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A Multicriteria Approach to Adaptive Reuse of Industrial Heritage: Case Studies of Riverside Power Plants

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Abstract: City riverbanks usually have great landscape value and are iconic public spaces. However, there are many cities with large abandoned industrial buildings, such as power plants, on their riverbanks. Such buildings run the risk of being demolished in order to recover the surrounding natural landscape, despite having an important presence in the collective memory of the citizens and in the history of the city. This article seeks to analyse the reuse and refurbishment of industrial power plants on riversides from a modern artistic/recreational approach in order to restore and enhance the landscape value of the site by regenerating the environs and turning them into hubs of activity. Two case studies from different locations are considered in order to extract the information. A methodology is used that allows us to analyse and study a complex reality in a straightforward, concise and direct way. That means it can be used by many agents currently involved in those reuse processes to compare and to monitor the different cases over time. This research has sought to highlight the power plant typology, its relationship with the riverside, and subsequently, to extrapolate the criteria used to study other industrial buildings.

Keywords: industrial heritage; adaptive reuse; power station; riverside; heritage buildings

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1. Introduction

Industrial areas represent the power of technology during the first half of the 19th Century, and they were the social and economic powerhouses of the whole era [1], however, the 21st Century has seen a growing interest in industrial heritage and in how the role it plays in the transformation of landscapes and societies helps us to understand the past [2,3]. In this context, as this article shows, conserving and adaptively reusing that heritage has become particularly important in recent years [4–6], particularly in the fields of urban and architectural regeneration. Over the last decades, culture has played an increasingly important role in driving these regeneration dynamics. As a vital meeting point between the past and the future of cities [7], cultural heritage can attract internal investment and speed up these changes. In this sense, cultural heritage is a key resource for promoting the economic, social and urban development of cities, and conservation has become a vital strategy for the balance between quality of life and sustainability [8].

According to their importance, cultural heritage buildings require researchers, urban planners and industry managers to consider them. The reuse of industrial buildings is an important point in sustainability planning since it can be considered as a substitute for demolition and new construction [9]. Within the current conservation policies, adaptive reuse is becoming increasingly important. The International Committee for the Conservation of the Industrial Heritage (TICCIH) defines industrial heritage as the remains of industrial culture which are of historical, technological, social, architectural or scientific value. These remains consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and stores, places where energy is generated, transmitted and used, and transport and all its infrastructure [10].

Among the main documents that the TICCIH analyses is the Nizhny Tagil Charter, which was signed in 2003, and the TICCIH Guide to Industrial Heritage Conservation of 2013, which addresses issues of preservation, cataloguing and research on industrial historical heritage. It highlights that industrial heritage is the evidence of activities that have had and still have profound historical consequences. It also states that the adaptation of an industrial site into a new one as a way of ensuring its conservation is usually acceptable [10].

In the early 21st Century, the concept addressing the reuse of obsolete architecture made a strong comeback and attracted the attention of architects, engineers, urban planners and researchers. It has raised awareness of the reuse of buildings, their conservation and their low environmental impact. In fact, functionally obsolete industrial buildings have technical and architectural values that make their adaptive reuse and conservation possible [11].

The adaptive reuse of industrial buildings is an area that is generating increasingly more interest within the field of application, as buildings that represent an interesting period in history are turned into new functional centres within contemporary cities [12–15]. Adaptive reuse is a step towards sustainability, which transforms large, disused buildings in a state of disrepair into attractive places that have regenerated the urban setting.

Adaptive reuse plays an important role in meeting the demand for facilities and the regeneration of cities, so it is necessary to generate tools that facilitate adequate management [16]. The functional retrofitting of a building has unquestionably been a standard practice throughout history, even though a more conscious focus on architecturally conserving the built environment is now being used [14]. The architectural conversion of industrial buildings occurred most commonly in the 1970s and onwards with the restructuring of cities in the post-industrial period, a process that meant large buildings fell into disrepair. Even though those buildings have reached the end of their initial function, they still offer possibilities regarding their physical life and as a great contribution to the built environment [17].

Even though the literature on reused industrial buildings is very extensive, sufficient attention has not been paid to the riverside industry, particularly to power plants. It is not by chance that they are located on the riverbanks, as the location is determined by many points: first of all, it is very efficient that the power plants are located on the riverbank because this greatly facilitates the cooling process, which they must undergo due to the fact that some fluid is needed to absorb the heat [18], and with the growth of cities, they have become embedded in the urban fabric, becoming places of great potential.

Authors such as Capel [11] describe them as plants with large sections and simple characteristics, and they have been internally designed for the layout of machines. This is a common power plant typology that is a flagship of the industrial era. Apart from enhancing the area, the reuse of those buildings provides an additional benefit as they restore the landscape value, with the revitalisation of the riverside being a benefit at for urban area. In the configuration of urban coastal fronts, social, economic and cultural processes converge that benefit cities [19].

Two specific cases have been selected and studied in this article to showcase the industrial typology of power plants. Therefore, the methodology of Vizzareri et al. is used and optimised [1]. Even though that methodology was originally conceived to study the feasibility of plans and determine the ideal use for future adaptive reuse projects, this study seeks to analyse case studies of buildings that have already been reused.

Therefore, this research uses three of the four factors that Vizzareri et al. [1] considered to develop adaptive reuse strategies, which are described as environmental, social and urban planning factors. However, in regard to the economic factor, the concepts put forward by Arfa et al. [20] are used, given that their research focuses on cases of reuse, and it addresses questions with assessable potential, and it is closer to the reality of the already constructed cases studies that are considered in this research. In addition to those four factors, a scale of values is introduced to allow us to quantify them. Thus, apart from the (i) assessment and (ii) enhancing of the riverside power plants in the context of the contemporary city, the novelty of this article lies in (iii) its contribution of a methodology that is capable of allowing us to perform a direct analysis of a complex reality, thereby facilitating its application to a large number of agents involved, enabling a comparison between cases and throughout their evolution over time, as the value scale quantifies the building performance in relation to the environs.

2. Research Review

The adaptive reuse of industrial buildings is one of the main aspects of the process of converting industrial land for other uses, which has been accentuated by the restructuring of cities from industrial to post-industrial ones. That process led to large industrial buildings falling into disuse and disrepair; buildings which have technical and architectural characteristics that make their conservation important [11].

In regard to adaptive reuse, it should be noted that while a building may have reached the end of its original function, it still offers opportunities regarding its physical life. Thus, the belief that conserving and giving them a new life and function could be a great contribution to the built environment [17]. Adaptive reuse seeks to mitigate the negative effects and foster more sustainable construction in the future, but it is also the path to conserving the heritage and those heritage buildings and to driving social change in the environs [21].

Navarro [22] points out that enhancing the tangible heritage is the first step to avoiding its destruction, and that by means of performing functional reprogramming and certain material changes, structures that were not originally designed to be inhabited can be enhanced. Even so, they have spatial and structural qualities that can contribute great value, for example, they show that they are buildings with a history behind them, and in many cases, they hold great meaning for their cities.

There are numerous factors to be taken into account in the adaptive reuse process, such as the location, the importance of the heritage, the architectural assets, the market trends, the people's needs and the quality of the environment, along with the physical conditions of the place in question [23].

