
Influence of Spatial Characteristics of Former Industrial Buildings on Their Adaptability for Recreational Uses in Kenya.

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Abstract

This study examines how the spatial characteristics of Former Industrial Buildings (FIBs) influence their adaptability for recreational uses in Kenya. It addresses both a theoretical problem, involving the spatial adaptability of FIBs, and a practical challenge, focusing on repurposing these structures to meet the demand for accessible recreational spaces. It also explores how adaptive reuse can preserve industrial heritage and support sustainable urban development. The study is grounded in urban regeneration, adaptive reuse, and sustainability theories. This set of theories explain how industrial spaces transform into functional and socially inclusive recreational environments. A qualitative research approach was applied here. Case studies, sample survey and observation research methods were used in complementation. These were operationalised through the specific techniques of structured interviews of key informants (property managers, architects, designers, and consultants), and direct participant observations. The observation checklists, structured interview schedules, sketches & photography data collection tools facilitated essential field work. The study findings highlighted key spatial factors influencing adaptability in FIBs for recreation. These included vertical integration, retention of flexibility in spatial layouts, acoustic and lighting innovations, cultural and artistic integration, safety considerations, economic feasibility, and a phased reuse strategy in brownfields. Additionally, balancing industrial aesthetics with contemporary design and incorporating interactive technologies were identified as being critical. The study concluded that successful adaptation depended on maintaining historical integrity while ensuring modern functionality. It recommended an integrated approach that prioritizes economic viability, inclusivity, and sustainability. By transforming industrial heritage into vibrant recreational spaces, these strategies foster urban revitalization, enhance community engagement, and create lasting social impact.

Keywords: Adaptability, industrial, heritage, sustainability, revitalization, recreation.

1. Introduction

1.1 Background to the Study

The construction value chain accounts for approximately 40% of global energy consumption and industrial-related CO₂ emissions (IFC, 2023). Without intensified mitigation and adaptation efforts, emissions are projected to increase by 13% by 2035, equivalent to the total construction emissions of the United States in 2022 (IFC, 2023). Consequently, interest in energy-efficient building designs and retrofitting existing structures to meet sustainability standards has surged (UNEP, 2009). For instance, abandoned industrial areas cover 3% of Italy's land (ISTAT, 2012), exemplifying the scale of underutilized infrastructure. This underlines the emerging global research focus on adaptive reuse (Vardopoulos, 2022).

Green renovations and retrofits outperform new green construction in global growth, with rates of 17% and 11.5% respectively, and owners report that such projects increase asset values by over 9% (Dodge Construction Network, 2021). Steel, a predominant industrial building material, contributes 7.2% to global greenhouse gas emissions, emphasizing the need to prioritize its reuse and recycling (UNEP, 2023). Global floor space is expected to double by 2060, and every five days, the world builds new structures covering an area equivalent to Paris, while raw material consumption is projected to nearly double due to economic growth and rising living standards (UN Environment & International Energy Agency, 2017; OECD, 2019).

Vacant industrial buildings number in the millions worldwide. The U.S. alone has over 100,000 such structures, reflecting a growing inventory amid oversupply and shifting industrial demand (National Association of Realtors 2019; Cushman & Wakefield, 2025). The global adaptive reuse market was valued at \$2 trillion in 2018, with a compound annual growth rate forecasted at 5.5% from 2019 to 2025, driven by sustainability concerns and urban revitalization (World Green Building Council, 2018). Urbanization trends predict two-thirds of the global population will live in cities by 2050, intensifying demand for recreational and urban renewal spaces.

Adaptive reuse of obsolete urban industrial facilities supports sustainability and smart growth by concentrating regeneration within inner cities, reducing urban sprawl, and maximizing existing infrastructure and materials (Fong, 2005; Lepel, 2006). Cities worldwide are enacting policies to revitalize Former Industrial Buildings (FIBs), reflecting their critical role in social, cultural, and architectural discourse (Vizzarri et al., 2020). Industrial sites repurposed for recreational and cultural uses, such as art galleries, are prevalent examples of urban renewal. Shanghai's West Bund art-led gentrification is a notable case (Ma et al., 2023).

Culture-led urban regeneration leverages industrial heritage for vibrant, economically sustainable neighbourhoods through cultural activities and community engagement (Luo et al., 2022). Detroit's Packard Plant (figure 1), once the world's largest abandoned factory designed by Albert Kahn and dormant since 1958, is undergoing selective demolition with parts preserved for adaptive reuse into mixed-use public spaces, representing a strategic response to urban decay and

economic challenges (Luescher & Shetty, 2019). In Europe, subsiding industrialization has left many industrial “black holes” or vacant monuments symbolizing urban abandonment and pollution (Vardopoulos, 2022). Effectively repurposing these complex industrial structures requires a nuanced understanding of their architectural character (Antic et al., 2023).



Figure 1: Packard Plant, Detroit, USA. Source: The Detroit News, 2022.

In Africa, the Zeitz Museum of Contemporary Art Africa (MOCAA) in Cape Town exemplifies adaptive reuse (Scher, 2017). The transformation of 42 historic grain silos into 80 gallery spaces designed by Thomas Heatherwick preserves the original industrial form while creating a modern cultural institution. In Kenya, numerous vacant FIBs reflect economic transitions and industrial decline in cities like Nairobi, Mombasa, and Kisumu. These structures offer promising opportunities for conversion into recreational spaces, aligning Kenyan urban development with global regeneration trends. There is a growing array repurposed buildings in Kenya. These cover museums developed from historical structures, cultural centers curved out of colonial-era offices, and shipping containers adapted into affordable housing. Such schemes preserve cultural heritage with social and environmental sensitivity. Good examples include, the Nairobi Gallery, Fort Jesus, Gedi Ruins, Kongo sensitivity Mosque, Muranga colonial building, Kipande House, shipping container homes and abandoned buildings repurposed as social housing.

Despite global awareness of adaptive reuse, there is limited research exploring the specific spatial, socio-economic, and environmental factors influencing the adaptability of FIBs for recreation in Kenya. Prior studies address general conversion challenges but lack detailed insights into the Kenyan context. This research aims to fill that gap by analysing how FIB spatial characteristics impact their feasibility for sustainable and accessible recreational reuse in Kenyan cities. This will enhance knowledge about their potential contribution to urban recreational infrastructure.

1.2 Problem Statement

Adaptive reuse holds transformative potential for urban development by prioritizing internal city regeneration over outward expansion. This approach, fuelled by cultural and social imperatives, addresses contemporary urban challenges while conserving resources and reducing emissions (Vizzarri et al., 2020). Globally, construction-related carbon emissions stem significantly from emerging and developing economies, which currently contribute two-thirds of the total and are poised to increase by 2035. This rise is driven by the vast stock of non-adapted buildings, carbon-heavy construction methods, and accelerated investment growth compared to wealthier nations (IFC, 2023).

Kenya exemplifies these dynamics. Its urban population is forecasted to surge from 25 million to 44 million by 2050, intensifying demands for housing, recreational spaces, and other urban needs amid rapid urbanization. Developing countries, which housed 81% of the global population in 2020, are projected to claim 87% by century's end, reflecting worldwide urban shifts (Roser et al., 2013; United Nations, 2020).

Materials like concrete, steel, and aluminium account for 23% of global emissions, underscoring the environmental stakes of traditional construction (Global Alliance for Buildings and Construction et al., 2019). Meanwhile, many former industrial buildings (FIBs), characterized by their robust, large-scale, and uniquely shaped forms, decline in urban Kenya, marked by broken windows and overgrowth. These structures, often neglected due to industrial decline, technological change, and population shifts, embody a vast, untapped resource for adaptive reuse, especially for recreational purposes. However, their spatial traits, marked by spacious interiors, high ceilings, exposed utilities, and poor natural lighting, pose challenges for conversion into vibrant community spaces fostering healthy lifestyles.

In Nairobi's industrial area, the government announced in 2020 plans to alter land use and construct 10,000 affordable homes on 56 acres (Wanjohi, 2020). Nightclubs have begun replacing defunct factories along Baricho road, revitalizing an area long suffering from infrastructure neglect, including poor roads, unreliable electricity, and water shortages that forced manufacturers to relocate (Omondi, 2024; Macharia, 2022). Shifts in Kenya's retail landscape, with international players like Carrefour, are driving demand for modern warehouses, shifting industrial hubs toward locales like Northlands and Ruiru (Macharia, 2019).

Thika town mirrors this industrial transition. Once dubbed the Birmingham of Kenya for its diverse industries, Thika now bears the scars of industrial decline with abandoned factories and rusted railways (figure 2). Yet, the area is evolving as a residential hub, fuelled by the completion of the Thika Superhighway's and its proximity to Nairobi (Bizrika, 2013; Wangari, 2023; Wambui, 2018). Efforts like Food for Education that are repurposing unused industrial spaces into kitchens feeding thousands highlight the inherent community benefits of adaptive reuse. Kiambu County's 2022 plan to develop 635 acres of former Delmonte land further signals industrial rebirth (Kamau, 2022).



Figure 2: A photograph of an abandoned industrial building in Juja near Thika, Kenya.
Source: Pilot Study by Author¹, 2025.

Thika's industrial narrative dates to 1914, when trader Jimal Hirji established the first shop, attracting entrepreneurs to a largely agricultural town (Kamau, 2016). Mid-20th century government incentives encouraged industries in Thika and beyond Nairobi. Conversely, towns like Magadi and Webuye face sustainability challenges tied to resource dependence and industrial closures. This is exemplified by the shutting down of Kenya's sole paper mill and associated community facilities (Kamau, 2016).

Kenya grapples with a systemic shortage of public recreational spaces, particularly in Nairobi, where high residential densities force overflow of household activities into constrained public realms. Children, as principal participants of recreation, often resort to unsafe, unsupervised spaces (Wanjiru, 1982; Wairimu, 1990; Wanjiru, 2020). Outside Nairobi, Lamu, Mombasa, Kisumu, and Trans Nzoia, museums and cultural institutions are sparse. This underscores the gap in cultural infrastructure (Nation, 2016; Njuguna et al., 2016).

Rapid urban growth threatens public open spaces as development pressures mount, accelerating encroachments for housing and commercial use, especially in informal settlements (Mutisya, 2021). Adaptive reuse of FIBs emerges as an innovative strategy to address these challenges. However, limited resources and understanding impede their effective integration into urban recreation.

This research investigated how unique spatial features of Kenyan FIBs, which comprise of their layouts, dimensions, materials, and lighting, affect suitability for recreational uses. It sought to identify design challenges and opportunities, considering user needs, accessibility, and safety. It aspired to propose strategies to repurpose FIBs while preserving their architectural identity. This

approach strives to revitalize underutilized industrial heritage, enhance urban green spaces, foster community engagement, and contribute to sustainable urban transformation in Kenya.

1.3 Review of related literature

1.3.1. Adaptive reuse

Adaptive reuse is a type of historic preservation or conservation where an existing historic building or structure is repurposed for a new use while maintaining its historical character and integrity (Vardopoulos, 2023). It should be encouraged as a sustainable practice that embodies the principles of the circular economy (Vardopoulos & Theodoropoulou, 2020; Vardopoulos *et al.*, 2020).

1.3.2. Adaptability

Adaptability refers to the capability of a building to adapt, upgrade, and rearrange its elements to accommodate technological advancements, changes in usage, or external influences (Boyd & Jankovic, 1993). The concept of building adaptation involves making modifications that go beyond basic maintenance to change the building's capacity, function, or performance (Douglas, 2006). Efforts have been made to categorize building adaptation based on the level and type of intervention, ranging from minor changes like decoration to significant modifications such as building reconfiguration (Wilkinson & Reed, 2011). Adaptability falls into three categories. First is generality, which supports multifunctional use. Then follows flexibility, which accommodates various spatial configurations. Finally, there is elasticity, which enables further division or extension of the building (Larssen & Bjørberg, 2004). These types are consistently recognized in the literature under various terms such as convertible, multifunctional use and flexibility. From a real estate perspective, the following three additional types are introduced, within user, within use, and across use. While differences in terminology persist across the literature, these categorizations generally align with fundamental dimensions of use, physical layout, and size (Njuguna & Maringa, 2025).

1.3.3. Spatial characteristics of former industrial buildings

Spatial characteristics refer to the measurable attributes of a space, including its physical form, arrangement, and relationships with its surroundings. These characteristics encompass factors like size, accessibility, visual connectivity, adjacent neighborhood features, and the built environment (table 1). All these influence how people interact with a space (Mbiti, 2022). They also include the spatial form, structure, and connectivity of areas, which can be quantitatively analyzed using space syntax (Hillier, 1996; Zhang *et al.*, 2022).

