Maria Luisa Germanà · Natsuko Akagawa ·
Antonella Versaci · Nicola Cavalagli   *Editors*

Conservation of Architectural Heritage (CAH)

Developing Sustainable Practices

Fourth Edition

Advances in Science, Technology & Innovation

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Antonella Versaci · Nicola Cavalagli
Editors

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A Culmination of Selected Research Papers from
the International Conference on Conservation of
Architectural Heritage (CAH—6th), Palermo (IT) 2022

Fourth Edition

Springer

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Preface

The Conservation of the Architectural Heritage is a complex activity, with many and intertwined facets. For this reason, although it is not a new theme, it continues to be appropriate to feed the reflections, from various perspectives.

Thanks to the initiative of IEREK (International Experts for Research Enrichment and Knowledge Exchange), the CAH International Conference offers an opportunity for a stimulating comparison between researchers from all over the world: each of them is the bearer of a precious contribution, which suggests trying to change point of view, understanding how our usual values are always relative and their general validity cannot be taken for granted.

The sixth edition of the CAH Conference was hosted outside Egypt for the first time. I am grateful to IEREK's CEO, Dr. Mourad Amer, for accepting my suggestion to choose, as the location for the 2022, Palermo: a place where the traces of cultural intertwining have settled for millennia and which maintains its vocation as a crossroads and mixing.

The University of Palermo was proud to take up the baton, which is why the choice of the place to host the conference fell on the Botanical Garden of Palermo, a setting where heritage and knowledge come together.

I sincerely thank all those who contributed to the organization and all the participants, both in presence and from a distance.

<div align="right">

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Acknowledgments

We want to thank the Authors of the research papers that were selected for addition to this book. We would also like to thank the Reviewers who contributed with their knowledge and constructive feedback to ensure the manuscript is of the best quality possible. Special thanks goes to the Editors of this book for their foresight in organizing this volume and diligence in doing a professional job editing it. Finally, we would like to thank the IEREK team for supporting the publication of the best research papers submitted to the conference.

Contents

Quality in the Conservation of Architectural Heritage: Methodological Issues for Developing Sustainable Practices

Maria Luisa Germanà

Abstract

The goal of architectural heritage conservation has never been questioned since the very concept of heritage arose. This objective has evolved during the last century, on the one side enlarging the object of conservation (from the single building to the historical landscape) on the other including intangible forms of heritage. Furthermore, on the one hand, the objective of conservation has gradually acquired a dynamic dimension (since its achievement extends over time, since punctual results are not sufficient); on the other, it is now considered fully integrated with the contemporary world (in the multiple and intertwined dimensions of the social, cultural, economic and environmental aspects). Observing the evolution of the objective of conservation of architectural heritage, it can be observed that the focus initially shifted quickly from "why" to conserve to "what" to conserve, and then moved more slowly to "how" to conserve. This last step is still maturing today, both theoretically and operationally, helping to emphasize the importance of quality orientation, pivotal in any technological process, also in the field of built heritage. Therefore, the noun *conservation* today is no longer sufficient and needs qualifying adjectives (such as *sustainable*; *reliable*; *inclusive*), which largely depend on the kinds of conservation practices. That is why a conscious approach to the process-based vision of conservation (in which experts and users interact and in which clearly defined objectives can guarantee reliable results) is increasingly important. The contribution explores the meanings that a sticky word as "quality" can assume in the conservation of the architectural heritage, aiming to lay the foundations for a comparison between the many good practices already available, in a way that can be useful for spreading and increasing them.

1 Quality Practices: the Need for a Process-Based View

During the second half of the last century, the issue of quality made its way within the ACE (Architecture, Construction and Engineering) sector, due to the need to deal with phenomena whose huge and immediate quantitative impact did not hide the evidence of serious critical conditions in terms of quality. The research produced the *Performance Building Design* (PBD) approach, which was based on the identification of the set of characteristics that contribute to defining the quality of the built environment: "The performance approach is, first and foremost, the practice of thinking and working in terms of ends rather than means […]. It is concerned with what a building or building product is required to do, and not with prescribing how it is to be constructed" (Gibson, 1982). This approach put the user and his needs at the centre of attention, which is not new, because it was already present in the traditional architectural culture; but it was in any case a significant methodological progress, which laid the foundations for a shared definition and, consequently, for an objective evaluation of quality, a rather slippery topic.

At the end of the last century, the theme of building quality, initially focused only on new constructions, began to be developed with reference to the refurbishment of the generic built environment and then also to the conservation of the built heritage (Germanà, 1995; Sposito Germanà,

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2004). However, the difficulties that the PBD approach has generally found in applications within the building sector, in the field of interventions on the built environment, have been even more insurmountable, due to the dominant tendency to orient oneself according to the "case-by-case" principle, that eschews any replicable methodology.

