

THE CHALLENGE OF ADAPTIVE REUSE TOWARDS THE SUSTAINABILITY OF HERITAGE BUILDINGS

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Abstract

Stamps of many civilizations, Tlemcen city (Algeria) contains today pre-eminent historical vestiges, some of which are obsolete, require a reshuffle, in order to be updated on the new destinations. Undoubtedly, the decision to reuse heritage buildings depends mainly on their sustainability; it includes the compatibility of the new use with the valences of the heritage buildings and its territory. To explore how adaptive reuse can lead heritage legacy into the sustainability process, this article aims to provide a comprehensive review of the criteria influencing the decision to adopt a strategy for sustainable adaptive reuse of historic buildings. In order to understand the ins and outs of historical monuments sustainability, a qualitative approach is implemented based on the methodological triangulation which interactive complementarity between the three instruments of investigation; 80 semi-structured interviews were conducted with specialists, managers and residents of the city of Tlemcen to examine their current understanding of the sustainability issues associated with the adaptive reuse of heritage buildings, historical documents analysis which aims to determine the intervention frameworks towards to heritage values and finally the construction of an evaluation grid of the degree of durability. The subsequent data show that, despite the set of opportunities offered by the adaptive reuse of the monument in terms of sustainability, there are gaps that prevent coordination between sustainable development principles and this process, requiring updating the overall system through continuous assessment to achieve sustainable adaptive reuse. This work identifies the strengths and weaknesses of sustainable adaptive reuse in the city of Tlemcen. It presents a directive evaluation model for future similar projects, which can be applied in other regions of the world by adapting sustainability criteria according to time and space.

Keywords: Heritage buildings; Adaptive reuse; Sustainability; Assessment; Tlemcen (Algeria)

Introduction

The actions taking charge of the architectural heritage [1] are multiplying, mainly according to its container [2]. Of all these, only the adaptive reuse which has become the commonplace allows a new life to the building through the compatibility between the building's future and the insertion of program [3-6]. The reconversion of a monument is recommended if the new use allows the enhancement of the architecture of the place [2], as it influences each other. In fact, the architectural character of the building that seeks the maintain of the building's authenticity, takes precedence over the type of use [7, 8]. However, if architectural reuse targets urban regeneration and sustainability [8, 9], it would be an effective strategy to ensure the sustainability of historic buildings and encourage urban revitalization of the city [7, 10]. However, the decision concerning the reuse of historic monuments stills a complex decision; it

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can cause many conflicts [11]. It depends mainly on the evaluation of their sustainability, which accords with the criteria of sustainable development [13, 14]. The living factors of the architectural monument change over time, which directly affects its degree of sustainability [15], referring to a continuous evaluation.

To explore how adaptive reuse can lead heritage legacy into the sustainability process, this article aims to provide a comprehensive review of sustainability criteria. This research work is projected on Tlemcen city, a case that has never been treated on this axis. It is based on a qualitative investigation, implemented thanks to the method of triangulation which allowed a constant interaction between the results of; the semi-directive interview, the analysis of historical documents and the construction of a sustainability rating grid. And this, through criteria related to society, economy, environment, governance, in fine to the form and function of the historic building.

Adaptive Reuse, Dynamic and Alternative Process

The patrimonial conceptions constituting the living memory of humanity, symbolizing a multitude of civilizations in nowadays [2]. That's why, Françoise Choay insists on the relativity between the monument and its action on the individual's memory, in such a way as to emphasize the presence of the recovered past, in order to maintain and preserve the identity of a community [16]. The old building seduces increasingly the thinkers of the city, it presents more interests than those of today [5], each having different conditions and problems [8], the historic building's type of care is necessary for each historic property [17]; hence the plurality of interventions [1]. Besides restoration, these interventions fall into three categories according to [4]: renovation and reuse. However, adaptive reuse is the most requested action in the architectural heritage management. Interpreted as conversion, adaptation, restoration, rehabilitation and others [10], it is the best solution that provides the historic building's functional life that prevents its degradation [2, 5, 6, 17,], through improvement and conversion alliance [7]. It brings to the existing structure a new use [10] that is supposed to manipulate its soul [18]. The compatibility between that new function and the existing form is necessary [5]. However, it can only be succeeded if it respects the authenticity of the existing building [6, 10], it adds a contemporary touch to the heritage building without destroying its historic character [7, 18]. The major advantage of reuse is the transmission of old installations with contemporary performance [19]. It is therefore the most advantageous of the management actions. It constitutes a research avenue that is constantly evolving in the world of promoting architectural and urban heritage.

