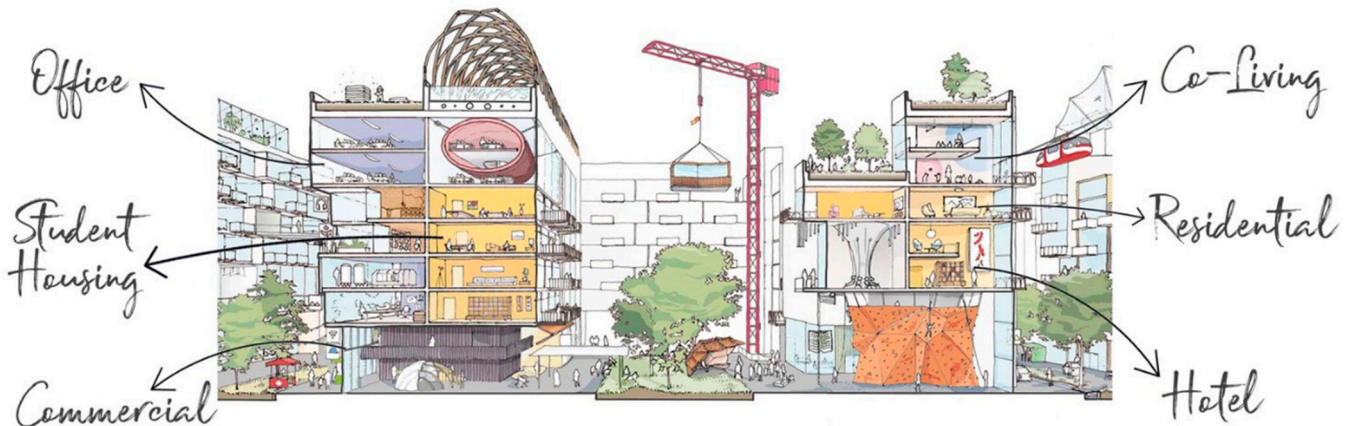
- Achieving multifunctionality through design: Multifunctionality refers to the capacity of a space to accommodate diverse and overlapping uses. Traditionally rigid office layouts can be reconfigured into flexible living environments, integrating residential, work, and recreational functions. This flexibility enhances spatial efficiency, allowing users to customize and adapt their surroundings in response to evolving personal and societal needs. Recent studies have highlighted the role of multifunctional homes in addressing urban lifestyle challenges [12].
- Benefits of adaptability in building conversions: Adaptability emphasizes the ability of spaces to evolve over time without requiring extensive structural modifications [11]. In the context of office-to-housing conversion, adaptability enables buildings to transition seamlessly between functions while reducing material consumption and construction waste. By prioritizing designs that anticipate future shifts in lifestyle and urban demands, adaptability supports both economic feasibility and environmental sustainability.

When synergistically implemented, these principles encourage a departure from mono-functional urban development in favor of resilience and resource efficiency. Converting office buildings into adaptable, multifunctional housing addresses not only immediate housing shortages but also the broader goal of sustainable urban transformation by mitigating unnecessary demolition, optimizing existing infrastructure, and minimizing urban sprawl. Integrated building retrofit strategies have been proposed to enhance flexibility and adaptability [17].

### *1.2. Multifunctionality—A Sustainable Answer to Present Needs*

Within the building development sector, architecture and design are increasingly embracing multifunctionality as a response to the challenges of globalization, urban migration, and evolving work-life dynamics. This shift promotes the integration of diverse uses within

a single structure, fostering adaptability and long-term sustainability. By accommodating layered functionality—such as retail, cultural spaces, hospitality (e.g., cafés, restaurants, hotels), co-living, and co-working—buildings can remain relevant and economically viable despite shifting societal needs, as shown in Figure 1.



**Figure 1.** Building conversion: giving second chances to office/retail buildings (adapted from Sidewalk Labs).

Beyond commercial applications, multifunctionality presents a viable solution to the growing demand for affordable housing. Smaller yet highly functional living spaces, designed with adaptability in mind, can help address housing shortages while maintaining a high quality of life. Concepts like flexible compartmentalization, space redefinition, and automation (e.g., the ADD-rest concept, as illustrated in Figure 2) enable buildings to evolve with minimal structural intervention. This adaptability ensures that spaces remain functional across different economic climates, reducing the risk of long-term vacancies and financial stagnation.



**Figure 2.** ADD-rest (multifunctionality)—affording solutions for any given context: ADD Comfort-Bed (a) and ADD Motion-Wall (b) [13].

Real-world examples, such as mixed-use developments in high-density urban areas (e.g., Tokyo’s capsule living solutions, Berlin’s adaptive reuse projects, or co-living hubs in Amsterdam), demonstrate the viability of this approach. By integrating multifunctionality from the outset, architects and developers can create resilient, future-proof spaces that blur the boundaries between work, leisure, and living—transforming static structures into dynamic ecosystems that foster community, creativity, and economic sustainability.

While homeworking became the norm during the COVID-19 pandemic, its impact on interior design persists beyond the immediate crisis. The need for versatile, adaptable spaces that blend work and living functions has continued to shape architectural design long after the pandemic's peak. Multifunctional spaces, particularly as embodied in the concepts mentioned above, were initially developed to address the changing dynamics of homeworking during lockdowns.

Multifunctionality is an interior space configuration concept that is both simple and complex. It operates on the principle of "use only what you need", rethinking the traditional boundaries of residential and office spaces. This approach redefines the roles of elements within a space, both materially and conceptually, as follows:

- (a) The furniture is not only functional but also serves as a building element and a surface for aesthetic interventions;
- (b) Spaces like the bedroom, typically reserved for nighttime use, become flexible, multifunctional ones serving as a sitting room or office during the day;
- (c) The overlapping affordances of these spaces create a dynamic environment where functionality can shift according to the user's needs;
- (d) Walls and partitions add flexibility through adaptable compartmentalization, allowing the space to be reconfigured as required.

The implementation of the above-mentioned concept offers several potential benefits: (a) it can create positive economic, environmental, and social impacts by optimizing space and reducing waste, (b) it improves the living, working, and congregating experience by providing flexible, user-centered environments, (c) it introduces a new model for environmental and social sustainability, encouraging adaptability and efficiency in urban spaces.

The persistence of remote work beyond the pandemic, as well as the ongoing social and environmental stresses facing urban areas, has fundamentally altered the nature of urban centers. Buildings that were originally designed for office use or commercial purposes have often been left vacant, their potential unrealized. These inactive spaces present an opportunity for adaptation and reactivation, introducing a new paradigm of building development—adaptability. As cities continue to expand and evolve, the ability to convert and adapt existing structures to meet shifting demands is increasingly seen as a critical strategy for sustainable urban development. The concept of inbuilt convertibility—designing buildings with the capacity to evolve with changing needs—has emerged as a crucial aspect of modern architecture [19].

As societies transition toward a predominantly urban future, urbanization continues to place significant pressure on cities. The rapid growth of megacities increases the demand for living spaces and requires a new approach to design that maximizes efficiency and functionality within limited space. This need for downsizing while enhancing utility is a central challenge for contemporary architecture. The application of multifunctional design offers a sustainable solution, helping cities adapt to both the ongoing stresses of overpopulation and the shifting demands of modern life.

### *1.3. The Concept: ADD-Rest and the Evolution of Interior Space Through Movable Systems*

The concept of ADD-rest illustrates the principles of multifunctionality in interior design through proposed movable systems such as the ADD Comfort-Bed and ADD Motion-Wall. These systems enhance spatial efficiency, reducing the need for additional floor area while enabling adaptive reuse and flexible configurations. They represent a shift away from rigid compartmentalization, fostering dynamic, multifunctional environments that respond to evolving human needs. These elements represent a paradigm shift in interior design, moving beyond rigid compartmentalization toward multifunctional and

adaptive environments that dynamically respond to human needs. ADD-rest is a concept of interior compartmentalization that challenges conventional spatial configurations. Traditionally, apartments are organized into predefined functional areas such as bedrooms, dining rooms, and living rooms. ADD-rest disrupts this static model by introducing transformable interior elements that adapt to the occupant's needs in real time. Through the integration of embedded mobility and multifunctional affordances, spaces once confined to a single use can transition fluidly between functions.

### 1.3.1. Multifunctionality and Adaptability in Action: ADD Comfort-Bed—A Sustainable Solution for Multifunctional and Adaptable Spaces

As urban spaces become increasingly constrained, multifunctionality and adaptability in interior design are emerging as key strategies for maximizing spatial efficiency without compromising comfort or usability. The ADD Comfort-Bed exemplifies this approach by integrating automated mobility into living environments, enabling seamless spatial transformation. Unlike conventional beds that permanently occupy valuable floor space, the ADD Comfort-Bed retracts into the ceiling when not in use, allowing a single room to serve multiple functions throughout the day—transitioning from a sleeping area to a workspace, social lounge, or recreational zone. This mechanism amplifies spatial efficiency, enabling a single room to accommodate multiple functions throughout the day (Figure 3).



**Figure 3.** ADD Comfort-Bed [13].

This system aligns with the core principles of building conversion and adaptive reuse by enhancing the flexibility of interior spaces in residential, commercial, and hospitality settings. Its impact on multifunctionality and adaptability is evident in the following three key areas:

1. **Optimizing space efficiency:** The retractable nature of the ADD Comfort-Bed allows for dynamic use of space, reducing the need for larger living areas while maintaining high functionality. This is particularly relevant for urban densification efforts, where maximizing existing spaces is essential.
2. **Sustainability in interior design:** By enabling a single room to fulfill multiple purposes, the system minimizes material waste associated with excessive furniture and unnecessary construction. Its low energy consumption further reinforces its role in sustainable living solutions.
3. **Enhancing adaptive reuse potential:** Movable interior systems like the ADD Comfort-Bed provide scalable solutions for repurposing underutilized buildings, such as vacant offices or commercial spaces, into highly functional living environments. By introducing flexible, modular layouts, this system supports a circular economy approach to urban development, reducing demolition waste and extending the lifespan of existing structures.

By integrating automation, adaptability, and sustainability, the ADD Comfort-Bed stands as an innovative case study in multifunctional design, demonstrating how interior spaces can be reimagined to meet evolving urban demands.

As an underlined suggestion and case study on movable interior systems, the ADD Comfort-Bed stands as an innovative example of how automation, adaptability, and multifunctionality can converge to redefine contemporary living environments, making urban spaces more resilient, sustainable, and responsive to evolving human needs.

### 1.3.2. Multifunctionality and Adaptability in Action: ADD Motion-Wall—A Dynamic Partition System for Adaptable Spaces

Static walls impose rigidity on interior layouts, limiting the ability of spaces to adapt to changing user needs. The ADD Motion-Wall (Figure 4) redefines this paradigm by introducing retractable partitioning, allowing seamless transitions between open-plan and enclosed configurations. By fostering a balance between privacy and openness, individual retreat, and social interaction, this system enhances flexibility in residential, commercial, and co-living environments.



**Figure 4.** ADD Motion-Wall [13].

As part of the ADD-rest system, the ADD Motion-Wall is designed to support adaptive reuse and building conversion, ensuring that existing spaces remain functional and relevant in evolving urban settings. By integrating motorized retractable partitioning, this system enables dynamic space reconfiguration, making it particularly valuable in high-density living and working environments where space optimization is crucial.

The ADD Motion-Wall aligns with sustainable interior design principles by the following:

1. Maximizing space efficiency—transforming static interiors into flexible, multi-use environments without requiring additional built space.
2. Enhancing adaptability—allowing rooms to shift between functions effortlessly, supporting modern lifestyle trends such as remote work, co-living, and hybrid spaces.
3. Reducing material waste and energy use—minimizing the need for permanent partitions and extensive renovations, extending the lifecycle of existing interiors while lowering construction-related emissions.

By integrating automation and modularity, the ADD Motion-Wall contributes to resource-efficient urban development, offering a scalable solution for repurposing under-utilized office buildings, optimizing micro-apartments, and enabling mixed-use spaces.

Together, the ADD Comfort-Bed and ADD Motion-Wall form a comprehensive interior system that supports compact yet highly functional urban housing. This integrated approach fosters the following:

1. Social sustainability—supporting evolving lifestyles, remote work, and shared living through user-centered spatial configurations.

2. Environmental sustainability—reducing the demand for new construction by making better use of existing spaces and materials.
3. Economic sustainability—enabling cost-effective space utilization, supporting co-living, short-term rentals, and flexible workspaces.

As urban populations grow and land scarcity increases, the key challenge is not merely expanding cities but rethinking how we use existing spaces. Maximizing spatial efficiency is a critical strategy for sustainability, prompting the following essential questions:

1. How does optimizing existing spaces reduce unnecessary consumption?
  - Material efficiency: Reduces the need for new construction materials.
  - Energy conservation: Retrofitting requires less energy than demolition and rebuilding.
  - Land preservation: Prevents excessive urban expansion, preserving green and agricultural areas.
2. How does maximizing space enhance the quality of life?
  - Greater access to green spaces: By limiting sprawl, cities can integrate more nature.
  - Flexible, adaptable living: Movable interiors allow spaces to evolve with user needs.
  - More walkable, compact cities: Encouraging densification improves infrastructure and community interaction.

By addressing these challenges through adaptable interior solutions, the ADD-rest system provides a forward-thinking approach to urban living—one that is efficient, sustainable, and responsive to contemporary spatial demands.

#### *1.4. Adaptability and Multifunctionality in the Built Environment*

The concept of structural adaptability has emerged as a paramount characteristic in urban design, particularly in light of the lessons learned from the COVID-19 pandemic. Urban environments, notably those characterized by high-density built forms and intensive human interaction, experienced significant strain during the pandemic. The high concentration of people in public spaces, offices, and residential units amplified the challenges of managing a health crisis. This has catalyzed a paradigm shift within the architectural and urban planning fields, wherein adaptability, particularly within interior space configurations, has become essential for future-proofing the built environment.

