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**REDUCE, REUSE,
RETHINK AND
PRESERVE: THE
REUSE OF HISTORICAL
BUILDINGS AS A
STRATEGY FOR
ENVIRONMENTAL
SUSTAINABILITY
AND HERITAGE
APPRECIATION**

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Abstract: This article seeks to explore adaptive reuse as a form of connection between the preservation of architectural and urban heritage and the sustainability of the built environment. Reuse in architecture can make the use of spaces more effective while preserving memory, as new life is given to buildings that have potential for use. Furthermore, bringing new function to an underutilized or disused historic building means avoiding complete demolition and less need for construction. Historic buildings represent much more than simply a physical construction, but also something that brings identity and character to the city and serves as a witness to the history of the place. Adaptive reuse is considered a preservation strategy; however it is only effective if it brings social fruition to the building. In this study, the category of reuse represents a new way of conceiving architecture in the 21st century. In this context, we discuss the reasons that make the reuse of architecture and urban ambience a viable alternative, in many cases, for the sustainable preservation of heritage and for the best use of a potential built environment. The criteria that make adaptive reuse an effective strategy for both environmental sustainability and heritage preservation are also presented and discussed. To be considered sustainable, adaptive reuse must preserve the historical value of the building and, at the same time, holistically bring social, economic and environmental advantages to it.

Keywords: Reuse. Patrimony. Architecture. Sustainability. Memory

INTRODUCTION

The consumer culture consolidated from the Industrial Revolution created a world where it became easier to replace something instead of repairing it and where there is the idea that the replaced product will always be superior to the old one, and this one, in turn,

would no longer have usefulness. The same applies to civil construction, as there is often a notion of “progress” when talking about tearing down the old to make room for the new.

It is unanimous among the scientific community that a dramatic climate change caused by human actions is already underway and it is feared that this will reach a point that is no longer reversible (PINTOSSI et al, 2023). The civil construction industry is one of those that generate the most environmental impacts, especially when it comes to the emission of greenhouse gases, the consumption of natural resources and the use and occupation of the soil (VARDOPOULOS, 2023).

There is a growing acceptance that adaptive reuse satisfies the key concept of sustainability, since by extending the useful life of an existing building, there is usually a decrease in the use of materials, transport, energy costs and pollution compared to the construction of a new building (GÜNÇE, MISIRLISOY, 2019). Furthermore, it has been widely accepted that reuse, when well applied, meets sustainability performance requirements, preserves architectural history and revives urban areas, as well as avoids unnecessary consumption of materials and energy (GÜNÇE, MISIRLISOY, 2019).

Adaptive reuse has intrinsic environmental advantages. One of them relates to the retention of the “embodied energy” of the original building, that is, the energy consumed by all the processes associated with the production of a building, such as the use of natural resources and the energy expenditure associated with the production of materials (INGARAMO, LAMI, 2022). By reusing a building, its embodied energy is retained and makes the project more environmentally sustainable than brand new constructions (INGARAMO, LAMI, 2022). In addition, there are also advantages to avoiding the

production of waste generated in an eventual demolition and subsequent construction of a new building, focusing on the development of the existing built environment and the rationalization of land use (DJEBOUR, BIARA, 2019).

Sustainability does not only refer to environmental goals, but also to economic, social and cultural issues (NASCIMENTO, 2012). This way, sustainable development offers environmental, social and economic benefits to a community or area (VARDOPOULOS, 2023). The potential of existing buildings has been recognized as part of sustainable development, and in recent years there has been a growing volume of literature, studies and reports that point to the value of historic and existing buildings in building sustainable communities (MISIRLISOY, GÜNÇE, 2016).

The integration of historic conservation with environmental concerns has become an innate feature of a sustainable agenda (BULLEN; LOVE, 2011). Historic buildings bring a distinct character to neighborhoods while at the same time providing a tangible connection to the past and local history (MELIS, 2010). Adaptive reuse has clear environmental benefits, especially because it has the advantage of retaining embodied energy, but these benefits can be further improved during intervention processes in historic buildings (DJEBOUR, BIARA, 2019).

One of the greatest concerns of society in the 21st century is the search for a sustainable future, thus, the way of conceiving the architectural project in order to minimize the environmental impact of the building on the environment and its inhabitants is a current consideration of architecture (PINTOSSI et al, 2023). Considering that adaptive reuse encompasses issues related to the environment, society and the economy, the three pillars of sustainable development, it can be said that

this process goes beyond the preservation of historical heritage (STONE, 2019). The reuse of existing buildings is an environmentally respectful approach to creating contemporary space, not only because the structure is already *in situ*, but also because existing buildings can be seen as an important cultural, social and architectural resource to shape the future. (STONE, 2019).