Former industrial buildings are structures initially designed to support industrial activities such as production, storage, and auxiliary services. They are characterized by their rational, flexible spaces and structural robustness. They embody modernist principles influenced by industrialization. As such they reflect spacious interiors to accommodate large machinery,

modular layouts, and robust materials like iron and steel (Caldas *et al.*, 2012). Despite these common features, these buildings vary in spatial patterns, ranging from simple rectangular layouts to more complex designs, including pavilion, block, and hybrid configurations (Antic *et al.*, 2023). Repurposing these structures emphasizes adapting them for new uses, such as recreational spaces, while maintaining their historical character and meeting contemporary design needs (Fisher, 2005; Antic *et al.*, 2023).

Table 1: Summarizing the measurable attributes of the spatial characteristics (aspects) of Former Industrial Buildings (FIBs).

ASPECTS (SPATIAL CHARACTERISTICS)	MEASURABLE ATTRIBUTES
1. Spatial Organization and Elements of FIBs	<ul style="list-style-type: none"> • Large, open floor plans with minimal internal partitions. • Robust structural frameworks (steel, concrete, timber). • Logistical elements (loading docks, wide corridors, internal railways). • Architectural features enhancing natural light and ventilation. • Opportunities for adaptive reuse and creative transformation.
2. Structural Aspects of FIBs	<ul style="list-style-type: none"> • Robust materials (steel, reinforced concrete, heavy timber). • Grid-like framework of columns and beams. • Flexibility in layout and spatial use. • Reinforcing structures for contemporary safety standards. • Preserving exposed structural elements for aesthetic appeal.
3. Building Services of FIBs	<ul style="list-style-type: none"> • Electrical systems (high-capacity transformers, extensive wiring). • HVAC systems (large ductwork, powerful air handling units). • Plumbing infrastructure (water supply, wastewater disposal). • Fire protection systems (sprinklers, alarms, detection devices). • Upgrading for energy efficiency and sustainability.
4. Building Envelope of FIBs	<ul style="list-style-type: none"> • Durable materials (brick, concrete, metal cladding). • Large windows and skylights for natural light. • Roof designs (flat or low-pitched). • Potential for solar panels and green roofs. • Insulation and waterproofing for energy efficiency.
5. Spatial Context of FIBs	<ul style="list-style-type: none"> • Strategic urban or semi-urban locations. • Proximity to transportation networks (railways, highways, ports). • Mixed-use developments and residential areas. • Historical and cultural significance. • Opportunities for urban regeneration and sustainability.

Source: Author¹, 2025, adapted from Njuguna & Maringa, 2025.

1.3.4. Recreation and functional needs of recreational spaces

Recreation is inherently a matter of choice, from deciding whether to participate to selecting the location and duration of the activity. Therefore, the effectiveness of a recreation plan relies on carefully considering and meeting the specific needs and desires of the targeted population (Wanjiru, 1982). These are outlined in table 2 here below. Recreation spaces include museums, art galleries/exhibitions, sports complexes, entertainment venues and even thriving community centers.

Table 2: Summarizing the measurable attributes of the spatial requirements (aspects) of recreational spaces

ASPECTS (SPATIAL REQUIREMENTS)	MEASURABLE ATTRIBUTES
1. Functional Needs of Recreational Spaces	<ul style="list-style-type: none"> • Space for specific activities (e.g., sports, events). • Adequate storage facilities. • Access to utilities (e.g., electricity, water). • Flexibility to accommodate different recreational Activities. • Accessibility of amenities (e.g., restrooms, seating, ramps).
2. Spatial Flexibility & Versatility	<ul style="list-style-type: none"> • Multi-functional use of spaces. • Ability to reconfigure layout for events and activities. • Adaptability to varying group sizes.
3. User Needs & Accessibility	<ul style="list-style-type: none"> • Inclusivity (age, ability, interest). • Physical Accessibility (ramps, paths, restrooms). • Visual/informational accessibility (signage, wayfinding). • Ease of entry & exit.
4. Safety and Compliance	<ul style="list-style-type: none"> • Adherence to building codes/regulations. • Physical safety (maintenance, infrastructure). • Proper lighting, security measures (surveillance, personnel). • Legal compliance.
5. Aesthetics and Ambience	<ul style="list-style-type: none"> • Industrial Aesthetics (Exposed structural elements, raw materials). • Sustainable materials/practices. • Art installations. • Attractive landscaping. • Natural elements (e.g., water features).

Source: Author¹, 2025.

1.3.5. Conceptual framework

The suggested interrelationship of these spatial characteristics, requirements and parameters are captured here below in a form of a flow diagram (figure 3). Information obtained from the field will help confirm the veracity of this framework and in all likelihood, as is common practice, intimate a reduced conceptual framework. This alternate framework will represent the actual interactions of concepts on the ground. It will also omit those seen not to be having firm relationships.

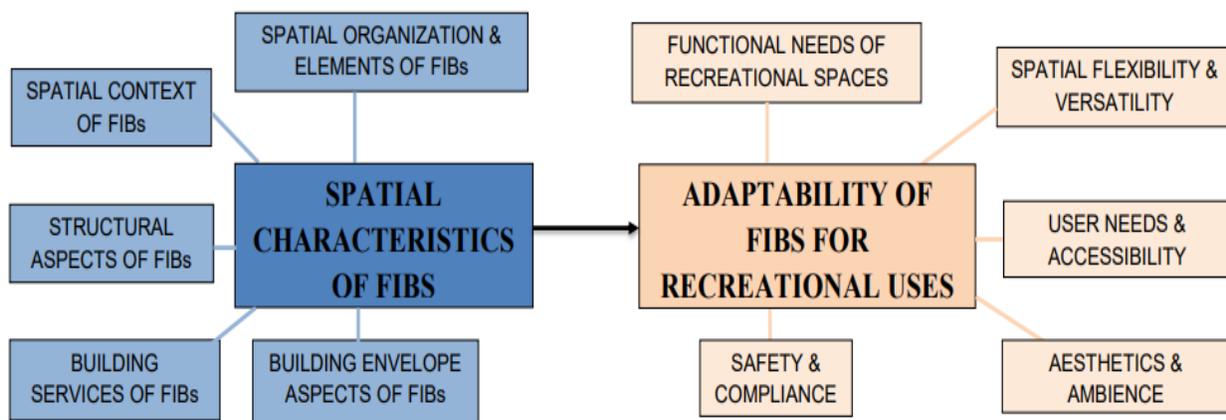


Figure 3: Conceptual framework. Source: Author¹, 2025, adapted from Njuguna & Maringa, 2025.

1.4 Objectives, research questions and hypotheses

1.4.1. Study objectives

General objective

To develop a design guide with which to suitably adapt the former industrial buildings (FIBs), given their spatial characteristics for recreational uses in Kenya.

Specific objectives

- i. To identify the spatial characteristics of FIBs repurposed for recreational uses.
- ii. To establish the spatial requirements of recreational spaces adapted from FIBs.
- iii. To determine the relationship between the spatial characteristics of FIBs and their adaptability into recreational uses.

1.4.2. Primary investigative research questions

- i. What are the key spatial characteristics of FIBs in Kenya, including their layout, dimensions, materials, and lighting conditions?
- ii. What are the essential spatial elements needed for creating functional and inviting

recreational spaces within FIBs?

- iii. What are the specific design interventions that can be employed to effectively utilize the unique spatial characteristics of FIBs for enhancing recreational experiences?

1.4.3. Variables

Independent variable

This is also termed the causal, predictor, or explanatory variable. The set of spatial characteristics of FIBs serve here as the independent variable.

Dependent variable

Adaptability of The dependent variable is the adaptability of FIBs for recreational purposes is the dependent variable.

1.4.4. Hypotheses

Advanced here are the following two substitutionary directional relational hypothesis, that posit possible relationships of the primary variables with a direction where one is caused, influenced or is a function of the other.

Alternative or research hypothesis (H_1)

There is a relationship between the spatial characteristics of former industrial buildings (FIBs) and their adaptability for recreational uses in Kenya.

Null hypothesis or statistical (H_0)

There is no relationship between the spatial characteristics of former industrial buildings (FIBs) and their adaptability for recreational uses in Kenya.

1.4.5. Correspondence of objectives, research questions and hypotheses to the research design

To test these hypotheses and address the research questions, the researcher employed a qualitative research design focused on exploring the impact of spatial characteristics on the adaptability of FIBs for recreational uses. The study used a multi-case study approach, analyzing The GoDown Arts Centre Dunga Road, Nairobi Street Kitchen, and Cyprus Park in Kenya. Data was gathered through structured observations of spatial elements such as layout, circulation, and materials, along with interviews of architects, designers, property managers. Archival research provided historical context on the original uses of these industrial buildings. Such a research design enabled an in-depth understanding of how spatial characteristics influence the transformation of FIBs to be achieved. It also supported judgement and whether these factors significantly affected adaptability of FIBs for recreational purposes.

2. Methodology

The research design employed a qualitative research approach to investigate the influence of spatial characteristics on the adaptability of former industrial buildings (FIBs) for recreational

uses in Kenya. The design centered on in-depth case studies to explore the physical, functional, and contextual factors impacting these transformations.

2.1 Selection of case studies

The case studies for this research were selected to explore contemporary examples of Former Industrial Buildings (FIBs) repurposed into recreational spaces across Kenya, with a focus on Nairobi and Nakuru. The selection was guided by criteria from Antic et al. (2023), considering time, location, purpose, and spatial differentiation.

The first case study, Cyprus Park in Nakuru, is located within the city's industrial area and demonstrates the conversion of an abandoned maize silo complex into a recreational park. The project displays the phased transformation of 30 silo domes and the challenges of repurposing large-scale industrial facilities in relatively smaller urban contexts. It also emphasizes the gradual redevelopment process. The second case study, GoDown Arts Centre is in the industrial area of Nairobi. It illustrates first the successful transformation of a World War II-era warehouse into CMC Motors for the production and sale of Ford vehicles. Later on, this same facility was converted into a contemporary arts center. This project underscores the socio-cultural benefits of adaptive reuse in densely urbanized environments. Showcased here is the manner in which industrial structures can be reimagined to serve community-oriented purposes. The third case study, the Nairobi Street Kitchen (NSK) in Westlands, Nairobi, portrays adaptive reuse beyond traditional industrial zones. This project involved converting an abandoned warehouse (Commercial Interior Design, 2016) and bus/train garage into a vibrant, multi-functional venue. It highlights innovative reuse strategies in commercial areas, offering insights into how adaptive reuse can thrive in mixed-use urban settings. Due to the scope and scale of such garages, their categorization as industrial structures influences their classification as a Former Industrial Building (FIBS) for this research.

These case studies offer diverse perspectives on adaptive reuse in Kenya, reflecting different spatial strategies and challenges encountered in transforming industrial buildings into recreational spaces.

2.2 Characteristics of respondents

The research engaged a targeted sample of 21 architects and consultants with professional experience in adaptive reuse. Also interviewed were 5 property managers who oversee operational aspects of repurposed FIBs. The selection criteria prioritized participants with direct involvement with spatial planning, architectural design, or management of repurposed industrial spaces. All participants were active within the Kenyan built environment, with no demographic restrictions applied beyond professional relevance.

2.3 Research instruments

Data collection included observations of repurposed FIBs, guided by pre-coded checklists to assess spatial features. Prime among these features were, floor plans, internal partitions, and structural frameworks. Additional tools like sketches and photographs captured the visual and spatial details, documenting the adaptation processes of the buildings. Interviews guided by structured interview schedules were conducted with property managers, architects, and designers to explore the spatial and functional needs of recreational spaces. These interactions provided insights into how spatial characteristics influenced flexibility, accessibility, and safety. Archival research supplemented primary data collection, analysing historical records and publications to understand the original functions of the buildings, and the nature of their adaptive reuse.

Table3: Research methods, techniques and tools used in this inquiry

Research Objective	Measurable attributes	Research Methods	Data collection field techniques	Data collection field tools
1. To identify the spatial character of FIBs repurposed into recreational spaces.	<ol style="list-style-type: none"> 1. Spatial Organization aspects and attributes of FIBs. 2. Structural aspects and attributes of FIBs. 3. Building Services aspects and attributes of FIBs. 4. Building envelope aspects and attributes of FIBs. 5. Spatial Context aspects and attributes of FIBs. 	Case study, Observation, Sample survey, Archival.	Direct and indirect non-participant observation, individual respondent and focus group interviews, documentary review	Pre-coded observation checklists, sketches, photography, note-taking, Structured interview schedules and open ended questionnaires (opinionnaires).
2. To find out the spatial requirements of recreational spaces adapted from FIBs.	<ol style="list-style-type: none"> 1. Functional Needs of Recreational spaces. 2. Spatial flexibility & versatility. 3. User needs and accessibility. 4. Safety and compliance. 5. Aesthetics and ambience 	Case study, Observation, Sample survey, Archival.	Direct and indirect non-participant observation, individual respondent and focus group interviews, documentary review	Pre-coded observation checklists, sketches, photography, note-taking, Structured interview schedules and open ended questionnaires (opinionnaires).

