

## Article

# Sustainability and Energy Efficiency in the World Heritage Site of the Historic Centre of Mexico City

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**Abstract:** On 26 April 2017, Mexico formally adopted the 2030 Sustainable Development Agenda to link the national government to local governments, the private sector, civil society and academia. The restoration of heritage residential buildings (recovery programme) and the construction of new residential buildings aim to create a diversified environment for populations at different economic levels. However, the restoration programme faces conservation challenges. Given this context, this paper presents the results of in-depth, semi-structured interviews conducted with stakeholders in Mexico's heritage and energy sectors. The duration of each interview was approximately two hours, with 52,372 total interview words. The paper identifies prevailing opinions regarding prioritising historical values, energy efficiency, historic buildings and users concerning Mexico City's Historical Centre, a World Heritage Site needing a more appropriate sustainable development plan. Using grounded theory and thematic analysis, the interview data were analysed based on the interrelationship between thermal comfort, energy efficiency and heritage conservation changes over time. The results of this research will strengthen our understanding of the interventions and processes involved in managing and living in this World Heritage Site and its future impacts on buildings. The approach also underscores the importance of how stakeholders prioritise different values in making energy efficiency-promoting decisions and enhances awareness of the decision-making process and actions adopted by heritage building users. Thus, understanding the dynamic interrelationship between values, users and energy could improve the sustainable management of heritage sites and future development.

**Keywords:** opinions; challenges; values; energy efficiency; Historic Centre; World Heritage Site; sustainable management



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## 1. Introduction

Given that building construction represents one of the largest sectors responsible for natural resource use, retrofitting existing heritage buildings is challenging, and novel approaches, such as those described in this study, are needed. The literature on energy efficiency and heritage buildings has led to the development of decision-making frameworks for assessing energy consumption and performance in energy efficiency-promoting practices and renewable energy systems [1–3]. A universal solution for historic buildings is impossible [4]. Despite contributing to social, economic and environmental goals, heritage has long been absent from the mainstream debate on sustainable development [5]. Integrating a sustainable development perspective into the World Heritage Convention will enable all stakeholders involved in its implementation, particularly at the national level, to act with social responsibility and promote innovative models of sustainable development to advance the reciprocal benefits for heritage and society [5]. In the World Heritage Convention context, applying a long-term perspective to all decision-making processes

about World Heritage Sites will foster intergenerational equity, justice and a world fit for present and future generations. Although it is important to recognise historical complexity as essential to heritage assets, conserving them is also more important. The conservation of material heritage plays a vital role in modern society due to the meanings and uses that people attribute to these material goods and the values they represent. The importance of heritage buildings lies in these meanings, uses and values, which should be understood as part of broader sociocultural processes. As such, heritage value and its conservation have always been a challenging component of the discussion on the transformation and support of the conservation of buildings where technologically advanced solutions should be implemented.

The role of World Heritage Sites as a guarantee of sustainable development needs to be strengthened. These needs reflect the concerns surrounding ‘planet, people, prosperity and peace’, identified as areas of critical importance in the 2030 UN Agenda for Sustainable Development [5,6]. The full potential of World Heritage Sites to contribute to sustainable development must be harnessed. To this end, it is important to ensure policy coherence and environmental agreements that promote responsible interactions in cultural and natural properties to avoid the degradation of natural resources and strengthen resilience to disasters and climate change [5–7]. In 1997, the Kyoto Protocol sought to reduce emissions in industrialised countries by at least 5% to mitigate climate change. The European Union (EU) has made gradual progress towards this goal by promoting different strategies in all productive sectors [8]. However, additional methods and techniques for battling climate change are required, and the historical and cultural values of the environment must also be conserved [8]. Hence, there is a need to promote the understanding that heritage constitutes a source of cultural development and incalculable wealth; its protection, conservation and revaluation must be preserved for future generations.

## 2. Materials and Methods

The Historic Centre (Centro Historico) of Mexico City was declared a World Heritage Site in 1987, as it fulfils at least six cultural and four natural criteria outlined in UNESCO’s (1972) operational guide. These aspects reflect Mexico City’s unique value; for example, it is an architectural and landscape ensemble that illustrates a significant stage in human history. The architectural styles of the buildings in the Historic Centre of Mexico City were developed between the 17th and 20th centuries. The materials vary because of the government restoration efforts that some buildings have been through (e.g., tepepate, cantera, brick, masonry and concrete). The area comprises 668 blocks with approximately 1500 buildings catalogued as having artistic and historical value [9]. Despite the efforts made, more actions to preserve the cultural heritage of the Historic Centre of Mexico City are needed. In addition, many conservation and renovation efforts have privileged commercial uses.

Consequently, the severe problem of the deterioration and depopulation of the site still needs to be addressed. Political issues have also contributed to the degradation of the Historic Centre; local and federal governments have worked separately and only a privileged group oversees the area. The revitalisation of social housing in Mexico City is part of the gentrification process that would make housing affordable to a wide population, making this region a compelling study area. The case of the Historic Centre shows the need for better design policies and management plans for all aspects of heritage sites, including sustainability, as the Historic Centre has seen many management plans that need more progress in matters related to sustainability [10]. Such projects include addressing legal or planning issues and ultimately guaranteeing the buildings’ historic continuity via direct interventions. Mexico City is a complex legal, administrative, cultural, economic and urban entity. Its Historic Centre, a space undergoing constant transformation, exhibits the same complexity.

### 2.1. Subjects

This paper focuses on stakeholders whose decisions affect the Historic Centre. Specifically, the research centres on one case study, and the units of analysis are the heritage and energy stakeholders. Interviews were conducted with individuals from the heritage, energy and industry sectors to establish a range of opinions. The semi-structured interviews dealt with four main subjects: heritage, energy efficiency, management and user values. Ten interviews were conducted with high-profile stakeholders from the government and industry sectors, who play a crucial role in decision-making processes in the country. These interviews were explicitly conducted with stakeholders involved directly with the Historic Centre. Resident interviews complemented these interviews (see [11]).