The adaptive reuse of industrial heritage currently plays an important role that not only affects the buildings, but it can also stimulate a renovation process in large urban areas, and it is considered to be a resource for local development strategies [7,24]. The continuous growth of the urban population since the 1980s, and the consequential demand for land for the expansion of the city, have made industrial areas attractive spaces for reuse. In the case of industrial areas on waterfronts, such as port complexes or power plants, among others, in addition to constituting an important legacy of their industrial past [25], they also act as a hinge between the waterfront and the city, which is why rehabilitating the connectivity and accessibility between these two enclaves is a key factor in these interventions. In this sense, it is worth highlighting the research by Carola Hein [26] on heritage and its relationship with water, and more specifically, the chapter by Pagés and Daamen [27] on the role of heritage in reinforcing the relationship, in this case, between ports and cities. Along the same lines of promoting the connection between the city and the port with water is the research carried out by Daldanise and Clemente [28]. They studied how creativity and cultural heritage enhancement can guide the definition of new trajectories of sustainable urban development, particularly in port–city interaction areas. The International Committee for the Conservation of the Industrial Heritage (TICCIH) defines the most obvious attribute of industrial heritage is that its importance does not lie in its singularity, but rather in its implementation and impact on a specific place [29]. Therefore, for sites of paramount importance in adaptive reuse interventions, and in the case of power plants, riparian reclamation elevates the impact of the intervention much more. As Jan Gehl [30] states, the better the public space is, the more urban life there is, emphasising that the soft edges are privileged sectors to be in, where the citizens can safely observe and enjoy the landscape, and they have the best climate in the city.

The adaptive reuse of historical buildings allows the industrial memory to be conserved by converting them into new functional centres within the existing urban structure. That being said, being able to find a new use that is compatible with the essential characteristics of the heritage element is key for its sustainability over time [31]. The safeguarding of heritage through cultural programmes continues to be a common practise, which often involves the museumisation phenomenon and the trivialisation of these historic buildings in the growing context of urban tourism, which can saturate and endanger these landscapes [32]. Some authors have claimed that the reuse of the industrial heritage does not need to involve its development, and the pursuing tourist and their speculative interests lead to the degradation of the identity of the heritage [33]. New, contemporary uses for those historical buildings and places must be identified from a systematic perspective that is compatible with their complex cultural importance, authenticity, integrity and social value. In this sense, the mixture of the uses of adaptive reuse with the drivers of local industries that are also attractive for tourism is essential to achieve the sought-after balance between the visitors and the inhabitants [34].

This article intends to analyse two cases of reused riverside power plants beyond the scale of the building by studying their relationship with the riverbank and how this affects the social acceptance of the intervention, therefore, we conduct an analysis both at the architectural and urban scales.

Regarding the scientific methodology for assessing the results of adaptive reuse at an architectural scale, Misirlisoy and Gunce [14] stress the importance of adaptive reuse in preserving the architectural originality. Thus, incorrect information will not be given to future generations about the original and historic functions, and the legacy will be kept alive. Vardopolus [35], on the other hand, considers one of the most famous cases in the recent history of Athens, the FIX building. The degree to which sustainable development is influenced in a system of interconnected relations was analysed, and it was conducted from the three main perspectives regarding socio-cultural, environmental, economic and sustainable development.

Real [36] set out different conversion strategies within the field of industrial architecture, offering a typological overview of the industrial architecture with a rich range of new uses which the old factories can be adapted to, taking their morphology into account.

Vizzareri et al. [1] propose a methodology based on three main goals: (i) firstly, the main factors that can be considered to develop adaptive reuse strategies and affect the decision-making processes were identified; (ii) secondly, reference was made to the defining of a heuristic and concise index of adaptive reuse, which will indicate the best use for the building; (iii) thirdly, the methodology was applied to a case study to be able to assess its effectiveness. Even though that methodology is a direct way to determine the appropriate use of a reused building, the indexes used mean that it is not easy for the general public to apply them.

In addition to these methodologies used to assess the results of adaptive reuse at the architectural scale, there are increasingly more researchers that are taking the urban area into account when they are analysing the interventions. In the case of Misirlisoy and Gunce [14], who stress that the main problem of the adaptive reuse projects is the lack of analysis prior to the intervention, which is completely necessary, the interventions were affected socially and economically. Within the same area and given the rapid spread of adaptive reuse initiatives worldwide, other researchers such as Liu, S., and Wang, G. [37] have proposed a methodology based on the Complex Adaptive System (CAS) theory, which is an assessment method used to establish the adaptability of heritage buildings, which quantitatively analyses the adaptability mechanism and explores the indicators that most affects the decision making within adaptive reuse.

This article seeks to put forward a user-friendly and straightforward methodology given the number of agents involved in those reuse processes at present. Therefore, three factors are used out of the four that have been proposed by the methodology of Vizzareri et al. [1], which in turn has sub-factors, where the main ones are: the environmental factor, the social factor and the urban planning factor. Even though the proposed methodology streamlines the analysis of reused industrial buildings using three out of the four of the main factors proposed by Vizzareri et al. [1], a direct rating technique will be appointed to those factors. The proposed methodology is thus based on the use of the theory of the multi-attribute value, where the quantitative data are handled, and they are obtained by reviewing the best practices that have been presented, data studies, network reviews and specific bibliographies regarding each factor using expert opinions to estimate the impacts on a qualitative scale.

Even though the methodology proposed by Vizzareri et al. [1] focuses qualitatively on the urban planning, social and environmental factors, which have been used as references, it was decided to use the classification proposed by Arfa et al. [20] for the economic factor, as it addresses questions with an assessable potential and is closer to the reality of the already constructed cases studies considered in this research.

The proposed methodology streamlines the analysis of the reused industrial buildings using three out of the four of the main factors proposed by Vizzareri et al. [1] and the economic factor of Arfa et al. [20]. A direct rating technique will be allocated to those factors, which estimates the strengths of the preferences for the different levels of a factor on a numerical scale of four.

3. Materials and Methods

The proposed methodology allows for a tool to be created to concisely and directly analyse and study a complex reality, such as the case of the re-functionalisation of an industrial building and a preliminary design of an industrial building that is to be built in the future. This not only allows us to compare between different case studies, but also their evolution over time, as the method uses indicators for the quantitative assessment of the main factors and sub-factors that are considered to develop adaptive reuse strategies. They, therefore, could be scored over a certain time range.

The urban planning, social and environmental factors proposed by Vizzareri et al. [1] were selected for the purpose of this research from the methodologies analysed in the literature review in the above section. However, as buildings that were in use were being studied, the economic factor was considered using the methodology of Arfa et al. [20] to achieve better alignment with the situation of the selected case studies.

The methodology was divided into several stages. Firstly, a search was conducted for the most important case studies of reused industrial buildings, particularly power plants, from around the world. Buildings were found that are currently being used for other purposes in the recreational/cultural field in order to subsequently break them down according to the three main assessment factors described by Vizzareri et al. [1] and the economic factor proposed by Arfa et al. [20], which represent the new adaptive reuse index, which we used to quantify the effectiveness of such projects.

The aim is to extract the best practices used from the selected projects so that they can be used as a model for those buildings that are still pending intervention and to be able to assess those that have already been reused.

The methodology, which is based on a type of direct rating, is able to quantify the importance of each factor and sub-factor involved in each case study. Four main factors—urban, economic, social and environmental ones—are considered in the methodology. This research proposes assigning a scale of values/intensities focused on reused industrial buildings. A tag is thus allocated to each factor where *environmental* = *A*, *social* = *B*, *economic* = *C and urban planning* = *D*, and a subindex is allocated to each sub-factor.

3.1. Choice of the Case Studies

Ten different case studies of interest were analysed to select the case studies. As shown in Table 1, only two of them met the characteristics that we sought. Both of the cases are power plants on riversides, have undergone adaptive reuse and are currently being used for recreational/social/cultural purposes. Case Study No. 1 is the Bankside Power Station in London, and Case Study No. 2 is the former Don Pedro de Mendoza Power Plant in the city of Buenos Aires. This research sets out a methodology that is able to highlight the potential of the adaptive reuse of riverside power plants by applying the methods used by Vizzareri et al. and Arfa et al. [1,20]. The methodology uses a direct rating technique for the power plants, which along with the value/intensity methods proposed in this article, provides results that will be useful for their future application to other cases and their assessment over time.

Table 1. Cases of re-functionalised power plants. Source: own compilation.

