



**Hungarian University of Agriculture and Life Sciences**

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# **Conservation Methods of Historic Gardens and the Adaptability to Contemporary Challenges**

*The revival of the royal palace Bardo garden in Tunisia*

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The Thesis of the Ph.D. dissertation

by

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## 1. RESEARCH BACKGROUND

Gardens, in general, are considered the intersection of human-made art and nature; in fact, by taming the natural elements and gaining horticultural skills and knowledge, we can even consider gardens as fully man-made creations based on using both natural elements and artistic/architectural approaches and techniques. As a consequence of the art and nature combination, historic gardens have been recognised as living heritage by the International Council on Monuments and Sites (ICOMOS) in the 2<sup>nd</sup> article of the 1981 Florence Charter. Furthermore, as the main constituents of these heritage sites are mainly vegetation, thus, they might be impacted by the cycle of seasons and hence are changeable and should be renewable (ICOMOS, 1981). Generally, gardens are characterised by their fragility and constant change and growth; the green elements will certainly grow, age, and die much like any living organism which can lead in extreme cases of neglect and low maintenance to the loss of the garden's identity or even full disappearance and merge with wild nature (Obad Šćitaroci, Marić, Vahtar-Jurković, et al., 2019).

Moreover, historic gardens hold significant cultural values for societies, as they were established over a long period of time and therefore reflect a historical significance. Throughout their lifetime, they have hosted different owners with various tastes, they have accommodated diverse historical events and a variety of plant species and ecosystems, but most importantly, they display various architectural styles from specific periods, artistic elements such as statues, fountains, gates and garden furniture as examples. Furthermore, historic gardens demonstrate the perception of nature and gardens in past times through the activities and events held within the garden. The identity of historic gardens is eventually equal to the identity of the society and their artistic and horticultural heritage; the preservation of such patrimony is crucial for the current and future generations.

In the 20<sup>th</sup> century, historic garden conservation witnessed a lot of achievements and new elaborated recommendations, starting with the Florence Charter created and published by the ICOMOS and IFLA to advise on the conservation of historic gardens and to emphasise their significance as heritage sites. Besides the Florence charter, historic gardens have been recognised by several international associations and organisations as a public heritage that should be preserved and maintained, such as UNESCO. These organisations had a major role in improving the perception of professionals about historic gardens and are still helping to raise awareness about their values as heritage sites through the published Charters and recommendations that included direct definitions and recommended conservation actions.

However, this might be only the beginning of a more efficient garden heritage conservation field. In fact, due to the constantly changing circumstances like climate change, urban heat island effects, mass tourism, land usage, finances and management, historic gardens are at a greater risk nowadays of losing their value and identity.

This research focuses on the adaptation of historic gardens to the various contemporary challenges they are facing by determining sustainable solutions that might be applied in a conservation process to match the environmental, cultural and historical requirements for such heritage sites.

## **2. RESEARCH AIMS AND QUESTIONS**

Historic gardens often struggle with remaining robust in the face of contemporary difficulties, starting with the changing climate and the impact of urban heat islands and reaching social and administrative challenges. However, because of the significance of such spaces, efforts to preserve historic gardens for future generations are necessary. This doctoral research aims to first, by collecting and investigating a large database of previous conservation strategies, and secondly, by evaluating the strategies on their results, the author will be able to formulate sustainable adaptation and ecologically beneficial practices together with heritage perspicacious actions.

This research attempts to:

1. Analyse the published international recommendations, charters and guidelines for historical gardens' conservation and preservation to study their main objectives, recommended actions and their adaptability to the heritage sites nowadays.
2. Identify the potential contemporary issues that historic gardens encounter nowadays and the possible risks that may accelerate heritage deterioration.
3. Outline a holistic approach that identifies the most efficient solutions for historic garden preservation and adaptation that might be applicable in future cases and ensures a sustainable solution that covers both the ecological and social aspects of the heritage site.

**This research raises several questions.**

1. What are the benefits of preserving historic gardens on the social, cultural, ecological, natural and economic aspects?

2. What are the threats that might accelerate the deterioration of historic gardens?
  - a. What are the contemporary challenges that historic gardens are facing?
  - b. How did these issues impact historic gardens?
3. What strategies and principles may help the historic gardens' adaptation to contemporary environmental and social issues while maintaining their historical authenticity and cultural values?
4. How can regulations and recommendations be developed within the sustainable conservation programs of historic gardens?