Device for adaptive reuse through sustainability

The adaptive reuse of a heritage building is a complex process [9, 11]. According to Misirlisory and Gunçe, the reuse requires not only the building's recycling, but a meticulous planning, taking into account all factors in this decision-making process to find the most appropriate function for the building and its environment [8]. This would be the best way to increase the most valuable community resources, reduce land acquisition and construction costs, revitalize existing neighborhoods and help control urban sprawl [2, 7]. Cooper suggests that the results of the adaptive reuse requires the challenges of; materials and resources efficiency (environmental sustainability), cost savings (economic viability) and retention (social sustainability) [19]; must therefore be a major driver of sustainable development [20]. The challenge of adaptive reuse lies in adapting the function within the historic building's structure to ensure sustainable development. That new use must ensure economic efficiency, integration of the building into its environment and societal aspirations. As a result, it becomes a strategy to ensure the sustainability of historic buildings and revitalize the city [7, 10, 19, 21]. Sustainability integrates economic and socio-cultural environmental objectives [20, 15] and meets the needs of different places and cultures [22]. Eventually, a close relationship is

established between conversion and sustainability. The first one interprets the building as a whole. The second interprets a combination of assessment and sustainable development [9, 13, 14]. Adaptive reuse recycles the building in order to achieve sustainability, while the latter requires a set of criteria that are supposed to be met when the sustainable adaptation project is carried out. In this context, sustainable adaptation demands the flexibility to change buildings and reuse them again [10]. It must be based on an analytical method [8] in order to meet the demands of time [8]. In other words, adaptation can only be sustainable if it meets all sustainability criteria. Only these criteria are not stable, requiring continuous evaluation to improve the adaptive reuse project. In this research, a set of criteria appear in the literature. They are presented in the physical character of the building (Form), the new use (Function), the interaction of the project with society (Society), its influence on the economic aspect (Economy), its integration into its environment (Environment) as well as the overall decision-making management of the project (Governance). See figure 1.

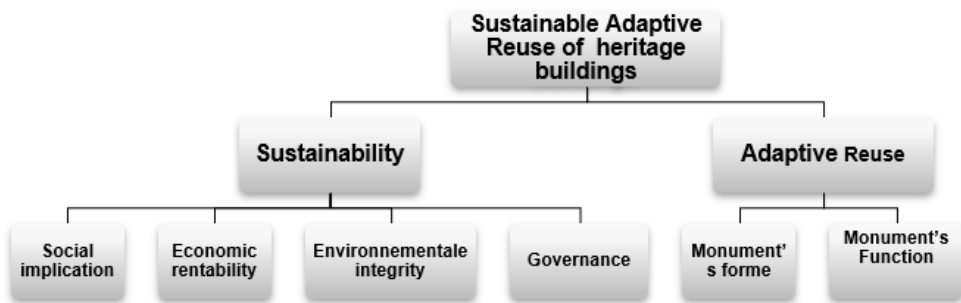


Fig. 1. Concepts and Dimensions of sustainable adaptive reuse of heritage buildings (Source: Author)

Assessment of the sustainability of the monument, tools and perspectives

Although the benefits of adaptive reuse are now being proven, owners and practitioners lack the support to justify and evaluate the decision to reuse existing assets [5], which constantly questions their sustainability, whose impact is increasingly necessary to achieve sustainability. However, this is a new and evolving concept, and there are very few examples of effective sustainability assessment processes implemented around the world [14]; indeed, until now there has not been a universal sustainability assessment model that can be applied in world-wide. Pope et al. [13] referred in his research on the conceptualization of sustainability assessment, the two parent approaches that constitute forms of assessment, they are presented in the Environmental Impact Assessment (EIA) that is affiliated with the first generation in the United States, after which it appeared the Strategic Environmental Assessment (SEA) used in Europe for the evaluation of policies, plans and programs (PPP). Both approaches integrate social, economic and environmental considerations, seeking to achieve the Triple Bottom Line (TBL) or more or less minimize unsustainability. Sharifi and Murayama in their work on comparing neighbourhood sustainability assessment tools, it concluded that these tools do not adequately cover the unbalanced aspects of sustainability. And only the tools integrated into the planning of the city concerned are applied correctly [13]. Currently, a multitude of research on the sustainability of converted monuments is adopting qualitative methods, studies carried out by many researchers, for exemple; Bullen, Elsorady, Ijla and Broström, Mısırlısoy and Gunce, confirm that the interview is the main mechanism for data collection. The latter is an effective tool for learning about issues that cannot be directly observed [23], as is the case for sustainability criteria. However, before talking about the sustainability of buildings, it is important to ensure the heritage value, which should precede any conservation or restoration

decision [25]. For this reason, interviews in studies on the sustainability of converted monuments are usually combined with documentary analysis or in-situ observation.

This research aims to contribute to the sustainable adaptation of historic buildings, drawing on the work already done on this subject. This document provides a model for a comprehensive review of sustainability criteria in an adaptive reuse project in order to contribute to the continuous improvement of the historic buildings condition through the scientific projection on the case study of Tlemcen city.