Behavioral changes, driven by the pandemic, have redefined how occupants interact with space. While large-scale structural modifications to the urban fabric are often constrained by logistical, financial, and political factors, the focus has increasingly shifted toward identifying adaptable spaces within existing buildings, including both underutilized and functional structures. This approach aligns with broader urban strategies that advocate for revitalization rather than expansion, particularly in the context of land-use optimization in dense urban cores and peripheral areas.

The compact city model, which emphasizes high-density development, multifunctional spaces, and urban revitalization, is under scrutiny in this new context. The compact city aims to limit urban sprawl by promoting higher densities and maximizing land use, thus reducing the need for new development at the urban fringe. However, the compact city model's efficacy has been questioned, especially as it inadvertently increases the concentration of public, residential, and commercial spaces, thereby heightening the exposure risk in times of crisis. In the post-pandemic era, the compact city concept must be reevaluated and adapted to address new demands for health, safety, and flexible use of space. This reevaluation is particularly critical for typologies like office buildings, educational institu-

tions, and high-density residential areas, all of which require substantial modifications to accommodate safety measures, social distancing, and flexible occupancy arrangements.

Vacant ground-floor spaces, once primarily reserved for retail and commercial activities, have become a critical issue in maintaining urban vibrancy. The underutilization of these spaces negatively impacts pedestrian flows and the economic vitality of urban centers. To address this, it is essential to revitalize these spaces through adaptive reuse strategies that introduce mixed-use programs, such as flexible workspaces, communal areas, and retail functions that can respond dynamically to evolving urban needs. Such interventions can contribute to the reactivation of urban street life, fostering a more resilient and sustainable urban economy.

At an individual level, the pandemic has accelerated the shift toward larger residential spaces, particularly in suburban areas, as people seek environments that can accommodate homeworking, online education, and increased family time. This shift has led to a greater demand for homes with flexible layouts, gardens, balconies, and other spatial configurations that support hybrid living and working. As a result, suburban areas are witnessing a resurgence in demand, leading to the revitalization of these areas, which were previously in decline due to the allure of urban living.

Despite the rising demand for residential expansion, urban development often prioritizes the intensification of housing stock at the expense of green space and common areas. Urban planners are increasingly advocating for a more balanced approach that integrates the “15 min city” model, where amenities are accessible within a 15 min walking or cycling distance. However, this model can be extended to the “5 min city” concept in suburban areas [20], where spatial constraints necessitate more localized solutions. Such initiatives focus on optimizing horizontal space utilization, as opposed to densifying urban centers further. This requires a paradigm shift in design and planning, moving away from traditional vertical growth toward more distributed, flexible land use patterns.

In this context, architects and urban designers play a pivotal role in rethinking the spatial organization of cities to respond to the pressing challenges of climate change, health crises, and socio-economic instability. By leveraging innovative design strategies, such as modular architecture, flexible floor plans, and adaptive reuse, architects can contribute to the creation of more resilient urban environments. These spaces must be capable of accommodating fluctuating uses, whether for residential, commercial, or communal purposes, without compromising on their functionality or safety.

The shift in working behaviors during the pandemic has also had profound implications on the demand for office space. The rise of remote and hybrid working models necessitates rethinking traditional office layouts, with an emphasis on spatial flexibility. Office buildings must be designed to allow for quick reconfiguration, whether to accommodate different working patterns, social distancing, or new health protocols. This can be achieved through the incorporation of automated partitioning systems, movable walls, and multi-functional spaces that can be easily adapted to changing requirements.

For instance, businesses require additional space to facilitate social distancing when necessary, and these adjustments need to be seamlessly integrated into existing buildings. This level of flexibility is essential in mitigating the challenges posed by future health crises, economic downturns, or other unpredictable events. However, such adaptations must be embedded within the architectural and structural framework of the building, as retrofitting existing structures can be a complex and costly process.

Urban environments, particularly in rapidly developing regions, are more amenable to these transformations due to the flexibility inherent in newer buildings and the absence of rigid historical constraints. In contrast, cities in developed countries, where the built environment is often constrained by historical preservation regulations, face greater challenges

in adapting existing structures to meet new demands. Nevertheless, adaptive reuse offers a more sustainable solution compared to new construction, aligning with global goals for resource conservation and environmental sustainability. The preservation and repurposing of existing buildings not only reduces waste and energy consumption but also contributes to the cultural and historical continuity of the urban landscape.

The transition to a more sustainable urban fabric, particularly in the post-COVID era, requires a paradigm shift in how buildings are designed, used, and maintained. Given the constraints of urban space, adaptive reuse, and building conversion are preferable strategies for demolishing and rebuilding. These approaches align with the need to create more adaptable, multifunctional spaces that can accommodate evolving needs over time. The focus should be on the strategic reuse of underutilized spaces—whether they are vacant office buildings or suburban opportunity areas—by integrating them into the urban fabric through adaptive interventions.

The concept of layered functionality—where a building complex can support diverse, complementary uses—has gained traction in this context. Such buildings can house a mixture of residential, commercial, and communal functions, allowing for greater economic resilience. The layered-functionality approach enables buildings to provide multiple income streams and mitigate the risks associated with the failure of individual businesses or tenants. Moreover, by incorporating automated partitioning systems and adaptable interior furnishings, buildings can be reconfigured quickly to accommodate changing needs without the need for extensive renovation or reconstruction.

In conclusion, the integration of adaptability and multifunctionality into the built environment is essential for creating sustainable, resilient cities. As the demand for flexible, hybrid spaces increases, architects and urban planners must embrace innovative design strategies that facilitate these transitions. Building conversion and refurbishment, particularly in the context of post-pandemic urban spaces, offer a viable alternative to new construction, aligning with sustainability goals and contributing to the resilience of urban communities.

## **2. Embedded Concepts: Adaptive Reuse and Multifunctionality in Building Conversion**

The transformation of office, commercial, or industrial buildings into multifunctional structures represents an increasingly viable and sustainable solution in contemporary urban development. While widely regarded as a pragmatic response to spatial and environmental challenges, the effectiveness of adaptive reuse hinges on a careful, case-specific approach. Poorly executed conversions can negatively impact user experience, leading to issues such as inefficient layouts, inadequate lighting, or compromised structural integrity. Therefore, successful building conversion must be grounded in a nuanced analysis that accounts for both the existing building's architectural potential and its long-term functional adaptability.

Buildings, as dynamic entities, possess an inherent capacity for transformation throughout their lifecycle. Designed to accommodate shifts in function, technology, and societal needs, their adaptability has been further enhanced by advancements in construction technology, materials science [21,22], and modular building systems. These innovations facilitate periodic refurbishments, allowing buildings to be incrementally upgraded to meet contemporary sustainability and efficiency standards. By integrating energy-efficient retrofitting, smart building technologies, and flexible interior configurations, adaptive reuse strategies can extend a building's operational lifespan while significantly reducing the environmental costs associated with demolition and new construction [23].

For a building to qualify for adaptive reuse, a rigorous pre-development assessment is essential. This evaluation must consider a range of factors, including its geographical

location—proximity to public transportation, access to amenities, and exposure to environmental risks such as pollution. Equally critical is an assessment of the building’s structural integrity, material resilience, and capacity for spatial reconfiguration. An adaptable design framework is necessary to ensure that the building can accommodate evolving functional requirements without compromising stability or environmental performance. This process must integrate principles of environmental stewardship, resource efficiency, and sustainable urbanism to ensure that conversion efforts contribute positively to the broader ecological and social fabric.

The urgency of adaptive reuse has been amplified by the ongoing housing crisis, often framed as a “building problem”. The inability of new construction to meet the demand for affordable housing—due in part to inefficient planning systems, protracted approval processes, and escalating construction costs—has exacerbated urban housing shortages. Adaptive reuse offers a strategic alternative by enabling the rapid conversion of underutilized buildings into functional residential or mixed-use developments. Compared to new construction, this approach is not only more time- and resource-efficient but also provides opportunities for innovative urban regeneration that aligns with both economic and environmental priorities [24].

In summary, building conversion is a key strategy in the broader movement toward sustainable urban development. By capitalizing on the latent adaptability of existing structures, it addresses interconnected challenges in housing, environmental sustainability, and urban renewal. As technological advancements continue to enhance the feasibility of adaptive reuse and as governmental policies evolve to support these initiatives—through zoning reforms, financial incentives, and streamlined approval processes—building conversion will play an increasingly critical role in shaping resilient, resource-efficient cities. Interdisciplinary collaboration between architects, urban planners, policymakers, and developers will be essential in realizing the full potential of adaptive reuse as a cornerstone of sustainable urban transformation.

### 2.1. Challenges of Building Conversion

Building conversion is a complex process that must be evaluated on a case-by-case basis, ensuring alignment with regulatory policies and maintaining the architectural integrity of the original structure. The viability of conversion depends on multiple factors, including the building’s structural characteristics, typology, and location [23]. Additionally, repurposing a building—especially transitioning from commercial to residential use—requires obtaining planning permission and adhering to zoning regulations.

A successful building conversion must meet a range of key standards and additional considerations to ensure safety, sustainability, and financial viability. Table 1 outlines these essential aspects.

**Table 1.** Key standards and considerations for building conversion [23].

Key Standards	Description
Structural integrity	Ensuring the building’s framework can support the intended change of use.
Safety regulations	Compliance with fire safety, accident prevention measures, and security requirements.
Site preparation	Managing hazardous material removal (e.g., asbestos), waste disposal, and environmental cleanup.

Table 1. Cont.

Key Standards	Description
Infrastructure and utilities	Upgrading communication systems, ventilation, sanitation, drainage, and energy-efficient electrical networks.
Sustainability compliance	Incorporating energy efficiency, sound insulation, and sustainable materials to enhance environmental performance.
Economic feasibility	Assessing project costs versus potential financial returns.
Risk management	Addressing hazards such as air and noise pollution, chemical exposure, flooding, and traffic congestion.
Design and layout regulations	Adhering to building codes for space planning, including floor area ratios, ceiling heights, room dimensions, and access to natural light.
Safety and insulation standards	Ensuring compliance with modern safety requirements, with proper insulation for energy efficiency.
Material and construction quality	Using high-quality, sustainable materials and construction practices.

A well-executed building conversion requires a holistic approach that balances architectural design, engineering solutions, regulatory compliance, and economic viability to create a functional and sustainable space that meets contemporary demands.

### 2.2. The Role of Building Typology in Conversion Feasibility

The typology of a building plays a crucial role in determining its potential for adaptive reuse. While traditionally linked to function, the contemporary understanding of typology has expanded to include broader conceptual and methodological frameworks [25]. This perspective recognizes that a building's form is not inherently fixed to its original function, allowing it to evolve and adapt over time. The concept of cyclical transformation—through renovation, repurposing, or expansion—has been fundamental to the growing success of building conversions in modern architectural practice [25].

Among various building types, industrial buildings are often the most desirable for conversion, particularly for luxury flats or public facilities [26]. Their bold aesthetic features, architectural uniqueness, and symbolic significance attract developers and designers seeking distinctive spaces. Across England, Europe, and the USA, repurposed warehouses and factories have gained popularity as they offer striking design potential that contrasts with conventional construction [27,28].

Post-war buildings (constructed between 1945 and the 1970s) also hold significant conversion potential, particularly due to their lack of strong conservation protections [28]. While regulatory constraints can present challenges, these structures offer advantages such as shallow floor plates, modular layouts, standardization, and flexibility in interior design. Their accessibility, ease of maintenance, and capacity to integrate modern utilities further enhance their appeal for conversion [29].

### 2.3. The Challenge of Converting Office and Commercial Buildings

Despite the popularity of industrial and post-war buildings for conversion, our primary focus is on a more challenging category: vacant office and commercial buildings. These structures are often considered less desirable due to rigid layouts, deep floor plates, and the technical difficulties involved in transforming them into residential or mixed-use spaces. Converting such buildings typically requires substantial investment and carries a high level of financial risk, particularly in terms of return on investment (ROI) [26].

Addressing this challenge necessitates stronger governmental support and policy interventions to facilitate conversions. For instance, England’s permitted development rights (PDRs) policy [30] provides incentives for converting office spaces into residential units, demonstrating the crucial role of regulatory frameworks in unlocking the potential of these buildings.

While aesthetics and creative potential are key motivators for building conversion, economic and technical feasibility remain central to the process. Overcoming regulatory and financial hurdles requires a strategic approach that integrates adaptive reuse principles, sustainable design, and government-backed incentives. As cities continue to grapple with urban density, resource scarcity, and housing shortages, building conversion will play an essential role in shaping the future of resilient and sustainable urban environments.

#### 2.4. Building Adaptability

Building adaptability refers to the capacity of a structure to evolve with changing user needs, environmental conditions, and technological advancements throughout its lifespan. According to Grammenos and Russell [31], adaptability is characterized by five key criteria: (i) convertibility, (ii) dismantlability, (iii) disaggregability, (iv) expandability, and (v) flexibility. These criteria facilitate the continuous improvement of a building, ensuring it can meet evolving requirements, from changes in function to structural and environmental upgrades.

Several factors drive the need for building adaptations, including code compliance, environmental enhancement, spatial modifications, and structural upgrades. These factors address both regulatory changes and evolving environmental and user demands. Additionally, technological advancements and urban renewal schemes increasingly necessitate adaptation. In many developed countries, the tendency to demolish and redevelop buildings contrasts with the adaptive reuse approach, which focuses on preserving and upgrading existing structures, especially in historic areas [31,32].

Adaptation can also be integrated into the building life cycle, from design through occupancy to eventual adaptation or conversion. While developing countries often favor redevelopment due to poor-quality building stock, developed nations are more likely to prioritize adaptive reuse, particularly in the context of sustainability, heritage preservation, and economic efficiency.

The following Table 2 summarizes the key factors and considerations related to building adaptability, as outlined by Grammenos and Russell [31], highlighting the criteria, reasons for adaptation, technological influences, and the distinctions between redevelopment and adaptation strategies.