### **3. MATERIALS AND METHODS:**

For further understanding of the living heritage conservation subdiscipline, the author initiates the research with an in-depth literature review to study historic gardens' conservation principles, referring to ICOMOS charters as a focal point. The author studies multiple international recommendations and guidelines and follows the alterations and amendments throughout time for a better understanding of the new needs for heritage sites and to examine their compatibility with the contemporary challenges that historic gardens are facing.

After establishing a clear vision of the international regulations and recommendations, the author elaborates an analytic approach to examine and analyse several historic gardens as case studies for conservation and adaptation theories and practices, and to extract the implemented solutions, the lessons learned, and their potential results, for the present time and the projected goals.

For this purpose, the author chose to work with precedents of conservation projects and strategies implemented in various gardens. The author is interested in historic gardens that are more or less exposed to the same challenges, but the conservation solutions, the steps of these projects, and their potential results were different.

- **Precedents and case studies**

The studied gardens are considered significant cultural sites with rich history and high artistic values. The precedents' sites represent various locations and different historical period, and obviously different landscape architecture styles, still they share the same threats and difficulties. Because of their large green spaces, these sites are home to valuable and vulnerable micro-

ecosystems, and historic elements that are a direct subject to the impacts of climate change and several contemporary challenges.

Furthermore, different strategies were implemented for the historic gardens conservation and working on decreasing the negative impacts caused by contemporary challenges. The author studies in full depth these conservation solutions and their impacts on historic gardens be either positive or negative.

- **KEW Royal Botanical Gardens:** Studying the “Climate positive by 2023” program published by the garden-management and analysing the sustainable solutions that the program proposes as well as the measuring methods for the carbon emissions within the garden.
- **Alhambra Gardens:** Studying the master plan for the preventive conservation proposal by the garden’s management to protect the heritage site from potential threats on different levels: ecological, mass tourism, environmental, risk management, etc.
- **Royal Park of Moncalieri Castle:** Studying the theoretical and holistic conservation proposal realised by researchers and professionals based on the Burra Charter heritage conservation strategy.
- **Royal Botanic Gardens Victoria Melbourne:** Studying the landscape succession strategy realised in the Melbourne Botanic Gardens in order to align with the projected climate and average temperatures.

Building on the literature review and the analytic research, the author should have understood the history and precedents of historic gardens' conservation principles, the relevant terms, and also learned the most suitable practices for the common contemporary challenges that most of the gardens are facing nowadays. Furthermore, the Author gathered and recorded the best conservation strategies to improve the condition of a historic garden, protect heritage, preserve its cultural values, and adapt the heritage sites to contemporary challenges.

The documentation will ensure the presence of different aspects of the heritage conservation matter (Climate change, mass tourism, maintenance issues, administrative protection, site material deterioration, etc), moreover, the documentation will be theoretical and mutable to fit with different climates, locations, landscape architecture styles, historical periods, type of usage, legal status, etc. Lastly, the Author will develop a theoretical restoration

and conservation strategy for the Royal Palace of Bardo in Tunis, Tunisia, based on the documentation developed in the previous phase.

The **Bardo Palace** in Tunis, Tunisia, holds significant historical and cultural importance. It has been a focal point for showcasing the national history of Tunisia through its collections, reflecting the country's heritage. The palace has witnessed transformations over the centuries, serving as a symbol of power and governance, and still exhibits the rich Tunisian culture nowadays. The palace was well known and mentioned in poetry and travellers' books for its large green spaces and rich vegetation that sadly vanished due to the severe space and functional changes that occurred within the palace perimeter.

#### **4. RESULTS AND DISCUSSION**

Historic gardens are living testimonies of cultural heritage, they reflect the artistic, social and environmental values of their establishment period. Because of their uniqueness and vulnerability, these heritage sites are irreplaceable representations of centuries of horticultural knowledge and artistic expressions. This doctoral dissertation examines the field of historic gardens' conservation with a modern approach. It investigates the complex and evolving challenges facing the conservation of historic gardens, emphasising the urgent need for dynamic and modern science-based solutions.

Based on the analysis of international regulations and recommendations, historic gardens are well defined and recognised as cultural heritage, however, the adaptation of these sites to the contemporary challenges, more precisely climate change, is still a grey area nowadays as the Fundamental document for historic gardens the Florence Charter was elaborated by ICOMOS more than forty years ago.