### 2.2. Data Collection

The interviews were conducted during the fieldwork activities from August 2019, December 2019 and January to March 2020. Interviews featured at least one participant from each sector involved in the Historic Centre, energy efficiency and heritage buildings. A consent form was obtained from the participants. The research did not address sensitive information, and sufficient information about what was involved in the study was provided so that participants could make a fully informed choice about whether to participate. A code was assigned to each participant to preserve the participants' anonymity (Table 1). An open, semi-structured interview guide was developed for each sector to establish opinions. The interview guide focused on each subject pertinent to the interviewee's experience. Because of the differences in expertise, two interview guides were developed: one for the heritage sector and one for the energy sector. The interviews used open-ended questions to avoid assumptions. The questions were given in the same order for all semi-structured interviews conducted.

**Table 1.** Participant organisation, project, sector and code.

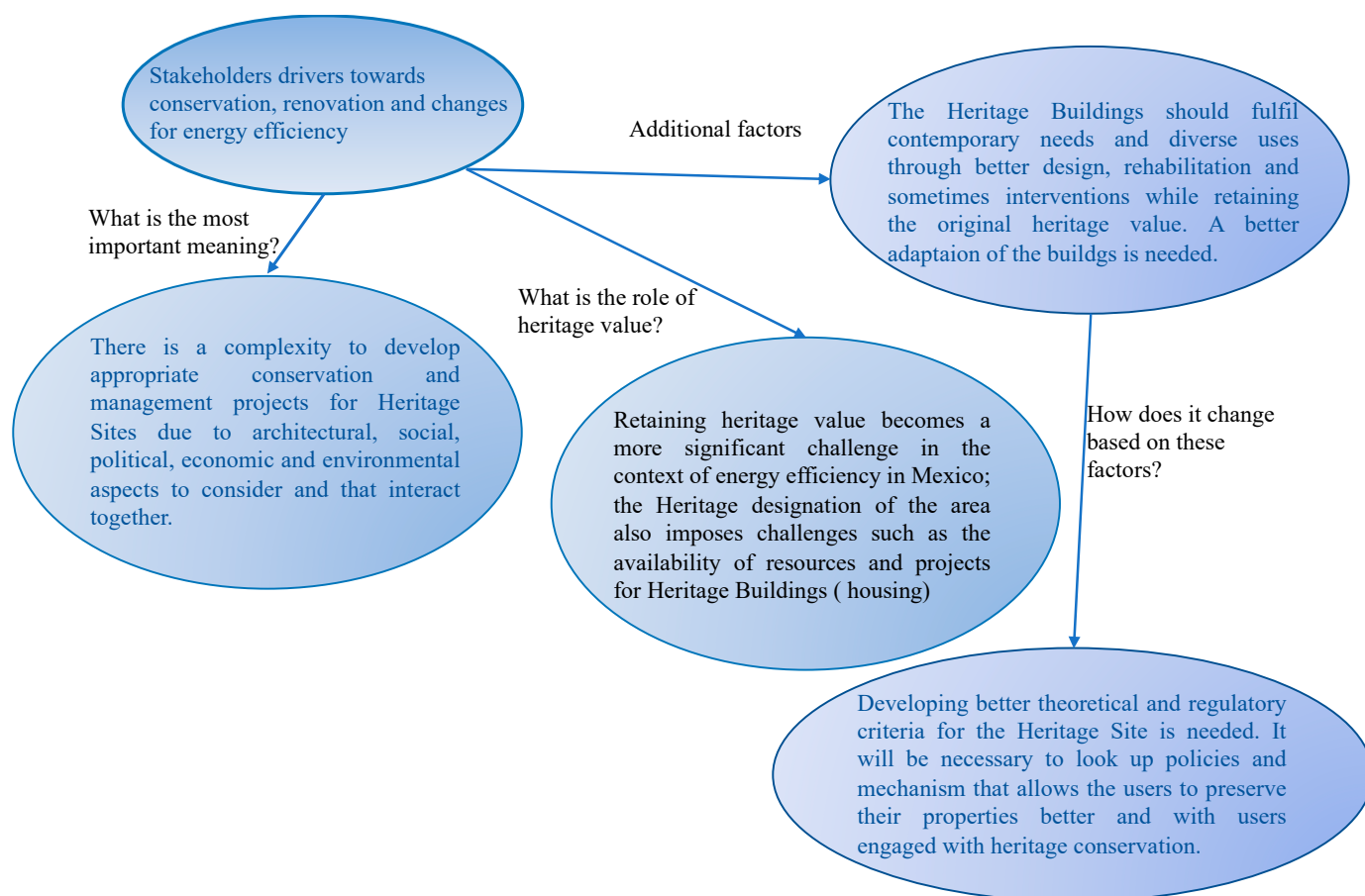
Organisation	Project	Sector	Code
Secretariat of Energy	National Commission for the Efficient Use of Energy	Public–Energy	MX-ES01
Secretariat of Energy	National Commission for the Efficient Use of Energy	Public–Energy	MX-ES02
National Institute of Anthropology and History	National Coordination of Historical Monuments	Public–Heritage	MX-HS01
Mexico City government	Mexico City Historic Centre Authority	Public–Heritage	MX-HS02
Mexico City government	Mexico City Historic Centre Trust	Public–Heritage	MX-HS03
Mexico City government	Mexico City Historic Centre Trust	Public–Heritage	MX-HS04
Mexico national government	National Autonomous University of Mexico	Public–Heritage	MX-HS05
Mexico national government	National Autonomous University of Mexico	Public–Heritage	MX-HS06
National Institute of Fine Arts	Palace of Fine Arts	Public–Heritage	MX-HS07
Mexico City organisation	College of Architects of Mexico City	Private–Heritage	MX-IS01