**Table 2.** Key factors and considerations for building adaptability [31].

Factor	Details
Adaptability criteria	<ol style="list-style-type: none"> <li>1. Convertibility: Ability to change use</li> <li>2. Dismantlability: Safe and efficient demolition</li> <li>3. Disaggregability: Reusable materials from dismantled buildings</li> <li>4. Expandability: Allows for increases in volume</li> <li>5. Flexibility: Shifts in space planning, from minor to major changes</li> </ol>

Table 2. Cont.

Factor	Details
Reasons for adaptation	<ol style="list-style-type: none"> <li>1. Code compliance: Building standards, accessibility, fire safety, sound insulation, structural stability, thermal efficiency</li> <li>2. Environmental enhancement: Improved energy efficiency, sustainability, indoor climate, external environmental upgrades</li> <li>3. Spatial modifications: Adjusting unit size, division into smaller units, combining spaces, changing functions, and expanding accommodation</li> <li>4. Structural and fabric upgrading: Recladding, new columns, repairing defective elements</li> </ol>
Declining performance factors	<ol style="list-style-type: none"> <li>1. Standards (e.g., user/owner set standards)</li> <li>2. Legislation (health and safety, accessibility)</li> <li>3. Wear and tear</li> <li>4. User expectations</li> <li>5. Poor energy efficiency, comfort, or environmental impact</li> </ol>
Technological factors	<ol style="list-style-type: none"> <li>1. Developments in automation, prefabrication, and IT</li> <li>2. Innovations in microprocessors, materials (synthetic/composite)</li> <li>3. Global issues: energy conservation, pollution reduction, resource loss, and sustainability policies</li> </ol>
Urban renewal schemes	<ol style="list-style-type: none"> <li>1. Dynamic factors trigger the need for urban renewal</li> <li>2. Adaptation as part of urban renewal, especially in historic areas</li> <li>3. Pressures to update/upgrade buildings to meet new demands</li> </ol>
Opportunity for change	<ol style="list-style-type: none"> <li>1. Buildings prone to change in use or condition</li> <li>2. Activity or occupancy levels may vary during service life</li> <li>3. Control of changes through adaptation</li> </ol>
Building life cycle and adaptation	<ol style="list-style-type: none"> <li>1. Adaptation throughout the building life cycle: design, construction, occupancy, maintenance</li> <li>2. Adaptation as an alternative to demolition as buildings become obsolete</li> </ol>
Redeveloping vs. adaptation	<ol style="list-style-type: none"> <li>1. Developing countries: greater incentive for redevelopment due to poor quality stock</li> <li>2. Developed countries: tendency for demolition and redevelopment, with heritage pressures influencing preservation [31,32]</li> </ol>

Building changes occur through a range of external and internal influences:

- External factors: Economic or market shifts can lead to building obsolescence or redundancy. For example, the decline or restructuring of traditional industries in the latter half of the 20th century rendered many purpose-built buildings unnecessary. More recently, the COVID-19 pandemic led to a surplus of office buildings as remote work became widespread in the first half of the 21st century.
- Internal factors: Changes related directly to the building itself, often driven by user-generated issues such as lack of maintenance, can lead to fabric deterioration.
- Aleatory influences: Shifting user needs or expectations may lead to modifications, such as changes in functionality. Some buildings may undergo multiple adaptations during their life cycle (e.g., conversion of offices into flats).

Building adaptation typically involves (a) functional changes (e.g., conversion), (b) size adjustments (e.g., extensions), and (c) performance improvements (e.g., refurbishment). The extent of adaptation, as well as the frequency of such changes, is largely driven by demand [31].

As buildings age, their physical conditions deteriorate [33]:

- Physical damage: External factors like weathering can cause visible deterioration (e.g., façade discoloration, cracking, soiling), as well as wear and tear, user abuse, and vandalism.
- Structural deterioration: This is typically caused by dampness, decay, and movement [34], impacting both the structure and fabric of the building over time.

A building's structure and fabric will degrade due to two primary influences:

- Environmental factors: These affect the exterior and can eventually impact the interior.
- User activities and functional influences: these impact the interior of the building but can also affect the exterior over time (e.g., lack of maintenance leading to external degradation).

In conclusion, building adaptation is a critical response to the evolving needs of users and changing external conditions. It encompasses a range of interventions, from functional conversions to structural refurbishments, aimed at extending a building's lifespan and improving its performance. The deterioration of buildings over time—whether due to environmental influences, user neglect, or changing demands—highlights the importance of proactive maintenance and adaptation. These efforts not only contribute to sustainability by reducing the need for demolition but also enhance the building's utility, ensuring its relevance in a dynamic urban landscape.

### 2.5. Adaptability to Other Uses

The concept of adaptability in building conversion is significantly influenced by the type of building and its inherent physical features. According to Remøy and de Jonge [35], the potential for adaptive reuse depends on factors such as the building's structure, façade, floor plan, layout, stairwells, and elevators. Gann and Barlow [36] further emphasized the critical role of the building's structure, floor span, frame, and design considerations, particularly when converting offices to residential spaces. These characteristics vary in terms of their reuse potential, depending on their embedded features and their compatibility with new uses.

In the case of mixed-use development, the layered-functionality approach offers a promising solution. This approach integrates a blend of office, commercial, and residential spaces, alongside publicly accessible squares and common areas. It also enhances connectivity to surrounding areas and introduces active frontages with commercial uses, while retaining and improving employment floor space. This model of building conversion not only addresses the growing demand for housing but also supports urban regeneration and community interaction.

The widespread orientation toward office-to-residential conversion is driven by the redundancy of office spaces, coupled with the acute demand for housing in urban centers. Office buildings are often considered highly adaptable to new uses due to their inherent design flexibility. Key factors contributing to this adaptability include the following:

- Floor plan: Office buildings typically feature open layouts with minimal vertical supports, circulation pathways, and clustered services, which facilitate the creation of independent units for various uses [37].
- Flexibility in design: The abstract and modular nature of office layouts allows for a variety of configurations, making it easier to repurpose spaces for diverse functions.

- Partitioning: The partition structure in offices is often independent of the load-bearing framework, facilitating easier modifications for new uses, such as co-living or co-working arrangements, with both social and economic benefits [37].
- Balance between individual and communal spaces: The relatively high percentage of communal spaces in office buildings makes them especially suitable for co-housing configurations, where shared amenities are essential.

However, the conversion of offices to self-contained residential units can present challenges, particularly regarding the typological requirements needed to create functional living spaces [36].

The location of a building plays a crucial role in determining the success of a conversion project. Remøy and de Jonge [35] argued that a building's location is often more critical than its physical structure in achieving a successful conversion. Douglas [23] similarly pointed out that the potential for conversion is often constrained by locational factors, such as the availability of quality services and amenities, accessibility via public transport (ideally within a five-minute walking distance), and proximity to pollution sources (e.g., industrial sites) [8,38]. Historic buildings, while often burdened with technical and regulatory challenges, can benefit from prime central locations, which enhance their desirability for conversion.

For developers, the key determinant in pursuing a conversion project is often the building's marketability—its "sellability". This makes the typological and locational characteristics of a building paramount when converting it to residential use, as these factors directly impact the ability to sell or rent the resulting housing units.

However, this dynamic changes when the conversion project is intended for low-income renters, social housing, or temporary accommodation for the homeless. In these cases, typological and locational factors are often deemed less critical, as the primary goal is to provide affordable housing for vulnerable populations. The quality of these conversions tends to be lower, with less attention paid to design standards, due to the lack of choice for the target occupants [39,40].

The increasing focus on building conversions, driven by government incentives and financially viable real estate opportunities, has led some developers to prioritize profit over quality. In some cases, relaxed regulations and a lack of oversight encourage developers to produce low-quality projects, particularly those intended for social housing or low-rent units. Moore [41] highlighted that such poor-quality conversions are often motivated by developers' desire for maximum profit, which frequently results in projects that fail to meet the needs of vulnerable tenants. These conversions are often carried out by inexperienced developers or those new to the housing industry, sometimes without the involvement of qualified architects, or with the sole aim of maximizing the number of units within a restrictive floor plan. As a result, these low-quality projects can lead to a series of cascading social, economic, and environmental problems, further exacerbating urban stresses.

In summary, while adaptability is a key factor in the successful conversion of buildings, the challenges of typology, location, and regulatory frameworks must be carefully considered. While office-to-residential conversions hold significant potential, their success depends on a delicate balance of design, functionality, and the ethical responsibility of developers in meeting both market demand and the needs of the community.

### *2.6. The Conversion of Buildings Through Use Change*

The conversion of buildings through changes in use, particularly the transformation from office spaces to residential units, has gained significant traction in contemporary urban planning [1,42]. This practice is relatively new but has become a logical response to the pressing issues of surplus office spaces in major cities and the growing demand for housing

driven by increasing urban populations. For example, in Milan, 31% of office spaces were vacant in 2018, as reported by Fianchini and Ferrucci [26], while simultaneously, housing demand in urban areas continues to rise [43]. The mismatch between supply and demand has spurred greater advocacy for office-to-residential conversions [44] and increased investment in adaptive reuse projects, particularly for buildings of historical significance in prime urban locations [45].

Adaptive reuse is not a novel concept but rather a time-honored practice with many historic precedents. The transformation of the Baths of Diocletian in Rome into a church during the Renaissance [46] is one of the earliest and most famous examples of adaptive reuse. In recent decades, there has been a resurgence in practice, particularly with the rediscovery of industrial heritage. Many old factories and warehouses are being repurposed for cultural, commercial, or residential uses. A notable example is the conversion of the Paintbrush Factory in Cluj-Napoca [47] into a cultural center for the arts, or the repurposing of a former wax factory in Madrid into a villa [48], among others. These examples demonstrate the versatility of adaptive reuse in addressing contemporary urban needs while preserving architectural heritage.

In regions where building stock predominantly dates from earlier periods, such as Italy, the prevalence of older buildings necessitates a construction industry focused on retrofitting and repurposing existing structures. According to data from the SSDA [49], 30% of residential buildings in Italy were constructed before 1945, and 60% before 1970. Given the age and condition of many buildings in such areas, adaptive reuse has become an essential practice. Retrofitting, along with energy efficiency interventions, is increasingly seen as an important strategy not only for the preservation of buildings but also for reducing urban sprawl and land consumption [44,50].

Buildings with historical, morphological, or architectural value, as well as those in prime locations—such as city centers or other strategic urban areas—are particularly attractive to investors. These properties can be converted for a wide range of purposes, including public-driven projects (e.g., cultural centers, museums, universities), private commercial developments (e.g., residential, tourism, office spaces), or socially-oriented initiatives (e.g., community hubs, non-profit enterprises) [51]. These diverse uses reflect the broad potential of adaptive reuse to support various urban needs and contribute to the revitalization of neglected areas.

While the adaptive reuse of buildings often brings substantial benefits, there are also negative aspects that need to be addressed. When carried out with professionalism and a sense of civic responsibility, building conversions can greatly enhance the built environment and contribute to the public good. However, when developers or other stakeholders prioritize profit over the long-term well-being of communities, the results can be less beneficial. Poorly executed conversions, for example, may fail to meet safety standards, provide adequate living conditions, or preserve the historical integrity of buildings. It is essential to raise awareness of these potential pitfalls and advocate for responsible development practices.

### 3. Research Methods and Results

To establish a methodology for building conversion, it is valuable to draw from case studies of previous projects. Analyzing these cases helps identify key factors that determine successful conversions and highlights challenges that need to be addressed.

#### 3.1. Examples and Counterexamples: The Unintended Consequences of Building Conversions

An exemplary case of a successful building conversion is the transformation of Riddel's Warehouse [52], a grade B+ listed building at risk in Belfast. After its acquisition in 2014,

the building was restored and repurposed as a center for the arts, intended to meet the evolving needs of the local community. The primary goal of the restoration was to promote symbolic value through a change of use, bridging the gap between the building's industrial past and the contemporary demands of the creative sector. The project has been designed to provide performance spaces, exhibition areas, and co-working facilities, positioning the warehouse as a hub for creative industries. This adaptive reuse not only preserves the historical essence of the building but also reintegrates it into the urban fabric of Belfast, offering public access and serving as a testament to the city's industrial peak. Moreover, the project incorporates heritage, environmental, and community elements, requiring active engagement with both the local and broader Belfast community [52].

Despite the successes of projects like Riddel's Warehouse, there are also numerous instances where building conversions have been exploited for profit at the expense of residents' well-being. These negative examples often stem from opportunistic interpretations of governmental programs intended to promote urban renewal and community welfare. In such cases, real estate developers and landlords prioritize financial gain over the quality of living for tenants, exacerbating housing crises rather than alleviating them.

Poor examples of office-to-residential conversions typically result in housing targeted at financially pressured households. These substandard conversions are often intended for emergencies, temporary accommodation, or for private rental markets, rather than long-term housing solutions. Poor design, lack of convenience, and locational deficiencies demonstrate the consequences of permissive planning. In many cases, the demand for affordable homes is not met, as the wrong type of housing is created in unsuitable locations.

One of the most significant problems arises from the use of policies like permitted development rights (PDRs), which allow for office-to-residential conversions without full planning permission. Initially designed to ease housing shortages, PDRs have led to numerous cases of substandard living conditions.

**Lack of natural light and ventilation:** Basement flats, often created through PDRs, frequently lack essential attributes such as ventilation and natural light. Julia Park, Head of Housing Research at Levitt Bernstein, highlights this issue, stating, "Daylight and space are the two most obvious victims of permitted development rights". Hugh Ellis, Head of Policy at the Town and Country Planning Association (TCPA), argues that "dwellings of any kind without natural light should not be allowed under any circumstances".

**Expansion of PDR:** Initially limited to office-to-residential conversions, PDRs have expanded to include commercial-to-residential conversions, upward expansions of buildings (adding additional floors), and the replacement of commercial buildings with residential units through demolition and reconstruction, all without requiring planning permission [45,53]. Research comparing PDR projects with those subjected to full planning procedures often reveals significantly lower standards in the former [30].