Moreover, several internationally significant case studies have elaborated their site-specific strategies to ensure long-lasting and ecological preservation. the Alhambra Garden management elaborated a preventive master plan to address threats and risk before they occur and prevent irreversible damage, while Kew gardens adopted a different approach tackling the impacts of climate change by reducing their carbon emissions by switching to clean energy and more sustainable and green solutions within the garden, on the other hand, the Royal Botanic Gardens of Victoria applied a more intense solution as they work on adapting the garden to the future projected climate by changing the current plant species to more drought tolerant ones. All these strategies are still ongoing however, they have promising outcomes.



As a result of their literature review and case studies analysis, the thesis proposes a comprehensive Historic Garden Adaptation and Conservation Toolkit. This contribution addresses both physical and temporal dimensions of historic gardens, aiming to ensure continuity, sustainability and resilience while maintaining historical authenticity.

As a last step, the thesis applies the toolkit to the Bardo Palace in Tunis to evaluate its practical utility. The project includes a theoretical reconstruction of the 19th century layout of the Bardo gardens based on archival resources and aims to implement sustainable management and long-term conservation planning. The results demonstrate the toolkit's adaptability and its potential to support heritage functionality while enhancing ecological aspects. However, due to the limited archaeological data, the project will need further deep site-specific research for a more complete conservation strategy.

In conclusion, the dissertation offers an analytic and practical framework for the adaptation of historic gardens to contemporary challenges. It contributes to the field by linking scientific, cultural and artistic approaches, and provides a groundwork for future research aiming to expand the adaptive strategies and conservation methodologies.

## **5. CONCLUSION AND RECOMMENDATION:**

Historic gardens are a vital cultural heritage intersecting with several aspects of human life, they are living representations of artistic expressions, ecological knowledge and society's history. As multipurpose heritage sites, their significance extends beyond ornamentation and aesthetic aspects, in fact, in dense urban environments historic gardens are contributing in mitigating the impacts of urban heat islands and improve air quality, they function as a community asset that helps enhancing the mental wellbeing of its visitors, and lastly, they can be significant touristic destination that generates revenue while exhibiting historical and cultural aspect as well.

Despite their cultural and ecological values, historic gardens are facing several threats because of the complicated modern environmental, social and economic pressures. In fact, climate change is considered the most critical and urgent issue because of the rising temperatures and the extreme weather events that disturb the fragile microclimates within a historic garden. Urban sprawl pressure adds the risk of land loss and invades of the site's perimeter and boundaries, accompanied by air, noise and soil pollution. Additionally, the loss of traditional handcrafts and

horticultural practices showcases the struggle of accommodating a sustainable adaptation in modern contexts.

The preservation of historic gardens in the 21<sup>st</sup> century requires revision and updating from static conservation strategies to dynamic adaptation. This research has examined how historic gardens conservation can evolve to address contemporary issues while maintaining its fundamental mission of safeguarding its cultural heritage. This thesis reveals through precedents and case studies that sustainable conservation and effective adaptation strategy should balance between existing policies and practices with new realities and issues.

The climate-positive strategy applied in The Royal Botanic Gardens of Kew demonstrates not only the significance of science-based solutions but also the ability of botanical institutions to lead environmental actions while preserving heritage values as well. Their climate-positive by 2030 strategy focuses on eliminating the carbon emissions within the site by implementing a comprehensive carbon management plan that includes renewable energy transitions, sustainable water recycling. On the other hand, the Royal Botanic Gardens of Victoria adopted a different adaptation pathway as they planned a 30-year transition plan and replaced the plant species of the garden with more resilient species that are compatible with the projected climate. The Alhambra preventive Master Plan represents a proactive, knowledge-based approach to preserving the historic gardens against contemporary threats. its effectiveness lies in clearly defining a framework of strategic aims and targeted actions, ensuring the site's resilience and safeguarding its authenticity at the same time.

Based on the literature review and the precedents, this study elaborated a comprehensive strategic toolkit for the sustainable adaptation of historic gardens to contemporary challenges. The toolkit addresses several dimensions of the garden's elements, incorporating both physical elements and temporal axis to create an integrated approach that respects historical and cultural aspects while addressing present issues and ensuring continuous sustainability and resilience in the future.

The thesis suggests applying the comprehensive toolkit to the Bardo Palace garden in Tunis, and the toolkit demonstrates efficiency in addressing the site's unique challenges. The project proposes to reconstruct the 19<sup>th</sup> garden layout through archival plans and historic photographs while ensuring sustainable management of the garden's ecosystem and tourism; moreover, it suggests elaborating a long-term conservation management plan as well. The toolkit's multi-elements approach proves its flexibility in different cultural and climate contexts, focuses

on balancing the historical aesthetics and climate resistance, and proves that preventive, time-sensitive adaptation can sustain heritage functionality while enhancing ecological performance.