### 2.3. Analysis of Qualitative Interviews

As outlined by Strauss [12], due to the complexity of social phenomena, data collection must be guided by successively evolving interpretations made during the study based on the researcher's interpretations. To this end, the number of participants in the present study was selected based on an in-depth case-oriented analysis essential to qualitative research. Additionally, qualitative samples were selected for their capacity to provide rich information relevant to the study. As a result, an 'information-rich' case was established to facilitate a deep understanding of the phenomena [10,11]. A thematic analysis was performed after the literature review (Table 2). The interviews were transcribed and translated from Spanish to English. Afterwards, they were thematically analysed using NVivo software, enabling coding and the identification of cause-and-effect relationships

among factors affecting a specific intervention (or lack thereof). The principles of grounded theory were followed, allowing the data to drive the hypothesis [12]. The process was applied with each interview to understand the management of heritage sites and buildings and the drivers of energy efficiency and preservation. The first nodes were identified at this stage, and the data were grouped into categories according to stakeholders' heritage values and drivers. Table 2 shows a thematic analysis of heritage values and drivers from stakeholder interviews, including themes, codes, and quotes.

Codes from 109 broad nodes were grouped until three main categories emerged: conservation and management projects, retaining heritage value and adapting to contemporary needs. The process identified key common and unique themes and links between codes and categories, which can be developed into a theory about trends. From the resulting data (35,150 total words from interviews), predominant and potentially significant trends were selected. The overarching categories discussed by all interviewees were drivers of conservation, renovation and changes for energy efficiency, heritage values, heritage management and sustainability. Afterwards, the thematic analysis at a macro-level illustrated the stakeholder's drivers towards conservation, renovation and changes for energy efficiency. Figure 1 shows a macro level of the thematic map of the four main categories analysed.



**Figure 1.** Macro-level thematic map with the main categories of conservation and management projects, retaining heritage value and adaptation to contemporary needs.

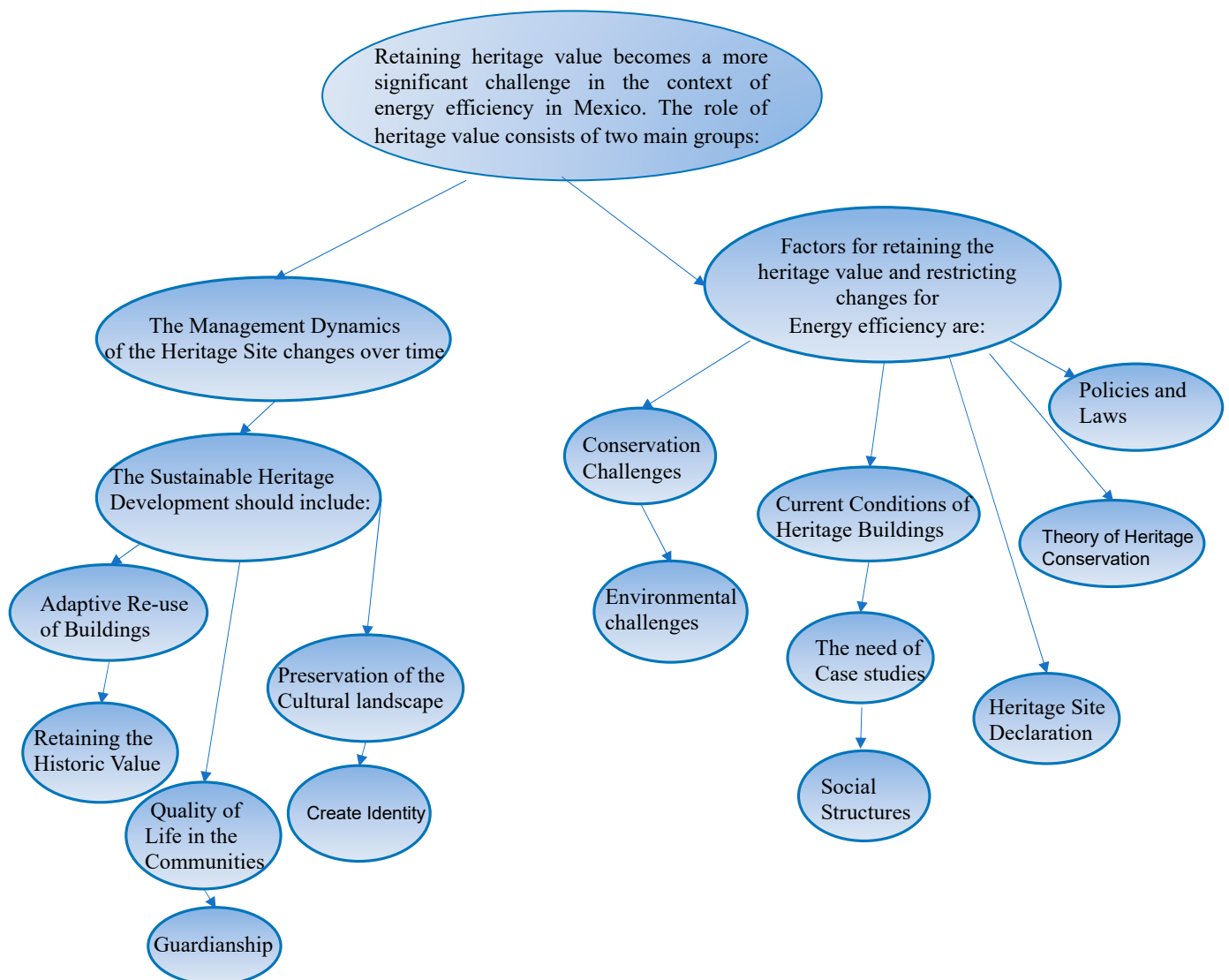
Subsequently, thematic analysis identified the challenges and factors associated with retaining heritage value at the micro-level. Figure 2 shows the role of maintaining the heritage value in two groups. For instance, factors for retaining the heritage value and restricting changes for energy efficiency, such as the conditions of the heritage buildings and conservation challenges, are shown. On the other side, the management of the heritage site



is a sustainable development. It includes subgroups such as adaptive reuse, preservation of the cultural landscape, retaining the historic value, creating identity, the communities and guardianship (Figure 2). The discussion was aided by both the micro- and macro-levels, as well as the subgroups involved.