Presentation of the Case Study "Tlemcen City"

Its strategic location within the Mediterranean countries and the African continent enabled Tlemcen to become the capital of the central Maghreb during the Zianid era. This city presents a rich civilizational stratification of which it conceals until today predominant historical vestiges. It has been designated by ISESCO (Islamic Educational, Scientific and Cultural Organization) as the "Capital of Islamic Culture for 2011". Thanks to this event, many projects for the restoration and rehabilitation of cultural heritage have been launched [26]. Indeed, a good number of historic buildings have been highlighted, some of which still retain their primary functions at a time when others have simply become obsolete: a state of affairs that has dedicated them to new destinations. This event allowed them to come back to life, they were the subject of an adaptive reuse, almost all of which is currently devoted to the "Museum" function.

These historic buildings, which are the subject of this research, are mainly located in the heart of the city's historic center and derive from different historical periods (Zianid, Merinid, and French) [27]. These monuments refer to a varied typology of mosques, medersas, royal palaces and town halls. Indeed, many studies have been carried out on Tlemcen city, especially after the major transformation phase underwent with the event. Only the sustainability subject of converted monuments has never been addressed in this city. Occasion to conduct this work to contribute to the progress in the intervention process on these overriding legacies.

Research methodology

Data Collection

In a need to understand the ins and outs of the sustainability of historic buildings reused in the city of Tlemcen (Algeria) in an adaptive reuse project and to draw a comprehensive review of the sustainability degree of this heritage represented by some criteria influencing the decision of adopting a strategy for sustainable adaptive reuse of historic buildings, a qualitative approach is implemented, relying on the methodological triangulation that is used to combine the benefits of several investigative instruments that must interact with each other in order to get the best out of each and give a more concrete result [28]. Three investigative instruments are chosen for this research, with regard to:

Semi-Structured Interviews

The interview aims to examine the current understanding of sustainability issues associated with adaptive reuse. It was chosen as the main data collection mechanism because it is an effective tool for learning about issues that cannot be directly observed [23].

Eighty interviews were conducted with various stakeholders (obtained as a result of the Cochran formula), including city specialists, managers and citizens. The interviewees were chosen for their ability to contribute to this study through their explicit knowledge and their experiences towards the historic buildings reuse in Tlemcen city. The non-probability quota sampling calculated is as follows:

The sample (n) is taken according to the *Cochran formula* [24]:

$$n = t^2 \cdot (p)(1-p)/d^2,$$

where: t - confidence level according to the normal law for a 95% confidence level 95%, $t = 1.96$; p - estimated proportion of the population (when unknown $p = 0.5$); d - margin of error tolerated in this case, $d = 11\%$ ($n = (1.96)^2 \cdot 0.5 \cdot (1-0.5) / (0.11)^2 \approx 80$).

The samples are defined as follows: 40 specialists, 20 managers, 20 citizens. A size equal to the number of points of view if the objective is to know the various opinions on a given project [29]. In choosing to establish a semi-directive interview [29], main questions are asked about the relationship of adaptive reuse with the sustainability of historic buildings and other secondary questions that concern the dimensions previously defined in the literature review. The interviewees' words are analysed according to dimensions, they are selected to provide the indicators belonging to each dimension of sustainability and then, they are implemented in order to find the assessment for each indicator in the evaluation grid.

Documentary analysis

The research began with a literature review to evaluate sustainable reuse performance that determines the frameworks of intervention relative to heritage values. This documentary analysis using the various plans, photos and diagnostic report allowed the discernment of the adaptive reuse contributions about the historic building, the permitted modifications of the physical characteristics and site modifications.

The Evaluation Grid

The evaluation grid is a questioning and analysis tool designed to highlight the strengths and weaknesses of a project in terms of sustainable development criteria [13]. Using a collection of questions, the grid makes it possible to qualify a project via a multicriteria analysis; the reading "sustainable development" results from the meeting of a list of criteria to be reviewed and a scale of appreciation. The evaluation grid consists of:

- **The scale of appreciation:** It allows estimating the state of the criterion in the project of adaptive reuse of the historic building. It is organized in order: Not taken into account, Badly taken into account, Moderately taken into account, Quite well taken into account and Well taken into account.
- **The performance table:** it represents the grid core from which all graphics applications and outputs are developed to provide the desired sustainability profile. The filled cells are automatically converted into predefined numeric values. At the initial scale (text) is substituted a numerical scale whose values range from 1 to 5 in the same order as the scale of appreciation (Table 1).
- **The sustainability profile:** Using Microsoft Excel, the profile is established from the performance table, whose graphical applications of the grid work with the previously defined values. (degree of dimension = total of the component indicators degrees)