### **Limitations and future research:**

While the proposed toolkit provides a structured, comprehensive methodology for historic gardens' adaptation to contemporary challenges, the prototype still requires further research and result analysis to become more efficient. During the application of the toolkit in the Bardo Palace context, the author came across several issues related to the lack of sufficient archaeological and horticultural data, hence, the solution is still lacking depth. Moreover, the author comprehends that the conservation of Bardo Palace's Garden requires long-term analysis, further historical data, in-depth analysis of the climate change impacts on the site, a political and legal approach due to the national significance of the site and lastly, the cooperation of stakeholders and communities.

Additionally, the toolkit strategy should be flexible and adaptable to address the wide variety of environmental and climate challenges, especially in a global context. This could be achieved by incorporating international communication and cooperation, and taking into consideration the lessons from diverse conservation and historic gardens adaptation models.

## **6. NEW SCIENTIFIC FINDINGS**

**THESIS 1: The Florence Charter remains a fundamental layer due to its relevant and still valid definition of historic garden, as well as its emphasis on preservation and conservation. However, considering the contemporary social, environmental, and climate challenges historic gardens are facing, the document and its theoretical statements have become increasingly limited as a reference.**

Building on a deep literature review and analysis of international recommendations, guidelines and conservation principles in the first chapter, the Florence Charter is still a relevant and valid document that addresses historic gardens conservation, offering an appropriate and enduring definition of historic gardens while highlighting the significance of their preservation. however, the document's theoretical framework has grown increasingly limited as a point of reference in the light of contemporary social, environmental and climate-related challenges.

The Florence Charter was published by ICOMOS in 1981 as an addendum to the Venice Charter as an attempt to integrate the designed surrounding area, the open or green space around

the buildings, into the conservation scope. Based on the analytic approach in the literature review, the charter initially focuses on guiding professionals through the conservation process by providing historic gardens definitions, including the nature of the site, scope, different scales, components, etc. Moreover, it clarifies the types of intervention within the site, the management and overall preservation of the site, the types of heritage-friendly usage and lastly, the legal and administrative protection. The charter is a significant base for the garden heritage preservation pathway, setting the fundamentals of the processes and advocating the values and significance of cultural heritage and promoting the best practices on an international level.

The Florence charter indicates in “article 11” that continuous maintenance in historic gardens is essential to maintain their good condition, especially with the existence of green elements, acknowledging the evolving nature of the site. However, since the creation of the charter, several changes have occurred, including climate change and its impacts on environmental and social aspects globally. Additionally, four decades have elapsed since the publication of the Florence Charter in 1981, which is a significant duration in the context of historic gardens as their main ‘building material’ is the green heritage, the dynamic, living entity consistently influenced by environmental impacts and the ecological system. Therefore, the current charter’s recommendations hardly offer the relevant conservation principles as they cannot address the contemporary social and environmental challenges that historic gardens are facing.

Moreover, ICOMOS Australia have published and adopted the revised version of the Burra Charter in 1999, a significant cultural heritage document discussing the contemporary challenges. However, the document was tailored to fit the Australian Heritage conservation first and is wide ranged to be applied in historic gardens. Hence, the two documents, the Florence Charter and the Burra Charter, might create a balance together, and the historic garden field can benefit from Australia’s experience. Still, the efforts to update the Florence Charter to call attention to the contemporary challenges have become mandatory as the conservation of historic gardens faces new and severe challenges all over the world.

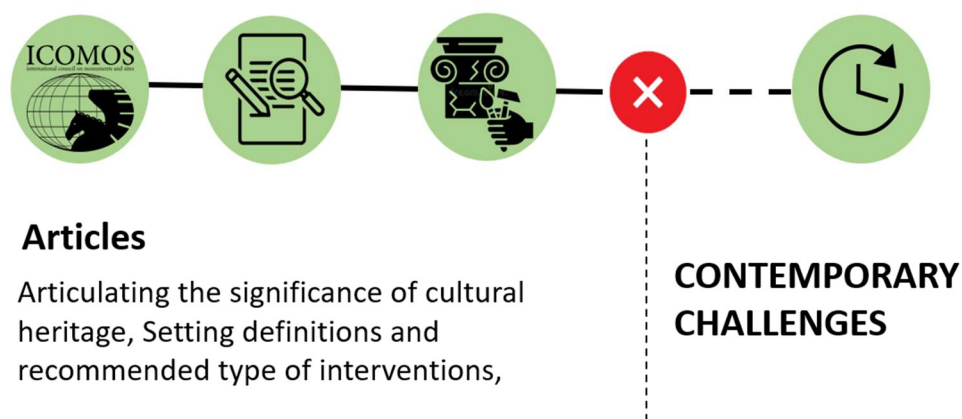
**THESIS 2: As the most significant document for historic garden conservation, the Florence Charter must be revised in the light of the contemporary challenges, especially climate change and mass tourism, that heritage gardens are facing nowadays.**