**Table 2.** Thematic analysis of heritage values and drivers based on one stakeholder.

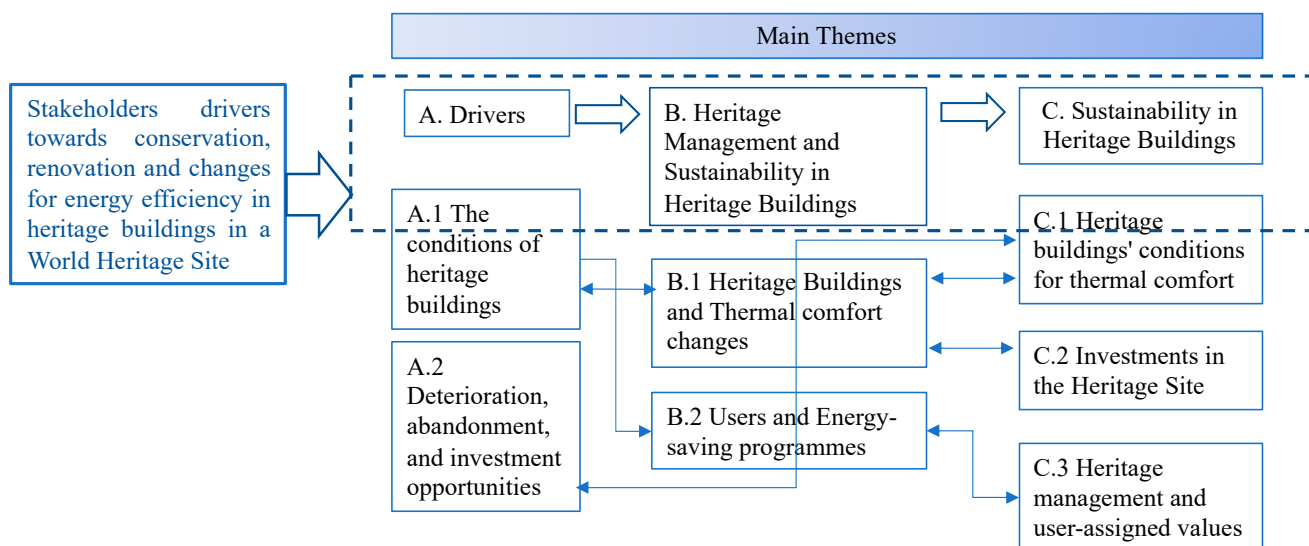
Topic/Thematic Category	Heritage Values	Drivers
Overarching theme	Decision-making process drivers (research objective)	
Code or subtheme	Historic	Adaptation
Quote Stakeholder	MX-S06: 'I think that the historical part allows us to understand the different processes of their transformation, such as the economic, political and social changes'.	MX-HS01: 'This is why we seek to better adapt these buildings for contemporary needs and unrestricted use through mechanisms of use, design, rehabilitation and, sometimes, even construction while retaining the original heritage values'.



**Figure 2.** Micro-level thematic map focusing on one of the three main themes: retaining heritage value.

Finally, seven interrelated analytical and explanatory themes that affect drivers and challenges were defined by the stakeholders: (1) the condition of heritage buildings (A.1);

(2) deterioration, abandonment and investment opportunities (A.2); (3) heritage values (B.1); (4) user-assigned heritage values and site values (B.2); (5) heritage building conditions for thermal comfort (C.1); (6) investments in the heritage site (C.2); and (7) heritage management and users-assigned values (C.3) (Figure 3). The relationships between the main themes (drivers, values and management, sustainability in heritage buildings) that informed the discussion were also defined.



**Figure 3.** Identified themes that affect the drivers and challenges of decision-making, as determined by the stakeholders, and relationships between the three main themes.

### 3. Results

The results are divided into the main themes and discussed accordingly. From these, the study's discussion and conclusions are provided. Overall, the interviewees agreed that the buildings possess architectural values that cannot be substituted or replaced (intangible) with other heritage buildings (tangible). Thus, the final goal is to preserve the values that are part of a protected heritage environment and represent community identity: *'I think it will be necessary to look for policies and mechanisms that allow the inhabitants to preserve the Historic Centre as a way to preserve identity roots and a population interested in conserving heritage, their heritage'* (MX-HS01).

However, the results differ regarding driving energy efficiency in historic buildings. Although the heritage and energy sector views sustainability and its environmental, economic and aesthetic benefits positively, the system for constructing historic buildings and the technical requirements needed for modernisation are incompatible and need to be more regulated than other projects. In addition, both sectors find it difficult to have standard regulations due to heritage site restrictions and building values.

Therefore, there is a need for a normative standard that includes energy efficiency-related interventions in social housing. A clear difference of opinion emerged between industry and government. While government approaches are more conservative and look for more adequate solutions (renovations and restoration), the industry approach to heritage is directly related to the economic benefits that can be gained from historic buildings and heritage sites.

Both sectors agreed that sustainability is an essential element of heritage, implying the presence of distinct challenges in buildings' environments. The concept of sustainability involves sustainable tourism and management policies to avoid exploiting and destroying heritage assets while ensuring the proper conservation of such assets. This would allow for the future development of heritage value and the generation of resources that can be used for intervention projects involving heritage buildings with better schemes. The emergent consensus implied that public policies must be updated or changed and that

case studies must be conducted to examine sustainability in historic buildings, including energy efficiency. Doing so can help prove their usefulness in Mexico while preserving their heritage values.