In recent decades, the topic of sustainable development has taken center stage in discussions on climate change, economic prosperity, social equality and others. The civil construction sector plays a fundamental role in achieving the global goals of sustainable development, since it covers the social, environmental, economic and, in many cases, cultural areas (PINTOSSI et al, 2023). Historic preservation is also directly related to the issue of sustainable development, which implies a new way of thinking about the process by which one decides what and how to preserve, its real economic and social benefits and the role that heritage can help reduce impacts on the environment (PINTOSSI et al, 2023).

The objective of this study is to reflect on the dual function of adaptive reuse in serving the preservation of historic buildings and sustainability. This preservation goes far beyond just leaving the building intact, but also refers to preserving the memory and symbolism behind this building. Each building is distinct and the circumstance of this difference means that each one has an individual story to tell, something that describes the narrative of its existence (STONE, 2019). Adaptive reuse offers the opportunity to reinforce the particular character of an area while at the same time using up-to-date techniques for a contemporary population. Issues of collective memory and identity combined with ideas of tradition, history and culture mean that it is possible to maintain a sense of continuity with the past as a way of

creating the future (STONE, 2019).

SUSTAINABILITY IN THE REUSE OF HISTORIC BUILDINGS

From the middle of the 20th century, the perception emerges that the expanding production and consumption pattern in the world would not be able to last permanently, since the understanding arises that the environment is not capable of absorbing all the environmental impacts caused by industrial society (NASCIMENTO, 2012). Thus, from this moment on, several discussions are initiated on the risks of environmental degradation and on the limits of the development of the planet (NASCIMENTO, 2012).

This search for a balance between reducing environmental degradation and economic development, inaugurated by the 1972 Conference on the Environment, later evolved into the notion of sustainable development, a term first used in 1987, in the Brundtland Report, entitled "Our Future Common". There is an intense debate in the academy about the meaning of sustainable development, however, the most frequent version for the term integrates the Brundtland Report (1987, p. 2): "the development that allows satisfying the needs of the present without compromising the possibilities of future generations to satisfy their own".

The emerging demand for a sustainable future has caused the importance of the built environment to be reassessed in recent decades, with the issue of sustainable development in civil construction starting to gain greater relevance from the 1990s onwards (FUFA et al., 2021). One of the first international scientific events that sought to discuss the topic of sustainable construction was the *First International Conference on Sustainable Construction*, which took place in 1994 in Tampa, Florida (AKSEL, EREN, 2015).

In 1996, the Habitat Agenda II was published by the United Nations Conference in Istanbul, Turkey, which, according to the *International Council for Research and Innovation in Building and Construction* (CIB, 1999), meant one of the most important agendas for civil construction until then, as it dealt with both human aspects and the development of civil construction (AKSEL, EREN, 2015).

In 1999, Agenda 21 was published on *sustainable construction*, which focuses on the entire production chain of construction and customers. In general, the document presents the main challenges of sustainable construction: (a) process and management; (b) product and building aspects; (c) resource consumption; (d) impacts on the urban environment and the natural environment and (e) social, cultural and economic issues (AGOPYAN; JOHN, 2011).

The construction of new buildings consumes significant amounts of natural resources, in addition to generating high rates of carbon emissions. The construction industry is responsible for 40% of global greenhouse gas emissions and 44% of total material consumption (AKSEL, EREN, 2015). Buildings are also responsible for more than 40% of global energy use, more than 10% of the world's freshwater extraction and about 25% of wood extraction (AKSEL, EREN, 2015). The civil construction industry still manages to generate approximately 136 million tons of waste annually, with almost half of this amount coming from demolitions (YUNG; CHAN, 2012).

With this, extending the useful life of an existing building through reuse can reduce pollution and consumption of material, energy and transport, in addition to significantly contributing to the reduction of carbon emissions (FUFA et al., 2021). Furthermore, adaptive reuse avoids an unnecessary demolition process (YUNG; CHAN, 2012).

These environmental benefits combined with the economic and social advantages of reusing a valued historic building make reuse an essential component of sustainable development (YUNG; CHAN, 2012).

Conserving and reusing unused historic buildings can play an important role in the process of urban regeneration, as well as contributing to meet the growing need for new buildings (PINTOSSO et al, 2023). The adaptive reuse of existing buildings in the urban stock is already an action based on sustainable guidelines, however, when reuse involves historic buildings, the environmental benefits are more significant, as these buildings offer much to the landscape, identity and society. amenity of the communities to which they belong (VARDOPOULOS, 2023).

Writer Jane Jacobs stated in 1993 that buildings considered greener are those that already exist, and more and more research has supported this statement, mainly due to the fact that the reuse and sustainable renovation of existing buildings can result in fewer adverse effects than new constructions considered sustainable or green (MERLINO, 2018).