Findings

Following the review provided by the evaluation grid, a qualitative estimate of the set of sustainability criteria was determined for subsequent quantification through the coding system within Microsoft Excel. A series of graphs were obtained to reveal the profile (rate) of sustainability of an Adaptive Reuse project for historic buildings in the city of Tlemcen (Algeria), which was analyzed to target the project's strengths and weaknesses. The criteria identified as important reasons for the implementation of an adaptive reuse strategy for heritage buildings were as follows (a degree of 4): Responding current requirements, implementing the form, Compatibility of the historic building with the new current - requirements, Limits and modalities of the management of historic buildings. The semi-directive interview established following a progressive hierarchy, which required the respondents to give their qualitative assessments about the degree of sustainability of the reused historic buildings. Almost all the answers converge to say that "the updating of the function of the historic building increases its

lifespan", and "the shape of the building is in constant interaction with its function" in such a way that it cannot be successful only if it respects the historic building authenticity.

Table 1. Evaluation Grid: Performance Table

List of criteria to review	Taken into account					Value
	Scale Pondération	No 1	Badly 2	Moderately 3	Quite Well 4	
1. Social Implication						
1.1 Social Connections	Not taken into account					1
1.2 Social Solidarity	Not taken into account					1
1.3 Cultural Identity	Badly taken into account					2
1.4 Social Impact	Not taken into account					1
1.5 Social Knowledge	Not taken into account					1
Total Social Dimension						1.2
Equitable Interface						1.5
2. Economique Rentability						
2.1 Economic Coherence	Moderately taken into account					3
2.2 Economic Dynamics	Quite well taken into account					4
2.3 Financial Equilibrium	Badly taken into account					2
2.4 Financial Impact	Moderately taken into account					3
Total Economique Dimension						3
Viable Interface						1.3
3. Environmental Integrity						
3.1 Environmental Impact	Badly taken into account					2
3.2 Environmental Management	Moderately taken into account					3
3.3 Project Integration	Moderately taken into account					3
Total Environmental Dimension						2.7
Interface Vivable						0.6
4. Gouvernance						
4.1 Government Management	Not taken into account					1
4.2 Concertation and Stakeholder participation	Not taken into account					1
4.3 Limits and Modalities of management	Quite well taken into account					4
4.4 Evaluation, Supervision	Badly taken into account					2
4.5 Respect for Human values	Not taken into account					1
Total Government Dimension						1.8
5. Monument's Forme						
5.1 Compatibility	Quite well taken into account					4
5.2 Réversibility	Moderately taken into account					3
5.3 Minimal Intervention	Badly taken into account					2
5.4 Readability	Badly taken into account					2
5.5 Authenticity	Moderately taken into account					3
5.6 Differentiation	Not taken into account					1
Total Monument's Forme Dimension						2.5
6. Monument's Function						
6.1 Implementing the form	Quite well taken into account					4
6.2 Scalability/ Innovation	Moderately taken into account					3
6.3 Usefulness of space	Moderately taken into account					3
6.4 Adaptability	Moderately taken into account					3
6.5 Responde the current requirements	Quite well taken into account					4
Total Monument's Function Dimension						3.4

The interviews helped to situate the positioning of the adaptive reuse project in the sustainability process; they provided the value of sustainable development criteria in the implementation of the project with the aim of advancing the existence as well as the historic building function. It should be noted that social ignorance or unawareness is a major impediment to the success of adaptive reuse. The interviewees were very motivated by the desire to revitalize their identity despite their marginalization when making decisions about the management of the city's historic heritage.

The durability of the monument through use

The assessments collected from the interviewees identified the representative degree of each sustainability ²criterion to be taken into account in the reuse of monuments (Fig. 2). The results indicate that "the monument's function" (3.4 degree) is the criterion that presents the most important degree of sustainability that the Adaptive Reuse project can offer to a historic building. In addition, the updating of the function according to the economic, environmental and social requirements can bring the old building to "life", which explains the considerable rate of the criterion of "the monument's form" (2.5 degrees). However, the intervention mechanisms on the old building should be revised before the new use to avoid deficits that slow down the sustainability of this authentic heritage. As well, the profile knows its downfall when talking about the coaptation of society with its city. Here, a degree of (0.6 degree) reigns on the livable interface, which induces a deficit at the level of the governance, which presents in turn the generating element of the harmony between the old reused building and the sustainable development criteria. Being dissociated, these criteria must be combined in a system able to homogenize, all that concerns the economy (3 degree), the governance (1.8 degree), the environment (2.7 degree) and the society (1.2 degree) (Fig. 2.) (degree of dimation = total of the component indicators degrees (Table 1)).