### 3.1. The Conditions of Heritage Buildings and Drivers of Change

The heritage sector recognises the conservation challenges of adapting historic buildings for new uses through better designs or more conscientious rehabilitation that simultaneously maintains their heritage values:

*Their use implies that the buildings must be used in the [context of the] social dynamics of the country and city but respected and conserved according to their values, which are heritage values. This is why we seek to better adapt these buildings for current needs and unrestricted use through mechanisms of use, design, rehabilitation and, sometimes, even construction while retaining the original heritage values. Currently, I think that the current need to adapt historic buildings for contemporary use with technology is basically due to the need for historic buildings to have new uses. (MX-HS01)*

Heritage buildings possess several architectural values that cannot be substituted or replaced. Instead, their originality, aesthetics and historic aspects become added values that make heritage zones more attractive than modern architecture to residents, tourists and investors. The conditions of heritage buildings also require constant monitoring:

*I think they (heritage buildings) have advantages compared to the no heritage architecture or the buildings with no heritage value and contemporary architecture. ... Although they are not focused solely on sustainability, more evaluations are made for conservation purposes; the discourse that will always prevail outside the recovery of historic buildings is conservation and restoration. Then, the evaluation is made based on the topic. (MX-HS02)*

Evaluations serve as diagnoses of the current conditions, after which actions are taken for the buildings and the heritage site:

*A diagnosis is made of the current conditions in [the place] where the Historic Centre is located. We also see economic and social development in terms of infrastructure. A diagnosis is made to determine the current conditions in which it is found. So, according to that [diagnosis], we can see the action or the set of actions that could be adopted to solve [the identified] problems. (MX-HS03)*

While users are an important part of maintaining the conditions of buildings, the government also shares part of the responsibility:

*Some buildings are well preserved because they have been properly used for a long time—a decent purpose—which is not the same for the best-known buildings. It mainly depends on the users and all the people who could be involved in the current conservation of historical heritage. (MX-HS04)*

### 3.2. Deterioration, Abandonment and Investment Opportunities

According to the heritage sector, heritage buildings possess architectural qualities that make them valuable. They were erected years ago, and their architectural features and material characteristics take advantage of the natural environment and weather conditions in their respective locations. However, the same environments may have affected the construction methods and materials used over time because of their natural components:

*Historical monuments built in past centuries were made with a vision of some sustainable way, indicating that the construction process used materials from the region. The architectural features made them somehow appropriate for the weather and the natural characteristics [of their locations]. (MX-HS01)*

The current conditions of the buildings represent, on the one hand, the antiquity of the buildings and the lack of maintenance and investment by their owners, which has caused damage over time and led to the devaluation of public spaces. On the other hand,

the management level can only cope with some of the challenges associated with heritage site management. In addition, housing for rent or purchase is scarce, which has caused many properties to be invaded. All of these factors combined have led to the current critical conditions of heritage buildings:

*The problem of deterioration has accumulated over the years; they (heritage buildings) have yet to receive due attention and need to be appropriately preserved. Many modifications to these buildings have altered their historical characteristics, and only some elements (building features) have been preserved, which has given them recognition as having heritage value. For example, sometimes only the facades or some components of these buildings considered important have been preserved. Still, they have been modified to quite the extent.... We can also see extraordinary examples of the conservation of heritage values, but only very few. (MX-HS05)*

Maintaining the good conditions of heritage buildings is a complex task at the management and built environment levels. The antiquity of buildings has led to considerable internal and external deterioration, which means that owners oversee their maintenance or make additional investments. This has also caused the devaluation of public spaces. In addition, there is a housing shortage for rent, and legal obstacles have emerged due to illegal inhabitants who have invaded the buildings and surrounding properties. Indeed, there is a diversity of other causes, including the quality of construction materials and the application of inappropriate construction systems. Environmental damage over time may also lead to deterioration. In response, the local government of Mexico City has made physical interventions to the sites according to the community's needs:

*So, if I am going (to the institution) to carry out a revitalisation project from a physical point of view, it is good that people are aware of what they need and how they think we can achieve it. We have a management plan that was created together with UNESCO. It serves as a valid guide in managing heritage buildings, and all our actions align with it. (MX-S04)*

Political issues have also exacerbated the degradation of the Historic Centre. Since many local or federal institutions work separately, this complicates management:

*The government and the corresponding authorities would also need decisive interventions to make the best decisions for conserving heritage buildings and hiring adequate specialists. The government, unfortunately, is far from solving them [the problems] conveniently. Specifically, there needs to be more specialists who can take care of the entire built heritage site. There are no policies that can address the whole problem efficiently, and there is also considerable risk in that area. (MX-S06)*

There is a need for constant intervention, maintenance and restoration of each historic feature of the buildings. The National Institute of Anthropology and History creates guidelines for any interventions made to the historical and archaeological monuments in the country. According to the INAH, owners must maintain their historical monuments properly. In the case of private properties, such as housing, keeping the buildings in the right conditions is a complicated task due to a lack of resources. Thus, owners must maintain their monuments with their resources or efforts. At the same time, they must request authorisation from the INAH and fully comply with its guidelines. This slow process further delays the preservation of buildings. Environmental conservation is also a significant challenge in terms of policies and management.