Yet, in the last two decades much awareness of the need for a methodological renewal has arisen, starting from the critical observation of the interventions already carried out. In order to ensure that the quality of practices on built heritage does not remain a mere good intention and to achieve satisfactory concrete results, it is essential to apply a process-based vision: if instead of looking only at the objectives, one looks at the activities necessary to achieve them and strives to organize them according to a sequence of phases, it is easier to identify the skills, operational tools, procedures, and resources needed.

In particular, the process-based vision pushes us to consider that every intervention must be divided into: (1) a *planning phase* (in which what, how much, why, and how to conserve are identified, taking into account resources and constraints); (2) a *design phase* (in which functional and technological alternatives are compared and chosen and all aspects of the selected solutions are explored); (3) an *implementation phase* (in which operators with adequate skills carry out the planned interventions); (4) a *management phase* (in which the assets, once conserved, are used and maintained).

The scanning in phases contributes to the identification of: clients, operators and beneficiaries of each action; necessary resources to implement them. As in the generic building process, also in the practices on the built heritage, which move in a sphere dominated by the public dimension, conflicts and difficulties of interaction between people and entities involved from time to time must be addressed.

The first step in the achievement of positive results (and to a quality that can be objectively evaluated) is taken if: (1) the activities necessary to achieve the objectives of knowledge, conservation and enhancement are articulated in an organized sequence of decision-making, implementation and management phases; (2) the skills, the operational tools, procedures, and the resources necessary for their performance are identified. The knowledge, conservation, and enhancement processes should be integrated and interact with each other, so as not to arouse conflict or redundancies: therefore, a unified direction is needed (which places interdisciplinary contributions in a systemic framework) and a common basis, which supports the necessary interoperability to overcome the critical nodes between the procedural phases, identified as factors of inefficiency even in the most ordinary building process. A first condition of the quality of conservation, therefore, is that it is integrated

with knowledge on the one hand and with enhancement on the other, by applying a unitary approach, based on common cultural and technical-operative bases.

1.1 Critical Issues Within the Knowledge Processes

The countless scientific contributions and programmatic declarations on the subject of architectural heritage have always indicated the knowledge as an indispensable prerequisite for any intervention. However, some sore points can also be identified in the most basic objective referred to heritage, that is to know and to understand it, in order to be able to preserve it adequately. The main aspects that can compromise the quality of knowledge are how it can be applied and how it can be updated. Regardless of the application field, the acquisition of knowledge includes a series of activities that requires a planning phase (in which, starting from a framework of available resources and constraints, the object of knowledge, the level of detail, and connection with the context deemed necessary are defined), a design phase (in which the cognitive tools are decided, on the basis of the planned feasibility), an implementation phase (in which suitably qualified operators collect data and information on various types of media and the knowledge achieved is validated), a management phase (in which the information collected is archived, consulted, and updated).

The critical aspects of knowledge are found throughout the entire process, but they are concentrated—above all—upstream and downstream. In the planning phase, not being able to rely on an ordinary plan of dedicated financial resources, one often navigates on sight, using the available funds from time to time, and this hinders the definition of a systematic and progressive programmatic framework. In the management phase, the problems lie in the applying knowledge and in its obsolescence. The knowledge already acquired must be easily identifiable and accessible, on pain of being almost useless. In addition, this knowledge must be maintained, because it is subject to double obsolescence. Concerning objects in continuous evolution (both seen in themselves and read with reference to the complex interactions with the context with which they relate) they must be updated, periodically or following unforeseen events. Furthermore, the knowledge (in the form of reports, graphics, drawings, photographic documentation) is archived on supports which are also subject to deterioration; the advent of digitalisation does not evade the question, which is indeed aggravated by the acceleration of digital obsolescence, which involves both hardware and software.

Some significant steps forward an improvement of the knowledge processes can be traced back to the cultural

developments of *planned conservation* (Della Torre, 2021) and to the consequent operational progress in the field of maintenance (Gasparoli, 2012), with particular reference to the *information system* (Della Torre and Pilli, 2020), in which archiving, processing, use, and updating of information are activities considered, overall, as indispensable decision-making and operational support. The systemic vision makes it possible to govern the complexity of knowledge, both in the initial acquisition phase and in the subsequent updating phases, in which the feedback information, deriving from the inspections and conservation interventions carried out, play a strategic role. This highlights the opportunity not to separate the processes of knowledge from those of conservation.