Research Objective	Measurable attributes	Research Methods	Data collection field techniques	Data collection field tools
3. To determine the relationship between the spatial character of FIBs and the adaptability of FIBs into recreational uses.	Measurable attributes			
	<ol style="list-style-type: none"> 1. Influence of Spatial Organization on FIBs’ Adaptability for recreational uses. 2. Impact of Structural Aspects on FIBs’ Adaptability for recreational uses. 3. Impact of existing building services on FIBs’ Adaptability for recreational uses. 4. Impact of Building Envelope on FIBs’ Adaptability for recreational uses. 5. Contextual Compatibility. 			
		Research methods, and data collection field techniques and tools		
		Relies on the analysis and findings of data obtained for the first two objectives to infer relationships. It therefore does not attract any methodologies unique to itself.		

Source: Author¹, 2025.

The design integrated complementary research methods (table 3) to offer a nuanced understanding of how spatial features affect the adaptability of FIBs for recreational purposes. This helped generate comprehensive insights into the transformation of these spaces.

2.4. Sampling procedures

A combination of purposive and snowball sampling techniques was used. Purposive sampling ensured that only those with direct, relevant expertise were selected, while snowball sampling expanded the expert network through referrals. This approach maximized access to key informants and allowed for a range of spatial transformation scenarios to be studied. Case studies were drawn from the three varied urban contexts discussed earlier in section 2.1 on selection of case studies, in order to capture spatial diversity.

2.5 Sample size, power, and precision

The structured interview schedule used for architects targeted 21 key informants as respondents in total, balancing the need for in-depth qualitative insight with practical feasibility. The sample size was deemed adequate given the specialized nature of the field and the data collection methods employed. A larger sample was avoided to maintain data manageability and analytical depth.

From the 3 selected case study spaces, 5 management staff members were interviewed using the structured interview schedules as property managers. In 2 of the 3 institutions, 2 property managers each completed separate questionnaires.

2.6 Data analysis

Data was analyzed using thematic analysis to identify patterns in qualitative responses. Comparative analysis was applied too so as to contrast spatial characteristics and adaptation

strategies across case studies. Interpretive analysis was also employed to situate the findings within broader architectural theory and the Kenyan urban context. This multi-layered approach revealed how spatial features influenced the adaptability of former industrial buildings for recreational use.

3. Results

3.1. Results from the data collected via observation & unstructured interviews with property managers

Cyprus Park, the first of the three cases studied, began in 2021 with the renovation of four of the thirty domes. They were subsequently launched as functional spaces in 2022, marking the commencement of business operations (figures 4 & 5).



Figure 4: A collage of photographs showing the site plan & perspective view of Cyprus Park. Source: Author¹, 2025.

As of July 2024, ten domes were in use and the rest in planning/design phases. They were developed on phased approach to adaptive reuse due to the scale & complexity in some brownfields. Each dome has a 20-meter diameter. They are spaced 10 meters apart, resulting in a center-to-center distance of 30 meters. Each dome features either two or three small square openings measuring about 450x450mm. One of these openings is positioned at the top of each dome. This top opening is accessible through a steel staircase leading to it. Given that the original structure lacks openings that are ergonomically sufficient for human access, the first step in the adaptive reuse process involves identifying an access point and creating openings in the structure mechanically to facilitate this access (figures 4 & 5).



Figure 5: A collage of photographs showing entrances created. Source: Author¹, 2025.

The entrance is fitted with steel doors and a sturdy tent. This provided an opportunity to create an inviting entrance, an intervention that is common when adapting former industrial buildings as a response to their utilitarian nature. In some domes, water leaks through the entrances, signaling a challenge in achieving waterproof joinery between the existing and new parts. One of the challenges observed is the arguably limited integration of the high head rooms. In Cyprus Park, for example, the domes feature sloping floors that reach approximately 15–20 meters at the center. The interventions brought to bear here in response, involve soil compaction to near ground level and the provision of ramps and staircases (figures 4 & 5).



Figure 6: A collage of photographs showing the interiors & a floor plan of the domes.

Source: Author¹, 2025.

However, beyond circulation, the vertical space remains underutilized (figure 6). Exploring alternative uses of the high ceilings, such as mezzanine levels, aerial activities, or suspended

installations, could enhance spatial efficiency and functionality. Further, the heavy rains of 2024 further exposed flooding issues in some domes due to below-grade floors. With this, the need for robust site planning comes to the fore.

The interior walls have been whitewashed to enhance light reflection, creating a bright and open atmosphere. However, in domes with partitions such as those housing washrooms and saunas, artificial lighting is required throughout the day. Given that industrial structures typically feature large, open spaces, the integration of partitions to accommodate specific recreational needs underscores the importance of strategic lighting design.

Next is the second case study, the GoDown Arts Centre. It was a creative hub developed through the phased adaptive reuse of a former warehouse on Dunga Road. It featured a central performance space, a minimalist “white box” gallery, and surrounding artist studios and offices, all designed to support collaboration and accessibility. Over four key phases of development, the Centre introduced workspaces, an auditorium, visitor amenities, and expanded facilities for visual artists. Despite its cultural significance, the GoDown was eventually demolished. Its legacy continues with a new project on the same site, the African Contemporary Arts & Cultural Centre (figure 7).



Figure 7: A collage of photographs showing the Go-Down Arts Centre. Source: The GoDown Arts Centre Kilimani. 2024.

Finally comes the third case study, the Nairobi’s Street Kitchen (NKS). This displays a heavy reliance on artificial lighting which is in use throughout the day on ground level. Additionally, the prevalence of hard surfaces such as exposed concrete and metal can lead to sound reverberation, necessitating integrated acoustic and lighting fixtures to improve spatial comfort (figure 8).

The building envelope in all the 3 case studies features paintings that celebrate local artistry, contributing to visual appeal for recreation (figure 8). Balancing the preservation of the industrial aesthetic while meeting contemporary needs is particularly clear in the Nairobi's Street Kitchen.



Figure 8: A collage of photographs showing the interiors at NSK. Source: Author¹, 2025.

NSK integrates new universal steel columns with matte black paint to support the first floor. It does so while preserving the original concrete columns and exposed beams, and in this way maintains its industrial aesthetic. The adaptive reuse approach extends to exposed plumbing and ventilation systems, use of coloured expanded metal mesh and repurposed shipping containers for unique dining spaces (figure 9).



Figure 9: A collage of photographs showing the Go-Down Arts Centre, Nairobi Street Kitchen and Cyprus Park from left to right. Source: Author¹, 2025.

3.2 Perceptions of property managers on the spatial requirements of spaces in Former Industrial Buildings (FIBs adapted for recreation)

3.2.1 Rating of preference for the functional needs of recreational spaces

Trends in the data obtained here underscored a strong consensus among respondents on the critical importance of designing for specific needs of recreational spaces (table 5, figure 10). Such designs would offer specific activity support, adequate storage facilities, essential utilities

access, flexibility for diverse activities, and accessible amenities. This highlights a clear priority for versatile, well-equipped, and user-friendly environments.

Table 4: Value of space for specific activities in recreational facilities.

<i>Query 1: Space for specific activities (e.g., sports, events) in recreational facilities are important.</i>				
Sentiment level/rank	Numerical value/score	Frequency of responses	Total number of responses x numerical value/score ascribed to rank	Percentage
Least important	1	0	0	0%
Slightly important	2	0	0	0%
Moderately important	3	1	3	20%
Very important	4	1	4	20%
Most important	5	3	15	60%
Add total number or frequency of responses and divided by the total number of respondents $22/5 = 4.4$, rounded off to 4 on the Likert scale, corresponding to the ranking of very important.				

Source: Author¹, 2025, field data.

To this extent, most of the respondents (80%) here considered the provision of space for specific activities in recreational facilities of high importance (table 4). Of these 60% ascribed it a status of being most important (rank score 5) while 20% felt it was very important (rank score 4). However, the derived mode value settled at a rank score of 4, confirming that property managers considered it very important. This suggests the need to incorporate dedicated spaces or zones within repurposed industrial buildings that are specifically designed and equipped for a variety of recreational activities, such as sports, events, and gatherings.

Similar computations were carried out for the other four attributes that measure preference for the functional needs of recreational spaces (table 5, figure 10). These were, adequate storage facilities, access to utilities, flexibility to accommodate different recreational activities, and accessibility of amenities, in recreational spaces.

Table 5: Consolidated preferences for the functional needs of recreational spaces

Spatial flexibility of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Value of space for specific activities in recreational	0%	0%	20%	20%	60%	4

Spatial flexibility of recreational facilities.	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Value of space for specific activities in recreational facilities.	0%	0%	20%	40%	40%	4
2. Value of adequate storage facilities in recreational spaces.	0%	0%	20%	40%	40%	4
3. Value of access to utilities in recreational spaces.	0%	0%	0%	40%	60%	5
4. Value of flexibility to accommodate different recreational activities in recreational spaces.	0%	0%	0%	40%	60%	5
Total						22
Total rank score divided by the total number of entries $22/5 = 4.4$, rounded off to 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

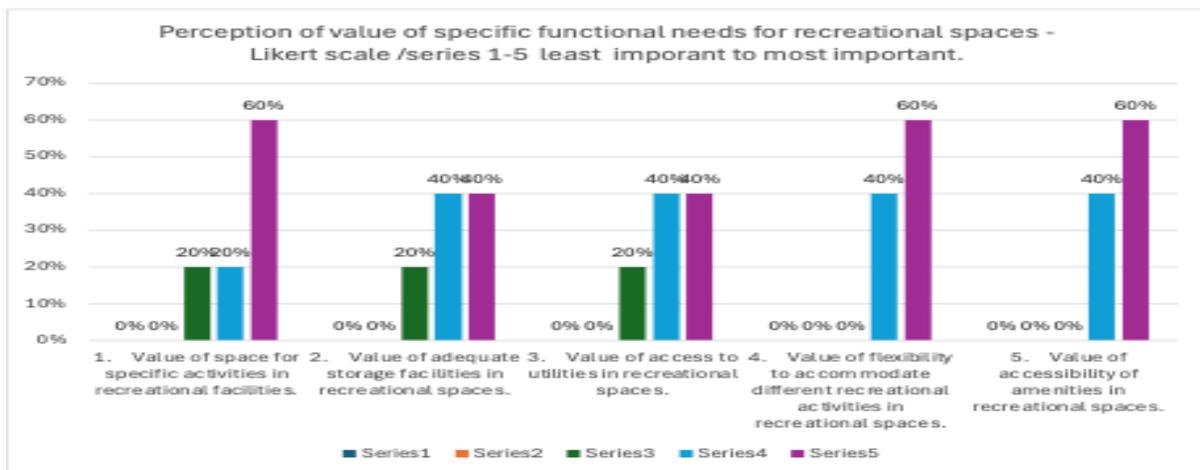


Figure 10: Value of the functional needs of recreational spaces. Source Author¹, 2025, Field data.

The following profile emerged for the value of adequate storage facilities and access to utilities in recreational spaces was concerned A total of 80% of the respondents here felt that provision of adequate storage facilities and access to utilities in recreational spaces was of high priority. Half of these (40%) regarded both to be very important (rank score 4) and the other half (40%) most

important (rank score 5). For this attribute of storage facilities, the derived mode arrived at was a rank score of 4, indicating that respondents favoured proper storage solutions and access to utilities as being very important (table 5, figure 10). This showing supports the prioritisation of incorporating dedicated, well-organized, and easily accessible storage areas into the design of recreational spaces within repurposed industrial buildings. Such would accommodate equipment, supplies, and user belongings. Further, it suggests a need to incorporate readily accessible and reliable utility systems, including electricity, water, and waste disposal, into the design of recreational spaces within repurposed industrial buildings (table 5, figure 10).

For value of flexibility to accommodate different recreational activities and accessibility of amenities in recreational spaces, the following trends were observed. Similar proportions of 40% and 60% of the respondents were of the opinion that both aspects of flexibility and access were very important and most important, respectively. The resulting endorsement for both of these two aspects then added up to 100%. These aspects of flexibility to accommodate different recreational activities and accessibility of amenities in recreational spaces both scored a derived mode rank score of 5 (table 5, figure 10). This showed that respondents considered flexibility and access as being most important in repurposing former industrial buildings for diverse recreational uses. Incorporating adaptable layouts, multi-purpose spaces, and modular elements such as movable walls, multi-functional furniture, and integrated technology needed to be accorded priority. These initiatives would create necessary flexible spaces for a variety of recreational activities within repurposed industrial buildings.

Further, when adapting former industrial buildings for recreational purposes, it was necessary prioritize accessible design features, including well-lit and easily accessible restrooms. These would include strategically placed comfortable seating areas and clearly marked pathways.

3.2.2 Rating of preferences for spatial flexibility of recreational spaces

The emerging patterns from the data highlight a strong preference for flexible and adaptable recreational spaces. Key design priorities include movable furniture, modular layouts, and adjustable partitions to support diverse activities and group sizes (table 7, figure 11). The observed trends emphasize the need for multi-functional spaces that can efficiently cater to varying user scales and needs.