The vitality of the Historic Centre requires a way to intervene and better preserve the characteristics and use of the area through policies and regulatory mechanisms, which must cover the frequent and correct use of natural resources, energy efficiency, heritage resources and heritage preservation with the most appropriate adaptation and conservation procedures. These procedures must simultaneously use the most modern techniques without deteriorating a building's historical value. In particular, the instruments used by the authorities are the normative standard; they include a strategic framework for

developing the values and sustainability of tourism, the conservation of currently used sites and prospects for a better future:

*The deterioration indicates a situation where if a property is not maintained, it is abandoned, as is happening in the Historic Centre of Mexico City. . . what happens then? There is a sector (industry). . . that knows what they can generate (investment and economic growth) in these buildings or areas. So, there has been a situation where for these buildings to be demolished (and for everything to work properly), there must be a communion of three: the authoriser, the executor and the leader of new construction. Heritage buildings have exceptional value for economists and investors who know (even more about other heritage sites). (MX-IS01)*

### 3.3. Heritage Management and Sustainability in Heritage Buildings

In 1980, the Historic Centre was declared a site for major conservation. Heritage sites' meanings are multifaceted; they are linked to national identity, which renders the recognition of an area as a heritage site. A policy was introduced to declare a space as having heritage value, focusing on the country's main historical centres. It aimed to protect, conserve and manage the tangible and intangible values of the country's identity. The Historic Centre is essential because of its historic value as a geographic centre of economic, social, religious and political significance. Hence, one of the primary meanings of the Centre is that it represents the country's identity and symbolism:

*The values that make sense are the city's original and essential symbolic spaces. (MX-HS4) I think the historical part allows us to understand the different processes of their transformation, such as the economic, political and social changes. (MX-S06)*

Both sectors (heritage and energy) agreed that heritage sites are complex. The fact that they have different land use characteristics (e.g., commercial, housing, tourism and government offices) makes it challenging to integrate various needs. Therefore, these needs must be met in a balanced way. The main challenge in managing the residential buildings of the Historic Centre is keeping them in good running condition. Compliance with environmental technical standards for sustainability is limited in the Historic Centre:

*However, we are not talking about heritage issues, where different actions should be taken because you cannot change the main meaning of a heritage building. You cannot make a significant modification or intervention, for example, to a museum when it requires adequate lighting conditions and a specific type of spotlight. You cannot remove the main meaning by enhancing energy efficiency in these buildings. Yes, it is important to reduce energy consumption, and that should not be a problem with the main use or meaning of buildings, and this is even less the case with the technological aspect of energy efficiency. Therefore, the government should recognise and work within the technological barriers of the historic built environment of Mexico City. (MX-ES01)*

Part of sustainable development is the cultural landscapes with tangible and intangible factors that have value for the lives of communities. Adapting heritage buildings for new uses while retaining their values is part of this development. Recovery of these buildings for housing promotes their reuse. This strategy seeks different public policies or action programmes to conserve the Historic Centre of Mexico City. Furthermore, both sectors (heritage and energy) agree that heritage buildings are sustainable, and many advantages can be found in the characteristics that simultaneously make them more vulnerable:

*Historic buildings offer substantive advantages in natural ventilation, natural lighting, the generosity of living spaces, the stability of structures (of construction) in which they are located and the climatic conditions. However, the lack of maintenance and the fact that the buildings are left for urban and social activities that no longer exist result in incompatibilities. Sometimes, wanting to include another unintended purpose can lead to difficulties in preserving that building. I think it is a matter of compatibility and current use that causes the activities for which these buildings were designed to differ. (MXHS03)*



The historic environment needs a diagnosis of the current conditions of the buildings and the context in which the Historic Centre is located. Developing a cross-disciplinary framework to integrate values that ensure sustainability in decision-making is needed. In relation to this, improving building energy efficiency is an opportunity to achieve sustainability in heritage areas. In the case of Mexico, the Secretary of Energy and the Federal Electricity Commission are the institutions responsible for ensuring the efficient use of energy, reducing consumption and improving lighting in spaces, thus achieving lower costs for the energy sector. Thus far, the government has conducted only a few case studies on cultural and historical monuments, most of which were carried out by the National Institute of Fine Arts (INBA) using solar panels. However, interventions to enhance energy efficiency are not commonly used in the heritage sector. Due to these challenges, Mexico's policy mechanism has not included historic buildings:

*Nowadays, for example, we know about INBA projects that are being applied to many of its artistic monuments so that they can have solar cells and benefit from their many advantages. In the same way, it is thought that, in some cases, spaces are linked to natural areas, such as buildings in rural or archaeological areas. They may have a set of criteria for sustainability in water management, rain collection, irrigation and proper waste management services in these areas. Nevertheless, obviously (energy efficiency) is a topic that requires more work and specific projects dealing with historical monuments. (MX-ES01)*

#### 3.4. Heritage Buildings and Thermal Comfort Changes

The government's interventions or changes to heritage buildings should not damage them in any way; however, it is impossible to achieve this goal most of the time. There is always a need to install devices that help improve a building's operation:

*Sometimes, there is nothing more to do than perform invasive interventions in the buildings and ensure they will create as little damage as possible. The interventions or modifications made should be as invisible as possible. (MX-HS05)*

The priorities for interventions in all cases are the structures and materials, but the local government is also working on the issue of property ownership. Establishing ownership status is essential because only owners can intervene and access governmental resources simultaneously. The facade and values are always the main priority for enhancing a building's features. Proper modifications that preserve their value will render an appropriate urban image of the Historic Centre and respect its characteristics as a World Heritage Site: 'We particularly work to solve issues regarding building facades or their artistic and historical elements' (MX-HS06).

However, there is a dilemma between prioritising building conservation and ensuring users' comfort. In any debate, who makes decisions must be clarified, and a consensus must be reached to find the best ways forward for all involved. However, the local government lacks the resources needed to achieve sustainability and initiate conservation efforts to preserve buildings:

*The technical standard for sustainability is frankly limited in the Historic Centre; it is a theme that appears in the objectives set forth by the public institutions in charge of conservation or local governments. However, the problem of conservation and structural conservation should be solved first, followed eventually by meeting sustainability objectives, such as using clean energy, creating internal conditions to promote thermal housing satisfaction, internal soundproofing of spaces such as bedrooms or issues that are sometimes important for the coexistence of all users. (MX-HS07)*

Conservation efforts are also present in the energy sector, and more knowledge and assistance to promote any changes towards sustainability should be included in existing guidelines and public policies. The characteristics of the environment play another role in the adaptation of historic buildings, in that these conditions have affected historic buildings over the centuries. An integral intervention programme is needed where, on the one hand,

the deterioration of the buildings is mitigated and the heritage values that make them essential are conserved and, on the other hand, the new occupants assigned to them cover the needs of the contemporary society that uses and protects them. Future challenges must consider technology, conservation theory and social practices to determine which heritage values to preserve. A holistic conservation strategy for heritage areas is also necessary. Aside from promoting investments, it can also help to develop a sustainable economic situation at each site.