Industrial Building	City	Stage	Riverside	New Use	Functioning Original	Re-Functionalisation
Zar Power plant	Moscow	Built	No	Art Centre	1955–1984	2021
Bankside Power Station	London	Built	Yes	Art Museum	1952–1981	2001
Alcudia Thermal Power Plant	Palma de Mallorca	Out to tender	Yes	Cultural Centre	1955–1984	Not built
Mediodía Thermal Power Plant	Madrid	Built	No	Social	1899	2008
Tejo Power Plant	Lisbon	Built	Yes	Energy museum	1909–1972	2001–2005
Battersea Power Station	London	Planned	Yes	Housing	1939–1983	Not built
Usina del Arte	Buenos Aires	Built	Yes	Art Centre	1916–1979	2011
Thermal Power Plant	Castilla y León	Built	No	Energy museum	1920–1971	2011
Hanasaari Thermal Power Plant	Helsinki	Planned	Yes	Art Museum	1974-present	Not built
Asunción Power Plant	Asunción	Built	No	Energy museum	1919–1986	2013

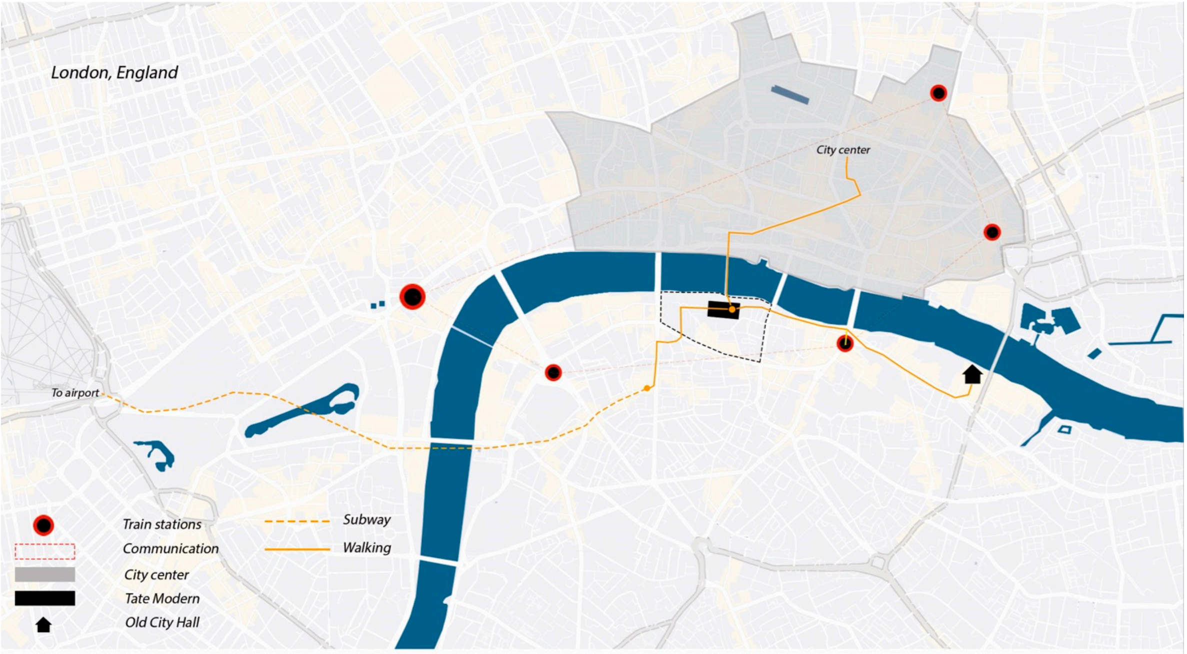
The first case is the Bankside Power Station, which is located in London, England south of the River Thames, an area that was an industrial area. It stopped producing electricity in 1981 (see Table 1). The Bankside Power Station is a very interesting case as since 2001, the "Tate Modern Museum" has been operating in its place. It has been declared as an industrial historical heritage building.

The second case is about the Don Pedro de Mendoza Power Plant, which is located in the city of Buenos Aires, Argentina. In 1979, the Usina closed its doors, to finally undergo a restoration and adaptive reuse process in 2011 to become the current Usina del Arte (see Table 1). It was declared a historical heritage site in the city.

Both buildings contain art inside, and they have grown on social, urban and architectural scales (see Figure 1). The two cases have cultural purposes in common, and culture plays a key role in the decision-making processes due to its ability to link people with their environment and with each other, build cohesion and enact community and collective action [28].

3.2. Description of Factors and Values in the Four Dimensions

The factors and sub-factors are considered for the development adaptive reuse strategies set out in stage no. 1 of the *A holistic approach for the adaptive reuse project selection* article by Vizzareri et al. [1] and for the economic factor in the *Criteria of "Effectiveness" and Related Aspects in Adaptive Reuse Projects of Heritage Buildings* article by Arfa et al. [20]. They are allocated a quantitative direct rating, which would be easy for the different agents involved to access and analyse (see Table 2).



CITY	BUILDING	DISTANCE											
London Population 2022 8,982 millions	Tate Modern	City Hall				Airport				Train Station			
		km	Walking	Bus	Subway	km	Walking	Bus	Subway	km	Walking	Bus	Subway
		2,3 km.	23 min.	20 min.	15 min.	32 km.	6.2 h.	45 min.	50 min.	0,9 km.	12 min.	13 min.	15 min.

CITY	BUILDING	DISTANCE											
Buenos Aires Population 2022 2,890 millions	Usina del Arte	City Hall				Airport				Train Station			
		km	Walking	Bus	Subway	km	Walking	Bus	Subway	km	Walking	Bus	Subway
		3,1 km.	44 min.	19 min.	25 min.	11 km	2.5 h.	44 min.	1 h.	3,5 km.	31 min.	15 min.	-

Figure 1. Case studies of re-functionalised power plants. Source: own compilation.

Table 2. Description of values and factors in their 4 dimensions. Source: own compilation.

Factor	Description	Intensity Range		Intensity Range Description	Data Acquisition
				Environmental factor = A	
Compatibility with the local context A_1	Environmental compatibility of the building adaptation project with the environs.	1	Very low	Large areas that protrude from the original building; green spaces not generated.	Field research Network review
		2	Low	Large areas that protrude from the original building; green spaces created.	
		3	Medium	Respecting the environs; small areas added to the original building; green spaces created.	
		4	High	Respecting the environs; areas of the original building in synergy and scale with the surroundings and green spaces created.	
Quality of the landscape A_2	Quality of the environs	1	Very low	<1000 m^2 (less than) public space in a radius of 200 m.	System of indicators and constraints for large and medium cities [38]
		2	Low	≥(greater than or equal to) 1000 m^2 public space in a radius of 200 m.	
		3	Medium	≥(greater than or equal to) 5000 m^2 public space in a radius of 200 m.	
		4	High	≥(greater than or equal to) 1 hectare public space in a radius 200 m.	
				Social factor = B	
Public space surface area B_1	Quantifies the surface area as public space compared to the built area.	1	Very low	Outdoor public space surface area ≤ (less than or equal to) 10% of the built area.	Field research Network review
		2	Low	Outdoor public space surface area ≥ (greater than or equal to) 10% of the built area.	
		3	Medium	Outdoor public space surface area ≥ (greater than or equal to) 50% of the built area.	
		4	High	Outdoor public space surface area ≥ (greater than or equal to) the total built area.	
Appeal of the site B_2	Presence of activities that contribute to user appeal.	1	Very low	Limited to a single function; lacks suitable public space; does not offer complementary services; poor relationship with the riverside.	Field research Network review
		2	Low	Limited to a single function; public space suitable for outdoor activities; poor relationship with the riverside.	
		3	Medium	Mixture of uses; prevalence of leisure and recreational activities; suitable public space for outdoor activities.	