Considering the ability to reconfigure layouts, a considerable 40% and 60% of the respondents valued the flexibility of spaces for different uses in recreational spaces (table 6). They ranked it as very important (rank score 4) and most important (rank score 5) respectively. The derived mode value here was the rank score 5, insinuating a strong need for spaces that prioritize adaptable layouts. These would incorporate features such as movable furniture, easily rearranged equipment, and modular design elements. Such would facilitate flexible configurations and cater to diverse user needs.

Table 6: Ability to reconfigure layout (rearrange furniture or equipment) in recreational spaces.

<i>Query 6: Value of the ability to reconfigure layout (rearrange furniture or equipment)</i>				
Sentiment level/rank	Numerical value/score	Frequency of responses	Total number of responses x numerical value/score ascribed to rank	Percentage
Inflexible	1	0	0	0%
Slightly flexible	2	0	0	0%
Moderately flexible	3	0	0	0%
Flexible	4	2	8	40%
Very flexible	5	3	15	60%
Add total number or frequency of responses and divided by the total number of respondents $23/5 = 4.6$, rounded off to 5 on the Likert scale, corresponding to the ranking of very important.				

Source: Author¹, 2025, field data.

Field data was synthesised similarly for the other two attributes that measure preferences for spatial flexibility of recreational spaces (table 7, figure 11). These were, multi-functional use of spaces, and adaptability to varying group sizes.

Table 7: Consolidated preferences for spatial flexibility of recreational spaces

Spatial flexibility of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Value of ability to reconfigure layout in recreational spaces.	0%	0%	0%	40%	60%	5
2. Value of flexibility of the multi-functional use in recreational spaces.	0%	0%	20%	40%	40%	4
3. Value of adaptability to varying group sizes of spaces in recreational spaces.	0%	0%	20%	40%	40%	5
Total						13
Total rank score divided by the total number of entries $13/3 = 4.4$, rounded off to 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

The following patterns came to the fore for multi-functional use of spaces, and adaptability to varying group sizes (table 7, figure 11). An equal proportion of 40% of the respondents favoured

flexible (ranks score 4) and very flexible (rank score 5) multi-functional use of spaces and adaptability to varying group sizes, in recreational facilities respectively. The derived mode was a rank score of 4, and this showed preference for flexible multi-functional spaces and ones that were adaptable to varying group sizes. It is therefore of value to incorporate flexible design elements such as movable partitions, multi-purpose furniture, and integrated technology. These help create spaces that were adaptable to a wide range of activities. Use of flexible design elements, such as movable furniture or adjustable room dividers, to optimize the space for diverse group activities was also advisable.

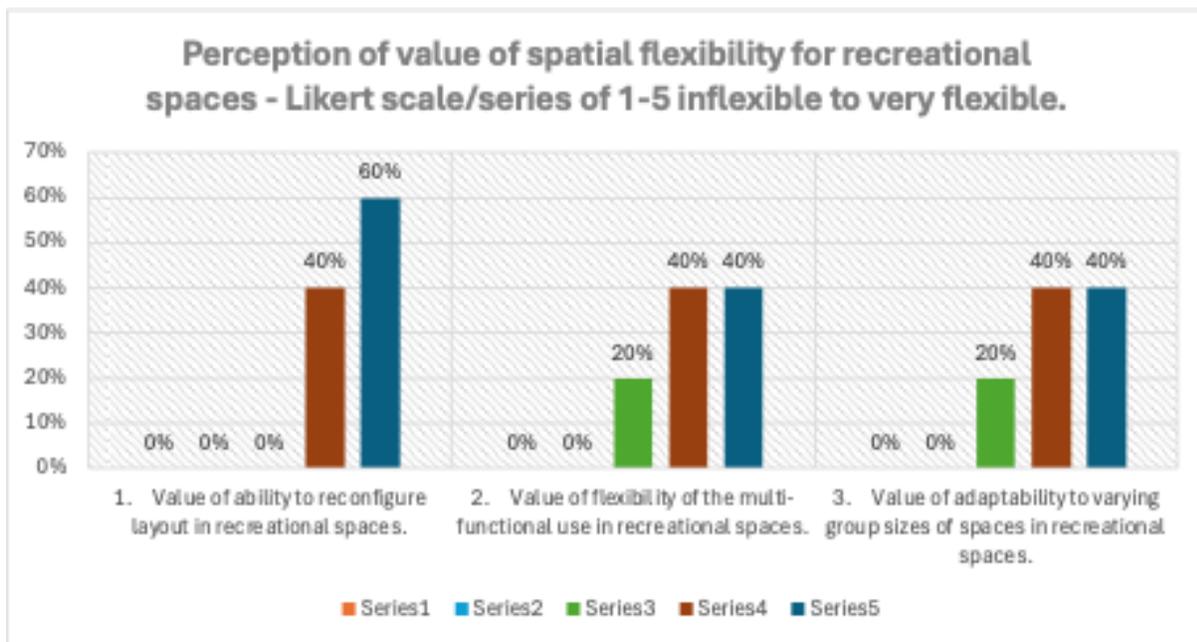


Figure 11: Perception of value of spatial flexibility for recreational spaces. Source: Author¹2025, field data.

3.2.3 Rating of preferences for accessibility aspects (feature)s of recreational spaces

The profiles that emerge from the data emphasise the need for accessibility, ease of navigation, and inclusivity in repurposed industrial buildings (table 8, figure 12). Key priorities include clear pathways, well-marked entrances, intuitive wayfinding systems, and accessible amenities like restrooms, seating, and ramps. These features ensure a welcoming and user-friendly environment for all visitors.

Here too data was processed similarly as in the two preceding aspects of functional needs and flexibility and their respective sets of attributes of recreational spaces. The four attributes considered here were, accessibility compliance, signage and wayfinding, accessible amenities

and ease of entry and exit (table 8). The following trends were noted for the four attributes of accessibility of recreational spaces.

Table 8: Consolidated preferences for accessibility aspects of recreational spaces

Accessibility features of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Value of KNBC/PDA*accessibility compliance	0%	0%	20%	20%	60%	5
2. Value of clear signage and wayfinding	0%	0%	20%	40%	40%	4
3. Value of accessible amenities such as restrooms, seating, parking and ramps	0%	0%	0%	40%	60%	5
4. Value ease of entry and exit	0%	0%	0%	60%	40%	4
Total						18
Total rank score divided by the total number of entries $18/4 = 4.5$, rounded off to 5 on the Likert scale, corresponding to the maximum status.						

Source: Authour¹, 2025, field data. *Kenya National Building Code 2024 (KNBC)/Persons with Disabilities Act 2025 (PDA).

For these Kenya National Building Code 2024 (KNBC)/Persons with Disabilities Act 2025 (PDA) accessibility compliance standards, 60% of the respondents favoured the very most accessible status (ranks score 5) while 20% were happy with a very accessible level (rank score 4) of compliance. The derived mode ranks score came to 5, consistent with the most accessible status (table 8, figure 12).

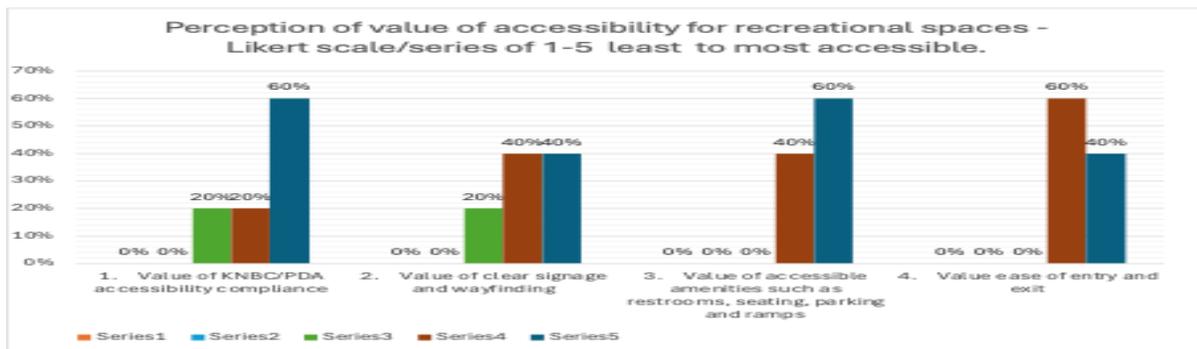


Figure 12: Perception of accessibility for recreational spaces. Source: Author¹, 2025, field data.

Respondents therefore favoured adherence to the most accessible standards among the accessibility features in creating inclusive spaces within repurposed industrial buildings. It is therefore importance to prioritise features such as clear pathways, well-marked entrances, and minimal barriers to movement, to ensure a welcoming environment for all users.

Similarly, 40% of the respondents preferred most accessible (rank score 5) facilities while another 40% favoured very accessible premises (rank score 4) within repurposed industrial buildings for the use of clear signage and wayfinding. The resulting mode rank score settled at 4 (table 8, figure 12). This counselled for a need to incorporate clear signage, directional arrows, and maps to guide users throughout the spaces. Such action would ensure intuitive way finding systems that facilitate confident movement and exploration.

On the availability of accessible amenities such as restrooms, seating, parking and ramps, 40% of respondents were interested in very accessible facilities (rank score 4), while another 60% preferred the most accessible status (rank score 5). The derived mode rank score value of 5 was arrived at, indicating that respondents desired the benchmark of maximized accessibility in creating inclusive and welcoming spaces within repurposed industrial buildings (table 8, figure 12). According such a priority for these amenities would ensure all users can comfortably access and enjoy the facilities.

For ease of entry and exit, 60% of the respondents were satisfied with the very accessible status. Another. 40% were happy with the very accessible status. A derived rank score value of 4 ensued, and this rendered support the provision of clear pathways, well-marked doors, and minimal barriers to ensure safe and convenient access for all users.

3.2.4 Rating of the preferences for the effectiveness of safety measures for recreational spaces

The data trends obtained here underscored a strong emphasis on safety and security in repurposed industrial buildings (table 9, figure 13). Key in priorities considered included fire detection and suppression systems, clearly marked emergency exits, evacuation plans, and adherence to building codes and regulations. These measures ensure a secure and compliant environment for all users.

Table 9: Consolidated preferences for effectiveness of safety measures in recreational spaces

Safety measures of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Fire safety systems	0%	0%	00%	40%	60%	4
2. Emergency exits and evacuation plans	0%	0%	20%	40%	40%	4
3. Compliance with building	0%	0%	0%	60%	40%	5

Safety measures of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
codes and regulations						
Total						13
Total rank score divided by the total number of entries $13/4 = 4.3$, rounded off to 4 on the Likert scale, corresponding to the maximum status.						

Source: Authour¹, 2025, field data.

Once more the data here was given a treatment similar to the one applied to the preceding three aspects of functional needs, being, flexibility and accessibility of recreational spaces and their respective sets of attributes. Key priorities include fire detection and suppression systems, clearly marked emergency exits, evacuation plans, and adherence to building codes and regulations. These measures ensure a secure and compliant environment for all users.

The benchmark of very effective fire safety was endorsed by 40% of the respondents, while 60% preferred highly effective safety measures (table 9, figure 13). A derived rank score value of 4 resulted here. It was an indication that respondents considered fire safety measures to be critical for ensuring a safe and secure environment within repurposed industrial buildings. This preference suggests prioritizing well-maintained and up-to-date fire detection and suppression systems, clearly marked exits, and emergency procedures to create a secure environment for users.

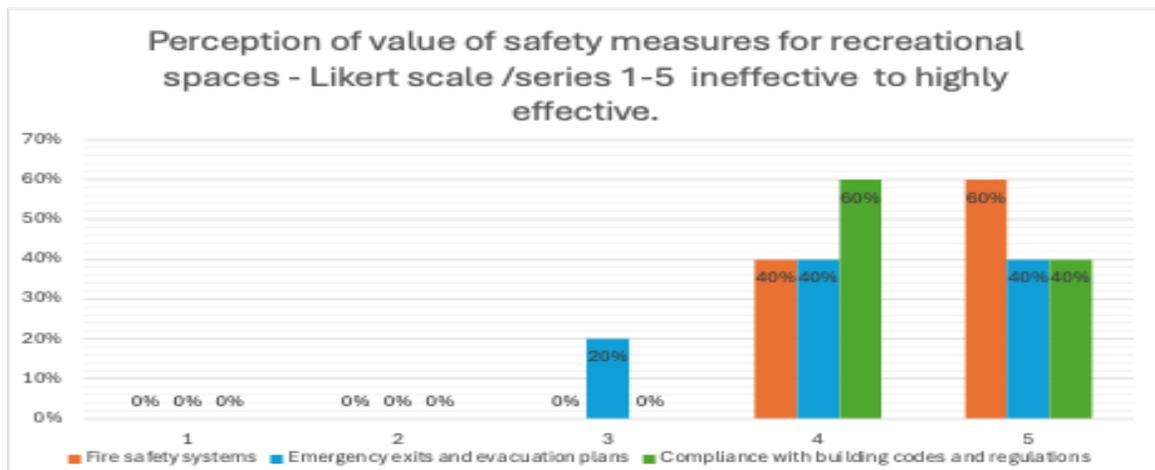


Figure 13: Perception of measures of safety for recreational spaces. Source: Author¹, 2025, field data.