Illustrative examples of poor conversions include the following:

1. **Reliance house and other micro-flats [54]:** Developers often opt for the cheapest, quickest solutions, resulting in "micro flats" that meet minimum legal requirements but fail to provide adequate living conditions. These units, leased to individuals in urgent need of housing, create cramped, unsafe, and unhealthy environments.
2. **3 Church Road, Croydon [30]:** A striking case where poor planning led to health and safety concerns, including mold, poor indoor thermal comfort, and faulty sewage systems. Developers' reluctance to take responsibility for these consequences exacerbated the problem.
3. **Underground parking conversions in Romania [55]:** In cities like Bucharest and Cluj-Napoca, underground parking spaces have been illegally converted into living apartments. These spaces, originally designed for vehicle storage, often lack ven-

tilation, natural light, and insulation, leading to serious health risks. Additionally, such transformations violate construction norms, exacerbate parking shortages, and overload utility networks, resulting in broader urban infrastructure problems.

### 3.2. *The Economic Model Behind Substandard Conversions*

The underlying economic model driving these conversions prioritizes profit over quality. Developers and landlords opt for cheaper, lower-quality projects that yield high rental returns, even if the units are unfit for human habitation. Vulnerable populations, who have limited housing options, are forced into these inadequate spaces.

Hugh Ellis warns that this trend results in “the building of the slums of tomorrow” where individuals live in conditions that undermine their health, dignity, and overall well-being [56].

While successful adaptive reuse projects like Riddel’s Warehouse demonstrate the potential of building conversion to enrich urban spaces and communities, many projects fail to meet basic living standards. The negative consequences of poorly executed conversions highlight the urgent need for stricter regulations and responsible urban planning. Without these safeguards, building conversion risks becoming a tool for financial exploitation rather than a solution for sustainable urban development.

### 3.3. *Analyzing Perceptions in Building Conversion—A Survey-Based Study*

Within the research methodology applied in this scientific paper, the use of questionnaires represents a fundamental tool for collecting relevant data on the perception and acceptability of building conversions from the perspective of end-users and construction specialists. By approaching these two target groups—the general public and professionals in the fields of architecture, engineering, design, and urban planning—in a complementary manner, a complex analysis is ensured, which allows the correlation of the needs and expectations of the beneficiaries with the technical and strategic solutions proposed by the experts.

In this context, two questionnaires were designed and addressed to target groups. The first questionnaire, addressed to users, explores their preferences and requirements regarding the adaptability and multifunctionality of housing, highlighting housing trends, openness to building conversions, and the impact of demographic factors on these aspects. The second questionnaire, aimed at construction professionals, provides a technical and strategic perspective on the feasibility of implementing these concepts, identifying challenges, innovative solutions, and barriers from an architectural, economic, and regulatory point of view.

The questionnaires were distributed to participants from Romania and China, the countries where the study initiators operate, as well as to collaborators from additional countries such as Spain, Montenegro, Serbia, Slovakia, Albania, Italy, Japan, and the Russian Federation. This international distribution of the questionnaires allows for a comparative analysis of diverse cultural and professional perspectives on building conversion. Regional differences in urban planning regulations, architectural trends, and user preferences can provide a broader understanding of the applicability of the principles of adaptability and multifunctionality. The methodological approach for the questionnaires was purely exploratory, aiming to capture a broad range of perspectives on adaptability in building conversions rather than establishing statistically representative samples. No strict quotas were set for region, gender, or other demographic factors, as this study’s goal was to explore trends and perceptions rather than quantify them. Given this, responses were analyzed descriptively, focusing on qualitative insights and frequency distributions rather than inferential statistics. While geographical diversity was naturally present, this study did not

systematically control for regional biases. Instead, findings were interpreted within the context of self-reported experiences and professional backgrounds, acknowledging potential limitations related to self-selection and contextual differences in adaptability perceptions.

Over 200 responses were received from end-users, and more than 100 responses were collected from professionals. By correlating these two sets of data, the research provides a clear picture of how building conversion principles can be effectively applied, both from a demand and supply perspective. Thus, the results obtained contribute to the formulation of design strategies and urban policies better adapted to the realities of the real estate market and the current challenges related to sustainability and the optimization of built spaces.

The survey findings highlight minor gaps between professionals and residents regarding adaptable building design and sustainability. While professionals recognize the importance of flexibility, they focus more on feasibility and structural limitations, whereas residents prioritize practical benefits like optimizing space for daily activities. In terms of sustainability, professionals emphasize strategies such as energy efficiency, water recycling, and maximizing natural light, whereas residents view sustainability through immediate financial benefits like reduced bills and comfort. The biggest barriers to adaptability for professionals include high investment costs, technical challenges, and regulatory constraints, whereas residents are more likely to adopt flexible spaces if they are affordable, in desirable locations, and offer customization options. This divergence suggests that professionals focus on large-scale constraints, while residents prioritize personal usability and affordability, underscoring the need for a balanced approach that integrates both perspectives for more adaptable and sustainable urban spaces.

### 3.3.1. Adaptability and Multifunctionality in Building Conversions—Questionnaire for Residents

The first three questions in the survey are essential to understanding respondents' needs and preferences regarding adaptability and multifunctionality in building conversion. These questions provide key information about the demographic profile of respondents, the type of home they live in, and the length of time they spend in that home.

Age segmentation allows for the identification of specific preferences and needs of different generations. For example, young people (18–25 years old) may have different needs than older people (over 55 years old) in terms of flexibility and functionality of spaces.

Young people (18–35 years old) tend to be more open to flexible and multifunctional spaces, as they have a more dynamic lifestyle (e.g., students, young professionals working from home, or who move frequently). Older people (over 55 years old) may prefer more stable and less flexible spaces, as they have a more sedentary lifestyle and less variable needs.

Correlation with other questions: Age directly influences the answers to questions such as “How important is adaptability in your living space?” or “Would you prefer to live in a building that allows for quick adjustments?”. Young people are more likely to value adaptability and be interested in innovative solutions, while older people may be more reluctant.

The type of housing (apartment, private house, shared space) provides information about the context in which respondents live and the constraints or opportunities they have in terms of adaptability.

Apartments and shared spaces (e.g., co-living) are often associated with greater needs for flexibility, as space is limited and needs to be used efficiently. These types of housing benefit most from adaptable solutions, such as movable walls or multifunctional furniture. Private houses may offer more space, but they can also benefit from adaptable solutions, especially for families with variable needs (e.g., home office, guest room).

Correlation with other questions: the type of housing influences the answers to questions such as “How often do you need to change the layout or functionality of your

rooms?”. Those living in smaller spaces (apartments or co-living) tend to need changes more frequently compared to those living in private houses. Also, the type of home can influence preferences for certain adaptable features (for example, movable walls are more useful in apartments, while multifunctional furniture can be relevant in both apartments and houses).

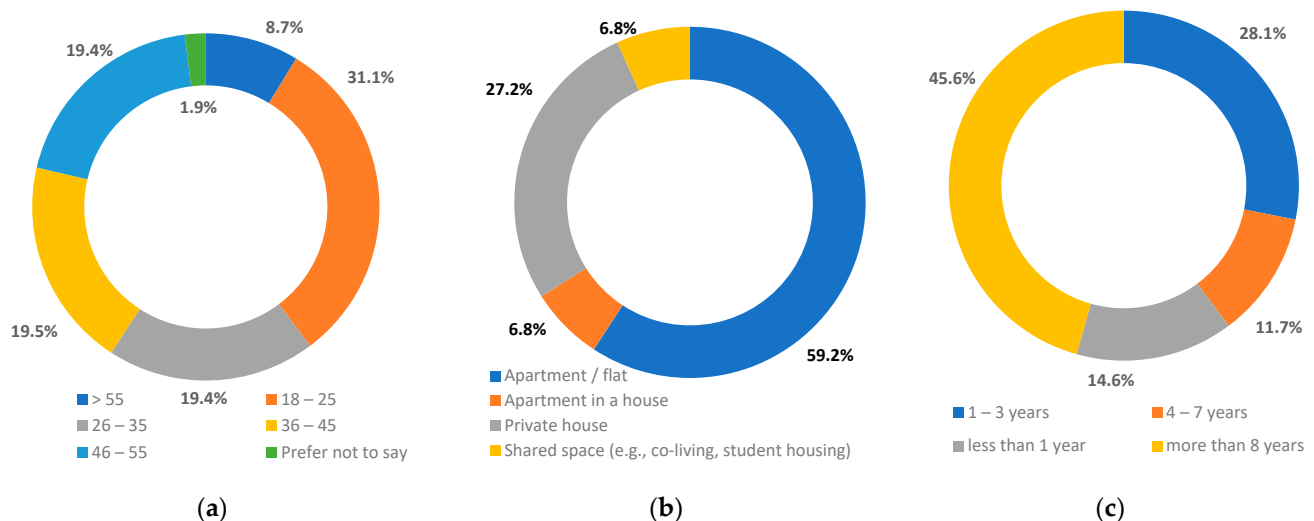
Length of residence provides information about the stability of respondents and how much they have experienced the need for adaptability in their living space.

Those who have lived in a home for less than 1 year may be more open to changes and adaptations, as they are still adjusting to the space and defining their needs. Those who have lived in a home for more than 8 years may be less interested in adaptability, as they have already organized their space according to their needs and may be more reluctant to change.

Correlation with other questions: Length of residence is correlated with questions such as “How often do you need to change the layout or functionality of rooms?” Those who have lived in a home for longer tend to change the layout less often, while those who have recently moved may have a more frequent need for reconfiguration.

Length of residence may also influence the willingness to pay more for an adaptable space. Those who have lived in a home for a longer time may be less willing to invest in adaptable solutions, but in sustainable and personalized spaces, while those who have recently moved may be more open to such investments, appreciating the mobility.

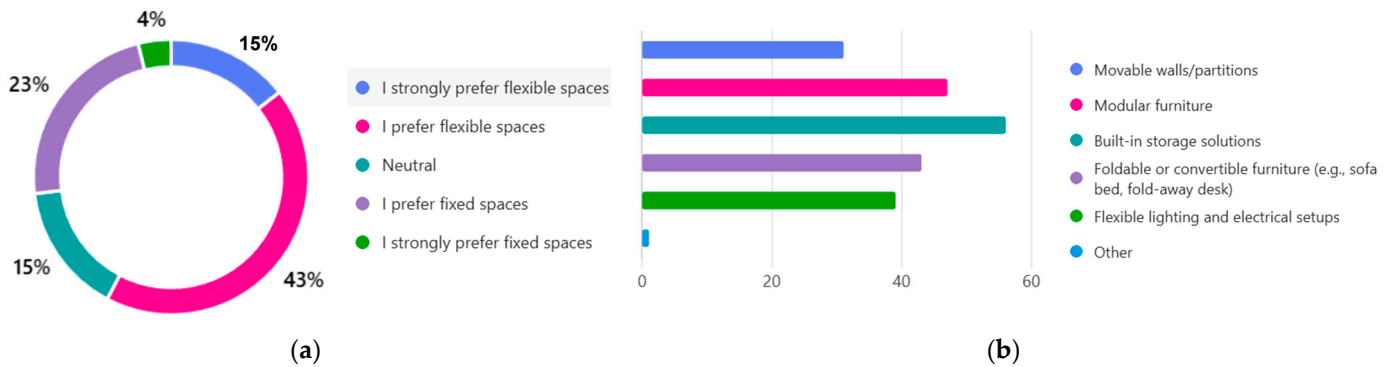
According to Figure 5a, the distribution by age group indicates the participation of a diverse range of respondents with a higher concentration in the 18–25 age group, with a preponderance among young adults. Most respondents live in apartments or single-family homes, reflecting basic preferences for conventional spaces, but are open to newer concepts (b) and there is diversity in length of residence, suggesting both stable respondents and people in transition (c).



**Figure 5.** Demographic profile of respondents: (a) distribution by age, (b) type of accommodation, (c) length of residence. Most respondents (89%) consider adaptability to be extremely important or somewhat important. This suggests a preference for spaces that can be easily reconfigured to meet changing needs (e.g., working from home, recreation, family activities).

There is a correlation between age and the importance of adaptability: Younger respondents (18–25 years old) tend to consider adaptability more important than older ones, stating that they need to change the layout or functionality of their rooms very frequently or occasionally. This indicates a real need for flexible spaces that can adapt to changes in daily life. In the same idea, the majority of respondents (58%) who have

already experienced flexible spaces (e.g., movable walls, convertible furniture) are very satisfied or somewhat satisfied with their usefulness (Figure 6a). This suggests that flexible spaces are appreciated and useful in practice, being in line with the general trend toward multifunctional housing. The most commonly mentioned useful features seen as essential for creating an adaptable and multifunctional space are built-in storage solutions and modular/foldable or convertible furniture (Figure 6b).



**Figure 6.** Preferences for adaptable spaces (a) and the most useful features for them (b).

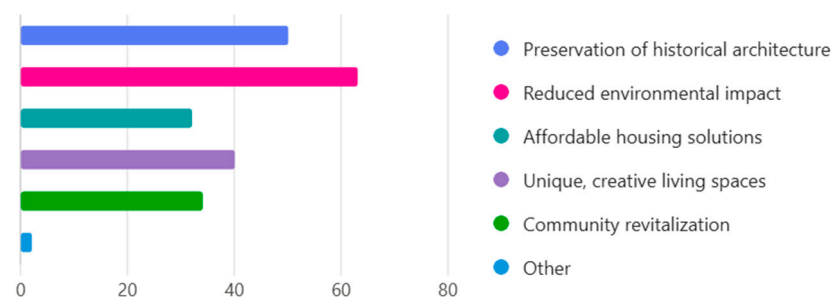
According to the answers received, most respondents (73%) would pay more for an adaptable and multifunctional space, although some condition this decision on price. Adding additional functionality should justify the costs by reducing long-term expenses and by creating a balance between initial costs and the benefits offered (sustainability, comfort). This indicates a potential market for such solutions.