Table 2. *Cont.*

Factor	Description	Intensity Range		Intensity Range Description	Data Acquisition
		4	High	Mixture of uses; prevalence of leisure and recreational activities (subsistence activities, hospitality and shops, etc); good relationship with the riverside; suitable public space for outdoor activities.	
Walkability B_3	Ability of the project to channel the flow of people	1	Very low	Bus stop over 400 m away; Tram stop over 600 m away; Bike mobility network over 400 m away; Urban paths over 400 m away.	System of indicators and constraints for large and medium cities [38] Field research Network review
		2	Low	Bus stop 400 m away; Tram stop 600 m away; Bike mobility network 400 m away; Urban paths 400 m away.	
		3	Medium	Bus stop 300 m away; Tram stop 500 m away; Bike mobility network 300 m away; Urban paths 300 m away.	
		4	High	Bus stop at less than 300 m away; Tram stop at less than 500 m away; Bike mobility network less than 300 m away; Urban paths less than m away.	
Economic factor = C					
Number of activities C_1	Obtaining greater economic value through different activities	1	Very low	Sector not revitalised, and the amenity does not offer activities that are attractive to new users of the sector.	Cultural amenities as urban cohesion factor, the case of the film library in El Raval neighbourhood of Barcelona. [39] http://diposit.ub.edu/dspace/bitstream/2445/44870/2/Gutierrez%20Juarez%20Eduardo_parte2.pdf (accessed on 20 De-cember 2022) Network review Best practices review
		2	Low	New visitors attracted to the sector in question.	
		3	Medium	Revitalisation of the zone, and new visitors are attracted to the sector in question.	
		4	High	Revitalisation of the zone, regeneration of the environs with green spaces, quality of life of the users improved, and new visitors attracted to the sector in question.	

Table 2. *Cont.*

Factor	Description	Intensity Range		Intensity Range Description	Data Acquisition
New jobs C_2	Takes into account the new jobs generated following on from the adaptive reuse	1	Very low	<1000 jobs generated	Field research Network review Best practices review
		2	Low	≥(greater than or equal to) 1000 jobs generated	
		3	Medium	≥(greater than or equal to) 2000 jobs generated	
		4	High	≥(greater than or equal to) 4000 jobs generated	
Economic growth in the zone C_3	Analyses the economic growth of the zone following on from the re-functionalisation	1	Very low	The amenity did not manage to generate any type of economic growth in the sector.	[40] https://www.informacion.es/opinion/2010/10/18/crecimiento-ciudad-7106518.html (accessed on 20 December 2022)
		2	Low	The amenity did not manage to generate neighbourhood growth in the zone, it was not the driving force for new buildings in the zone, and the economic growth is low.	
		3	Medium	The amenity generated medium-level of neighbourhood growth, it was the driving force for a few buildings in the surrounding area, and it generated medium-level of economic growth in the environs.	
		4	High	The entity generated neighbourhood growth, increase the real estate value of the zone, it was the driving force for other buildings, and it generated general economic growth in the environs.	
Urban planning factor = D					
Functional potential D_1	Presence of useful activities for development and regeneration	1	Very low	A single cultural activity; lack of public space; no complementary activities; building camouflaged by the urban fabric.	Field research Network review Best practices review
		2	Low	Cultural and social development activities; meeting point; lack of public spaces.	
		3	Medium	Social and cultural development activities; meeting point; landmark in the city; complementary green spaces.	
		4	High	Social and cultural development activities; meeting point; landmark in the city; complementary green spaces; complementary activities (hospitality and shops, etc.).	

Table 2. *Cont.*

Factor	Description	Intensity Range		Intensity Range Description	Data Acquisition
Architectural quality D_2	Considers the aesthetic quality of the project	1	Very low	Functional indoor spaces; poor upkeep of the industrial building; public spaces small/in poor repair.	Field research Network review Best practices review
		2	Low	Functional indoor spaces; poor conservation of the industrial building; quality of outdoor spaces.	
		3	Medium	Quality indoor spaces; partial conservation of the industrial building; quality of outdoor spaces; synergy with the built environment.	
		4	High	Quality indoor spaces; partial conservation and management of the industrial building; quality of outdoor spaces; synergy with the built environment.	
Space flexibility D_3	Readability of the building both from the perspective of its original function and from the point of view of the original structure.	1	Very low	Poor conservation of the original building; partial conservation of the structures; the original function cannot be made out; camouflaged industrial warehouses.	Field research Network review
		2	Low	Partial conservation of the original building; partial conservation of the structures; the original function cannot be made out; camouflaged industrial warehouses.	
		3	Medium	Conservation of the original building; partial conservation of the structures, but its original function can thus still be made out; heritage building housing new functions.	
		4	High	Conservation of the original building; conservation of the structures and smokestacks; industrial warehouses in clear sight; heritage building housing new functions.	
New buildings D_4	New volumes and structures introduced in the process to transform the industrial site.	1	Very low	New building representing $\geq$ (more than or equal to) 50% of the original building.	Field research Network review Best practices review
		2	Low	New building representing $\geq$ (more than or equal to) 30% of the original building.	
		3	Medium	New building representing $\geq$ (more than or equal to) 15% of the original building.	
		4	High	No areas attached to the original building.	

Table 2. *Cont.*

Factor	Description	Intensity Range		Intensity Range Description	Data Acquisition
Demolished buildings D_5	The number of buildings demolished to achieve the site conversion.	1	Very low	Demolition ≥ (greater than or equal to) 50% of the original building.	Field research Network review Best practices review
		2	Low	Demolition ≥ (greater than or equal to) 30% of the original building.	
		3	Medium	Demolition ≥ (greater than or equal to) 15% of the original building.	
		4	High	No areas demolished.	

3.2.1. Environmental Factor (A)

The first factor that we analysed within those selected as main factors influencing adaptive reuse was the Environmental factor (A), which refers to the effects of the transformation in terms of contamination and the consumption of natural resources and green areas [1].

There are two sub-factors within this factor:

Compatibility with the local context (A_1) assesses the environmental compatibility of the adaptation project of the building with the environs. The criterion refers to the opportunity to create synergies with the existing built environment. A scale with 4 values/intensities is proposed (see Table 2), taking into account the background review, field research and the study of best practices, where: high (A_1 = 4) respecting the environs refers to there being areas of the original building, in addition to the synergy with and scale of the surrounding area and green spaces that have been generated; medium (A_1 = 3) respecting the environs refers to there having been medium-sized areas added to the original building, which stand out in the surrounding area and the green spaces that have been created; low (A_1 = 2) refers to there being large areas that protrude from the original building, and green spaces that have been created; very low (A_1 = 1) refers to there being large volumes that protrude from the original building, and green spaces have not been generated (see Table 2). The result is: A_1 = 1; 2; 3; 4.

Quality of the landscape = A_2 takes into account the quality of the environs, the presence of parks and the proximity of the green areas [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the indicators set out in [38], where: high (A_2 = 4) $\geq$ (greater than or equal to) refers to there being 1 ha. of public space in a radius of 200 m; medium (A_2 = 3) $\geq$ (greater than or equal to) refers to there being 5000 m^2 of public space in a radius of 200 m; low (A_2 = 2) $\geq$ (greater than or equal to) refers to there being 1000 m^2 of public space in a radius of 200 m; very low (A_2 = 1) refers to there being <1000 m^2 (less than) of public space in a radius of 200 m (see Table 2), with the result being: A_2 = 1; 2; 3; 4.

3.2.2. Social Factor (B)

The second factor analysed is the Social Factor (B), which refers to the multifaceted consequences of the intervention in the population, taking into account the services for the residents, public security and social inclusion [1].

Sub-factor: Public space surface area = B_1. This quantifies the surface area as the public space compared to the built area [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the network review and the application of best practices, where: high (B_1 = 4) refers to there being outdoor public space surface area $\geq$ (greater than or equal to) the total built area; medium (B_1 = 3) refers to there being e outdoor public space surface area $\geq$ (greater than or equal to) 50% of the built area; low (B_1 = 2) refers to there being outdoor public space surface area $\geq$ (greater than or equal to) 10% of the built area; very low (B_1 = 1) refers to there being outdoor public space surface area $\leq$ (less than or equal to) 10% of the built area (see Table 2). The result is: B_1 = 1; 2; 3; 4.