One of the main environmental advantages of reusing historic buildings concerns the retention of embodied energy, that is, the energy consumed by all processes associated with the production of a building, from obtaining natural resources to product delivery, including mining, material and equipment manufacturing, transport and administrative functions (LEWIS, 2013). When a historic building starts to fulfill a social need and serve for new uses, there may be less need for a new building destined for these uses, and thus, the environmental impacts generated by the construction of a new building are avoided (CLARK, 2013).

In addition to environmental advantages, adaptive reuse is a sustainable option for

promoting urban strengthening, as well as encouraging revitalization efforts, since by providing a new life to historic buildings, it can guarantee social and economic benefits for communities, in addition to contributing to the preservation of built heritage (MISIRLISOY, GÜNÇE, 2016). Adaptive reuse is essentially the recycling of a building and, commonly associated with historic preservation, the process involves more than rehabilitation or restoration (IJLA and BROSTRÖM, 2015). While rehabilitation is the act or process of making possible the compatible use of a property through repairs, alterations and additions, preserving the parts or characteristics that transmit its historical, cultural or architectural values, adaptive reuse, on the other hand, seeks to find new uses for the building rather than trying to continue the existing use through upgrades or restoring it for a specific period (IJLA and BROSTRÖM, 2015).

Among the ways in which heritage sites can contribute to prosperity and sustainable economic development are the attraction of people and investments by improving the amenity or “adaptability” of cities and functioning as important tourist attractions in urban centers and regional areas. (CLARK, 2013). Furthermore, when effectively implemented, it also contributes to building social and cultural capital and urban regeneration, aspects that are also part of sustainability (CLARK, 2013).

All buildings are subject to the action of time and the different uses that have been given to it throughout its history (INGARAMO, LAMI, 2022). This way, adaptive reuse has gained strength in recent decades as an alternative to preserve and, at the same time, bring a usefulness to an unused or underutilized building, structure or place (INGARAMO, LAMI, 2022). Adaptive reuse brings new life to a site rather than trying to keep it frozen

in a given moment in time, exploring options that lie between the extremes of demolition and its transformation into an untouchable museum piece (CLARK, 2013).

This way, the effective adaptive reuse project is the one that best respects and maintains the historical significance of the building, while adding a contemporary layer to it that guarantees its functioning in the future (MISIRLISOY, GÜNÇE, 2016).

THE SOCIAL FUNCTION OF REUSED HISTORICAL HERITAGE

There is something in cities that goes far beyond a set of buildings and people divided and guided by busy streets, and this corresponds to the memory and history of the place (GÜNÇE, MISIRLISOY, 2019). We identify in ourselves and our communities in relation to these places, clinging to something that may have happened decades ago or perhaps just a few years ago (MELIS, 2010). The character and identity of the city correspond to the result of a process that occurs over time, where cultures come together, communities are formed and memories give meaning and life to the place (MELIS, 2010).

A historic building brings a sense of wonder to society and makes it want to know more about the people or culture that produced it (GÜNÇE, MISIRLISOY, 2019). She is also familiar to that society due to the fact that she is permanently in that place and is part of individual and collective memories. Buildings considered as historical heritage configure intrinsic architectural, aesthetic, historical, documentary, archaeological, economic, social and even political and spiritual or symbolic values (DJEBOUR, BIARA, 2019). However, the first impact will always be emotional, as it corresponds to a symbol of the identity and cultural continuity of a society, a part of its heritage (MELIS, 2010).

Bringing an effective use to the building,

as well as making adaptations so that it meets the current needs, corresponds to a valuable resource for its survival to be ensured, since architecture, as a mainly utilitarian good, needs to be used to survive (BULLEN, LOVE, 2011). However, reuse, in order to fulfill its function in favor of heritage preservation and environmental sustainability, must presuppose a dynamic to the place, must guarantee a permanent flow and a social function to the construction (KIROVOVÁ, SIGMUNDOVÁ, 2014).

The preservation of the built urban heritage includes the valuation of the building, mainly determined by the use and guarantee of social fruition (INGARAMO, LAMI, 2022). Therefore, there is no point in giving a new function to the building if it does not bring life, does not streamline the environment, as this reuse will not be fully contributing to the preservation of the building, in addition to not meeting the social criterion, which is decisive for sustainable development. (KIROVOVÁ, SIGMUNDOVÁ, 2014).

The process of implementing adaptive reuse goes far beyond the simple conversion or rehabilitation of a structure (GÜNÇE, MISIRLISOY, 2019). This must take advantage of the original energy and quality of a building and combine them with the new energies and activities that a new use generates (KIROVOVÁ, SIGMUNDOVÁ, 2014). That is, well-executed adaptive reuse also acts as a promoter of the social quality of the environment (CLARK, 2013). As with all other construction activities, good design, respectful planning and skillful execution are required, however, specific issues associated with sustainability must also be taken into consideration, in adaptive reuse design (GÜNÇE, MISIRLISOY, 2019).