1.2 Critical Issues Within the Conservation Processes

The activities carried out on the built heritage in order to preserve it consist of interventions which—like any other technological process—involve a certain degree of "technical risk", which depends on a set of conditions which can prevent the achievement of satisfactory results, in whole or in part part (Germanà, 2004; Mecca & Masera, 1999). Effects can include: time and costs out of control; unfinished or unused works, unmanageable solutions under functional or technical aspects, difficulties in the long term duration and even in the the permanence of the built heritage that has been subject of intervention.

In fact, conservation does not end in punctual episodes, but needs repeated practices over time and, like knowledge, must be seen as a process: every conservation intervention must be divided into a planning phase (in which one identifies what, how much, why and how to conserve, taking account of resources and constraints), a design phase (in which functional and technological alternatives are compared and chosen and all aspects of the selected solutions are studied in depth), an implementation phase (in which operators with adequate skills carry out the planned interventions), and a management phase (in which the built heritage, once conserved, is used and maintained). The scanning in phases contributes to the identification of clients, operators and beneficiaries of each action and to the identification of the resources necessary to implement them: as in the generic building process, also in the conservation of architectural heritage, which moves in a sphere dominated by the public dimension, conflicts and difficulties of interaction between people and entities involved from time to time must be faced (Germanà, 2014).

The critical issues of conservation are encountered throughout the entire process, but many of them can be traced back to planning, which confirms the interest of the topic of preventive and programmed conservation. This phase is often short-lived, due to the inconstancy of the flow of funds and the tendency to pursue short-term effects, and is often ignores the requisites connected to the management phase (maintenance and involvement of the operators concerned; openness towards requests of hosting communities).

Similarly to what was stated above for the knowledge process, the maintenance requirements can help to address many critical issues, attributing importance to the maintainability of conservation interventions and imposing a long-term vision, by planning the inspection activities, thus helping to make concrete the objective of the permanence of historical evidence. But the planning phase of architectural heritage conservation, with a view to integration already indicated in 1975 and decidedly consolidated in the following decades up to today (CoE, 1975; CoE, 2005), must also include other objectives, which involve effects on life and which require the widest possible sharing of choices with local authorities and communities. In fact, the most technically successful conservative intervention, which however has not taken into account the social and economic aspects of the management phase in a programmatic way, quickly vanishes: at best, few will notice its existence; at worst, it will soon be vandalised.

For this reason, as shown by some current trends, the entire conservation process, with methods that adapt to the different phases, must provide for the involvement of the communities, especially aiming at the younger and older age groups, acting on the levers of volunteering and of associations, as well as making use of the collaboration of educational institutions. Participation triggers a virtuous trigger which, through identification with the architectural heritage, stimulates a sense of belonging from which we derive respect and a spontaneous propensity for care (as taught by the rose of the Little Prince (de Saint-Exupéry, 1943) preconditions for conservation for a long time neglected by the experts. The participation of the local community also proves to be decisive in the executive aspects of conservation interventions, which are often considered only from a technical and specialist point of view. These considerations also prove the need to integrate the various processes relating to the architectural heritage, with particular reference to the intertwining of conservation objectives and enhancement objectives.

1.3 Critical Issues Within the Enhancement Processes

The integrated vision of conservation is directly linked to the objective of enhancement, which adds to the intergenerational dimension a focus on the present time, placing emphasis on the use of built heritage. This objective is linked to the

theme of the development of the hosting communities and it is often placed at the center of local policies, as well as being the subject of numerous researches in the economic and social fields. Thanks to the attention paid to enhancement, some important aspects have begun to be taken into consideration, such as the determination and attribution of the costs necessary for conservation and use. Therefore, having raised the bar of the cultural heritage objectives, adding enhancement to knowledge and conservation, can be considered a positive fact because it has helped to outline a more realistic picture around issues that previously were often addressed without taking into due account of these aspects, which has generated examples of carelessness due to non-productive management and not fed by the necessary resources. In this, the architectural heritage does not differ from the more ordinary building heritage, of which correct management can be considered a prerequisite for maintaining the value and therefore a premise for any valorisation.

The critical aspects of enhancement are even more complex, numerous, and heterogeneous, requiring the contribution of many points of view that are not always convergent. Today, the time is ripe to consider enhancement as a tool which contributes to the cultural and civil growth of the local community, without neglecting to reflect precisely on the value that each individual attributes to the builtl heritage, in the framework of one's interests, ambitions and ethical models.