More moderate perceptions were noted for the attribute of the importance of having a clear and accessible plan for evacuating the building in case of an emergency in recreational spaces. In this case 40% of the respondents considered the attribute to be very important while another 40% rated it as being highly important (table 9, figure 13). A derived rank score value of 4 emerged. It underscored the need to include well-marked exits and regular practice drills.

It was apparent here that respondents considered emergency preparedness measures to be very effective in ensuring a safe and secure environment within repurposed industrial buildings. The disposition suggests prioritizing clearly marked and easily accessible emergency exits, well-communicated evacuation plans, and regular safety drills to ensure user safety in case of an emergency.

The attribute of compliance with building codes and safety standards, in recreational spaces, was rated as being highly effective, with a derived rank score value of 5 (table 9, figure 13). Correspondingly, 60% considered it very important and a smaller proportion of 40% highly important. Such a response level confirmed that ensuring the safety and legality of repurposed industrial buildings was of top priority. It was an absolute necessity then to ascertain maximised adherence to all applicable regulations, including regular inspections and maintenance, to create a secure and compliant environment for users.

3.2.5 Rating of the preferences for the aesthetics & ambience of recreational spaces

Trends in the data here signified the need for a strong emphasis on aesthetics and atmosphere in repurposed industrial buildings. Key priorities include well-designed lighting, cohesive interior aesthetics, and visually appealing exteriors with landscaping and architectural details. Additionally, creating inviting spaces with comfortable seating, natural light, and a sense of community was viewed as enhancing user experience while fostering engagement.

Table 10: Consolidated preferences for aesthetics and ambience in recreational spaces

Safety measures of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Interior design elements such as lighting and décor.	0%	0%	20%	40%	40%	4
2. Exterior aesthetics	0%	0%	0%	40%	60%	5
3. Atmosphere conducive to recreational activities	0%	0%	0%	40%	60%	4
Total						13
Total rank score divided by the total number of entries $13/4 = 4.3$, rounded off to 4 on the Likert scale, corresponding to the maximum status.						

Source: Authour¹, 2025, field data.

The attribute of interior design attribute of aesthetics and ambience in recreational spaces was considered of very good use by 40% of the respondents and of excellent use by another 40% of the residents. As a result, it's derived rank score value was calculated to be 4 (table 10, figure 14). This reflected a focus and use value on interior design that was considered very good (table 10, figure 14). This suggests prioritizing well-designed lighting, attractive décor, and a cohesive aesthetic to enhance the user experience and create a welcoming atmosphere.

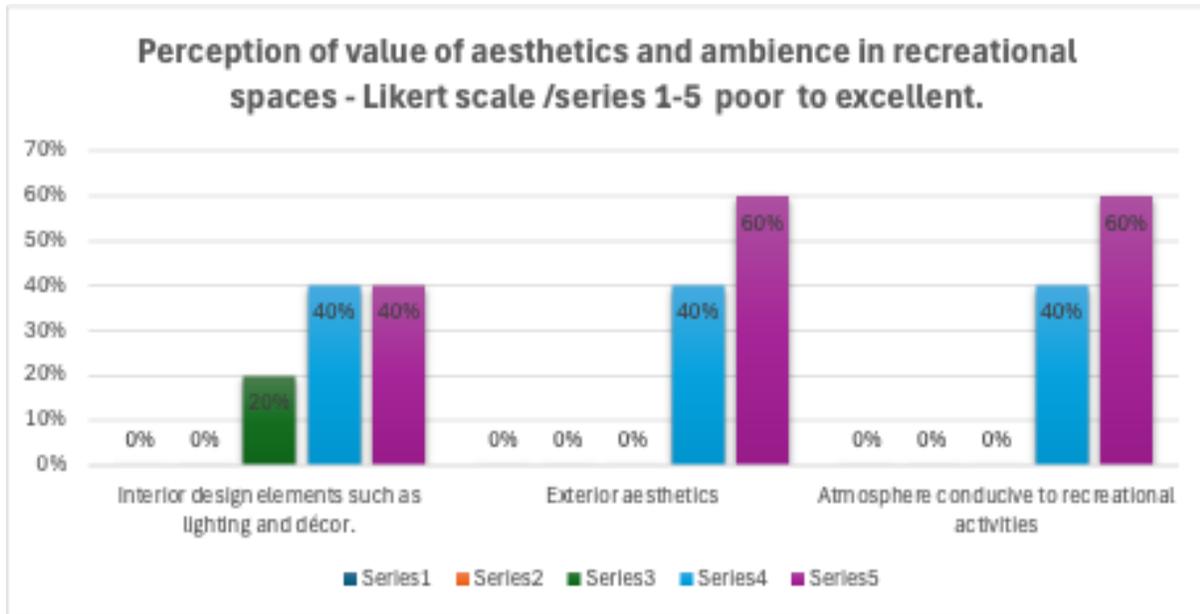
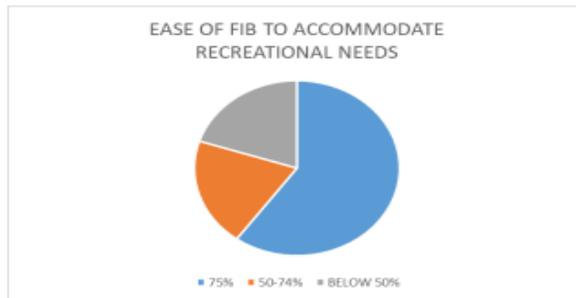


Figure 14: Perception of preferences for aesthetics and ambience in recreational spaces. Source: Author¹, 2025, field data.

In its turn, the attribute of exterior aesthetics in recreational spaces was considered of very good value 40% of the respondents and of excellent import by 60% of the respondents. Its corresponding derived rank score value was established to be 5 (table 10, figure 14). This posture favours prioritisation of attractive landscaping, well-maintained facades, and engaging architectural details to enhance the overall appeal of the space and create a positive first impression.

On its part, the attribute of atmosphere conducive to recreational activities in recreational spaces was considered of a very good value by 60% of the respondents and of excellent worth by 40% of the respondents. Accordingly, it was accorded a derived rank score value of 4 (table 10, figure 14). This pointed to the need to accord priority to design elements that promote a relaxed, enjoyable, and welcoming environment. Such would include comfortable seating areas, natural light, and a sense of community, to encourage relaxation, engagement, and a sense of belonging.

On overall gauging ease of adaptive reuse produced profiles consistent with those encountered so far. The ease with which the former industrial building accommodated changes to meet spatial needs was rated at 75% by the majority of the residents. The balance few of the residents rated FIBs at 50%-74% and below 50%.



Figures 15: Rating of ease of FIBs to accommodate changes to meet recreational needs. in recreational space. Source: Author¹, 2025, field data.

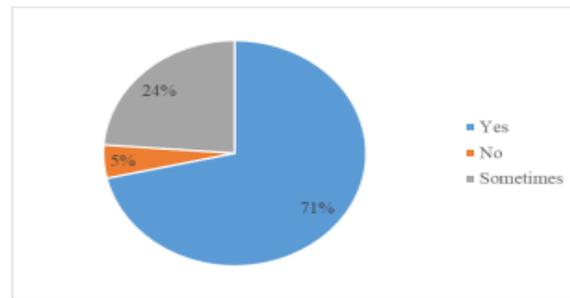


Figure 16: Rating of whether spatial characteristics of FIBs are a critical aspect for their adaptability to recreational uses. Source: Author¹, 2025, field data.

3.3. Perceptions of architects on the spatial characteristics of Former Industrial Buildings (FIBs)

At least 71% of architects view the spatial characteristics of Former Industrial Buildings as a critical aspect for their adaptability for recreational uses (figure 16). Data here was processed similarly to the one encountered on the aspects of the spatial requirements of recreational spaces and their respective sets of attributes in section 3.2 above.

3.3.1 Rating of the functional needs of recreational spaces

The ratings received from architects show how vital the functional needs of recreational spaces are (table 11, figure 17). Architects provided insight on how to design recreational spaces in FIBs by balancing historical preservation, flexibility, sustainability, technology, community engagement, and safety.

Table 11: Consolidated rating for the functional needs of recreational spaces

Spatial flexibility of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Integration of specific recreational facilities.	0%	4.8%	14.3%	42.9%	38.1%	4
2. Enhancement of space for various recreational uses.	0%	4.8%	14.3%	33.3%	47.6%	4
3. Adaptability to future needs	0%	9.5%	23.8%	38.1%	28.6%	4

Spatial flexibility of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
Total						12
Total rank score divided by the total number of entries $12/3 = 4$. Accepted as 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

The attribute of integrating specific recreational facilities was rated highly with 39.1% of the respondents tagging it as most important and another 42.9% flagging it as very important. This set the consensus of its positive value at 81%, and with a derived rank score value of 4 that coincides with the status of being very important (table 11, figure 17). By and large, respondents therefore considered the integration of specific recreational facilities as very important. This emphasizes the need to include tailored recreational amenities in repurposed industrial buildings to effectively support user activities.

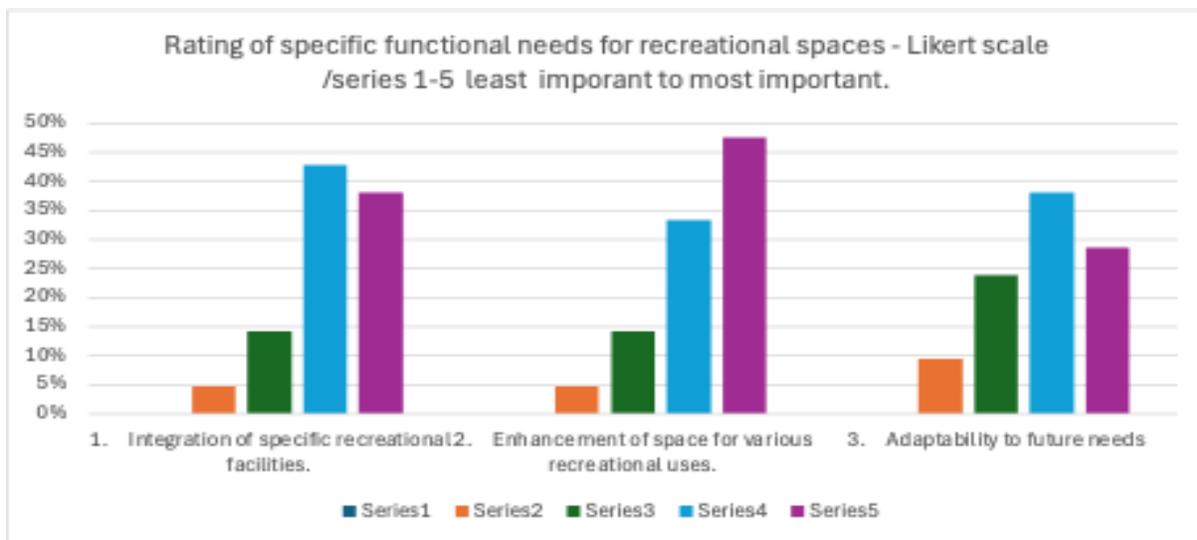


Figure 17: Ratings of the value of specific functional needs for recreational spaces. Source: Author¹, 2025, field data.

Further, the attribute of enhancement of space for various recreational received derived rank score value of 4, indicating that respondents considered it very important. Correspondingly, 47.6% of the respondents felt it was most important while 33.3% were of the opinion that it had very important value (table 11, figure 17). This high regard for the attribute then was supported by a total of 80.9% of the respondents. It confirmed the necessity to design adaptable and accommodating areas within former industrial buildings to support diverse recreational activities.

The attribute of adaptability to future in turn was considered to be most important by 28.6% of the respondents, with another 38.1% regarding it as very important (table 11, figure 17). The overall favourable rating then was embraced 66.7% of the respondents. Still, it's by resulting derived rank score value settled at 4. Accordingly, most respondents considered adaptability to future needs as very important. This underscored the importance of designing recreational spaces within former industrial buildings that can accommodate evolving user demands over time.

3.3.2 Rating of spatial flexibility strategies

The ratings made by architects show how effective the spatial flexibility strategies are. Architects provided insight on maximizing flexibility in FIBs through modular furniture, adaptable layouts, multi-functional zones, and temporary structures to accommodate diverse uses.