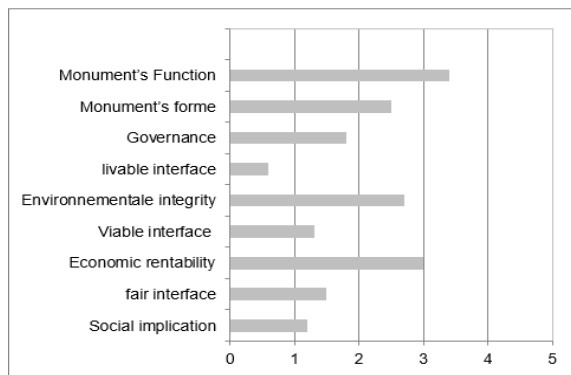


Fig. 2. Degrees of criteria influencing the process of sustainable adaptive reuse

Modalities and limits of sustainable adaptive reuse

The figure below provides an analysis of indicators degrees constituting dimensions degrees (Table 01). This makes it possible to identify gaps and opportunities in the adaptive reuse of the historic building towards sustainability (Fig. 3). Although the new use will revive the obsolete monument, it may not respect its authenticity. The differentiation (1 degree) was considered problematic, the observer cannot differentiate the existing from the addition, but it does not relate to the intervention. That explains the degree of importance of the criterion of the monument's function (2.5 degrees) (Fig. 2). In most cases, adaptive reuse is seen as commendable (2.75 degrees) (Fig. 2), but the financial equilibrium (2 degrees) (Fig. 3), remains of primary concern. Once reused, the propelling monument of the economic dynamics of the city (4 degree) (Fig. 3), see a long-term self-financing. Nevertheless many obstacles relate to society (1.2 degree) (Fig. 2), because cultural identity is transmitted through the monuments

(witnesses of the people history). Often society modifies marginal (1 degree) (Fig. 3), in family decisions in charge of heritage, which has encountered the gap of social impact (1 degree) (Fig. 3), on the sustainability of the historic building. But not only, can't the building therefore reflect more the cultural identity. All these obstacles relate to a management system whose pyramid of participatory actors knows a global anarchy, with the almost total absence of coordination between the missions of the actors, which questions the durability of the city, and negatively influences the management of historic buildings sustainability, research topic.

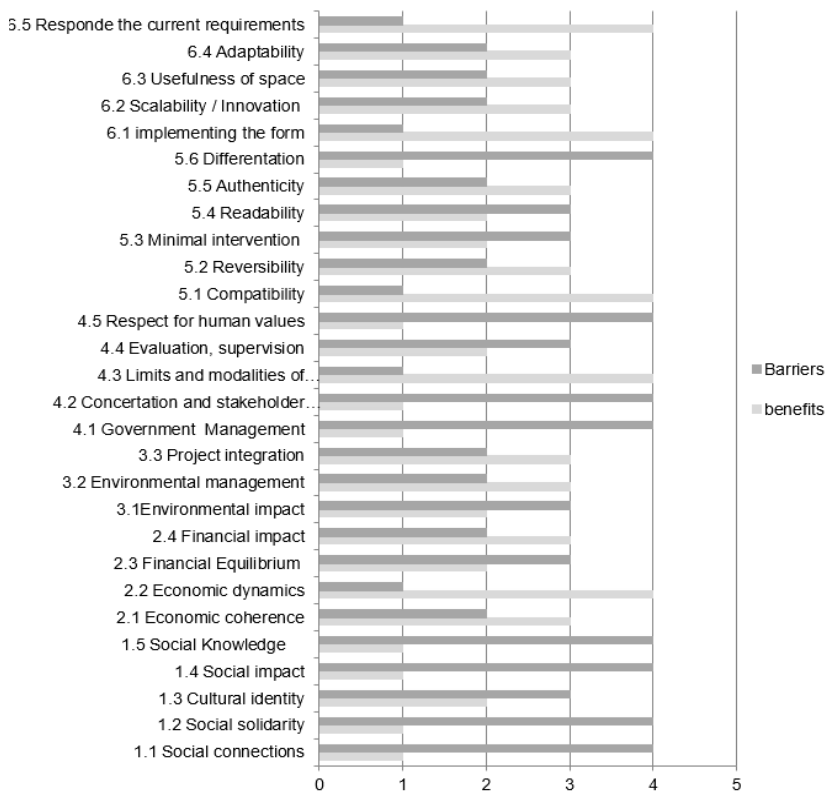


Fig. 2. Barriers and benefits of implementing sustainable adaptive reuse

Aimed at an sustainable adaptive reuse of heritage buildings

The reuse of a historic building has several interests (Fig. 3, Benefits):

- the new function of the monument, respond in general to the new –current-requirements (4 degree), allow an adaptive usefulness of space (degree), scalability and innovation (3 degree), as well as implementing the form (4 degree), which makes the new use a main factor of the sustainability of heritage buildings.

- The revitalization of heritage buildings has a considerable financial impact (3 degree) allowing the economy of the city to move forward (4 degree), but it won't be durable unless the financial equilibrium (3 degree) will be taken into account along the life of the building.