Sub-factor: Appeal of the site = B_2 considers the presence of leisure activities that could help to attract local residents and visitors [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the network review and the application of best practices, where: high (B_2 = 4) refers to there being a diversity of uses and the prevalence of leisure and recreational activities (subsistence activities, hospitality and shops, etc.), a good relationship with the riverside and a public space that is suitable for outdoor activities; medium (B_2 = 3) refers to there being a diversity of uses and the prevalence of leisure and recreational activities and a public space that is suitable for outdoor activities; low (B_2 = 2) refers to it being limited to a single use and having a public space that is suitable for outdoor activities; very low (B_2 = 1) refers to the it being limited to a single use, lacking suitable public space, not offering complimentary service and having a poor relationship with the riverside. The result is: B_2 = 1; 2; 3; 4.

Sub-factor: Walkability = B_3. The function of this criterion is to establish the ability of the project to channel the flow of people [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the indicators set out in Arfa et al. [20] where: high (B_3 = 4) refers to there being a bus stop less than 300 m away, a tram stop less than 500 m away, a bike mobility network less than 300 m away and urban paths less than 300 m away; average (B_3 = 3) refers to there being a bus stop being 300 m away, a tram stop being 500 m away, a bike mobility network being 300 m away and urban paths being 300 m away; low (B_3 = 2) refers to there being a bus stop being 400 m away, a tram stop being 600 m away, a bike mobility network being 400 m away and urban paths being 400 m away; very low (B_3 = 1) refers to there being a bus stop at over 400 m away, a tram stop at over 600 m away, a bike mobility network at over 400 m away and urban paths at over 400 m away. The result is: B_3 = 1; 2; 3; 4.

3.2.3. Economic Factor (C)

The third factor analysed within this research is the Economic Factor (C). The economic factor proposed in the *Criteria of "Effectiveness" and Related Aspects in Adaptive Reuse Projects of Heritage Buildings* article [5] is taken into account to address this factor, as it adapts to the reality of the case studies selected for this paper.

Sub-factor: Number of activities = C_1 refers to obtaining greater economic value by means of different activities [20]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the parameters set out in the article [39] where: high (C_1 = 4) refers to there being a revitalisation of the zone, regeneration of the environs with green space, improved quality of life of the users, and appeal generated to attract new visitors to the sector in question; medium (C_1 = 3) refers to there being a revitalisation of the zone and appeal generated to attract new visitors to the sector in question; low (C_1 = 2) refers to there being appeal generated to attract new visitors to the sector in question; very low (C_1 = 1) refers to the sector not having been revitalised, where the amenity does not offer activities that attract new users to the sector (see Table 2). The result is: C_1 = 1; 2; 3; 4.

Sub-factor: New jobs = C_2 takes into account the new jobs generated from the adaptive reuse [5]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field research, the study of the best practices and the network review, where: high (C_2 = 4) $\geq$ (greater than or equal to) refers to 4000 jobs having been generated; medium (C_2 = 3) $\geq$ (greater than or equal to) refers to 2000 jobs having been generated; low (C_2 = 3) $\geq$ (greater than or equal to) refers to 1000 jobs having been generated; very low (C_2 = 1) refers to <1000 jobs having been generated. The result is: C_2 = 1; 2; 3; 4.

Sub-factor: Economic growth = C_3 analyses the economic growth of following the re-functionalisation [20]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the parameters set out in [40], where: high (C_3 = 4) refers to the amenity-generated neighbourhood growth, the increased real estate values in the zone, how much it was the driving force for other buildings and how much it generated general economic growth in its environs; medium (C_3 = 3) refers to the amenity-generated medium-level neighbourhood growth, how much it was the driving force for a few buildings in the surrounding area and how much it generated medium economic growth in the environs; low (C_3 = 2) refers to the amenity not managing to generate neighbourhood growth in the zone, it was not the driving force for new buildings in the zone and the economic growth was low; very low (C_3 = 1) refers to the amenity not managing to generate any type of economic growth in the sector. The result is: C_3 = 1; 2; 3; 4.

3.2.4. Urban Planning Factor (D)

The fourth factor analysed in this research is the Urban planning factor (D). It refers to the urban planning aspects that take into account the cultural heritage and the urban structure, along with the accessibility and mobility parameters [1].

Sub-factor: Functional Potential = D_1 refers to the presence of useful activities to develop the district and regenerate the city [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field work, the study of the best practices and the network review, where: high (D_1 = 4) refers to there being social and cultural development activities, meeting points, landmarks in the city, complementary green spaces and complementary activities (hospitality and shops, etc.); medium (D_1 = 3) refers to there being social and cultural development activities, meeting points, landmarks in the city and complementary green spaces; low (D_1 = 2) refers to there being cultural and social development activities, meeting points and a lack of public spaces; very low (D_1 = 1) refers to there being a single cultural activity, a lack of public space and no complementary activities, with the building being camouflaged in the urban fabric. The result is: D_1 = 1; 2; 3; 4.

Sub-factor: Architecture quality = D_2 considers the aesthetic quality of the project [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field work, the study of the best practices and the network review, where: high (D_2 = 4) refers to there being quality indoor spaces, the partial conservation and management of the industrial building, high-quality outdoor spaces and synergy with the built environment; medium (D_2 = 3) refers to there being high-quality indoor spaces, partial conservation of the industrial building, high-quality outdoor spaces and synergy with the built environment; low (D_2 = 2) refers to there being functional indoor spaces, poor conservation of the industrial building high-quality of outdoor spaces; very low (D_2 = 1) refers to there being functional indoor spaces, poor upkeep of the industrial building and public spaces being small or in poor repair. The result is: D_2 = 1; 2; 3; 4.

Sub-factor: Space flexibility= D_3 takes into account the possibility of maintaining the readability of the building both from the perspective of its original function and from the point of view of the original structure [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field work, the study of the best practices and the network review, where: high (D_3 = 4) refers to there being conservation of the original building, conservation of the structures and smokestacks, industrial warehouses in clear sight and the heritage building housing new functions; medium (D_3 = 3) refers to there being conservation of the original building, partial conservation of the structures, but its original function can thus still be made out and the heritage building housing new functions; low (D_3 = 2) refers to there being partial conservation of the original building, partial conservation of the structures, the original function cannot be made out and the industrial warehouses are camouflaged; very low (D_3 = 1) refers to there being poor conservation of the original building, partial conservation of the structures, the original function cannot be made out and the industrial warehouses are camouflaged. The result is: D_3 = 1; 2; 3; 4.

Sub-factor: New buildings = D_4 includes the number of new volumes and structures introduced in the process to transform the industrial site [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field work, the study of the best practices and the network review, where: high (D_4 = 4) refers to there being no areas attached to the original building; medium (D_4 = 3) refers to there being new building replacing $\geq$ (greater than or equal to) 15% of the original building; low (D_4 = 2) refers to there being new building replacing $\geq$ (greater than or equal to) 30% of the original building; very low (D_4 = 1) refers to there being new building replacing $\geq$ (greater than or equal to) 50% of the original building (see Table 2). The result is: D_4 = 1; 2; 3; 4.

Sub-factor: Demolished buildings = D_5 refers to the number of buildings demolished to achieve the site conversion [1]. A scale with 4 direct rating values/intensities is proposed (see Table 2), taking into account the field work, the study of the best practices and the network review, where: high (D_5 = 4) refers to no areas having been demolished; medium (D_5 = 3) refers to demolition $\geq$ (greater than or equal to) 15% of the original building; low (D_5 = 2) refers to demolition $\geq$ (greater than or equal to) 30% of the original building; very low (D_5 = 1) refers to demolition $\geq$ (greater than or equal to) 50% of the original building. The result is: D_5 = 1; 2; 3; 4.

4. Application of the Methodology to Two Case Studies Results

The methodology was applied using empirical data. Two case studies were selected in different countries, with different implementations and degrees of intervention. Apart from (i) highlighting the power plant industrial typology in the current context, the application sought to (ii) conduct a comparison between both of the case studies, (iii) consider the possibility of studying their evolution, and (iv) offer a user-friendly methodology for the different agents involved.