2 From Separation to Integration, a Holistic Approach

The architectural heritage comprises the parts of the built environment that have acquired cultural meanings, disregarding age, place or dimensions (CoE, 1985, art. 1). Even if this term has maintained its significance over time, its qualitative and quantitative aspects have radically evolved in the last decades. Nowadays, the architectural heritage has extended its scope far beyond the single building, involving the urban and landscape context. In addition, the intangible dimensions of the built heritage are increasingly invoked, in order to gain a deeper understanding and better effectiveness of the interventions of conservation and enhancement.

In the origins of the very concept of heritage, a sort of distance from contemporaneity can easily be found, deriving from the discontinuity between Present and Past (Germanà, 2019). This explains the reason why, in the vision developed during the last century, the architectural heritage was separated from the ordinary sphere, as if it were enclosed in a niche, where only experts have a say.

This separation between heritage and contemporaneity has contributed to generating many of the critical issues in architectural heritage practices and has deep roots, in the cultural caesura between Past, Present and Future induced by the linear vision of time, which has long dominated the culture of construction and of the built heritage: the traces of the Past are stratified into the heritage, heavy in its material identity and rooted in the place, of which the Present feels the responsibility of transmission to the Future, limiting itself to the role of passer. Instead, a circular vision of time is gaining ground in the twenty-first century within technological processes, including those involving the built heritage. This vision is consistent with the objective of "continual improvement" in the Quality Management Systems (Keen, 2021). For this reason, the immaterial aspects of the interventions (procedures, organisations, operating models), in which the surrounding cultural, social, organizational, and economic conditions are expressed, are to be considered equally important as the material aspects.

After decades of sometimes forced sectorisations and specialisms, the unitary approach to interventions on the architectural heritage requires a renewal of the theoretical and operational foundations, embracing the entire contemporary built environment with long-term strategies, of which the heritage is a part that does not can be delimited, both for its widespread diffusion and because it reflects meanings that can change with the evolution of the cultural sensibility.

Therefore, in the vision shared today, the distance between architectural heritage and contemporaneity seems as it is shortening: it has been understood that the built heritage cannot be considered separately from the rest of the built environment. In addition, the evidence has emerged of the need for considering the architectural heritage always in the framework of the relationships with people, from the host communities to the visitors, keeping account of the individual and collective levels. In fact, in the contemporary vision, heritage is always more based on the "people-centered approach" (Wijesuriya, 2015) and it plays a pivotal role in pursuing the the objectives of human development and of quality of life (CoE, 2005, art. 9).

The evidence of the change from separation to integration between the built heritage and the built ordinary environment, is especially clear focusing on the meanings of the contemporary use, that have increasingly become pivotal within the processes regarding the architectural heritage (Germanà, 2021). In fact, the practices on the built heritage must involve the protagonists of the use (visitors and host communities) within a unitary framework, in which every process of transformation and management of the built environment is inspired by the "baukultur" (Swiss Confederation, 2018; Swiss Confederation, 2021), which shuns the cultural segmentations inherited by the last century.

3 The Common Theoretical Basis for Sustainability and Conservation

Sustainability has been the main horizontal issue during the last decades and it will certainly continue to be central in every technological theme also in the long term. Developed from the awareness of limits of the natural resources (Meadows et al., 1972) and increased by the evident irreversible consequences of scientific and technological progress on our planet (Hamilton et al., 2015), the shared goal of the sustainability has been proved crucial for future whole survival of humans (UN, 2015). The aim to give substance to the sustainable development, defined in the light of the intergenerational equity, has made clear the need for fully integrating its economic, social, and environmental dimensions in a coherent vision (UN, 1988). Nowadays the sustainability also plenty regards the cultural heritage: the very idea of conservation stems from the intergenerational vision that lies at the hearth of the sustainability. In fact, generally speaking, heritage is worth to being conserved because it is a witness of the Past that could have meanings and suggestions for the future generations.

This common theoretical basis contributes to explain the reasons why some various dimensions concurrently characterize both the conservation and the sustainability, in an intertwined mix of social, economical and environmental aspects. In addition, the link between sustainability and heritage has been increased in the last decades thanks to the always-broader consideration of culture as the *fourth pillar* of the sustainability: "Cultural heritage, in all its multiple forms, from memories to landscapes, is a testament to human creativity, and is a resource for the construction of the identities of people and communities. As something that is alive and constantly evolving, it should be integrated into life and society in dynamic ways" (UCLG, 2015, p. 12).