- The planning of the city (3 degree) has been successful, thanks to the adaptive reuse of heritage buildings, as it allows the minimizing of the implantation of the new structures from one hand and the reintegration of the old areas (3 degree) of the new extension of the city.

However, many obstacles arise (Fig. 3, Barriers):

- The non-involvement of society is at the head, which explains the lack of knowledge (4 degree), which dominates the situation, even preventing the creation of social connections (4

degree) and social solidarity (1 degree). As a result, cultural identity (3 degree) is diluted in an atmosphere of considerable social change.

- Although adaptive reuse is considered as a process that ensures the sustainability of the project compared to a simple readjustment, the project’s governance includes barriers to the sustainability of historic buildings, with respect to the marginalisation of users (4 degree) when making decisions, the anarchy of the actors' missions (4 degree). Obstructions that all lead to a disorder in the coordination between the different criteria capable of guaranteeing sustainability, as well as government mismanagement (4 degree), hence the dysfunction of a historic building.

After a thorough review of the sustainability criteria, this research identifies strengths and weaknesses that can promote or obstruct sustainable adaptive reuse (Table 1):

Table 2. Weak and Strong points of the sustainable adaptive reuse

<i>Weak points</i>		<i>Strong points</i>	
-	Differentiation	-	Responde the current requirements
-	Readability	-	Adaptability
-	Minimal intervention	-	Usefulness of space
-	Respect for human values	-	Scalability / Innovation
-	Evaluation, Supervision	-	implementing the form
-	Concertation and stakeholder participation	-	Authenticity
-	Government Management	-	Reversibility
-	Environmental impact	-	Compatibility
-	Financial Equilibrium	-	Limits and modalities of management
-	Social Knowledge	-	Project integration
-	Social impact	-	Environmental management
-	Cultural identity	-	Financial impact
-	Social solidarity	-	Economic dynamics
-	Social connections	-	Economic coherence

Discussion

The evaluation model developed in this research confirmed the reliability of adaptive reuse in the delivery of the historic monument in Tlemcen city with its sustainable character. It proves its standardization through its composition relative to the sustainable system by coordinating the sustainable development poles (as adopted in EIA and SEA) with the existing form and its new use. However, this system tries to get involved in the planning of Tlemcen city through its reference to the government management aspect. This was strongly recommended in the study previously prepared by Sharifi and Murayama, 2013. The sustainability criteria applied are global. They allow adaptability to the context and type of development in the city of Tlemcen and offer generalisation considering the indicators composing the sustainability dimensions is taken into account (Fig. 3). The function and form are relatively proportional; they have evolved with reuse despite their previous degradation. The reuse has made the monument an economic engine and urban generator of the city of Tlemcen. The social aspect remains constant because it is not involved in the decisions of this project. The reuse has stabilized government management (requiring the overall mobilisation of decision-makers) (Fig. 4). The degree of each sustainability dimension depends on the total degrees of its indicators, which are not balanced with each other (Fig. 2) because of the different values obtained. So despite the complementarity between the sustainability criteria, they are not homogeneous and require a meticulous treatment (Fig. 4).

This composition confirms that the sustainability system follows a progressive hierarchy; it allows discovering the strengths and weaknesses (Fig. 3) of an adaptive reuse process through the evaluation that is regularly carried out on historical monuments (Fig. 5). Indeed, this operation goes beyond the desire to reduce unsustainability as is the case in the EIA and SEA according to *Pope et al.* conclusions [13], it rather sets out to seek the sustainability of historic buildings through the constant improvement of adaptive reuse (Fig 5). This aspect allows the contribution of this research to the results generalisation obtained following a case study to reach a wider field than it seems.