The two case studies selected (see Table 1) are the Tate Modern, the former Bankside Power Station, which is located in London and was built in 1952 and re-functionalised in 2001, while the other one is the Usina del Arte, the former Don Pedro de Mendoza Power Plant, which is located in the city of Buenos Aires and was built in 1916 and re-functionalised in 2011 (see Figure 2).

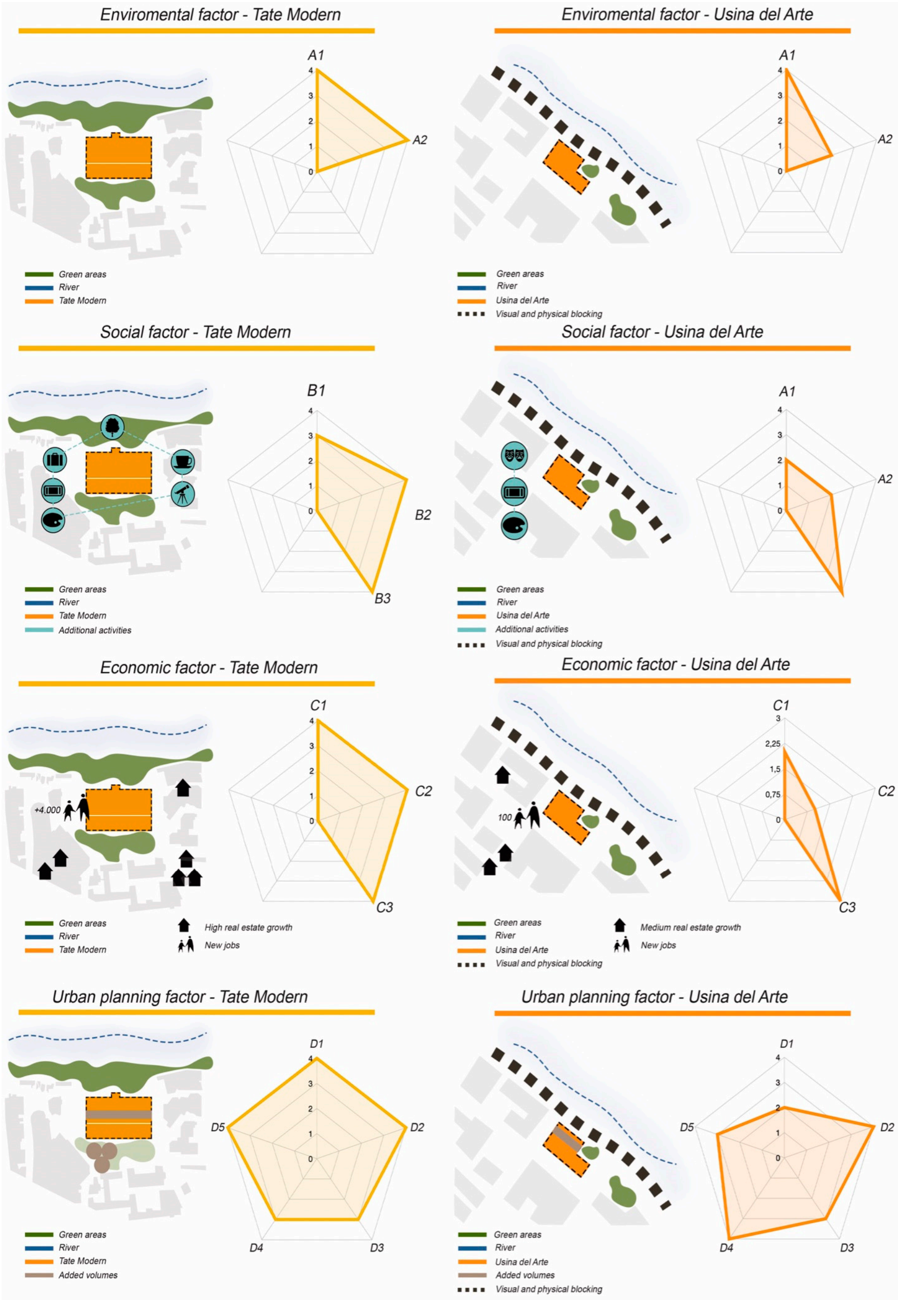


Figure 2. Results of applying the methodology. Source: own compilation.

4.1. Environmental Factzor (A)

A_1 Compatibility with the local context

Tate Modern: The strategy used by the architects Herzog and de Meuron (2001) was based on integrating the building in the urban fabric. They, therefore, designed a large green space that structured the industrial building according to the rest of the city and, above all, the riverside [41], where: $\mathbf{A_1 = 4}$.

Usina del Arte: The focus for the current Usina del Arte, unlike the previous case study, was to strive to recreate the original building exactly. Nearly two years were spent solely working on the façades to produce the original aspect of the bricks, carpentry and even the mouldings. The restoration process was important in this case. During the third stage of the re-functionalisation, a square was added to the Usina del Arte, which is located near to the building, where outdoor music concerts are held [42], where: $\mathbf{A_1 = 4}$.

A_2 Quality of the landscape

Tate Modern: The Tate Modern has the Tate Modern Gardens nearby, with a surface area of approximately of 26,441 m^2 of habitable public space, and taking into account the factors analysed on the value scale, it corresponds to $\geq$ (greater than or equal to) 1 ha. of public space in a radius of 200 m, $\mathbf{A}_2 = \mathbf{4}$.

Usina del Arte: The Usina del Arte has the Plaza del Arte (Art Square) within a 5 m radius, with a surface area of roughly 2500 m^2, and taking into account it corresponds to $\geq$(greater than or equal to) 1000 m^2 of public space in a radius of 200 m, $\mathbf{A}_2 = \mathbf{2}$.

4.2. Social Factor (B)

B_1 Public space surface area

Tate Modern: The Tate Modern Gardens have a surface area of approximately 26,441 m^2, which falls in the range of outdoor public space surface area $\geq$ (greater than or equal to) 50% of the built surface, corresponding to roughly 34,000 m^2; this sub-factor thus has a value/intensity of $\mathbf{B_1 = 3}$.

Usina del Arte: The last stage of the project was the Plaza de las Artes, an outdoor square, where the activities include concerts. It has a surface area of 2500 m^2, which falls in the range of outdoor public space surface area $\geq$ (greater than or equal to) 10% of the built surface, but it is lower than 50%, corresponding to roughly 15,000 m^2 [43]; this sub-factor thus having a value/intensity of $\mathbf{B_1 = 2}$.

B_2 appeal of the place

Tate Modern: Based on the proposed value scale, the Tate Modern in this sub-factor would have a value/intensity scale of $\mathbf{B_2 = 4}$ as it has a diversity of uses, a prevalence of leisure and recreational activities (subsistence activities, hospitality and shops, etc.), a good relationship with the riverside and a public space that is suitable for outdoor activities.

Usina del Arte: Taking the proposed value scale into account, it has a diversity of uses, a prevalence of leisure and recreational activities and a public space that is suitable for outdoor activities. For the reasons analysed in this section, it is equivalent to a medium value/intensity range of $\mathbf{B_2} = \mathbf{3}$, as it does not contain additional services other than the main ones, and it does not have a large public space of a high spatial quality. (See Table 2).

B_3 Walkability

Tate Modern: The zone where the Tate Modern is located has very good transport links with the rest of the city (see Figure 1). Taking into account the indicators analysed, it has an underground station that is less than 300 m away, more than four bus lines, clear immediate pedestrian and private vehicle access, and there are four airports at a considerable distance away, and so, $\mathbf{B_3 = 4}$.

Usina del Arte: In the case of the Usina del Arte, the nearest train station is over 2 km from the amenity (see Figure 1). However, it has a bus stop that is in close proximity. Based on a perimeter study of the building using street view tools, the amenity can be seen to have good perimeter pedestrian paths, and so, $\mathbf{B_3 = 4}$.