### 3.5. Users and Energy-Saving Programmes

User behaviours are one of the challenges in developing comprehensive energy efficiency policies, standards and guidelines [13]. Therefore, it is essential to identify building users' energy efficiency and conservation behaviours. Social science research has explored individual drivers of behaviour and has proposed different decision-making models. For example, based on individual behaviours, it is necessary to understand how users make decisions because they impact energy use and the environment [14]. The energy sector in Mexico has the same view. To achieve the objectives of energy behaviour strategies, it is essential to consider the social context and learning and collective actions, among other factors [1]. In all cases, the 'user is the one who uses the energy' (MX-ES02):

*The fact that a resident feels cold or warm inside a building affects the decision-making process related to changes without knowing the right solution, which can cause damage to the properties. Making buildings more comfortable in the right way helps the user and enables the properties to stay in good condition. (MX-ES02)*

Regarding environmental improvement, the Energy Trust promotes and induces actions focused on results for the efficient use of electrical energy:

*In terms of energy efficiency, we must prioritise users' knowledge and awareness. First, we teach users to use all their equipment correctly, then change it and, in the final stage, think about making better changes to the facades because we know that it is costly. In Mexico City, a building may offer poor thermal comfort due to the cold winter weather, but you do not need heating if the building is well-designed. (MX-ES02)*

The projects developed by the Energy Trust link technological innovation and electrical energy consumption through the application of efficient technologies. They also deal with the conservation of non-renewable resources, the sustainable use of energy and the reduction in greenhouse gas (GHG) emissions. The Energy Trust is optimistic regarding including heritage buildings in its agendas. Building values are the first concern when it comes to any changes. Historic buildings must be set apart from others regarding energy efficiency and sustainability. Energy efficiency should not impede sustainability but should add value to buildings with heritage value:

*The government must recognise and work within the technological barriers of the historic built environments of Mexico City. Annual programmes are based on law and strategy, so they are the instruments we use and the instruments of public policy that shape the objectives of modern buildings, but not historical ones. (MX-ES02) In the end, I think energy can present something important. Aside from promoting conservation in the case of heritage buildings, I understand that I am taking care of the public good with national use and improving that use. (MX-ES01)*

### 3.6. Investments in the Heritage Site

The dynamics of World Heritage Site management are tourism and economic development to ensure continued permanence whilst preserving a site's historical value. In particular, the instruments the authorities use are normative; they include a strategic framework for developing the values and sustainability of tourism, the conservation of currently used sites and prospects for a better future.

*The deterioration indicates a situation in which if a property is not maintained, it is abandoned, as is the case of the Historic Centre. Who is responsible for the decay of these buildings, what happens then? The real estate developers would say, Here, I can do this, that and more, but we will tear down the buildings. So, there has been a situation in which for these buildings to be demolished, there must be a communion of three: who authorises, who executes and who will lead the new construction. Heritage buildings have exceptional value in terms of economists and investors who know. (MX-IS01)*

In this sense, the correct development and preservation of the characteristics and uses of the area through policies and regulatory mechanisms should cover the frequent and proper use of natural resources, energy efficiency, heritage resources and heritage preservation of the landscape. The cultural landscapes comprise a set of elements of both tangible and intangible factors that have value for the lives of the communities in which they are located. Acquiring heritage buildings for new uses whilst retaining their values is part of this development. Thus, recovery for housing promotes the reuse of existing buildings whilst leaving out the part of large-scale trading and warehouses, because, at some point, they have been instrumental in the building's deterioration.

*Unfortunately, after the 1985 earthquake, many buildings were left empty, and over time, they were used as warehouses or commercial spaces. Nowadays, there is a trend of rebuilding buildings by both the government and the private sector. We try to recover them for housing or mixed-use purposes whilst leaving out the part of large-scale trading and warehouses, because at some point they have worsened the deterioration of the buildings. (MX-HS0D)*

### 3.7. Common Goal between Heritage Management and User-Assigned Values

The Historic Centre is essential because of its historic value as a geographic centre with economic, social, religious and political significance. The value of the Mexican identity—everything that has to do with Mexico, such as its archaeological, religious and social values—goes through the Historic Centre. Hence, one of the primary meanings of the Centre is that it represents the country's identity.

*The values that make sense are the city's original and essential symbolic spaces. (MX-HS4)*

*I think that the historical part allows us to understand the different processes of their transformation, such as the economic, political and social changes. (MX-S06)*

*It is subject to urban planning that serves the entire city and the country; in that sense, it has many values. (MX-HS08)*

*To preserve the Historic Centre is to preserve the country's identity roots and ensure a population interested in conserving heritage—their heritage. (MX-HS01)*

The values assigned to the sites are diverse. According to the heritage sector, the principal value has to do with the historical significance in general terms and customs and in knowing that there are a series of buildings with heritage values representing universal symbols for everyone.

*I suppose they do not have knowledge about heritage or conservation, but I believe the identity value persists. With that characteristic, the knowledge that characterises us as Mexicans, the fact of knowing us Mexicans, of being able to recognise historical and archaeological monuments. Sometimes, neighbours, non-governmental organisations and neighbourhood residents' associations are the foremost defenders of heritage elements. (MX-HS01)*

User participation in the conservation process can be highly diverse because everything has to be officially guided by the local and federal authorities. The owners of the properties are also expected to engage in community participation.