Based on the literature analysis in the first chapter, several severe conservation challenges could be damaging to historic gardens. Recent studies highlighted critical threats from climate change and mass tourism, which seem to have the most damaging effects. These challenges have exposed gaps in the theoretical framework adopted by ICOMOS in the Florence Charter of 1981.

In the 20<sup>th</sup> century, the Florence Charter recognised historic gardens as living heritage that should be preserved in both cultural and ecological aspects. Ever since the publication and adaptation of the charter, several improvements have been witnessed in the field. However, accelerated impacts of climate change, biodiversity loss, urban expansions, etc, have created complex challenges that demand an improved approach to historic garden conservation. The charter's current framework no longer includes all necessary pathways for garden preservation, including adaptive management strategies and incorporating sustainable green solutions and facing the climate change impacts.

Contemporary challenges for historic gardens require deep and complex research, regional and international cooperation in the field of evidence-based or case study analyses, and science-based interventions to cope with challenges in the cultural and ecological aspects of historic gardens. Moreover, the growing demand for tourism and accessibility requires the integration of adaptive infrastructure while balancing the authenticity of the site.

Indeed, the Florence Charter is essentially a global guideline that attempts to assist the direction of conservation processes for historic gardens. However, keeping pace with the present-day issues will improve the credibility of the document worldwide. In this context, updating the Florence Charter to reflect the contemporary complexities would provide a more resilient and dynamic tool for authorities and stakeholders in terms of historic gardens conservation.



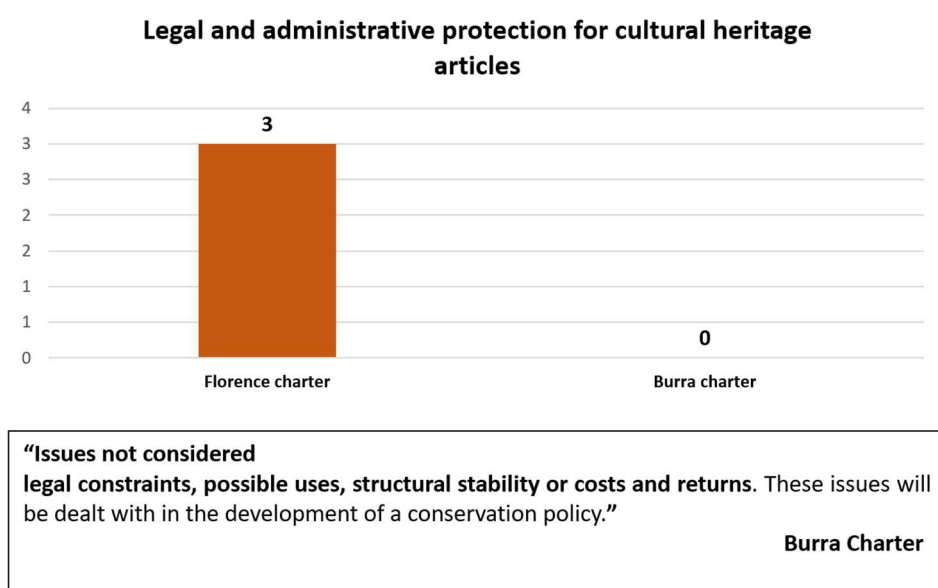
*Figure 1: Florence Charter Framework about contemporary challenges (Source: Made by the Author)*

**THESIS 3: To ensure the historic gardens' preservation and sustainable conservation on the long term, special attention should be paid to encouraging the legal and administrative protection.**

According to the literature review in the first chapter, the Alhambra case study in the second chapter and the historical and site analysis of the Bardo complex in the sixth chapter, legal protection plays a fundamental role in historic gardens' conservation by establishing firm frameworks that prevent unauthorised alterations and ensure long-term preservation. Over time, the lack of legal safeguards risks the loss of the artistic and cultural significance of the gardens.