4.3. Economic Factor (C)

C_1 Number of activities

Tate Modern: The authors of [44] point out that there have been changes in the zone since Bankside was converted into the Tate Modern. The project revitalised the area, and it was once again one of the busiest in the city [45–47].

As the intervention has generated cultural and social development activities, and meeting points (see Figure 2), it is a landmark within the city, and it generates complementary green spaces and complementary activities (hospitality and shops, etc.), it is considered to have a high value/intensity, where $\mathbf{C_1 = 4}$.

Usina del Arte: In the case of the re-functionalisation of the Usina del Arte, it became the official home of the city's Philharmonic Orchestra, which did not exist prior to the process, to give the building new functions [48]. The greatest contribution of the Usina del Arte is now to provide a space that is wholly for cultural use [49–51]. In this case, it is allocated $\mathbf{C_1 = 2}$, as its re-functionalisation did not lead to any revitalisation of the zone, even though it did attract new visitors to the sector in question.

C_2 New jobs

Tate Modern: As we learned, the Tate Modern generated over 4000 jobs, and so, $\mathbf{C_2 = 4}$.

Usina del Arte: The Usina del Arte has provided between 100 and 200 new jobs since its re-functionalisation [52], and so, $\mathbf{C_2 = 1}$.

C_3 Economic growth in the zone

Tate Modern: As a study conducted by Mckinsey and company revealed, the number of hotel businesses in the area of the Tate Modern increased by 23% between 1997 and 2000, generating 1800 jobs in the area.

The Tate Modern had a great economic impact on the zone, as the properties increased in value from its re-functionalisation. Surveys have shown that 26% of the people interviewed relate the area with the art gallery [44], and so, $\mathbf{C_3 = 4}$.

Usina del Arte: The amenity generated some neighbourhood growth, was the driving force for a few buildings in the surrounding area and generated some economic growth in the environs, and so, $\mathbf{C_3 = 3}$.

4.4. Urban Planning Factor (D)

D_1 Functional potential

Tate Modern: The authors of [44] point out that there have been changes in the zone since Bankside was converted to Tate Modern. The project revitalised the area and it returned to being one of the busiest in the city [45–47].

As the intervention has generated cultural and social development activities and meeting points, it is a landmark within the city, and it generates complementary green spaces and complementary activities (hospitality and shops, etc.), it is considered to have a high value/intensity, where $\mathbf{D_1 = 4}$.

Usina del Arte: In the case of the re-functionalisation of the Usina del Arte, it became the official home of the city's Philharmonic Orchestra, which did not exist prior to the process to give the building new functions [42,50]. Taking into account the social and cultural activities, meeting point, and lack of public spaces generated by the re-functionalisation of the Usina del Arte, it has a low value/intensity in this case, with $\mathbf{D_1 = 2}$.

D_2 Architectural quality

Tate Modern: From a spatial perspective, they decided to keep the original building, including most of the roof, thus creating an area that is free of unnecessary elements. They decided to use industrial material inside, and thus, avoided the dichotomy of architecture from two time periods [47].

The intervention of the Tate Modern was approached from an integrative manner, which was in keeping with the growing trend in other factories around the world being turned into museums, when the industrial character was retained in a sophisticated building [44]. Taking into account the outstanding characteristics in this section, the Tate Modern has high-quality indoor and outdoor spaces, the conservation and management of the original building has been conducted, and it has synergy with the built environment. In this case, the value/intensity is high, and so, $\mathbf{D_2 = 4}$.

Usina del Arte: The goal of the re-functionalisation of the Usina del Arte was to reconstruct the original building exactly as it was.

At the time of the intervention, the brick building of the former power plant had fallen into disrepair due to lack of maintenance, and it was made up of a set of empty structures [43].

Sierna [42] describes it as an artistic giant that has turned La Boca neighbourhood into one of the most important and vibrant cultural hubs, not only of Argentina, but of the whole of Latin America.

Nearly two years were spent only working on the façades to produce the original aspect of the bricks, carpentry and even the mouldings. The restoration process was important in this case [42]

High-quality indoor spaces, the conservation and management of the industrial building, high-quality spaces and synergy with the built environment can be observed in this case study. Its value/intensity is therefore high, and so, $\mathbf{D_2 = 4}$.

D_3 Space flexibility

Tate Modern: In the case of the Tate Modern, the great halls of the power plant allowed the layout to be very flexible, as they were large, roomy spaces, as described by Capel [11]. With respect to the original structure, only the metal gantries with the original cranes were kept to move the works of art inside the halls, as the goal was to keep the original spatial distribution [41]. On this point, the industrial atmosphere is perfectly clear upon entering the building. The materials in the industrial halls are very easy to see even with their new function, and great respect was shown to the original building.

In the case of the Tate Modern, the conservation of the original building and the partial conservation of the structures can be seen, but its original function is still clear, and it is a historical building with new uses. Its value/intensity is at the medium level, and so, $\mathbf{D_3 = 3}$.

Usina del Arte: As mentioned in the previous sub-factors, the goal was always to completely rebuild the original building. The current Usina del Arte is, thus, exactly the building that was designed by Choigna in 1914. The reinforced concrete structures at the entrance to the exhibition room were demolished and replaced with main stairs. The metal roofs were also completely removed and strengthened by relocating the existing metal trusses in order to support a roof on both of the halls and ensure better acoustics for its new use. Metal frames were also used for all of the structures, and reinforced concrete was used for all of the rooms and staircases [53].

Given the proposed value scale, there is the conservation of the original building, and the partial conservation of the structures can be seen in this case, but its original function is still clear, and it is a historical building with new uses. Its value/intensity is at the medium level, and so, $\mathbf{D_3} = \mathbf{3}$.

D_4 New buildings

Tate Modern: The added area in the case of the Tate Modern, known as the Switch House, represents 60% of the space of the original building [46]. It is therefore a new building representing $\geq$ (greater than or equal to) 50% of the original building, and so, $\mathbf{D_4 = 1}$.

Usina del Arte: The Usina del Arte does not have areas that have been attached to the original building, and so, $\mathbf{D_4 = 4}$.

D_5 Demolished buildings

Tate Modern: Given that no area was demolished for the re-functionalisation, the value/intensity is high, and so, $\mathbf{D_5 = 4}$.

Usina del Arte: In regard to this sub-factor, even though no building was demolished, we did find that structures and smokestacks were demolished [43]. The value/intensity is therefore at the medium level, and so, $\mathbf{D_5 = 3}$.

5. Discussion

The adaptive reuse of heritage buildings is a challenging process since there are many factors that must be concerned in an integrated approach [14]. As Gravagnuolo [24] affirms, the adaptive reuse of cultural heritage and its landscapes satisfies the cultural, economic, and social sustainability requirements in tandem: (1) it safeguards important elements of our cultural heritage and identity; (2) it creates jobs and income, and it attracts new investments, attracts creative and innovative start-ups and boosts tourism; (3) it enhances the sense of pride and the engagement of the local community; (4) it reduces the depletion of raw materials, and it lowers waste and landfill environmental footprint.

Industrial buildings related to water, such as port buildings, gasworks, or as in this case, power plants, have an added value to the landscape. They are industries that have had a direct relationship with water throughout history, and it is not by chance that they are located on the riversides [18]. The adaptive reuse of these waterfront buildings should be a key resource for promoting the recovery of the riverside landscape, providing high-quality outdoor spaces and allowing a regeneration of the relationship between the shoreline, the building and the city. In the configuration of urban waterfronts, social, economic and cultural processes converge that benefit cities. Over the past few decades, planners, developers and residents have stressed the need to improve the urban habitat through the restoration of coastal spaces based on natural processes and sustainable technologies [19].