Initiatives that combine adaptability with sustainability have great potential. Sustainability is considered extremely important by 34% of respondents, or somewhat important by 48%. This suggests that, in addition to adaptability, people are concerned about the environmental impact of their homes. On the other hand, there is minimal reluctance regarding sustainability (only 2% mentioned that it is not important).

Regarding the viability of repurposing old buildings, the majority (53%) consider the idea viable but are cautious about its execution. The responses “It’s an excellent idea” (39%) suggest broad support for this approach, while the reluctance (“4% say No”) is likely associated with structural or aesthetic issues with the conversions.

The most appreciated benefits of building conversion are as follows (as shown in Figure 7):

- Reduced environmental impact (63 mentions): a common point of most respondents.
- Preservation of historical architecture (50 mentions): adds aesthetic and cultural value, appreciated by those interested in unique spaces.
- Creative and customizable spaces (40 mentions): adaptability increases attractiveness to the public.



**Figure 7.** Benefits of building conversion from the end-users’ point of view.

Preference for living in converted buildings: 49% would live in such a building if it is made in a sustainable way and meets their needs. At the same time, 33% answered “maybe”, agreeing with the idea that the adaptations are of quality, and the remaining 18% answered “No”, completely disregarding the idea of living in such a building. Among the decisive factors for choosing flexible housing are: (i) lower rent or purchase price, which attracts the attention of people looking for affordable options, (ii) a good location, which may be more important than design in some cases, and (iii) the integration of smart technologies and sustainability, which are preferred by young and educated respondents.

The majority of respondents believe it is very likely (17%) or somewhat likely (50%) that adaptable and multifunctional spaces will become the norm in residential buildings in the future. However, a third are neutral or pessimistic, citing possible financial or technical constraints. However, even today, over 50% believe that housing flexibility would improve their lives, with possible benefits mentioned including efficient working from home and organizing family and social activities in an adaptable space.

The last question asked respondents to share their thoughts on living in multifunctional spaces, and their personal experiences with building conversions. The comments highlighted some interesting aspects:

- The call for sustainability—“Governments should subsidize such projects”.
- The need for clarity—consumers demand “clear information” to understand the benefits of these spaces.
- Pilot projects are preferred before large-scale implementations.

### 3.3.2. Adaptability and Multifunctionality in Building Conversions—Questionnaire for Professionals

The first three questions in the questionnaire are essential to understand the profile of the respondents and the context in which they operate. These questions provide key information about the role, sector of activity, and professional experience of the respondents, which are fundamental to the correct interpretation of their answers to the subsequent questions.

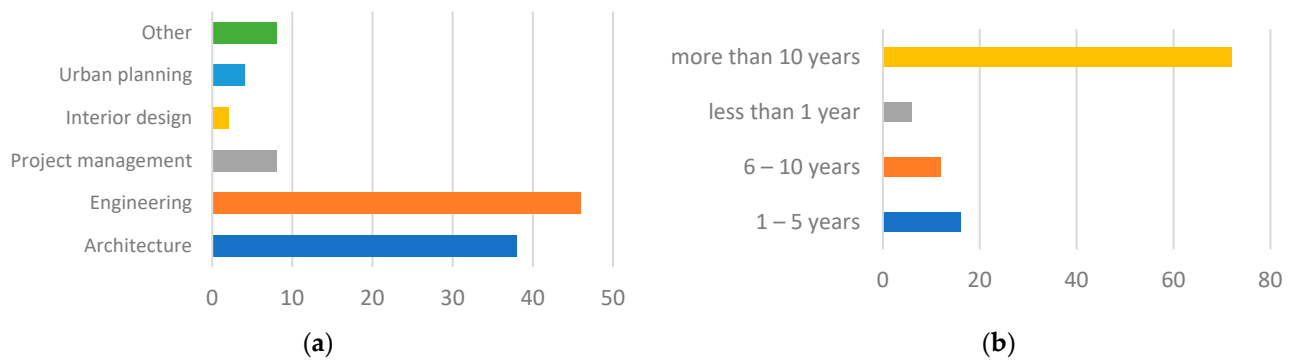
Knowing the role of respondents helps to understand how different professions approach adaptability and building conversion. For example, architects may be more interested in the design and planning aspects of buildings, including the adaptability and flexibility of spaces, while engineers focus on the technical and structural aspects of buildings, including the feasibility of modifications and innovative solutions. Urban planners focus on the impact of building conversion on the urban environment and communities, and project managers focus on the management of resources, costs, and time in conversion projects.

The sector of activity influences how respondents perceive adaptability and building conversion. For example, those working in the residential sector may be more interested in solutions that improve quality of life, while those in the commercial sector may be more focused on efficiency and profitability. Those working in the industrial sector view conversion as a transformation of unused buildings into mixed or residential spaces, and those in the mixed-used construction sector believe that adaptability can support diverse social activities and urban revitalization.

Respondents’ experience, measured in years, influences how they perceive building adaptability and conversion. Those with more experience offer deep insights, based on extensive knowledge, and tend to be more aware of technical and cost challenges, while younger and less experienced ones may be more open to innovative solutions.

Figure 8 shows the role and the experience of respondents working in the construction sector. Respondents cover a wide range of professions, including architects, engineers,

urban planners, project managers, and sustainable design researchers. Their average experience in the construction field is over 10 years, indicating that their opinions are based on solid experience and deep knowledge of the field.

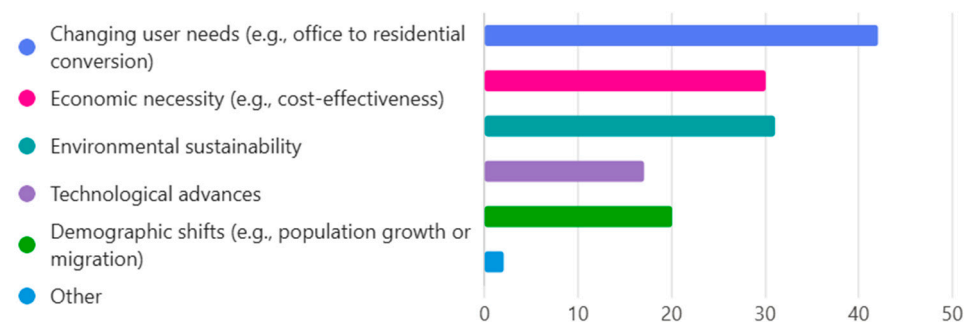


**Figure 8.** The role (a) and the professional experience of respondents (b).

Regarding the importance of adaptability in modern building design, the majority of respondents (74%) consider it very important. This reflects a general trend toward flexible spaces that respond to the changing needs of users. Those who consider adaptability very important tend to be more open to the conversion of existing buildings and support the use of innovative solutions such as automated furniture and movable walls. There were also “neutral” responses, which reflected a balanced view, recognizing the importance of adaptability, but also the limitations or challenges associated with it. For example, some buildings have well-defined functionalities, where frequent changes are not necessary or desired (e.g., critical infrastructure, historic buildings), a museum or a specialized factory may need long-term functional stability, or, in certain contexts, legislation and building codes may limit the degree of adaptability, imposing strict requirements for safety, energy efficiency or heritage conservation.

The main motivations for building adaptation include the following (see Figure 9):

- Changing user needs (e.g., converting offices into residential spaces);
- Economic necessity (lower costs compared to demolishing and building new buildings);
- Environmental sustainability (reducing construction waste and carbon footprint);
- Demographic changes (population growth or migration).



**Figure 9.** The most common reasons for adapting a building.

Relevance to the study: These motivations highlight that building adaptation is seen as a practical and sustainable solution to meet social, economic, and environmental needs.

The majority of respondents consider that the conversion of existing buildings into multifunctional spaces using automated furniture and movable walls is feasible (40%) or very feasible (36%). This indicates a high level of confidence in modern technologies and in the ability to adapt existing buildings to contemporary needs. However, there are also

practical barriers and technological limitations such as structural limitations (old buildings may have structures that do not allow easy modifications), initial investments in automated technologies and building adaptation can be high, legislation can limit the possibilities of conversion, resistance to change of users who may be reluctant to new solutions.

One key issue is whether converting existing buildings (as opposed to demolishing and building new ones) is a sustainable approach or not. The majority of respondents (almost all) agree or strongly agree that the conversion of existing buildings is a sustainable approach (Figure 10a). This reflects an awareness of the benefits that conversion brings from a sustainability perspective (Figure 10b). Some respondents (a minority) are neutral or disagree, noting that in some cases, demolition and reconstruction may be more efficient, especially when existing buildings are in very poor condition.

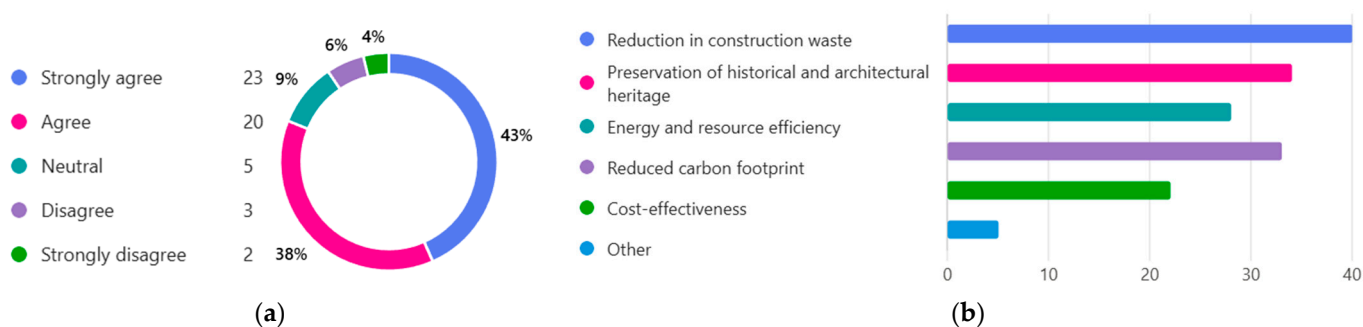


Figure 10. Converting a building is a sustainable approach (a) and the benefits of it (b).

According to experts, the most frequently mentioned sustainable practices essential in building conversion include energy-efficient technologies—24% (LEDs, advanced insulation, efficient glazing) and the use of renewable energy sources—21% (solar panels, geothermal). Maximizing natural light and natural ventilation (22% of responses) reduces reliance on artificial lighting and improves indoor air quality by reducing energy consumption and the need for mechanical air conditioning systems. Relevant examples include the following: industrial buildings converted into mixed-use spaces can include large windows, atriums, or interior courtyards to maximize natural lighting, and movable glass walls or semi-transparent structures allow for adaptable compartmentalization without sacrificing natural light in converted office buildings. Other notable practices: recycling of construction materials, stormwater management, and reduction of construction waste.

Among the types of conversions considered most beneficial by professionals, office → residential is the most popular option (40%), reflecting the post-pandemic trend of converting office buildings into homes, being an example of functional adaptability in response to economic and social changes (Figure 11).

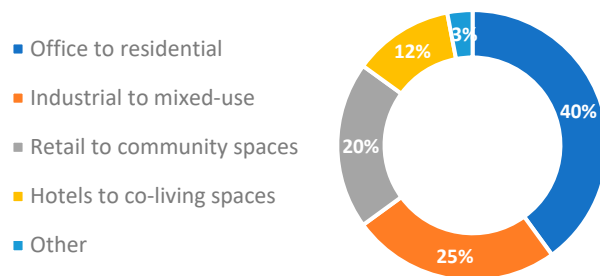


Figure 11. Types of building conversions most beneficial to end-users.

Most respondents consider it very important for end users to be able to adjust the space according to their needs. This aspect supports smart building and adaptive design trends, offering users maximum flexibility.

Regarding the increasing popularity of automated furniture conversions and adaptive design in the next 10 years, the majority of respondents answered, “Strongly agree” (32%) or “Agree” (45%), which shows a clear belief that these trends will dominate the construction sector. This trend is supported by the development of smart home technologies, which allow for maximizing space through dynamic solutions (sliding walls, multifunctional furniture, intelligent lighting, and air conditioning systems).

Among the construction sectors with the greatest conversion activity in the future is commercial—24% (e.g., offices), followed by industrial (24%) and that represented by cultural and community spaces (14%). Barriers to adopting building conversion, in experts’ opinion, are: technical challenges (29%), high initial costs (21%), regulatory constraints (19%), and lack of public or private sector incentives (18%).

However, most professionals in the fields of architecture, engineering, design, and urban planning agree that education and effective communication are essential to overcoming all challenges and promoting building conversion as a sustainable approach in urban design.

#### *3.4. Imputed Issues in Building Conversion and Urban Development*

In recent years, the trend of building conversions—especially from office spaces to residential units—has gained significant traction in many urban centers. This shift has been driven by factors such as rising housing demand, changes in work patterns, and the need to repurpose underutilized office spaces [7,30]. Studies on office-to-residential conversions in Milan and England have demonstrated how adaptive reuse strategies help address urban housing shortages while mitigating commercial vacancy rates [26,29]. Furthermore, research highlights how regulatory changes, such as the extension of permitted development rights in the UK, have facilitated this conversion trend, albeit with concerns about housing quality and affordability [39,40]. While adaptive reuse can be a sustainable and practical solution to housing shortages and the preservation of historic buildings, it is often fraught with challenges that arise from misaligned interests between developers, authorities, and communities. Studies highlight that regulatory loopholes, weak enforcement, and economic incentives often lead to conversions that prioritize financial returns over housing quality and social equity [30,39]. The outcomes of such developments can result in adverse architectural, social, and environmental consequences, as speculative investment frequently overshadows public interest [4,7]. Additionally, issues such as poor design quality, reduced living standards, and the loss of historical integrity have been documented in case studies examining the effects of office-to-residential conversions [9,26]. These challenges underscore the importance of strong regulatory oversight and community involvement to ensure that adaptive reuse aligns with broader sustainability and social equity goals.