Heritage protection has always been a complex topic due to the physical fragility and cultural significance of heritage sites; in the case of historic gardens, it is even more complicated as they combine art and nature, making their preservation a long and continuous process. Moreover, conservation processes should not be limited only to the physical restoration of the built elements and the adaptation of the green elements within a historic garden, as legal protection by the governmental parties is mandatory as well to maintain the results of the conservation efforts.

Certainly, the legal and administrative protection of cultural heritage should be studied and decided by local, regional and national authorities rather than international organisations. However, the ICOMOS charters, even though they hold a significant role in the field of heritage protection by setting definitions, guidelines and recommendations in the process of heritage safeguarding, they do not impose a legal obligation on stakeholders as they are a non-governmental organisation. However, they highly influence experts and professionals worldwide, and thus, encouraging local parties by elaborating and focusing on articles that state the importance of legal and administrative protection of historic gardens will improve the international point of view on this aspect of historic gardens.



*Figure 2: The number of articles for legal and administrative protection for cultural heritage sites in Florence Charter and Burra Charter (Source : Made by the Author)*

**THESIS 4: Science-based solutions, like the integration of ecological principles with targeted technologies, have resulted in the most effective approach for climate change adaptation and mitigation of historic gardens. As literature review and site analyses show similar processes and dangers for historic gardens all over the world.**

The case study analysis in chapter four demonstrates that in terms of climate change adaptation, science-based solutions are the most effective way to ensure that a historic garden can cope with and mitigate the undesirable impacts. The effectiveness of these solutions is the result of combining strong ecological principles with an appropriate framework that is suitable for a vulnerable site like historic gardens.

As historic gardens conservation has evolved recently to match the contemporary challenges, scientific methods in terms of climate adaptation have resulted in positive primary results that are promising in the long term. In fact, throughout this thesis, the author presented different science-based adaptation interventions applied in different major historic gardens, with different histories and backgrounds. Depending on the conservation projects, these interventions should always be simultaneous with the traditional conservation strategies presented by the guidelines and charters.

These science-based solutions in historic gardens focused only on the climate change impacts on the gardens' plant selection and ecosystem. Consequently, they are only dealing with one part of the conservation project. However, in order to achieve a successful conservation project, all the aspects of the garden should be considered. The Landscape succession strategy applied in Melbourne Botanic Gardens was only ensuring the transition of their plant species selection to be adaptable and survive the projected climate for 2090, however, it did not affect any other cultural or historic aspects of the garden. Moreover, the Climate Positive 2030 realised in the Royal Botanic Gardens included the garden's management into the agenda as well by promoting clean energy and green transportation within the gardens, including the historic greenhouses and buildings.

In this sense, the Author proposes that science-based solutions must be applied simultaneously with the tradition and wholistic conservation approaches as these strategies cover different significant parts of historic gardens, science-based solution can cover the adaptation of historic gardens to the climate change impacts while the traditional conservation interventions work on safeguarding the cultural and historic aspects of the site.

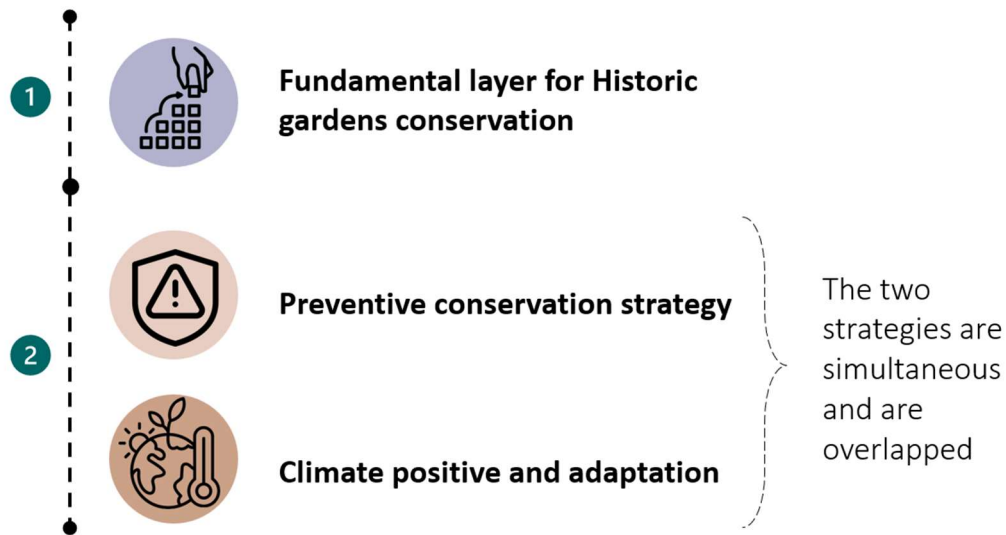


Figure 3: Effective strategy for safeguarding historic gardens (By author)