Table 12: Consolidated rating for spatial flexibility strategies of recreational spaces

Spatial flexibility strategies of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Use of modular furniture or equipment	0%	9.5%	14.3%	33.3%	42.9%	4
2. Flexible layout configurations	0%	4.8%	9.5%	38.1%	47.6%	4
3. Incorporation of multi-functional zones	0%	0%	19%	42.9%	38.1%	4
Total						12
Total rank score divided by the total number of entries $12/3 = 4$. Accepted as 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

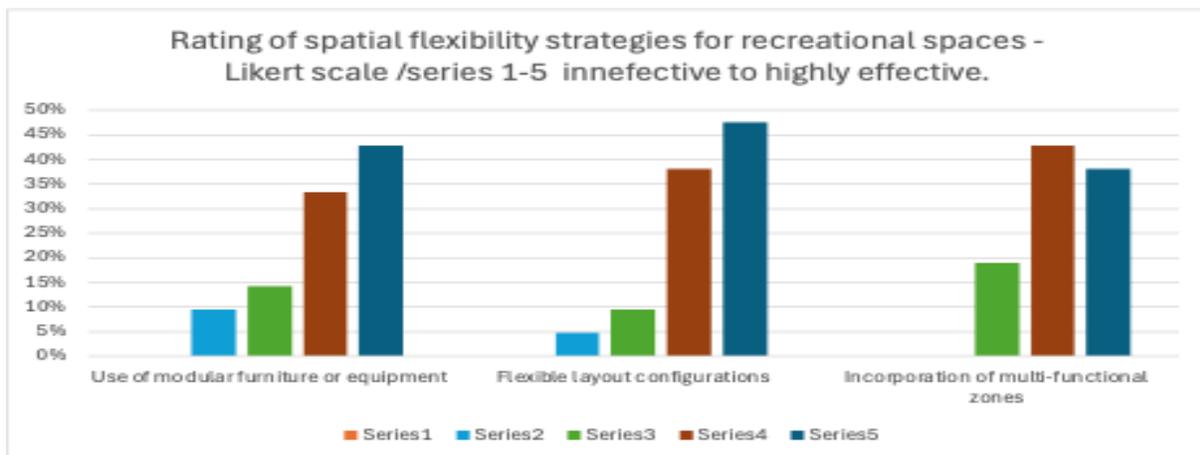


Figure 18: Ratings of the value of spatial flexibility strategies for recreational spaces. Source: Author¹, 2025, field data.

This attribute of use of modular furniture or equipment was regarded as being very effective and highly effective respectively by 33.3% and 42.9% of the respondents. The total of 76.2% of the respondents then gave it a positive rating, and with a derived rank score of 4 (table 12, figure. 18). Respondents considered the use of modular furniture or equipment to be very effective in promoting flexibility. This suggests that incorporating modular elements is a key strategy for enhancing spatial flexibility in recreational spaces within former industrial buildings.

A considerable 38.1% and 47.6% of the respondents rated the attribute of flexible layout configurations as being very effective and highly effective respectively, as a strategy to promote spatial flexibility in recreational facilities (table 12, figure 18). Overall, 85.7% of the respondents favoured this attribute bringing high value to the purpose of flexibility. The resulting derived rank score value was calculated to be 4, confirming that respondents considered flexible layout configurations to be generally very effective. The importance of adaptable spatial arrangements in enhancing the versatility of recreational spaces within former industrial buildings was in this way affirmed.

The attribute of incorporating multi-functional zones in recreational spaces, was acknowledged as being very effective and highly effective by 42.9% and 38.1% of the respondents respectively. In total 81% of the respondents appreciated the attribute important contribution to flexible design. It registered a derived rank score value of 4 (table 12, figure 18), and this corresponded with Respondents generally considered the incorporation of multi-functional zones to be very effective. This underscored the value of designing spaces that can support multiple recreational activities within former industrial buildings.

3.3.3 Rating of accessibility features

The ratings received from architects confirm the value of prioritising accessibility features in design (table 13, figure 19). Architects shared their approaches to prioritizing user needs in FIBs through universal design, inclusive amenities, seamless user experience, and intuitive way finding solutions.

The attribute of universal design principles is commended by 33.3% and 47.6% of the respondents who rated it as having been very prioritised and most prioritised respectively (table 13, figure 19). Accordingly, 80.9% of the respondents favoured its use in promoting accessibility within recreational spaces.

Table 13: Consolidated rating of accessibility features for recreational spaces

Accessibility features of recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Universal design principles	0%	4.3%	14.3%	33.3%	47.6%	4
2. Inclusive amenities and	0%	4.8%	14.3%	42.9%	38.1%	4

Accessibility features of recreational spaces facilities	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
3. Seamless user experience	4.8%	0%	19%	33.3%	42.0%	4
Total						12
Total rank score divided by the total number of entries $12/3 = 4$, accepted as 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

It recorded a derived rank score value of 4 in which on the whole respondents considered universal design principles have been very prioritised and were content with this as a good standard. The importance of inclusive and accessible design in recreational spaces within former industrial buildings is hereby emphasized.

Inclusive amenities and facilities received a derived rating of 4, indicating that respondents considered them being very prioritized as a good standard. As such 42.9% and 38.1% of the respondents regarded this attribute as deserving to very and most prioritised respectively, in promoting accessibility within recreational spaces (table 13, figure 19). Its derived rank score value was established to be 4, corresponding with the very prioritised level of worth. This underscored the importance of providing accessible features to accommodate diverse user needs within former industrial buildings.

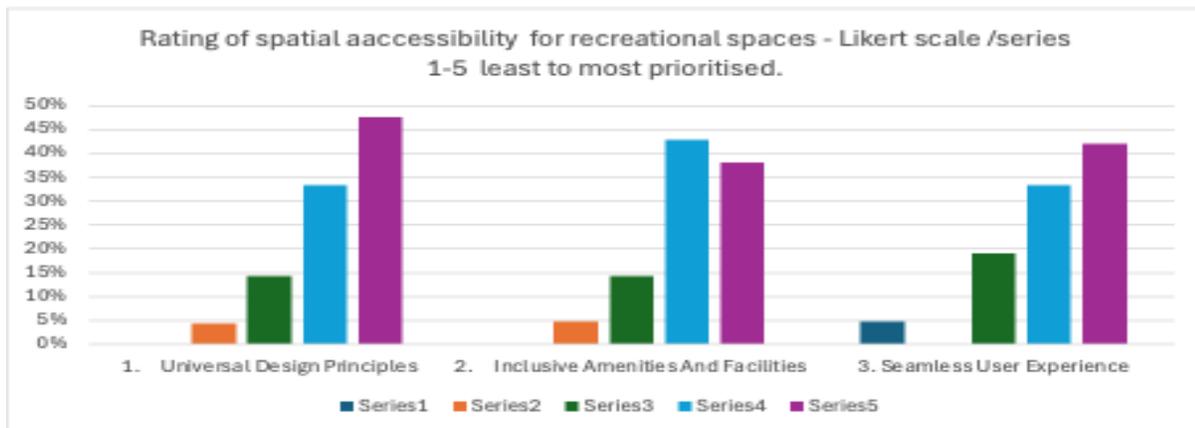


Figure 19: Ratings of the value of accessibility for recreational spaces. Source: Author¹, 2025, field data.

A seamless user experience was viewed with favour and considered an attribute that was very and most prioritised by 33.3% and 42.9% of the respondents, totalling up to 76.2% of the overall number of respondents (table 13, figure 19). It registered a rank score rating of 4, indicating that

on the whole respondents considered it to be very prioritized. This emphasised the need for smooth, intuitive design that facilitates easy navigation and interaction within recreational spaces in former industrial buildings.

3.3.4 Rating of the integration of safety measures

The ratings received from architects here demonstrate how sufficiently integrated the safety measures were into the design and acknowledged this as a good standard. (Table 14, figure 20). Architects emphasized safety in FIBs by ensuring compliant equipment, integrating emergency response plans, adhering to building codes, and conducting regular inspections.

Table 14: Consolidated rating of the integration of safety measures for recreational spaces

Integration of safety measures for recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
1. Safety features in recreational equipment	0%	4.8%	9.5%	33.1%	47.6%	4
2. Implementation of emergency response plans	0%	4.8%	19%	33.3%	42.9%	4
3. Compliance with building codes and regulations	4.8%	0%	19%	33.3%	42.9%	4
Total						12
Total rank score divided by the total number of entries $12/3 = 4$, <i>accepted as 4 on the Likert scale, corresponding to the second to maximum status.</i>						

Source: Authour¹, 2025, field data.

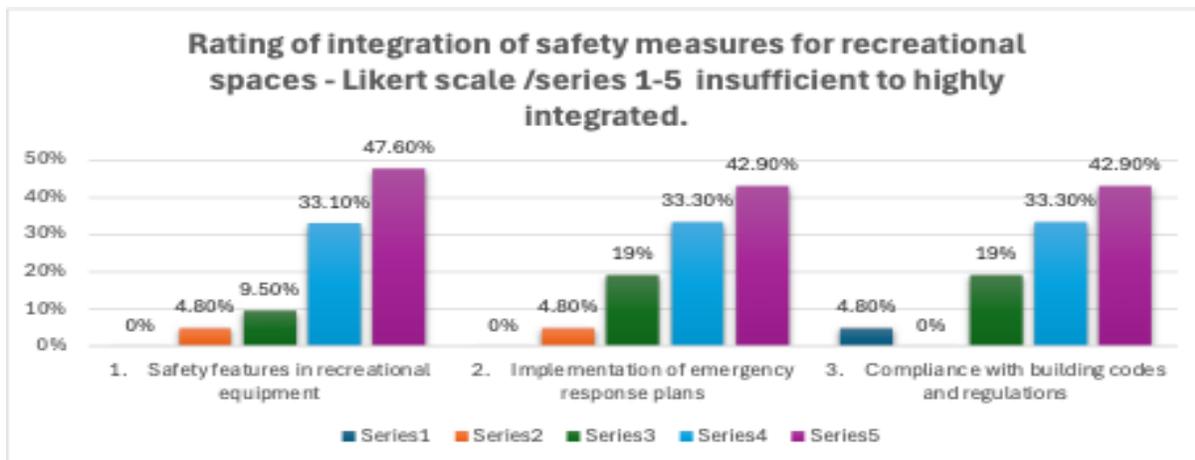


Figure 20: Ratings of the value of integrating safety measures in recreational spaces. Source: Author¹, 2025, field data.

Safety features in recreational equipment, were found to very integrated and highly integrated by 38.1% and 47.6% of the respondents respectively, giving a total high rating by 85.7% of all respondents (table 14, figure 20). This attribute registered a derived rank score value of 4, indicating that generally, respondents considered to warrant safety features of recreations equipment in recreational spaces a very integrated status. This highlights the required necessary priority to ensuring user safety through well-designed and reliable equipment within recreational spaces in former industrial buildings.

The implementation of emergency response plans was accorded a high rating attaining the status of being very integrated and highly integrated by 33.3% and 42.9% as rated by the respondents respectively (table 14, figure 20). A complement of 76.2% of the respondents returned this agreement to accord the attribute a rank score value of 4. Generally, then, respondents considered the implementation of emergency response plans to be very integrated, as a good standard. This underscored the importance of having well-established and practiced emergency protocols to ensure user safety within recreational spaces in former industrial buildings.

The need to integrate compliance with building codes and regulations in the design of recreations spaces was given prime value by the respondents. Here then, 28.6% and 52.4% of them flagged this attribute to be very integrated and highly integrated respectively. Such positive consensus was reached by a total of 81% of the respondents (table 14, figure 20). A derived rank rate value of 4 was recorded here. These trends signify that on the whole, respondents considered compliance with building codes and regulations to be very integrated. The critical role of adhering to legal and safety standards in the design and adaptation of recreational spaces within former industrial buildings roundly signalled here.

3.3.5 Rating of aesthetics & ambience enhancements

The architects' ratings received that the aesthetic and ambience enhancements were essentially successfully deployed as they perceived they ought to be (table 15, figure 21). Architects balanced aesthetics and functionality in FIBs by integrating natural elements, cohesive visual identity, ambience-enhancing features, and interactive technologies to create immersive and adaptable recreational spaces.

Table 15: Consolidated rating of aesthetics and ambience enhancements for recreational spaces

Aesthetics and ambience enhancements for recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
Integration of natural elements and lighting	0%	4.8%	9.5%	28.6%	52.4%	5
Creation of a cohesive visual identity	0%	4.8%	14.3%	42.9%	38.1%	4

Aesthetics and ambience enhancements for recreational spaces	Percentage responses (%) for the respective sentiments levels/ranks					Derived mode value of rank scores
	1	2	3	4	5	
Enhancement of user experience through ambience	0%	4.8%	14.3%	33.3%	47.6%	4
Total						13
Total rank score divided by the total number of entries $13/3 = 4.33$ rounded off as 4 on the Likert scale, corresponding to the second to maximum status.						

Source: Authour¹, 2025, field data.