Building conversions often present complex challenges related to planning policies, regulatory flexibility, and the prioritization of economic interests over social and environmental sustainability. Developers frequently seek to capitalize on central, historic, or strategically located properties, sometimes at the expense of heritage preservation and urban coherence. Studies highlight cases where financial incentives or zoning adjustments have enabled large-scale, high-density developments that disregard local architectural character and sustainability principles [2,5]. Additionally, research on planning policies reveals a persistent issue of regulatory loopholes, which allow developers to bypass affordable housing quotas, exceed height restrictions, or redefine project viability by compromising

material quality and livability standards [7,26]. These challenges underscore the importance of a strong regulatory framework that can balance urban development objectives with community well-being and long-term sustainability [9,12].

Another pressing concern in building conversions is the growing trend of real estate projects designed primarily as investment assets rather than functional, community-oriented housing. Studies on speculative real estate markets have shown that the privatization of public assets and the construction of high-end developments often lead to an oversupply of luxury units catering to global investors while neglecting local housing needs [30,36]. Additionally, research on England's extension of permitted development rights illustrates how deregulation has led to lower-quality housing outcomes in office-to-residential conversions [26,39]. This issue is compounded by the widespread use of sustainability rhetoric to justify profit-driven developments, where terms like regeneration and stewardship are used to market projects that primarily prioritize financial viability over social or environmental progress [50,57]. To address these issues, urban policies must integrate stricter enforcement mechanisms, ensure transparent community engagement, and redefine sustainability standards to promote long-term resilience rather than short-term profitability [41,58].

Building conversions represent a sustainable and cost-effective alternative to new construction, addressing housing shortages while optimizing underutilized infrastructure. Their success is contingent on factors such as building typology, location, and regulatory compliance. Strategic planning is essential to ensuring these projects maintain high residential standards while responding to economic and environmental challenges. Regulatory frameworks serve a critical function, balancing necessary oversight with the flexibility required for innovative design solutions.

Empirical research underscores the role of building conversions in mitigating housing shortages. A study on office-to-residential conversions in Indonesia highlights their capacity to accommodate increasing housing demand driven by population growth and economic pressures [59]. Furthermore, analyses of housing affordability crises emphasize adaptive reuse as a viable strategy to address homelessness and substandard living conditions [60]. Additionally, research on the extension of permitted development rights for office-to-residential conversions in England offers insights into the implications of deregulation on urban planning and housing supply [61]. These findings collectively highlight the necessity of policy support and adaptive planning in facilitating sustainable and resilient urban development and underscore the importance of supportive policies for sustainable and flexible urban development.

The growing demand for housing in urban areas is driven by multiple factors, including international migration, economic growth, and outdated infrastructure. As cities attract more people, the pressure to repurpose existing buildings for residential use increases, especially in areas where new construction is limited by green belt policies or high costs [7,62]. Rapid urban expansion and concentrated development create imbalances in housing availability, making adaptive reuse a practical solution to redistribute housing more efficiently [43]. Additionally, outdated buildings no longer meet modern needs, and conversions offer a cost-effective alternative to demolition and new construction [9,63].

Investment trends also play a significant role in driving building conversions. High domestic and international demand for real estate, coupled with speculative investments, intensifies competition for available properties, leading developers to repurpose existing structures [30]. Governmental delays in regulating real estate speculation and the lack of significant taxation on investment-driven property purchases further fuel this trend [39]. In many cases, a market-led approach prioritizes speculative projects, causing housing shortages that conversions help address more flexibly than new construction [24].

These factors collectively generate a confluence of pressures that intensify the demand for building conversions, presenting both strategic opportunities and operational challenges for urban centers seeking to mitigate housing shortages while enhancing urban resilience. The adaptive reuse of existing buildings offers a responsive solution to housing crises, enabling cities to address immediate needs while simultaneously preserving architectural heritage and reducing environmental impacts through resource-efficient development practices.

When considering building conversions, several considerations must be taken into account to ensure the process is effective, functional, and sustainable. These considerations cover various aspects, from understanding typological challenges to the regulatory environment, and the central role of architectural design in mediating these factors.

### *3.5. Key Considerations for Successful Building Conversion*

Successful building conversions require a tailored approach that considers the unique characteristics of each case, including location suitability, typological constraints, and necessary reconfigurations [35,36]. Architectural and design thinking play a central role in ensuring that conversions are both functional and aesthetically appealing while maintaining high living standards [17,26]. Prioritizing quality over quantity prevents the development of overcrowded or poorly designed units, enhancing long-term livability [30,40].

Regulatory frameworks significantly influence conversion outcomes, with constraints such as façade requirements or minimum space standards impacting design flexibility [38,44]. While adherence to legal provisions for natural light, ventilation, and spatial orientation is crucial for resident well-being [36,39], a degree of regulatory flexibility can foster design innovation [4,11]. Architects, as key facilitators, must navigate these challenges by proposing creative solutions that balance compliance with optimal functionality [32,63]. Comprehensive planning, such as addressing practical needs like parking and service accessibility, further ensures the success and sustainability of conversion projects [62,64]. Successful building conversions rely on a multifaceted approach that balances regulatory constraints, design creativity, and the specific needs of the location and typology. These considerations highlight the importance of a thorough, case-specific approach in building conversions, with architects playing a central role in navigating these challenges. Through thoughtful design and regulatory flexibility, building conversions can effectively address housing shortages, improve urban resilience, and preserve the cultural and historical fabric of cities.

## **4. Discussions: Real-Life Implementations of Multifunctional and Adaptable Interior Design Concepts**

The results of this study reinforce the growing relevance of multifunctionality and adaptability in building conversion, highlighting both the opportunities and challenges associated with their implementation. By analyzing responses from industry professionals and end-users, this research provides a critical perspective on how movable interior systems and flexible spatial design can contribute to sustainability, urban resilience, and economic efficiency.

This section synthesizes the survey findings with broader discussions on the potential real-life applications of adaptable and multifunctional spaces, considering both existing market trends and the barriers preventing their widespread adoption.

### *4.1. Perceived Benefits and Opportunities for Implementation*

The survey results indicate a strong demand for adaptive interiors, with 73% of respondents expressing willingness to invest in multifunctional spaces, citing benefits

such as cost efficiency, sustainability, and long-term usability. End-users view adaptable environments as a way to optimize living and working conditions, particularly in compact urban settings where space constraints necessitate flexible solutions.

From a professional perspective, architects and designers recognize multifunctionality as a tool for enhancing spatial efficiency, reducing resource consumption, and ensuring long-term viability. However, over 60% of professionals cited financial constraints as a major obstacle, reflecting concerns over high initial costs and uncertainty regarding return on investment. This suggests a gap between the perceived potential of these systems and the economic realities of their large-scale implementation.

#### 4.2. Sector-Specific Applications: Opportunities and Challenges

The data gathered from professionals and end-users suggest key areas where multifunctionality and adaptability hold the most promise:

- Residential adaptability and housing affordability: Survey results highlight affordable housing as a key area where adaptable design could have an impact. Given the rising costs of urban housing, 63% of respondents emphasized that multifunctionality could be a viable solution, particularly in converted buildings. Movable walls, automated storage solutions, and modular layouts were identified as essential for maximizing efficiency in small spaces.
- Workplace and office conversions: The post-pandemic shift toward remote and hybrid work has increased interest in adaptable office spaces. 40% of professionals expressed high feasibility for the integration of movable partitions and reconfigurable furniture. However, concerns over durability and compliance with existing building regulations remain a key barrier.
- Short-term rental and hospitality spaces: Survey participants recognized that short-term rentals and co-living spaces benefit from reconfigurable designs, as flexibility enhances both user experience and space optimization. Over 50% of respondents viewed modular hospitality spaces as highly desirable, yet regulatory adaptation and consumer trust were identified as limiting factors for widespread adoption.

These insights suggest that while adaptive reuse and multifunctionality are widely acknowledged as beneficial, economic feasibility, regulatory adaptation, and industry reluctance remain the primary obstacles to their implementation.

#### 4.3. Barriers to Implementation: Economic and Regulatory Constraints

Despite growing interest, several critical barriers hinder the adoption of multifunctional design solutions:

- Financial investment vs. long-term gains: Many professionals indicated that high upfront costs deter investment in adaptive interior solutions. While long-term savings and space efficiency are clear benefits, developers remain hesitant to commit without clearer financial incentives or policy support.
- Regulatory and zoning challenges: Local building codes and zoning laws do not always accommodate flexible or reconfigurable interiors, creating obstacles to their approval and integration. More than 50% of professionals cited the need for policy changes to encourage adaptive reuse.
- User familiarity and market readiness: While survey respondents expressed enthusiasm for multifunctional living, some professionals noted that consumer skepticism and lack of familiarity with adaptable systems could slow adoption. Pilot projects and real-world demonstrations could help bridge this gap.

#### 4.4. Toward Scalable Solutions: Bridging Research and Real-World Application

To accelerate the adoption of multifunctional and adaptable interior systems, the following steps should be considered:

- Financial Incentives and policy support: Governments and urban policymakers should explore tax incentives, grants, or subsidies to encourage adaptive reuse and multifunctional design.
- Cross-sector collaboration: Collaboration between architects, urban planners, and policymakers is necessary to create standardized guidelines that accommodate movable walls, automated furniture, and flexible spatial arrangements within existing regulatory frameworks.
- Pilot studies and market demonstrations: Implementing pilot projects showcasing the benefits of multifunctionality could enhance market trust and investor confidence, bridging the gap between innovation and large-scale adoption.

#### 4.5. Conclusion: Multifunctionality as a Key to Sustainable Urban Transformation

Survey findings confirm that multifunctionality and adaptability are increasingly recognized as essential components of urban resilience and sustainability. While obstacles remain, market demand and professional interest signal a shift toward more dynamic and resource-efficient design solutions.

The successful implementation of these systems depends on economic feasibility, regulatory adaptation, and wider public awareness. Addressing these challenges through policy incentives, financial models, and collaborative frameworks will be key to transforming vacant and underutilized buildings into vibrant, adaptable spaces that meet the evolving needs of urban populations.

#### 4.6. Key Interventions and Objectives in the Reuse of Empty Buildings for Residential Conversion

The reuse interventions on empty buildings are summarized in Table 3.

**Table 3.** Reuse interventions on empty buildings.

Social Projects	Low-Cost Rental Houses	Change of Use	Sustainability Objectives
Preferential due to the unmet demand for low-cost rental housing, addressing long-term leases (e.g., for welfare families) or temporary housing needs (e.g., for commuting students or workers), since most housing supply in metropolitan areas consists of homes for sale or high-end rentals.	The demand for low-cost rental housing is far more widespread than the demand for office spaces. Changing the intended use enables the valorization of properties in suburban areas.	The compatibility between residential and office buildings, given similar building typologies and technological solutions, facilitates a smoother conversion process, enhancing functionality, adaptability, and performance in redevelopment.	Reuse interventions contribute to the conservation of raw materials and energy, producing less waste compared to demolition and reconstruction, aligning with sustainability goals.

The success of a conversion project is influenced not only by technical feasibility but also by the investment required, as overcoming technical constraints may often prove costlier than demolition and new construction [36]. Economic factors also play a significant role in driving the conversion process, with incentives such as tax relief and the potential for enhanced streetscapes and downtown revitalization [26]. To streamline and accelerate the conversion process, especially in the context of office-to-residential transformations, governments have increasingly sought to reduce bureaucratic barriers and ease the licensing

process. This policy-driven approach, while subject to debate, has proven effective in stimulating conversions, with the private sector taking advantage of these streamlined procedures [63].

However, there remains a notable gap between the supply of offices and housing, particularly in regions like western and northern Europe. For conversion to be a viable solution, it is essential to carefully consider the opportunities and risks associated with repurposing vacant offices into residential spaces. According to Geraedts and van der Voordt [65], the success of a conversion project is contingent on several factors, including the duration of vacancy, the underlying reasons for vacancy (whether related to market conditions, location, or the building itself), municipal policies, and whether the conversion meets an identified need.

The factors influencing residential accommodation potential for conversion include:

- Building factors: structure, façade, and architectural identity.
- Supply and demand: alignment with tenant requirements.
- Location: proximity to essential services and public transport.
- Purpose: meeting the need for low-cost accommodation.
- Target audience: young professionals, families, low-income groups, etc.

Efforts to address the shortage of affordable housing for low-income families through office-to-residential conversions have gained traction globally. Initiatives like the AEOB (Abolish Empty Office Buildings) in the UK, the D.C. Council's efforts in the US, and the Office to Affordable Housing Task Force aim to explore and promote such conversions, focusing on turning surplus office space into rent-subsidized apartments [66].

Each conversion proposal, however, presents unique constraints and challenges, requiring interventions to achieve sustainability goals. These include the following:

- Sustainable design principles: minimizing resource consumption and striving toward nearly zero-energy buildings (NZEB).
- Functionality and space distribution: ensuring the design meets real needs and provides shared spaces that encourage social interaction.
- Compliance with housing standards: ensuring the proper size and amenities for different types of residents.

A typical building conversion process might proceed through stages such as functional analysis, environmental assessment, design development, and verification of compliance with mandatory requirements, including energy performance [66]. Moreover, conversion projects often aim to meet public housing standards, providing units of various sizes, communal spaces (e.g., laundry rooms, kitchens), and services (e.g., neighborhood facilities) to enhance the quality of life for residents.

Table 4 below outlines key reuse interventions for empty buildings, illustrating their social, functional, and sustainability objectives, which are essential for ensuring the success of the conversion projects. The functional program for building conversion is target-oriented and designed to meet real needs. It includes units in various sizes, complying with the standards of public housing (e.g., minimum/maximum floor area) [63]. The conversion process incorporates the following features to ensure it aligns with sustainability and community goals:

To meet updated requirements, such as energy standards, building conversions may include external wall replacements, added insulation and cladding, the introduction of shading devices, integration of green lawns on flat roofs, and the installation of photovoltaic and solar thermal systems. Additionally, increasing natural light and ventilation in flats is crucial. The process of conversion should focus on buildings with the capacity for easy adaptation and the potential to accommodate a wide range of solutions with varying levels

of conservation or transformation. The results should aim to create both high-end and affordable housing, as well as public services and spaces dedicated to co-working and co-housing [26].