**THESIS 5: During a historic garden conservation project, greater emphasis should be placed on preserving the site's authenticity, including physical and spatial elements, green elements, functions and main character.**

Building on the literature review, the case studies and the Bardo Palace example, the site's authenticity is the essence of heritage sites. Authenticity can be easily compromised by inappropriate alterations or inaccurate interventions, therefore, during a conservation project, it is a must to prioritise safeguarding the site's authenticity by focusing on protecting its physical and spatial elements.

Historic gardens are heritage sites that cannot be restored to the exact original state because of several factors, firstly, the original state of the green elements within a historic garden is a complex entity to preserve as it is always a subject to change and evolution, also the horticultural practices differ from the new contemporary applied solution. Moreover, the historic materials used in older designs are hard to imitate and recover.

Heritage conservation is, in fact, an interpretive discipline rather than an exact science, and hence, it might involve a level of uncertainty. However, further efforts should be implemented to fulfil the task of preserving the authenticity of the place. In the case of historic gardens, the efforts include used materials, horticultural techniques, local identity, etc.

As emphasised in the literature review, in some cases, a conservation process can represent a major threat to the site due to several factors:



**Loss of authenticity:** this might be the result of conducting a conservation and restoration process without understanding the history of the site, and hence leading to neglecting parts of the garden's history because of inaccurate facts. Also, it is always advised to differentiate between the original elements and newly added elements within a garden as an attempt to safeguard the authenticity.

**Inaccurate techniques and lack of specialised knowledge:** Most of the artistic techniques applied in heritage sites are also considered historical or very rare to find, and the lack of recognition of the significance of these techniques will lead to authenticity threats. In fact, in several cases, reconstruction projects will be applied in historic gardens in order to imitate the original state without the misinterpretation of the original state through applying specific original techniques.

**THESIS 6: Exogenous threats, arising from external factors beyond the boundaries of historic gardens, cause significant challenges to their preservation and long-term sustainability.**

Referring to the case study of Alhambra elaborated in chapter four, proactive protection against external threats like environmental factors and visitors' impacts is crucial for safeguarding the site. This is ensured by a robust legal framework based on national and regional heritage laws as well as comprehensive management plans like the Alhambra Master Plan. These measures enforced the sustainable preservation of the site and eliminated several exogenous threats and risks.

As cultural heritage sites, the conservation and preservation of historic gardens is mandatory, this might extend on different levels, starting firstly with the conservation project as a physical intervention within the garden, secondly, the continuous maintenance and adequate management and lastly, we should acknowledge the significant role of the legal and administrative protection of the site as well. Heritage sites might be impacted by exterior factors, from outside their perimeter, such as fast urban sprawl, mass tourism, land management, in addition to environmental issues as air pollution, which are considered to be direct threats to the site.

The lack of legal protection, such as laws, regulations and agreements from governmental parties, creates a new challenge to the preservation of the site and makes it vulnerable to different threats as it increases the risk of destruction and the loss of integrity due to the urban development and infrastructure projects leading to the loss of cultural and historic identity, furthermore, this might also impact the environmental aspects of the site and the loss of biodiversity due to the direct

exposure to urban pressure and pollution in general. Moreover, the lack of legal protection might lead to unregulated tourism, overcrowding and mass tourism. Hence, this will impact the internal management of the garden, creating a more challenging atmosphere to control the number of tourists and decrease the visitors' impact on the site. Lastly, the financial resources of a historic garden might be impacted as well in case of no legal protection, this will decrease the legal recognition that qualifies the site to financial support from the government or international organizations, in fact, not only the financial aspect will be affected, but also the site will have lower access to the international aid and expertise in general.

In summary, the legal protection of the site will ensure that the heritage site will be recognised and protected over time, providing financial resources and a framework that protects the site from potential exogenous threats that put the cultural and environmental aspects of the site at risk.