The integration of natural elements and lighting was found to be very and highly successful and desired to be so by 28.6% and 52.4% of the respondents respectively (table 15, figure 21). Overall, 81% of the respondents favoured this range of opinions. A rank score value of 4 resulted here, intimating that respondents considered the integration of natural elements and lighting to be very successful and needing to retain this status. It was therefore important to incorporate natural features and effective lighting in order to enhance the ambience of recreational spaces within former industrial buildings.

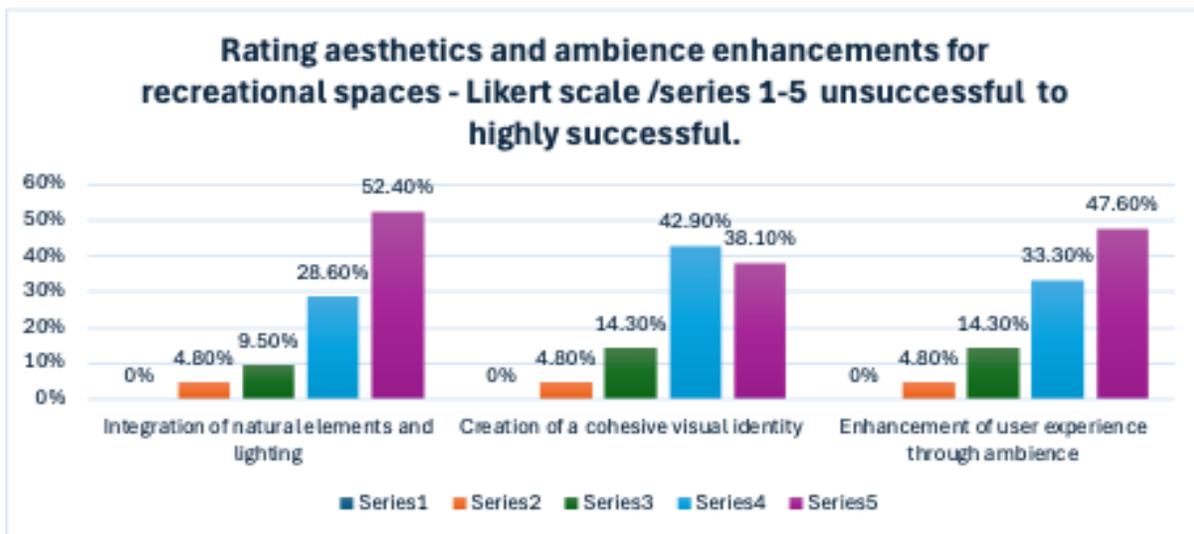


Figure 21: Ratings of the value aesthetics and ambience enhancement in recreational spaces. Source: Author¹, 2025, field data.

Creating a cohesive visual identity was viewed to be very and highly successful and expected to retain this threshold by 42.9% and 38.1% of the respondents respectively (table 15, figure 21). In total 81% of the respondents embraced this perspective. The derived rank score here settled at 4. In the main, the respondents therefore felt that the creation of a cohesive visual identity scored very successful and ought to be maintained there. Consistent and unified design elements that

enhanced the aesthetic appeal of recreational spaces within former industrial buildings was therefore crucial.

The enhancement of user experience through ambience was rated as being very and highly successful by 33.3% and 47.6% of the respondents respectively (table 15, figure 21). On the whole 80.9% of the respondents belonged to this persuasion. A derived rank score of 4 emerged here, suggesting that respondents considered the enhancement of user experience through ambience to be very successful and to function well at this level. The value of creating inviting and comfortable environments to improve user satisfaction within recreational spaces in former industrial buildings was here endorsed.

3.4 Overarching perspectives obtained from expert key informants

Experts emphasized the importance of preserving the historical and architectural character of former industrial buildings (FIBs) while integrating modern amenities and sustainable design strategies, such as eco-friendly materials, solar panels, and rainwater harvesting, to enhance functionality and reduce environmental impact. They highlighted community engagement as crucial in shaping recreational spaces that meet user needs, fostering a sense of ownership and ensuring long-term utilization. Additionally, the integration of smart technologies and security measures was seen as essential for optimizing user experience, improving safety, and supporting urban regeneration through adaptive reuse.

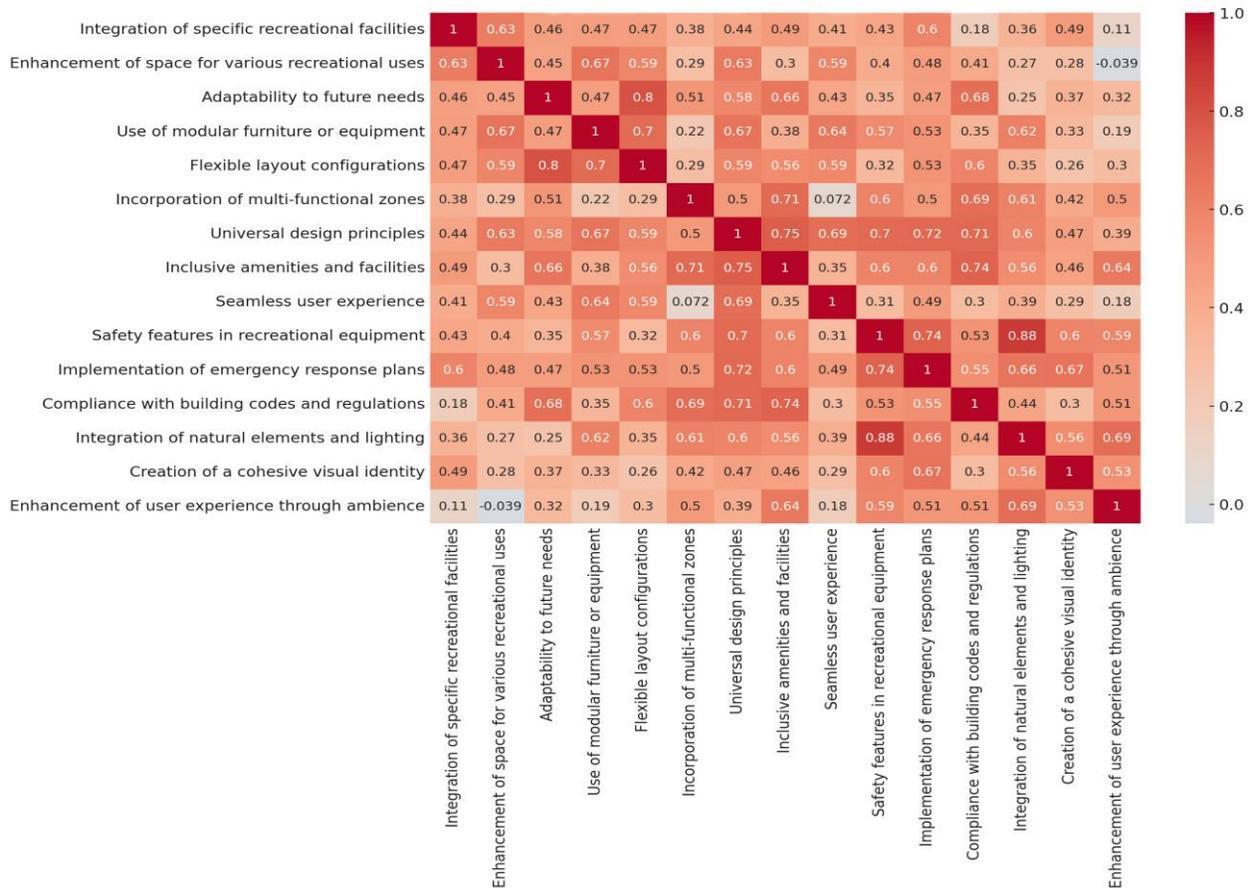
3.5 Associations of aspects and attributes of spatial characteristics of Former Industrial Buildings (FIBs)

The correlation analysis highlights how different spatial and design factors interact in the adaptive reuse of former industrial buildings (figure 22). Strong positive associations emerged around adaptability, inclusivity, and safety. Flexible layout configurations and adaptability to future needs show a very strong relationship (correlation coefficient value $r \approx 0.80$), affirming that spaces designed for flexible use are more readily repurposed. Similarly, integration of natural elements and lighting with safety features in recreational equipment demonstrates an even stronger correlation (correlation coefficient value $r \approx 0.88$), reflecting how environmental comfort and hazard protection often work together. Inclusive amenities also correlate strongly with both building codes (correlation coefficient value $r \approx 0.74$) and universal design principles (correlation coefficient value $r \approx 0.75$), emphasizing the alignment between inclusivity, regulation, and accessible design. Meanwhile, integration of specific recreational facilities with enhancement of space for various recreational uses ($r \approx 0.63$), and the link between enhanced recreational space and modular furniture (correlation coefficient value $r \approx 0.67$), reinforce the value of tailored facilities and flexible furnishing strategies with the above average strength of associations. Collectively, these strong correlations reveal a cluster where flexibility, safety, and inclusivity are mutually reinforcing, forming the backbone of adaptable design (figure 22).

Moderate to low correlations reveal more nuanced or context-dependent interactions (figure 22). Modular furniture with multifunctional zones (correlation coefficient value $r \approx 0.22$) and flexible layouts with cohesive visual identity (correlation coefficient value $r \approx 0.26$) suggest weak alignments, pointing to supporting but not decisive synergies. Similarly, seamless user experience with ambience (correlation coefficient value $r \approx 0.18$) and seamless user experience with multifunctional zones (correlation coefficient value $r \approx 0.072$) indicate that providing multi-functionality or atmospheric qualities contributes barely to smooth user journeys. Additionally, integration of recreational facilities with ambience (correlation coefficient value $r \approx 0.11$) shows an extremely limited association, suggesting that the provision of facilities alone does not guarantee atmospheric enhancement. It is also notable that enhancement of ambience with expansion of recreational space displays another extremely weak but negative correlation (correlation coefficient value $r \approx -0.039$), highlighting a potential trade-off between maximizing atmosphere and maximizing functional capacity.

A key insight is that weaker correlations do not necessarily imply a lack of relevance but rather point to areas where intentional design interventions could bridge gaps. For instance, while ambience alone may not strongly predict functional versatility, carefully designed lighting, acoustics, and material choices could mediate this relationship by enhancing both atmosphere and usability. Similarly, the limited correlation between seamless user experience and multifunctional zones suggests that without clear wayfinding, circulation strategies, and programming, multi-functionality can fragment rather than unify the user journey. These nuances indicate that design trade-offs are inevitable, and adaptive reuse projects must strategically prioritize which relationships to strengthen based on context, budget, and target user groups.

Overall, the findings underscore that while core design strategies (flexibility, safety, inclusivity) strongly reinforce adaptability, user experience factors (ambience, seamlessness, multi-functionality) exhibit weaker and less consistent connections. This suggests that achieving successful adaptive reuse requires not only capitalizing on strong synergies but also intentionally designing to bridge weaker links. By doing so, designers can ensure that functional adaptability is complemented by meaningful and coherent user experiences, thereby balancing technical robustness with human-centered outcomes.



3.6 Figure 22: Spearman Correlation heat map of the Associations of aspects and attributes of spatial characteristics of Former Industrial Buildings (FIBs). Source: Author¹, 2025, field data.

3.7 Associations of aspects and attributes of spatial requirements of spaces in Former Industrial Buildings (FIBs adapted for recreation

The analysis reveals several strong positive correlations, highlighting how certain spatial features reinforce one another in former industrial buildings adapted for recreational uses (figure 23). Spaces designed for specific activities very strongly align with enhanced fire safety and compliance (correlation coefficient value $r \approx 0.97$), indicating that specialized recreational spaces are more likely to prioritize regulation and safety.