**Table 4.** Key reuse interventions for empty buildings.

Building Conversion Features	Description
Unit sizes (compliance with public housing standards)	Units in various sizes, adhering to minimum and maximum floor area requirements.
Standard studios	Required for use by students, off-site workers, or for emergency needs (e.g., evicted families, migrants).
Space standard accommodations	Must include shared community spaces and facilities (e.g., laundry, community kitchen, playroom, etc.).
Ground floor	Should accommodate services or trade to enhance neighborhood facilities (benefiting both inhabitants and the community).
External/shared areas	Designed to promote outdoor activities and socialization.

In summary, conversion refers to the process of changing a building's function, such as from office or industrial to residential or commercial, or between other uses [57,67–69]. Projects typically follow three guiding principles [62,70]:

- **New function:** The new use must align with the building's characteristics, spatial layout, and the surrounding area's environmental, economic, and social context.
- **Design compatibility:** The design should respect the building's historical context, comply with current codes and regulations, and consider the architectural qualities of surrounding structures.
- **Sustainability:** The conversion must adhere to sustainable development principles, ensuring environmental and resource efficiency.

Table 5 highlights the challenges of building conversion, a key strategy in sustainable urban development. While it offers environmental, social, and economic benefits, such as waste reduction and increased property value, it also involves risks like unforeseen costs and technical issues. Adaptive reuse, which combines function change and material recovery, is gaining traction as an alternative to demolition, especially in response to global and socioeconomic pressures.

Building conversion and adaptive reuse promote sustainable urban development by reducing demolition and encouraging the reuse of existing structures, addressing global environmental concerns such as climate change and pollution, as well as socio-economic pressures like demographic shifts and economic speculation, particularly after the COVID-19 pandemic [23].

**Table 5.** Analysis of conversion challenges.

Advantages	Disadvantages
Environmental [9,71–73]: <ul style="list-style-type: none"> <li>• Reduces waste</li> <li>• Lowers consumption of natural resources and raw materials</li> <li>• Conserves embodied energy</li> <li>• Decreases energy use</li> <li>• Reduces greenhouse gas emissions</li> </ul>	Environmental <ul style="list-style-type: none"> <li>• Unforeseen issues can increase costs and duration (e.g., latent technical defects, structural instability, hazardous materials) [74].</li> </ul>

Table 5. Cont.

Advantages	Disadvantages
Social [58,75]: <ul style="list-style-type: none"> <li>Improves safety, living conditions, and residents' health.</li> </ul>	Social <ul style="list-style-type: none"> <li>Owners/investors often hesitate due to higher economic risks (return on investment) compared to new construction [64]</li> </ul>
Economic [67,71]: <ul style="list-style-type: none"> <li>Enhances property value</li> <li>Increases economic viability</li> <li>Generates 25% more jobs per square meter</li> </ul>	Economic <ul style="list-style-type: none"> <li>Higher costs and extended timelines due to unknown conditions in older buildings</li> </ul>

Adaptive reuse involves two main aspects: (1) changing a building's function (conversion) and (2) recovering and reusing materials (material reuse) [76]. These practices are recognized as sustainable alternatives to demolition, which can disrupt urban environments and communities. Demolition of repairable buildings may result in the loss of local heritage and the creation of poor-quality replacements, such as "Skarne" system-building blocks. Additionally, certain construction methods, while effective in their original contexts, are often inappropriate when applied to different climates, highlighting the issue of "foreign solutions to domestic problems" [77].

## 5. Conclusions: Advancing the Discourse on Adaptive Urban Spaces

Urban environments are continuously shaped by dynamic economic, social, environmental, and crisis-related factors. As global disruptions such as pandemics, wars, and economic crises intensify, coupled with structural challenges like demographic shifts and uneven development, it is evident that conventional urban planning strategies—particularly those that prioritize single-use buildings—are no longer viable. The surplus of vacant office and retail spaces highlights a fundamental inefficiency in contemporary urban development, underscoring the urgent need for adaptive, multifunctional spaces capable of evolving alongside societal demands.

This study extends the existing literature on repurposing vacant buildings by not only reinforcing the sustainability and economic benefits of adaptive reuse but also by incorporating a novel perspective—analyzing professional and user attitudes toward multifunctional, adaptable interiors. While prior research has largely focused on the technical and environmental advantages of building conversion, our findings reveal a significant gap between the potential of adaptable interiors and their real-world implementation. By integrating perspectives from architects, urban planners, and end-users, this research sheds light on the barriers preventing wider adoption, such as financial concerns, regulatory obstacles, and inertia in the construction industry.

Crucially, this study emphasizes two theoretical concepts with direct practical applicability, namely, multifunctionality and adaptability. These principles serve as the foundation for rethinking urban spaces, advocating for interiors that can dynamically transform in response to shifting needs. While multifunctionality ensures that spaces serve multiple purposes over time, adaptability allows for continuous spatial evolution, preventing obsolescence and fostering long-term economic and environmental sustainability. By situating these concepts within the context of real-world challenges and professional-user attitudes, this research offers a critical bridge between theoretical discourse and actionable strategies, ensuring its relevance for both scholars and practitioners.

### 5.1. Key Contributions to Theory and Practice:

- Bridging conceptual frameworks with real-world application—while existing studies advocate for adaptive reuse, our research directly links these theoretical discussions to practical design solutions, such as the ADD-rest concept and automated reconfigurable interiors. These findings emphasize that adaptability must be embedded at the interior level, rather than focusing solely on large-scale architectural transformation.
- User and professional insights as a catalyst for implementation—the survey data provide critical insights into the acceptability and perceived feasibility of adaptable interior solutions. Architects and urban planners recognize the potential of movable and multifunctional elements, yet these solutions remain underutilized due to perceived high costs and regulatory uncertainties. End-user responses indicate a growing demand for flexibility in work and living environments, reinforcing the need for practical implementation strategies that align with evolving urban lifestyles.
- Policy and urban planning implications—this research highlights the necessity for updated zoning regulations and building codes that encourage adaptive reuse. Policymakers can use these findings to design financial incentives, such as tax breaks or grants, to support conversion projects that integrate adaptable design principles. Additionally, our study suggests that real estate and development sectors must shift toward investment models that prioritize longevity and flexibility over short-term financial returns.

### 5.2. From Insight to Action: Guiding Future Urban Transformation

By demonstrating the discrepancy between enthusiasm for adaptable interiors and the lack of widespread implementation, this study serves as a call to action for architects, urban planners, and policymakers. The findings underscore the need for the following:

- Clearer financial incentives and policy support to accelerate adaptive reuse projects.
- Cross-sector collaboration between designers, developers, and policymakers to overcome regulatory hurdles.
- Increased public awareness of the benefits of multifunctional spaces, fostering a demand-driven shift in urban development strategies.

Ultimately, this study moves beyond theoretical discussions of building conversion to provide a data-driven roadmap for real-world implementation. By emphasizing multifunctionality at both the architectural and interior levels, we propose a paradigm shift in urban design—one that prioritizes adaptability, sustainability, and resilience in the face of ongoing global uncertainties.

### 5.3. Limitations and Future Research

While this study provides valuable insights into the role of multifunctionality and adaptability in building conversion, several limitations should be acknowledged.

First, the representativeness of the sample remains a constraint. Although this study gathered responses from industry professionals and end-users, these perspectives may not fully capture the diversity of urban populations or stakeholders involved in large-scale redevelopment projects. Additionally, regional constraints must be considered. As this study primarily focuses on specific urban contexts, its findings may not be directly transferable to cities with different regulatory frameworks, economic structures, or cultural attitudes toward adaptive reuse.

Moreover, building conversion strategies are inherently context-dependent, and their feasibility is influenced by factors such as zoning laws, material availability, and financial incentives. While this study highlights key drivers and barriers to implementing movable interior systems, broader generalizations should be approached with caution. Lastly,

given the short-term nature of this investigation, the long-term performance of these adaptive systems—particularly their impact on sustainability, economic efficiency, and user satisfaction—remains an open question.

Future research could address these limitations by conducting longitudinal studies on the sustainability and usability of converted spaces, tracking occupant satisfaction, energy efficiency, and economic returns over time. Additionally, comparative economic analyses could provide a more detailed understanding of how building conversion compares with new construction in terms of cost-effectiveness and environmental impact. Expanding research across different cultural and policy contexts would also offer valuable insights into how urban governance and financial incentives shape the success of adaptive reuse. Finally, exploring technological advancements—such as AI-driven space optimization and the integration of smart, modular interiors—could further enhance the efficiency and desirability of adaptable building solutions.

By addressing these research gaps, future studies can contribute to a more comprehensive understanding of sustainable building conversion, helping cities implement strategies that balance economic viability with environmental responsibility.

**Author Contributions:** Conceptualization, S.V. and R.M.; methodology, S.V.; validation, R.M.; formal analysis, S.V. and R.M.; investigation, S.V.; resources, S.V. and R.M.; data curation, R.M.; writing—original draft preparation, S.V. and R.M.; writing—review and editing, S.V. and R.M.; visualization, S.V.; supervision, S.V.; project administration, S.V. and R.M.; funding acquisition, S.V. and R.M. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** This study is waived for ethical review as Transilvania University of Brasov respects the European and national regulations related to the natural persons' protection with regard to personal data processing and the free movement of these data. For the internal regulation, with respect to the above statement, please visit [https://www.unitbv.ro/documente/about/regulations/General\\_Regulations/Regulament\\_pre lucrare\\_date\\_personale\\_GDPR\\_24.07.2024\\_engl.pdf](https://www.unitbv.ro/documente/about/regulations/General_Regulations/Regulament_pre lucrare_date_personale_GDPR_24.07.2024_engl.pdf) (accessed on 16 October 2024). This study did not ask for any personal data such as names, email addresses, phone numbers, or any other data that could lead to person identification later on.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Results data are available upon request.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Camocini, B. *Adapting Reuse. Strategie Di Conversione d'uso Degli Interni e Di Rinnovamento Urbano*; FrancoAngeli: Milan, Italy, 2016.
2. Huang, Y.; Wang, F.; Hiscock, A.V.; Satyarthi, J.; Smith, H. Including Embodied Carbon in Assessing Renovation Options for Industrial Heritage Buildings: A Review and Case Studies. *Sustainability* **2025**, *17*, 72. [[CrossRef](#)]
3. Owojori, O.M.; Okoro, C.S.; Chileshe, N. Current Status and Emerging Trends on the Adaptive Reuse of Buildings: A Bibliometric Analysis. *Sustainability* **2021**, *13*, 11646. [[CrossRef](#)]
4. Ryser, J. Planning for the Post-Covid-19 'New Normal'. *disP—Plan. Rev.* **2020**, *56*, 125–139. [[CrossRef](#)]
5. Vardopoulos, I.; Tsilika, E.; Sarantakou, E.; Zorpas, A.; Salvati, L.; Tsartas, P. An Integrated SWOT-PESTLE-AHP Model Assessing Sustainability in Adaptive Reuse Projects. *Appl. Sci.* **2021**, *11*, 7134. [[CrossRef](#)]
6. Kong, Y.; Teng, C.; Liu, C. Transition Design as a Strategy for Post-Pandemic Spatial Experience Enhancement: A Sustainability Perspective. *Sustainability* **2024**, *16*, 5834. [[CrossRef](#)]
7. Gavu, E.K.; Peiser, R.B. Embodied Carbon and the Nuances in Office-to-Residential Conversions. *Sustainability* **2024**, *16*, 2711. [[CrossRef](#)]
8. Olivadese, R. *Il Riuso Degli Edifici Esistenti a Scopo Residenziale in Italia: Nuovi Standard per l'innovazione Dei Modelli Abitativi*. Ph.D. Thesis, Università degli Studi di Pavia, Pavia, Italy, 2016.
9. Yung, E.H.K.; Chan, E.H.W. Implementation Challenges to the Adaptive Reuse of Heritage Buildings: Towards the Goals of Sustainable, Low Carbon Cities. *Habitat Int.* **2012**, *36*, 352–361. [[CrossRef](#)]