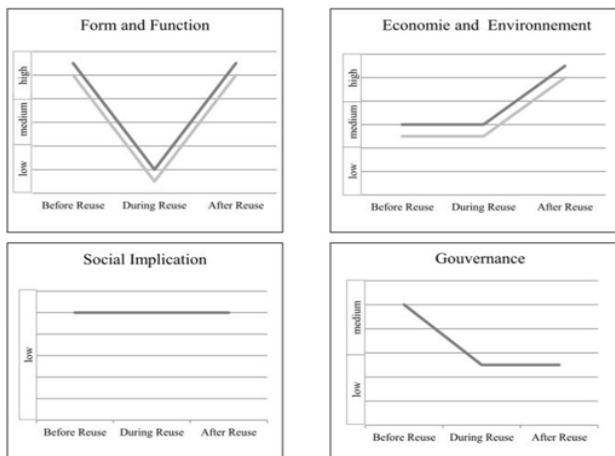


Fig. 3. Discussion of Sustainability Criteria

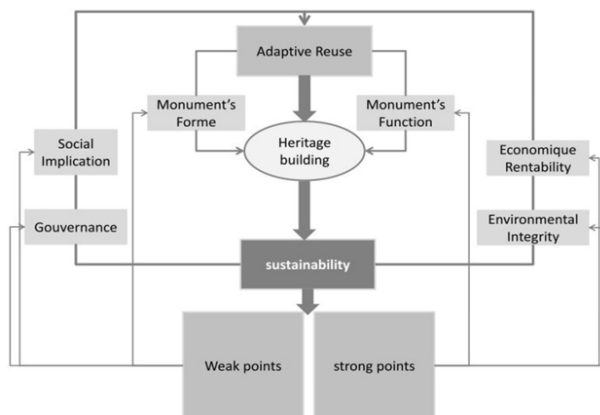


Fig. 4. Relational Scheme of Sustainable Adaptive Reuse

Adaptive reuse initiates the historic building's value over time, not only because it works to insert a use without compromising the place's authenticity, allowing both the scalability and place innovation, but also because reuse connects the historic building to its society, it promotes economic dynamics and the city's regeneration through comprehensive and meticulous government management. In this way, adaptive reuse provides a framework for the sustainability and heritage values. This aspect is ensured in the monuments case converted in Tlemcen thanks to the museum function, which has taken care not to make any major changes to the authenticity of the reused building, integrating it in the current city.

Conclusion

The reuse of historic buildings is a more approved solution, given the achievements it has offered to this heritage, having proved its relativity to sustainability. The latter initiates the heritage values attributed to the building, it contributes to the progression of the people's identity. Heritage buildings is a cultural mediators, their preservation has an impact on the community well-being. They become a fundamental means for the planning and socio-economic management of the city. However, the contribution of historic buildings to the principles of sustainability was not fully explored in Tlemcen. For this purpose, this work proposes a continuous evaluation model with a system of sustainability criteria for historic buildings that combines both form and function at the poles of sustainable development (social

involvement, economic rentability, environmental integration), in accordance with the city's government management. Indeed, this evaluation makes it possible to detect the strengths and weaknesses of a sustainable adaptive reuse process. This allows for continuous improvement of reused historic monuments in order to achieve sustainability. Due to its flexibility, the evaluation model is standard and can be adapted to other regions of the world. Notwithstanding, keep in mind that the sustainability of monuments in Tlemcen city; refers first to form, which is in no way devolved to a great transformation. Thanks to the new museum function, the place goes into the exhibition without compromising the principles of interventions on the old building, which contributes to preserving heritage values. Apart from the deficit which overwhelms the new character of the building and presents itself at the level of the distinction of the authentic elements compared to the new elements added, because this will necessarily lead to a profound revision of the intervention process, which mainly refers to the materials used and the qualified workforce for this work. Heritage buildings are cultural mediators and their preservation has an impact on the well-being of the community. However, the marginalization of society's opinion during decision making leads to its lack of knowledge, which can lead to an imbalance in the way of life of the people and therefore a repulsion of social sustainability. However, this is closely linked to government management, whose pyramid of actors is imbalanced in decision-making that deserves to be revised so that each stakeholder can seize its deserved share in order to transform the simple project of preserving heritage buildings into a sustainable reflection bringing together legacy and long-term sustainable development through the process of adaptive reuse. This character of respective interaction between the criteria and the building reflects the sustainability framework and the heritage values of adaptive reuse. The mediation of the architectural heritage through its reuse for today's purposes positively influences the economy of the city, it comes to contribute to its regeneration. The reused monument also becomes a source of production thanks to the winnings it earns from the visitors of the place. De facto, it's self-financing according to the regular maintenance work. This work introduces the projection of the evaluation model on other case studies allowing discovering convergences and divergences of the sustainability criteria. It also invites to more delve into the reused historic buildings in Tlemcen city; perform a comparative assessment to identify the propellants factors of sustainability specific to each.

References

- [1] E. Radziszewska, G. Sladowski, *Evaluation of historic building conversion options in the context of sustainable development*, **Civil Engineering**, 1(B), 2014, pp. 125-164.
- [2] D.A. Elsorady, *Assessment of the compatibility of new uses for heritage buildings: The example of Alexandria National Museum, Alexandria, Egypt*, **Journal of Cultural Heritage**, 15(5), 2014, pp. 511–521.
- [3] Elane Ribeiro Peixoto, *Autour des reconversions architecturales et des monuments historiques*, **L'Homme et la société**, 145, 2002/3, pp. 51-65, doi : 10.3917/lhs.145.0051.
- [4] P. Ponsot, *Faut-il opposer réutilisation et restauration. A propos de deux publications récentes [Dominique Rouillard, Architectures contemporaines et monuments historiques. Guide des réalisations eu France depuis 1980; Philippe Robert et Christine Desmoulins, Transcriptions d'architectures; architecture et patrimoine, quels enjeux pour demain]*, **Bulletin Monumental**, 164(3), 2006, pp. 291-294, doi: 10.3406/bulmo.2006.1895
- [5] P.A. Bullen, *Adaptive reuse and sustainability of commercial buildings*, **Facilities**, 25 (1/2), 2007, pp. 20-31.
- [6] D. Misirlisoy, K. Gunçe, *Assessment of the adaptive reuse of castles as museums: Case of Cyprus*, **International Journal of Sustainable Development and Planning**, 11(2), 2016a, pp. 147–159.
- [7] A. Ijla, T. Broström, *The Sustainable Viability of Adaptive Reuse of Historic Buildings: the experiences of Two World Heritage Old Cities; Bethlehem in Palestine and Visby in Sweden*, **International Invention Journal of Arts and Social Sciences**, 2(4), 2015, pp. 52-66.