**THESIS 7: Despite its cultural significance, the garden of Bardo Palace has not been included when registering the monument as a national heritage site, hence, the lack of a protective value-management has caused the partial loss of the historic garden both in its area and vegetal or built elements. The historical garden was subordinated to the new functions, which resulted in a mass tourism decreasing further the condition and values of the garden's open spaces.**

The Bardo Museum is a significant national cultural site, besides its architectural and artistic history, the site currently holds the richest mosaic collection that is indigenous to Tunisia. The monument is registered as a national heritage site since 1920; however, the protection decree only includes two palaces without mentioning their perimeter or gardens according to the urban development plan elaborated by the Ministry of Equipment, Housing and Spatial Planning and the Urban Planning Agency of Greater Tunis. Because of the lack of legal protection, the former historic garden of Bardo has disappeared, especially because of the several restoration projects in the area. One of the gardens has been transformed into a large parking lot to adapt to the visitors' needs, while the Romantic French Garden has lost its patterns and pathways.

Moreover, the Bardo complex experienced significant land loss throughout the years significant land loss due to the new allocated functions and usage. Several areas of the complex are not accessible to the public as they are registered as military areas or governmental buildings, whilst the only publicly accessible part is the parking area. The added functions to the site led to eliminating the visitors from experiencing the authenticity of the palace's gardens, which led to, hence, a part of the identity of the site is not well exhibited to the public.

**THESIS 8: For the context of Bardo Palace's Garden, the periodic reconstruction of the 19<sup>th</sup> century garden is the optimal and possible proposal due to the lack of historic documentation from the earlier periods.**

Based on the historic and the site analysis elaborated in the sixth chapter of this research, the Bardo Palace has witnessed significant architectural evolution projects throughout its history from the 15<sup>th</sup> until the 21<sup>st</sup> centuries, the structural alternations have resulted radical changes of the garden's spaces, structure and usage, Even though the data is not sufficient for a reconstruction project, the 19<sup>th</sup> century version of the garden is the most documented period Based on the collected archival data and the historic photographs based on the collected archival data and the historic photographs.

The thesis proposes to elaborate a reconstruction strategy of the 19<sup>th</sup> century version of the Bardo garden, which includes several parts of its history: the colonial-inspired design at the main entrance of the palace and the original elements representing the traditional North African landscape design and the influence of the Moorish culture.

However, the thesis proposes further archaeological investigation that might reveal more concrete information about the garden's structure and architectural elements and a deep horticultural investigation in order to identify precisely the previous plant species used within the garden.

- **Practical proposal:**

**THESIS 9: The conservation strategy should be based on a profound field survey that includes the garden's past, present, and future to arrive at optimal, long-lasting results. Due to global, regional, and local challenges on environmental, climate, and social aspects, the regular, traditional site survey and analysis method needs revision and development.**

As demonstrated in several case studies throughout this research, the key to a successful conservation project lies in the profound site analysis elaborated before the decision-making. The historic background of a historic garden, its current state and the weak points will provide a detailed understanding of the current state of the garden and its weak points. Historic gardens are defined by both their architectural and green elements, making the site subject to both fixed and mutable factors. Moreover, giving their time of creation the part of the garden should be included as well as its present and future.

**Past:** Analysing the historic and cultural significance of the historic garden will assist in deciding the conservation process and the preservation level that should be applied. This should be done through analysing archival documents, plans, paintings etc and it considered as a fixed factor as it already happened in the past and could not be changed.

**Present:** Assessing the current state of the site by conducting a wholistic site survey covering the state of the built elements through assessment of site plans and the current conditions of the materials and the state of the ecosystem and the green elements as well. Moreover, the assessment should also include the usage, management, legal protection and financial resources of the site.

**Future:** Projecting the future of the historic gardens is essential to understand the pathway of the conservation process especially in the shadow of the fast-changing times and the projected impacts of climate change.

## 7. LIST OF PUBLICATIONS

- CLIMATE CHANGE MITIGATION AND ADAPTATION STRATEGIES IN HISTORIC BOTANIC GARDENS

**Lahmar chaima**, Kinga Szilagyi

4D JOURNAL OF LANDSCAPE ARCHITECTURE AND GARDEN ART 2025

- THE EFFECTS OF CLIMATE CHANGE ON THE LIVING HERITAGE OF HISTORIC GARDENS – MAINTENANCE AND RESTORATION OPPORTUNITIES OF THE HISTORICAL TREE PLANTINGS

4D JOURNAL OF LANDSCAPE ARCHITECTURE AND GARDEN ART ( 1787-6613 ) : 65 pp 48-63 (2022)

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