*We have prepared a guide for the conservation of the Historic Centre; it is a fascinating book, where the citizens are shown how to keep their properties in good condition. (MX-S05)*

*We have a scheme of direct attention to citizenship, and we work in a coordinated manner with many agencies to give the best attention to citizenship in many ways. Then, we named each of these sectors or quadrants as neighbours interested in protecting and preserving heritage and citizen security. We ask them, 'Hey, would you be interested in reporting things to us as we are also doing with citizen security but with the heritage?' We intend to have close contact with the citizens, direct contact with the actors that are not necessarily neighbours and straightforward communication with the institutions. (MX-HS03)*

A community's heritage conservation is achieved by safeguarding the values found against external factors that could affect them. This shows that life in these heritage communities is more active and the perception of heritage is more noticeable. The values give life to the communities and are embodied in historical centres with geopolitical characteristics that undergo continuous modification and evolution. In this way, the concept of 'heritage' changes according to the features that make it much valued and appreciated. These characteristics appear and evolve according to context, community and time.

*History does not end in a moment. We continue to build history and values; the challenge is that those values are not destroyed but enriched and remain evidence for the new generations. This can be a mechanism (school of citizen participation) or initiated through informative talks. (MX-S03)*

*I think the site, as a reference, becomes a meeting place—a political, economic and cultural centre of critical importance from both the historical and archaeological perspectives. (MX-HS04)*

Thus, conservation strategies must evolve alongside the heritage concept, and there is a need to update policies that can meet this goal. Overall, the declaration of a World Heritage Site makes the site more attractive. At the same time, urban, environmental and heritage conservation must be provided.

#### 4. Discussion

The opinions, consensus and challenges discussed show the need to understand stakeholders' value prioritisation in making decisions surrounding energy efficiency and heritage building users' decision-making processes and actions. This section enhances understanding of the drivers of interventions, sustainability efforts, challenges and processes involved in managing World Heritage Sites and their future impacts on buildings.

Despite the efforts by the authorities, adaptation and conservation are expensive mechanisms that go beyond the local government budget to renovate new housing. There is no way to cover the budget, and there are no resources to maintain the programmes. Real estate could be a good investment opportunity. However, they must follow the regulatory frameworks for preserving the universal value granted by UNESCO to World Heritage Sites, making it essential to conserve and care for the community and the world.

The role of World Heritage properties as a guarantee of sustainable development needs to be strengthened. These reflect the concerns surrounding 'planet, people, prosperity and peace', identified as areas of critical importance in the 2030 UN Agenda for Sustainable Development. Thus, political and mutual environmental agreements and responsible interactions within cultural and natural properties are urgently required.

In Mexico, addressing problems with the institutional structure is crucial. While users play a vital role in maintaining heritage buildings, the government also bears responsibility. Current management policies must be more responsive to the demands of heritage and sustainability. Construction regulations must be adjusted to account for heritage buildings built long ago and may not comply with modern housing standards. Both the heritage and energy sectors agree that heritage buildings are inherently sustainable, but their building and material characteristics make them more vulnerable over time. Vulnerability increases if residents' values are not considered [3,4,8,10,11].

Sustainability has become an integral part of the energy and construction sectors. To achieve energy efficiency, it is essential to introduce passive measures. The primary target for energy efficiency is the user, who consumes energy. Heritage management can involve stakeholders and users in decision-making, such as community outreach programs and participatory design processes.

As highlighted by Ryghaug [15–17], there is a need for increased interaction among various professional groups with diverse skills during the energy decision-making process in building design. This has been identified as a significant obstacle to achieving improved energy efficiency [18]. In addition, it is crucial to address problems associated with institutional structure and social practices by understanding the relationship between individuals (users) and their surrounding conditions [19,20]. Therefore, it is imperative that public policies and guidelines incorporate both the conservation of heritage buildings and energy efficiency-related interventions.

## 5. Conclusions

Preserving material heritage is crucial in modern society as it carries significant meanings and values. Both the government and the industry sectors in heritage and energy acknowledge that historic buildings possess unique architectural values that cannot be replaced. Although efforts have been made to enhance energy efficiency, the applicability of related measures can still be quite complex when dealing with historic buildings. Such measures must include residents in decision-making and heritage buildings' potential for sustainable housing.

A considerable challenge is balancing appropriate adaptation and conservation procedures with modern facilities without causing deterioration to the structures and values. Heritage building conservation efforts need help adapting historic buildings for new uses. In the Historic Centre, where the retrofitting of buildings is on the rise due to the regeneration programme for social housing and tourism attractiveness, it is essential to consider whether buildings meet the goal of value preservation while striving to meet their new functions. However, the conditions of heritage buildings require constant evaluation. They are part of a protected heritage environment that embodies a community identity.

As stated by the authorities, improved guidelines should thus include better designs, improved rehabilitation processes, the use of technology for new services, intervention processes and sustainability aspects. Additionally, the severe problem of social housing deterioration must also be addressed. The Historical Centre's vitality must also be preserved. Even though the Historic Centre has become more attractive since being declared a World Heritage Site, efforts and investments in urban, environmental and heritage conservation are necessary. These investments can generate resources that can be used for better and more frequent intervention projects. To achieve this, the existing policy must encompass infrastructure, architecture, as well as socio-cultural and economic aspects.

A comprehensive conservation strategy that integrates users' values into policies for heritage areas is also necessary. In response to the challenge of incorporating heritage values and their conservation in the transformation and conservation of buildings, this study conducted analyses of stakeholders' opinions to determine the best way forward.

Methods and strategies are needed to battle climate change and conserve the historical and cultural values of the environment. This can be a complex task when sufficient resources are lacking. Still, public and private investments should help to address technological and theoretical criteria to promote conservation, preservation and changes to enhance the sustainability of heritage buildings that represent growth.

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