The approach needed to resolve social, as well as environmental and economic demands, and the identification of sustainable

development strategies, inevitably becomes more complex than the simple conversion or rehabilitation of a space (KIROVOVÁ and SIGMUNDOVÁ, 2014). Even if a specific adaptive reuse project apparently presents a viable program and future use, together with the necessary scale and funding and the reuse of materials and energy, such elements correspond to only one aspect of sustainable design (KIROVOVÁ and SIGMUNDOVÁ, 2014). It is also necessary to take into consideration, a variety of social and economic factors particular to each case (FUFA et al., 2021).

CRITERIA FOR SUSTAINABLE ADAPTIVE REUSE OF HISTORIC BUILDINGS

According to the UN, the sustainability of cities and communities corresponds to an important goal to ensure global sustainable development. With this paradigm shift, new buildings with green requirements are increasingly appearing around the world (YUNG e CHAN, 2012). However, the sustainability of cities cannot be achieved unless the stock of existing buildings is treated with care (YUNG e CHAN, 2012). In addition, it must be considered that the preservation of historic buildings is closely linked with urban sustainability. Such constructions keep aspects of the identity, memory and culture of a society, elements present in the social, economic and environmental dimensions of sustainable development (FUFA et al., 2021).

Green adaptive reuse can be defined as a mixture of adapting a building for a new function and the integration of green principles and technologies, consisting of an opportunity to improve the performance of the existing stock of buildings (LANGSTON, 2010). Through this strategy, a faster process of upgrading to higher standards of compliance can be achieved, while preserving important

cultural and heritage values (LANGSTON, 2010).

Despite being a strategy based on sustainable guidelines, the adaptive reuse of historic buildings cannot always be considered green or correspond to a guarantee of promoting sustainable development (LANGSTON, 2010). In many cases, adaptive reuse is not able to holistically achieve improvements in quality of life in environmental, cultural and economic aspects (MISIRLISOY, GÜNÇE, 2016). The sustainable preservation of any historic building requires the blend of sustainable design and historic preservation principles, as well as careful planning that considers its surrounding environment and the realities of its actors (FUFA et al., 2021). To be classified as green, adaptive reuse must extend the useful life of the building, reduce its carbon footprint and simultaneously preserve its cultural heritage values (LANGSTON, 2010). Table 1 presents the main criteria that an adaptive reuse project must meet to be considered as a strategy that follows the principles of sustainable development.

Category	Criterion
Environmental	Reduction of the ecological footprint of the building; low energy consumption; minimization of waste; improvement of the operational performance of the building; respect for the surrounding landscape; improving the useful life of the building.
Social	Dynamics; image / identity; amenity; aesthetics; provision of services and amenities; providing a "sense of place"; improvement of community character.
Economic	Proximity to services and shops; contribution to the local economy; income generation; encouraging investment in the surrounding area; expansion of the building lifecycle.
Cultural	Memory preservation; minimization of impacts on the building's heritage values; preservation of history; maintenance of the heritage significance of the building; preservation of local identity
Physical-functional	Flexibility; universal accessibility; security; comfort.

Table 1 - Parameters found in sustainable adaptive reuse projects

Source: author's elaboration.

When sustainable, adaptive reuse retains historic resources and community character, providing renewed life to historic structures in an economically viable way (BULLEN and LOVE, 2011). Effective reuse can promote a link between a community's history and its present and future while accommodating current needs. Furthermore, it is generally more harmonious with the character of the community than with new construction due to the fact that it brings a function to an already familiar building (STONE, 2019).

FINAL CONSIDERATIONS

The article sought to present adaptive reuse as a sustainable strategy and, at the same time, as a tool for the preservation of historic buildings, since this consists of bringing a coherent use to an existing building in the urban stock. The issue of sustainability has now become a central and indispensable topic in recent years in many fields, including civil construction. Each unused or underutilized building that becomes useful means one less

need for construction. Therefore, adaptive reuse by itself already represents a sustainable action.

Even though sustainability has gained relevant prominence in recent times, the idea still persists that an old product that is useful will always be inferior to a newer product, which leads to the disposal of perfectly good and usable resources in order to "update". This mentality in civil construction has generated several disturbances to the environment, in addition to having created cities with mass-produced buildings without identity. Evidently cities must modernize, new constructions will emerge and the landscape, consequently, transforms with time. However, the preservation of historic buildings must not be relegated to the background, as they represent the materialization of collective cultural identity and history. In addition, adaptive reuse is not only a sentimental effort to save buildings, but also a critical process to ensure the environmental, social and economic function of the built heritage.

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