The results obtained after applying the proposed methodology to assess the architectural and urbanistic impact of the adaptive reuse of the two power plants support the importance of the project strategies and the conservation of the building, as well as the landscape and public spaces for the social acceptance of these interventions. As it can be seen from the graphs showing the obtained results (see Table 3), the environmental factor performed very well in both of the re-functionalisation projects in the industrial power plants, as they both show synergy with the environs, and both of the projects have large public space areas in a radius of 200 m, as per the highlighted parameters [38]. It should also be noted that Case Study No. 1, the **Tate Modern**, has a high landscape value, which was generated through the direct connection between the riverside and the public space, unlike Case Study No. 2, **Usina del Arte**, where there is no connection with the riverside due to the motorway that has been built along the coast. (See Figure 2)

With respect to the social factor, a better performance can be seen in Case Study No. 1, the **Tate Modern**, as it has large outdoor public spaces and a direct connection with the natural environment (see Figure 2), while there is a lack of proposed public space in Case Study No. 2, **Usina del Arte**. There is also a difference in the appeal of the site sub-factor, as the **Tate Modern** has a greater number of functions inside than Case Study No. 2 does. Regarding the walkability sub-factor, both of the case studies have good accessibility and means of transport near to the amenity.

As far as the economic factor is concerned, Case Study No. 1, the **Tate Modern**, generated more new jobs through the re-functionalisation than Case Study No. 2, **Usina del Arte**, did, and it achieved great real estate growth in the zone, a factor that could not be seen in Case Study No. 2.

With respect to the urban planning factor, we can also find differences between both of the case studies. In regard to the functional potential and services, the **Tate Modern** has more tourist appeal functions than the **Usina del Arte does**, and the latter again does not have a high-quality outdoor public space. The architecture quality was found to be high in both of the case studies, as the building and original functions are visible, and the proposed value scale fosters the optimum use of the original building. It should also be noted that Case Study No. 1, the **Tate Modern**, is considered to be a signature example of architecture, and it is therefore a tourist attraction in its own right.

Table 3. Results of applying the methodology. Source: own compilation.

Factor	**Value/Intensity**	
Environmental factor (A)		
Sub-factor	Tate Modern	Usina del Arte
Compatibility with the local context A_1	$\mathbf{A_1 = 4}$	$\mathbf{A_1 = 4}$
Quality of the landscape A_2	$\mathbf{A_2 = 4}$	$\mathbf{A_2 = 2}$
Social factor (B)		
Public space surface area B_1	$\mathbf{B_1 = 3}$	$\mathbf{B_1 = 2}$
Appeal of the place B_2	$\mathbf{B_2 = 4}$	$\mathbf{B_2 = 2}$
Walkability B_3	$\mathbf{B_3 = 4}$	$\mathbf{B_3 = 4}$
Economic factor (C)		
Number of activities C_1	$\mathbf{C_1 = 4}$	$\mathbf{C_1 = 2}$
New jobs C_2	$\mathbf{C_2 = 4}$	$\mathbf{C_2 = 1}$
Economic growth in the zone C_3	$\mathbf{C_3 = 4}$	$\mathbf{C_3 = 3}$
Urban planning factor (D)		
Functional potential D_1	$\mathbf{D_1 = 4}$	$\mathbf{D_1 = 2}$
Architecture quality D_2	$\mathbf{D_2 = 4}$	$\mathbf{D_2 = 4}$
Space flexibility D_3	$\mathbf{D_3 = 3}$	$\mathbf{D_3 = 3}$
New buildings	$\mathbf{D_4 = 3}$	$\mathbf{D_4 = 4}$
Demolished buildings	$\mathbf{D_5 = 4}$	$\mathbf{D_5 = 3}$

With respect to new buildings and demolished buildings, it should be noted that the original building was kept in both of the cases. There were differences in that regard as the **Tate Modern** included new volumes, while the Usina del Arte did not. However, Case Study No. 2 does not have the unique architectural elements of the original function, such as smokestacks, while Case Study No. 1 does, and these reference the original function.

Both of the case studies function within the context for which they were designed and currently provide a leisure and cultural amenity for residents and visitors. Likewise, the results of the research show how the action to recover the landscape and its relationship with the building directly influence the quality of the intervention, as well as the attractiveness and acceptance of the place as a space, which is used for social interaction. As Gehl [30] states, the higher the quality of a public space is, the more diverse the urban life is. In this sense, the improvement of the landscape environment (A_2) not only attracts (B_2) different activities (C_1), investors and users, thereby increasing the number of new jobs (C_2) and its functional potential (D_1), and therefore, influencing the economic growth of the area (C_3), but it also improves its quality as a liveable space within the city.

This is clearly the case at the Tate Modern, even though its adaptive reuse was originally focused on culture to generate money for the global economy, and there are more for visitors than there are residents who use the building every day. The renovation of public spaces through the recovery of its natural landscape has also attracted a large number of inhabitants, furthering not only the economic resurgence of the place, but also its transformation into a space for coexistence and social gathering.

Paradoxically, although the Usina's adaptive reuse clearly established a set of eminently local uses within its adaptive reuse program, the permanence of the physical barrier that separates the building from the riverside has made the place less attractive as a meeting space for its inhabitants and, in turn, the persistence of the same original landscape has prevented the emergence of new uses in its surrounding environment.

6. Conclusions

This research paper seeks, on the one hand, to assess and enhance riverside power plants in the context of the contemporary city, by means of employing a methodology that is capable of allowing us to perform a direct analysis of a complex reality, facilitating its application to a large number of stakeholders involved, enabling a comparison between the cases and their evolution over time, as the value scale quantifies the building performance in relation to the environment.

On the other hand, this research seeks to encourage the adaptive reuse of industrial buildings, taking into account that this concept fosters sustainable construction, gives life and new uses to buildings that had a specific function, which is the outcome of the advancement of society and cities and is a necessary act. Granting a new use to a heritage building, without losing the original architectural quality or the original function from the site, is an example of what can be achieved without losing their history and giving a future to their past, even though cities and societies change over time.

The adaptive reuse of industrial buildings allows the environmental impact of new works to be reduced, provides new uses, drives urban and social growth and conserves the heritage, as most of those buildings are from an era when they played a key role in mass production, and they offer great flexibility due to the range of building typologies.

The application of the proposed methodology, in this case to re-functionalised riverside power plants, allowed us to perform a comparison between the cases, which lead to better knowledge transfer.

Throughout this case study, which has focused on two power plants, we could determine that the success of re-functionalised industrial buildings is directly proportional to the project strategies, the conservation of the building and the quality of the landscape. Consequently, this research finds from the previously analysed background that alongside the architectural dimension of adaptive reuse, the urban environment is crucial in those investments. Therefore, it is fundamental to take those factors into account, particularly in the case of riverside buildings, as waterfronts are iconic in city landscapes. The adaptive reuse of these waterfront buildings should be a key resource for promoting the recovery of the riverside landscape. At the same time, the importance of the connectivity of those buildings with the immediate surroundings is also reflected, as the values/intensities are proportional to the effectiveness of that connection. That involves the use of transport to reach the amenity, the distances between them, pedestrian circuits and the state of the infrastructure.

Another important aspect highlighted by the research is the importance of conserving the original building, as the values/intensities incentivise its better conservation, where the original function can be seen. In regard to the attachment of areas, the fact is that they have been designed in synergy with the original building and with the built environment, without hiding the original buildings. The pure and clean use of the original building in question is once again encouraged. The case studies have successfully shown clear interior flow routes, with an emphasis on the main entrance and accessibility from the public space.

As Misirlisoy and Gunce [14] describe, heritage buildings are crucial in terms of transferring the cultural identity for subsequent generations. It is inevitable that the adaptive reuse of industrial buildings is increasingly being used as it is a necessary process.

This research allows the assessment of adaptive reuse projects in industrial buildings based on determinants that can be applied to already consolidated buildings to check their suitability or to preliminary adaptive reuse designs for industrial buildings in order to thus be able to evaluate their functionality. The same methodology can be used to monitor the evolution of those projects, as the factors can be adapted or modified over time.

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