10. Monsù Scolaro, A.; De Medici, S. Downcycling and Upcycling in Rehabilitation and Adaptive Reuse of Pre-Existing Buildings: Re-Designing Technological Performances in an Environmental Perspective. *Energies* **2021**, *14*, 6863. [CrossRef]
11. Kamara, J.M.; Heidrich, O.; Tafaro, V.E.; Maltese, S.; Dejaco, M.C.; Re Cecconi, F. Change Factors and the Adaptability of Buildings. *Sustainability* **2020**, *12*, 6585. [CrossRef]
12. Vuscan, S.; Muntean, R. Multifunctional Homes: A Sustainable Answer to the Challenges of the Future. *Sustainability* **2023**, *15*, 5624. [CrossRef]
13. ADD-Rest Homepage. Available online: <https://add-rest.com/> (accessed on 10 October 2024).
14. Ori Furniture Homepage. Available online: <https://www.oriliving.com> (accessed on 23 October 2024).
15. Bumblebee Spaces Homepage. Available online: <https://bumblebeespaces.com/> (accessed on 23 October 2024).
16. Spaceplus Homepage. Available online: <https://www.spaceplus.com/> (accessed on 5 November 2024).
17. Scuderi, G. Designing Flexibility and Adaptability: The Answer to Integrated Residential Building Retrofit. *Designs* **2019**, *3*, 3. [CrossRef]
18. Askar, R.; Bragança, L.; Gervásio, H. Adaptability of Buildings: A Critical Review on the Concept Evolution. *Appl. Sci.* **2021**, *11*, 4483. [CrossRef]
19. Chung, H.; Seo, H.; Forbes, S.; Birkett, H. Working from home during the COVID-19 lockdown: Changing preferences and the future of work. *Kent Acad. Repos.* **2020**, *22*, 399–403.
20. Everett, C. How the ‘15-Minute City’ Will Transform Work. Available online: <https://www.raconteur.net/future-of-work/15-minute-city/> (accessed on 12 November 2023).
21. Wang, C.; Liu, J.; Lu, B.; Zhang, Y.; Ma, Z. Stiffness Degradation and Mechanical Behavior of Microfiber-Modified High-Toughness Recycled Aggregate Concrete under Constant Load Cycling. *Eng. Fract. Mech.* **2024**, *312*, 110608. [CrossRef]
22. Ma, Z.; Wang, B.; Zhang, Z.; Zhang, Y.; Wang, C. New Insights into the Effects of Silicate Modulus, Alkali Content and Modification on Multi-Properties of Recycled Brick Powder-Based Geopolymer. *J. Build. Eng.* **2024**, *97*, 110989. [CrossRef]
23. James, D. *Building Adaptation*, 2nd ed.; Routledge: Milton Park, UK, 2006; ISBN 9781136425103.
24. Gallent, N. *Whose Housing Crisis?: Assets and Homes in a Changing Economy*; Policy Press: Bristol, UK, 2019; ISBN 9781447346067.
25. Lee, C.C.M.; Jacoby, S. Typological Urbanism and the Idea of the City. *Archit. Des.* **2011**, *81*, 14–23. [CrossRef]
26. Fianchini, M.; Ferrucci, F. Turning Empty Office Buildings into Sustainable Social Housing. In Proceedings of the 42nd Iahs World Congress The Housing for the Dignity of Mankind, Naples, Italy, 10–13 April 2018; pp. 1–10.
27. Morris, A.; Trevorrow, H.; Spry, M.; Furlonger, N.; Patni, R.; Shearer, P.; Greenhalgh, J.; Torrance, L. *Departments to Apartments Converting Office Buildings to Residential*; Lichfields: Staffordshire, UK, 2011.
28. Zukin, S. Loft Living as ‘Historic Compromise’ in the Urban Core: The New York Experience. *Int. J. Urban Reg. Res.* **1982**, *6*, 256–267. [CrossRef]
29. Ginelli, E. Adaptive Reuse of Vacant Office Buildings in Milan. In Proceedings of the 41st Iahs World Congress Sustainability and Innovation for the Future, Albufeira, Portugal, 13–16 September 2016; pp. 1–11.
30. Madeddu, M.; Clifford, B. The Conversion of Buildings to Housing Use: England’s Permitted Development Rights in Comparative Perspective. *Prog. Plann.* **2023**, *171*, 100730. [CrossRef]
31. Grammenos, F.; Russel, P.K. Building Adaptability: A View from He Future. In Proceedings of the Buildings and the Environment International conference, Paris, France, 9 June 1997; pp. 19–26.
32. Brand, S. *How Buildings Learn: What Happens After They’re Built*; Penguin Books: Westminster, UK, 1995; ISBN 0140139966.
33. Nutt, B.; Walker, B.; Holliday, S.; Sears, D. *Obsolescence in Housing. Theory and Applications*; Lexington Books: Lanham, MD, USA, 1976.
34. Addleson, L.; Rice, C. *Performance of Materials in Buildings*; Butterworth-Heinemann: Oxford, UK, 1991.
35. Remøy, H.; De Jonge, H. Transformation and Typology; Vacancy, Characteristics and Conversion-Capacity. In Proceedings of the BSA 2007 Conference, Tokyo, Japan, 8 May 2007; pp. 163–170.
36. Gann, D.M.; Barlow, J. Flexibility in Building Use: The Technical Feasibility of Converting Redundant Offices into Flats. *Constr. Manag. Econ.* **1996**, *14*, 55–66. [CrossRef]
37. Tattara, M.; Aureli, P.V. Production/Reproduction: Housing Beyond the Family. *Harvard Des. Mag.* **2015**, *41*, 132–138.
38. Kincaid, D. *Adapting Buildings for Changing Uses: Guidelines for Change of Use Refurbishment*; Routledge: London, UK, 2003.
39. Clifford, B.P.; Ferm, J.; Livingstone, N.; Canelas, P. *Assessing the Impacts of Extending Permitted Development Rights to Office-to-Residential Change of Use in England*; RICS: Royal Institution of Chartered Surveyors: London, UK, 2018.
40. Clifford, B.; Canelas, P.; Ferm, J.; Livingstone, N.; Lord, A.; Dunning, R. *Research into the Quality Standard of Homes Delivered Through Change of Use Permitted Development Rights*; Ministry of Housing, Communities and Local Government: London, UK, 2020.
41. Moore, R. “It’s like an Open Prison”: The Catastrophe of Converting Office Blocks to Homes. Available online: <https://www.theguardian.com/society/2020/sep/27/housing-crisis-planning-converting-office-blocks-homes-catastrophe-jenrick> (accessed on 2 October 2023).

42. Russillo, F. La Conversione Del Patrimonio Immobiliare Terziario in Housing Sociale. Ph.D. Thesis, Università degli Studi di Napoli “Federico II”, Naples, Italy, 2016.
43. Micelli, E.; Mangialardo, A. Recycling the City New Perspective on the Real-Estate Market and Construction Industry. In *Green Energy and Technology*; Springer Nature: London, UK, 2017; pp. 115–125. [CrossRef]
44. Olivadese, R.; Remøy, H.; Berizzi, C.; Hobma, F. Reuse into Housing: Italian and Dutch Regulatory Effects. *Prop. Manag.* **2017**, *35*, 165–180. [CrossRef]
45. Benna, C. Attici e Loft Negli Ex Uffici, Nel Centro Di Torino Sta Spuntando Un Nuovo Quartiere Residenziale. Available online: [https://torino.corriere.it/economia/21\\_febbraio\\_21/attici-loft-ex-uffici torino-torna-centro-8cb4f804%E2%80%9393746a-11eb-88fd-12da203c2b8b.shtml](https://torino.corriere.it/economia/21_febbraio_21/attici-loft-ex-uffici torino-torna-centro-8cb4f804%E2%80%9393746a-11eb-88fd-12da203c2b8b.shtml) (accessed on 18 October 2023).
46. Di Biase, C. Suitable Use Rather than Adaptive Reuse: Religious Heritage in Contemporary Societies. In *Conservation Adaptation. Keeping Alive the Spirit of the Place Adaptive Reuse of Heritage with Symbolic Value*; Fiorani, D., Kealy, L., Musso, S.F., Eds.; EAAE Transactions on Architectural Education: Hasselt, Belgium, 2017; pp. 55–64.
47. Popa, N.; Pop, A.M.; Marian-Potra, A.C. Culture-Led Urban Regeneration in Post-Socialist Cities: From Decadent Spaces towards Creative Initiatives. *Cities* **2025**, *158*, 105707. [CrossRef]
48. See How Isabel López-Quesada Transformed a Former Wax Factory Into an Elegant Madrid Villa. Available online: <https://www.architecturaldigest.com/story/isabel-lopez-quesada-madrid-villa-article> (accessed on 14 January 2025).
49. SSDA—Servizio Studi Dipartimento Ambiente Il Recupero e La Riqualificazione Energetica Del Patrimonio Edilizio: Una Stima Dell’impatto Delle Misure Di Incentivazione. Available online: [http://documenti.camera.it/leg18/dossier/testi/am0036b.htm?\\_1626106810796](http://documenti.camera.it/leg18/dossier/testi/am0036b.htm?_1626106810796) (accessed on 9 August 2023).
50. Bottero, M.; D’Alpaos, C.; Oppio, A. Ranking of Adaptive Reuse Strategies for Abandoned Industrial Heritage in Vulnerable Contexts: A Multiple Criteria Decision Aiding Approach. *Sustainability* **2019**, *11*, 785. [CrossRef]
51. Lupacchini, R.; Gravagnuolo, A. Cultural Heritage Adaptive Reuse: Learning from Success and Failure Stories in the City of Salerno, Italy. *BDC Boll. Del Cent. Calza Bini* **2019**, *19*, 353–377.
52. Riddel’s Warehouse Project. Available online: <http://hearthni.org.uk/riddels-warehouse/project/> (accessed on 2 November 2023).
53. Whitney, H. New Homes: Extending into the Sky! Available online: <https://lichfields.uk/blog/2020/august/18/new-homes-extending-into-the-sky/> (accessed on 2 November 2023).
54. Wall, T. ‘It Feels Almost like Prison’: The Developers Building Homes with No Natural Light. Available online: <https://www.theguardian.com/cities/2019/dec/19/it-feels-almost-like-prison-the-developers-building-homes-with-no-natural-light> (accessed on 2 October 2023).
55. Dauray, H. How Parking Infrastructure Presents a Resilient Climate Opportunity. Available online: <https://pelr.blogs.pace.edu/2023/10/18/climate-resiliency-parking-structures/> (accessed on 6 January 2025).
56. TCPA. *The Wrong Answers to the Wrong Questions*; TCPA: London, UK, 2020.
57. Petković-Groždanovića, N.; Stoiljković, B.; Keković, A.; Murgul, V. The Possibilities for Conversion and Adaptive Reuse of Industrial Facilities into Residential Dwellings. *Procedia Eng.* **2016**, *165*, 1836–1844. [CrossRef]
58. Aigwi, I.E.; Egbelakin, T.; Ingham, J. Efficacy of Adaptive Reuse for the Redevelopment of Underutilised Historical Buildings. *Int. J. Build. Pathol. Adapt.* **2018**, *36*, 385–407. [CrossRef]
59. Pratiwi, W.D.; Zuraida, S.; Margono, R.B.; Kurniawati, I.; Dorothy, E.; Tang, A. Office Conversion to Residential: Innovation in Housing and Urban Vulnerability. In *Lecture Notes in Civil Engineering*; Springer Nature: London, UK, 2023; pp. 439–454.
60. Keene, D.E.; Blankenship, K.M. The Affordable Rental Housing Crisis and Population Health Equity: A Multidimensional and Multilevel Framework. *J. Urban Health* **2023**, *100*, 1212–1223. [CrossRef]
61. Clifford, B.; Ferm, J.; Livingstone, N.; Canelas, P. Understanding Office-to-Residential Permitted Development. In *Understanding the Impacts of Deregulation in Planning*; Springer International Publishing: Cham, Germany, 2019; pp. 35–45.
62. Zivkovic, M.; Kurtovic-Folic, N.; Jovanovic, G.; Kondic, S.; Mitkovic, M. Current Strategies of Urban and Architectural Conversion as a Result of Increased Housing Demands. *Teh. Vjesn.—Tech. Gaz.* **2016**, *23*, 561–568. [CrossRef]
63. Heath, T. Adaptive Re-Use of Offices for Residential Use: The Experiences of London and Toronto. *Cities* **2001**, *18*, 173–184. [CrossRef]
64. Shipley, R.; Utz, S.; Parsons, M. Does Adaptive Reuse Pay? A Study of the Business of Building Renovation in Ontario, Canada. *Int. J. Herit. Stud.* **2006**, *12*, 505–520. [CrossRef]
65. Geraedts, R.P.; Van der Voordt, D.J.M. A Tool To Measure Opportunities and Risks of Converting Empty Offices Into Dwellings. In Proceedings of the ENHR International Conference Rotterdam—Delft, Delft, The Netherlands, 25–28 June 2007. 22p.
66. Guazzo, G. I Molti Modi Del Pensiero Progettuale. In *Tecnica, Progetto e Scienze Umane*; Bertoldini, M., Zanelli, A., Eds.; CLUP: Milano, Italy, 2003.
67. Chan, A.; Cheung, E.; Wong, I. Impacts of the Revitalizing Industrial Buildings (RIB) Scheme in Hong Kong. *Sustain. Cities Soc.* **2015**, *19*, 184–190. [CrossRef]

68. Ren, L.; Shih, L.; McKercher, B. Revitalization of Industrial Buildings into Hotels: Anatomy of a Policy Failure. *Int. J. Hosp. Manag.* **2014**, *42*, 32–38. [[CrossRef](#)]
69. Wadu Mesthrige, J.; Wong, J.K.W.; Yuk, L.N. Conversion or Redevelopment? Effects of Revitalization of Old Industrial Buildings on Property Values. *Habitat Int.* **2018**, *73*, 53–64. [[CrossRef](#)]
70. Loures, L.; Panagopoulos, T. Sustainable Reclamation of Industrial Areas in Urban Landscapes. *WIT Trans. Ecol. Environ.* **2007**, *102*, 791–800. [[CrossRef](#)]
71. Sanchez, B.; Esnaashary Esfahani, M.; Haas, C. A Methodology to Analyze the Net Environmental Impacts and Building's Cost Performance of an Adaptive Reuse Project: A Case Study of the Waterloo County Courthouse Renovations. *Environ. Syst. Decis.* **2019**, *39*, 419–438. [[CrossRef](#)]
72. Conejos, S.; Langston, C.; Smith, J. AdaptSTAR Model: A Climate-Friendly Strategy to Promote Built Environment Sustainability. *Habitat Int.* **2013**, *37*, 95–103. [[CrossRef](#)]
73. Langston, C.; Wong, F.K.W.; Hui, E.C.M.; Shen, L.Y. Strategic Assessment of Building Adaptive Reuse Opportunities in Hong Kong. *Build. Environ.* **2008**, *43*, 1709–1718. [[CrossRef](#)]
74. Bullen, P.A. Adaptive Reuse and Sustainability of Commercial Buildings. *Facilities* **2007**, *25*, 20–31. [[CrossRef](#)]
75. Shen, L.Y.; Langston, C. Adaptive Reuse Potential: An Examination of Differences between Urban and Non-urban Projects. *Facilities* **2010**, *28*, 6–16. [[CrossRef](#)]
76. Shahi, S.; Esnaashary Esfahani, M.; Bachmann, C.; Haas, C. A Definition Framework for Building Adaptation Projects. *Sustain. Cities Soc.* **2020**, *63*, 102345. [[CrossRef](#)]
77. Latham, D. *Creative Reuse of Buildings: Volume One—Principles and Practice*; The Bath Press: Bath, UK, 2016; ISBN 9781873394335.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.