Similarly, storage capacity shows a very strong association with ease of entry and exit (correlation coefficient value $r \approx 0.91$), suggesting that clutter-free environments improve circulation and accessibility. Clear signage also tends to emphatically accompany spaces tailored for specific recreational functions (correlation coefficient value $r \approx 0.82$), underscoring the

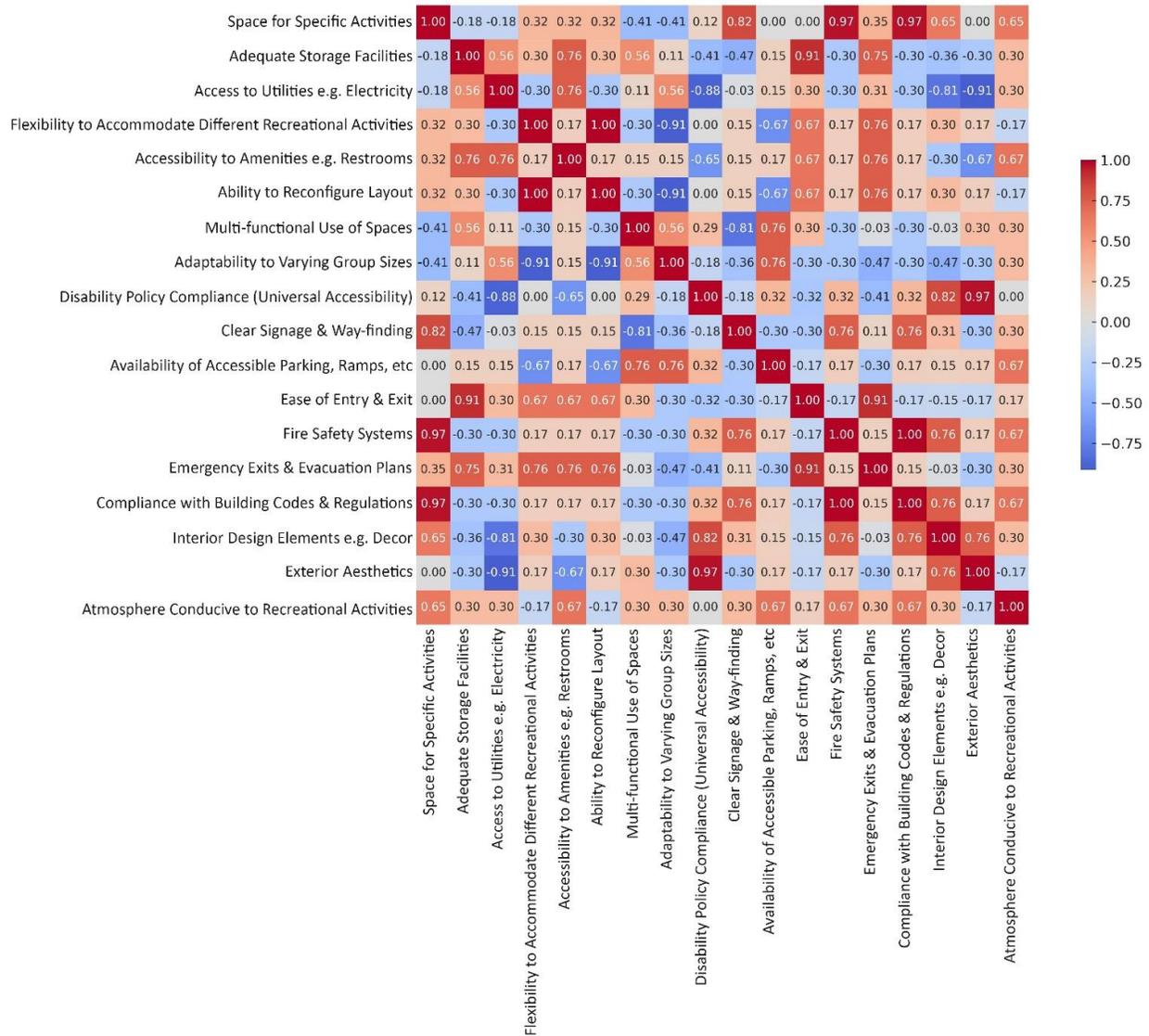
importance of wayfinding in activity-specific design. Additionally, amenities and utilities (correlation coefficient value $r \approx 0.76$) and exterior aesthetics and compliance (correlation coefficient value $r \approx 0.76$) correlate well positively, reflecting how user comfort and visual appeal often develop alongside technical and regulatory standards.

Conversely, strong negative correlations highlight trade-offs in spatial adaptability (figure 23). For instance, utilities are rather strongly negatively related to both disability compliance (correlation coefficient value $r \approx -0.88$) and interior aesthetics (correlation coefficient value $r \approx -0.81$), suggesting that technical upgrades may sometimes neglect inclusivity and design quality.

Another important trade-off appears between flexibility to accommodate diverse activities and adaptability to different group sizes (correlation coefficient value $r \approx -0.91$). This suggests that spaces optimized for a wide range of activity types may very much struggle to adjust effectively to varying group sizes, and vice versa. Such patterns indicate that enhancing one aspect of adaptability can sometimes reduce performance in another. This highlights the need for careful design prioritisation when balancing flexibility, inclusivity, and functional requirements.

Overall, the findings suggest that safety and compliance cluster strongly with functional specificity, producing safer and more regulated environments. However, tensions exist between utilities and inclusivity/aesthetics, pointing to the risk of overemphasizing infrastructure at the expense of accessibility or visual quality. Flexibility, too, presents a trade-off.

To this extent, while versatile layouts, amenities, and signage support specific activities, this may reduce the ability of spaces to remain multi-functional or to adjust easily for varying group sizes. In summary, recreational adaptability in former industrial buildings benefits from specialization and user-centered design, but this often requires balancing technical, aesthetic, and inclusive considerations.



3.7 Figure 23: Associations of aspects and attributes of spatial requirements of spaces in Former Industrial Buildings (FIBs adapted for recreation. Source: Author¹, 2025.

4. Conclusions

4.1 Conclusions on research objective 01: To identify the spatial characteristics of FIBs repurposed for recreational uses

The study found that former industrial buildings (FIBs) repurposed for recreational use maintained key industrial characteristics. Such included expansive open spaces, high ceilings, and exposed structural elements. These contributed to their unique identity but posed challenges for adaptability. Structurally, these buildings were robustly constructed with durable materials

and designed to support heavy industrial operations. They featured large floor plates and strong frameworks. Building services, including utilities and HVAC systems, often require modernization to suit recreational needs. The building envelopes were typically composed of resilient but minimally insulated materials, necessitating upgrades for energy efficiency. Lastly, the spatial context of FIBs within industrial districts often provided advantageous connectivity and historical value. This enhanced their potential for adaptive reuse. It also influenced design considerations within their surrounding communities.

4.2 Conclusions on research objective 02: To establish the spatial requirements of recreational spaces adapted from FIBs

The research identified critical spatial requirements for adapting former industrial buildings (FIBs) into functional recreational spaces. It emphasised flexible layouts, adequate storage, essential utilities, and accessible amenities to support diverse activities and user comfort. Functional needs were met by carefully allocating spaces for specific uses while maintaining adaptability. This was enhanced through modular furniture and multi-functional zones that enabled dynamic space usage. Prioritizing user needs and accessibility, including universal access and intuitive wayfinding was well ingrained in the structures. This fostered inclusivity and equitable access.

Safety and regulatory compliance were considered to be crucial, with effective fire safety systems and clear emergency protocols. This all ensured occupant protection. Finally, aesthetic improvements and a welcoming ambience played a significant role in attracting users. It also reinforced the cultural and recreational significance of the buildings within their respective urban settings.

4.3 Conclusions on research objective 03: To determine the relationship between the spatial characteristics of FIBs and their adaptability into recreational uses

The research found that the adaptability of former industrial buildings (FIBs) for recreational uses depended heavily on their spatial characteristics. These included structural integrity, flexible layouts, and natural lighting. Successful adaptive reuse balanced preserving industrial heritage with modern design. Often phased approaches were used to manage complexity and costs. Economic feasibility, safety improvements, cultural integration, interactive technology, vertical space use, and acoustic enhancements all played vital roles. They helped transform FIBs into vibrant, functional recreational spaces. The resulting spaces then met contemporary user needs while honouring their history.

5. Recommendations

This research offers targeted recommendations for adapting former industrial buildings (FIBs) for recreational use, with an emphasis on their distinctive spatial qualities.

5.1 Balancing Industrial Character with Modern Needs

Adaptive reuse should carefully blend preservation of industrial character with contemporary elements. The robust architecture and historic significance of FIBs offer a unique ambiance, but to transform these spaces into dynamic recreational hubs, introducing modern amenities is vital. Thoughtful interventions such as complementing original features with up-to-date materials and technologies maintain authenticity while enhancing comfort and functionality. The most successful projects achieve a harmonious mix of old and new, enriching the space with cultural value.

5.2 Maximizing vertical space

Effectively utilizing vertical space enhances both the usability and appeal of former industrial buildings for recreation. Mezzanines, lofts, or multi-level designs expand usable areas without enlarging the building's footprint. Activities like climbing gyms leverage high ceilings for vertical routes, while lofts or mezzanines can support yoga classes or relaxation zones. This strategy honours historic architecture while delivering diverse experiences.

5.3 Acoustic environment solutions

Large industrial structures often suffer from excessive echo and noise. Addressing these challenges is essential to create comfortable recreational spaces. Deploying advanced soundproofing such as movable acoustic panels, sound-absorbing ceilings, and innovative flooring (like rubber in fitness zones) can greatly reduce noise levels. These solutions foster an inviting, user-friendly environment.

5.4 Lighting improvements

Industrial buildings often lack adequate natural light and feature uneven illumination. Integrating adjustable LED systems, strategically placing skylights, and using reflective or light-coloured finishes can address these issues. Improved lighting makes these spaces more welcoming and functional.

5.5 Spatial flexibility

FIBs' spacious interiors support versatile layouts. Features like inflatable structures, sliding panels, transformable rooms, mobile furniture, and adaptive dividers enable easy reconfiguration for different activities. Multi-functional zones, interactive entrances, efficient storage, and creative exterior upgrades (e.g., green roofs, creative lighting) add further adaptability.

5.6 Integration of art and culture

Collaboration with local artists and organizations enlivens the adaptive reuse of FIBs. Site-specific art installations—murals, sculptures, and interactive artworks honour the building's

legacy while introducing contemporary expression. These cultural initiatives foster community engagement and enrich the neighbourhood.

5.7 Incremental redevelopment

Given the scale of most FIBs, phased redevelopment is often necessary. This incremental approach allows issues of structure, layout, and code compliance to be addressed sequentially. It spreads investment needs over time and enables ongoing refinement of strategy.

5.8 Economic feasibility

Sound financial planning ensures sustainability. Consider diverse revenue sources such as offices, studios, or co-working areas to attract tenants and stimulate local economies. Economic analyses should guide funding and operational models.

5.9 Safety

Ensuring structural integrity and addressing hazards (like asbestos) is paramount. Comprehensive surveys and remediation ensure health and safety. Infrastructure upgrades and community engagement also foster security around revitalized sites.

5.10. Technology & gamification

Interactive technologies (AR), digital displays, gamified fitness—create novel user experiences. Blending recreation with technology enlivens repurposed spaces and attracts broader audiences.

6. Implications of findings to theory and practice

This study offers significant insights for both architectural theory and practical approaches to adapting former industrial buildings (FIBs) for recreational use.

6.1 Theoretical contributions

The research advances architectural theory by highlighting spatial flexibility, heritage preservation, and the integration of historical and contemporary functions. It challenges static interpretations of the built environment, advocating for dynamic, user-centered spaces. The convergence of cultural memory, technology, and art enriches placemaking theories within adaptive reuse frameworks.

6.2 Practical applications

The findings provide actionable guidelines for design and planning, emphasizing phased development, economic viability, and spatial adaptability. Recommendations such as vertical integration, enhanced acoustics and lighting, and multifunctional layouts encourage the creation of inclusive, flexible, and sustainable recreational environments.

6.3 Policy and institutional implications

More flexible regulatory policies are needed to facilitate adaptive reuse. Collaboration among planners, authorities, and community stakeholders is crucial for successful implementation and lasting urban impact.

6.4 Social and economic impact

Adapting FIBs can drive urban renewal, transforming neglected industrial spaces into dynamic community centers. These projects support cultural engagement, economic growth, and social inclusion, thus strengthening urban resilience.

6.5 Implementation challenges

6.5.1 Public perception and cultural acceptance

FIBs are often seen as obsolete or unsafe, which may dampen public interest. Inclusive design, outreach initiatives, and community participation are essential to foster cultural acceptance and a sense of ownership.

6.5.2 Policy and regulatory barriers

Current building codes and planning policies can resist the complexities of adaptive reuse, with limited incentives and slow adaptation further constraining innovation. Responsive frameworks are needed to facilitate the transformation of industrial heritage into vibrant recreational assets.

6.6 Comparison with past research

Prior research divides into three strands. First, studies on repurposing FIBs often cover housing or cultural uses, but rarely focus on recreational adaptation (Vardopoulos, 2022; Vardopoulos & Theodoropoulou, 2019). Second, works addressing general building adaptability discuss broad strategies but do not tackle challenges unique to FIBs (Njuguna & Maringa, 2025; Vizzarri et al., 2020). Third, literature on recreational facility design rarely considers industrial sites, with some studies focused instead on outdoor or creative spaces (Mbiti, 2022; Zhuoran et al., 2024). This study bridges these gaps by analysing how spatial characteristics support the transformation of FIBs for recreational use.

7. Areas for further research

Further research should focus on Quantitative Analysis of Spatial Configuration & User Movement, examining how spatial layouts influence user behavior and space utilization in adaptive reuse projects. Long-Term Impact should investigate the economic, social, and environmental effects of adaptive reuse on communities. Additionally, User Experience, Satisfaction & Technological Integration can be assessed through post-occupancy evaluations, exploring how technology enhances usability, interaction, and overall engagement in adapted FIBs.

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