- [8] D. Misirlisoy, K. Gunçe, *Adaptative reuse strategies for heritage buildings: A holistic Approach*, **Sustainable cities and society**, **26**, 2016, pp. 91-98.
- [9] P.A. Bullen, P.E.D. Love, *Adaptive reuse of heritage buildings*, **Structural Survey**, **29**(5), 2011, pp. 411–421.
- [10] J. Douglas, **Building Adaptation**, **Butterworth-Heinemann**, 2006, Oxford.
- [11] V. Ferretti, M. Boterro, G. Mondini, *Decision Making and Cultural Heritage: an Application of the Multi-Attribute Value Theory for the Reuse of Historical Buildings*, **Journal of Cultural Heritage**, **15**(6), 2014, pp. 644-655.
- [12] A. Sharifi, A. Murayama, *A critical review of seven selected neighborhood sustainability assessment tools*, **Environmental Impact Assessment Review**, **38**, 2013, pp. 73–87.
- [13] J. Pope, D. Annandale, A. Morrison-Saunders, *Conceptualising sustainability assessment*, **Environmental Impact Assessment Review**, **24**, 2014, pp. 595–616.
- [14] R. Mohamed, R. Boyle, A.Y. Yang, J. Tangari, *Adaptive reuse: A review and analysis of its relationship to the 3 Es of sustainability*, **Facilities**, **35**(3-4), 2017, pp. 138-154.
- [15] F. Choay, **L'allégorie du patrimoine**, éditions du seuil, Paris, 1992,
- [16] Ponsot
- [17] S.C. Park, *Respecting significance and keeping integrity: approaches to rehabilitation*, **The Journal of Preservation Technology**, **37**(4), 2006, pp 13–21.
- [18] * * *, **Adaptive Reuse**, **Commonwealth of Australia**, Department of Environment and Heritage (DEH), Canberra, 2004.
- [19] I. Cooper, *Post-occupancy evaluation-where are you?*, **Building Research and Information**, **29**(2), 2001, pp. 158-63.
- [20] I. Grazulevičiūtė, *Cultural Heritage in the Context of Sustainable Development*, **Environmental research, engineering and management**, **3**(37), 2016, pp. 74-79.
- [21] P.A. Bullen, P.E.D. Love, *The rhetoric of adaptive reuse or reality of demolition: views from the field*, **Cities**, **27**(4), (2010), pp. 215-24.
- [22] N. Nasser, *Planning for Urban Heritage Places: Reconciling Conservation, Tourism, and Sustainable Development*, **Journal of Planning Literature**, **17**(467), 2003, pp. 468-477.
- [23] S.J. Taylor, R. Bogdan, **Introduction to Qualitative Research Methods: The Search for Meaning**, John Wiley and Sons Inc., New Jersey, 1998.
- [24] J.E. Bartlett, J.W. Kotrlik, C.C. Higgins, *Organizational Research: Determining Appropriate Sample Size in Survey Research*, **Information Technology, Learning, and Performance Journal**, **19**(1), 2001, pp. 43-50.
- [25] O.N. Cocen, C.B. Baniotopoulos, *Heritage building's sustainability assessment framework*, **Paper presented at Centre Europe Towards Sustainable Building (CESB13)**, Sustainable Refurbishment of Existing Building Stock, June 2013, Prague, Greece, available at: http://cesb.cz/cesb13/proceedings/1_refurbishment/CESB13_1284.pdf (accessed 20 October 2018)
- [26] W. Hamma, A.-I. Petrisor, *Assessing the Restoration of Sidi El Benna Mosque in Tlemcen (Algeria)*, **International Journal of Conservation Science**, **8**(4), 2017, pp. 589-598.
- [27] G. Marçais, W. Marçais, **Les monuments arabes de Tlemcen**, Édition Fontemoing, A, Paris, 1903.
- [28] S. Yeasmin, and K.F. Rahman, *Triangulation' Research Method as the Tool of Social Science Research*, **BUP Journal**, **1**(1), 2012, pp. 154-163.
- [29] M. Angers, **Initiation pratiques à la méthodologie des sciences humaines**, Les éditions CEC, Québec, 1996.

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