The comparison of sustainability and cultural heritage conservation could continue by reference to the risk of the "green washing", a sort of label attached to items or services in order to merchandising them. The awareness of the plural dimensions in sustainability and in conservation is the main precondition to avoid this risk. The conservation of architectural heritage is a complex objective, which on full achievement involves the satisfaction of multiple requirements. For this reason, there is the need for a multidimensional vision, like in the case of the sustainable development. Following the Triple Bottom Line theory (Elkington, 1997), this vision can be referred to three spheres: the Social (People/Equity), the Economical (Profit/Economy), and the Ecological (Planet/Ecology). By the 3BL theory, by now it is clear that the sustainable development mainly depends on an integrated approach, which focuses on the shared areas between these spheres, trying to resolve the conflicts between the diverging orientations that are usual in the three spheres considered individually.

Just as sustainability depends on concurrent fulfilling of socio-cultural, socio-economical and environmental requirements, so sustainable conservation should be *bearable*, *viable* and *equitable*. (1) Bearable, because the practices have costs, that must to be quantified in order to consider realistic targets; this implies the issue of the financial support of the interventions, in which the cooperation of private and public sphere and the voluntary activities are relevant. But also bearable in terms of the responsible use of the natural resources and of the considering health and well-being of operators and visitors. (2) Viable, because the feasibility conditions must be respected, in the tangible and intangible, technical, and operational aspects, with reference to human and financial resources and taking into account resilience, in order to consider the need for adapting to increasingly rapid social and climatic changes. (3) Equitable, because the results of conservation practices must be enjoyed by all (considering physical, cultural and social barriers) and must be inclusive, taking into account the variety of people possibly involved (children; elderly, disabled).

4 Conclusions

The theme of the quality of architectural heritage practices highlights the transition from the "why" and "what" to the "how" and makes it possible to look at the results in objective terms. On this basis, it is possible to compare the numerous examples of good practices, in order to be able to disseminate them taking into account the specificities of each specific situation.

Sustainable practices of conservation of the architectural heritage require a holistic approach that includes: an intergenerational vision; a multi-scalar and multi-dimensional nature; respect for both tangible and intangible elements, and recognition of the intertwined whole of social, economic, cultural and environmental factors that should involve the local communities in multiple, parallel ways.

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The Transcultural Dimension in Heritage Conservation

Olimpia Niglio

Abstract

In recent years the meaning and value of cultural heritage have taken on a local dimension, favoring the centrality of communities and the development of territories in relation to their characteristics. This new perspective has been favored by the need to regenerate all those cultural processes of local realities, putting the value of culture back at the center. The serious imbalances and disharmonies that currently exist in the world highlight the need to start from the cultural values of individual communities and to build transcultural relational processes capable of giving priority to human, spiritual and educational values, all fundamental references for building a sustainable world. Meanwhile, these complicated problems of the world highlight the need to enhance the value of local cultural realities, communities, individuals with the aim of pursuing greater balance and harmony. All this requires a greater capacity for sharing, cooperation and creativity in order to achieve lifestyles more compatible with the sustainable development that the whole world now requires. This contribution aims to bring the reader closer to some issues aimed at enhancing education in culture and one's own heritage, fundamental resources for the development of our personality and our life in dialogue with others.

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Respect for man and respect for the great human values […] Only after years of bewilderment do our people return to this deep and heartfelt sense of their own action.

Alexander Dubček Bologna November 12 1988

1   Introduction

The global pandemic has certainly changed our perception of the world. If until a few years ago there was discussion about the universal values of cultural heritage and the role of a unitary and globalized vision, all this has taken on a different meaning that today helps us to observe the world with new paradigms. In fact, the pandemic helped us understand that we were losing the important battle against climate change, ethnic inequalities, religions, and conflicts between different cultures, moving away from the fundamental issues that underlie the development of humanity. These problems, especially in recent years, have become more urgent and the economic devastation that the pandemic has produced has unmasked many problems that afflict the world: poverty, lack of education, scarcity of food resources, environmental crises, social crises.

Meanwhile, the pandemic, despite having produced a serious global health crisis, has unmasked many negativities, and has allowed humanity to open new horizons. Perhaps for the first time, after so many years, so many people, so many communities have come together to work for the common good, that is, to guarantee life on earth. Perhaps for the first time many communities have perceived that the first important heritage is the human one, it is life and therefore our existence on earth. Perhaps for the first time shared and participatory actions have been activated to save a common good that is not easy to circumscribe within generic categories such as "tangible" or "intangible" but which is extraordinarily called "life".

Generally, we are not used to thinking of the concept of heritage as a "human good" and therefore a "vital common

good" and above all we are not free from conceptualizations that do not let us observe the world as it really is, always forced to entrench ourselves behind a universal norm or convention, but not universally possible.

Paul Schafer, Canadian educator, expert in cultural law says that:

> […] While we seldom think about this in a systematic and concentrated manner, every person in the world is compelled to combine all the various parts of their lives together to form a "whole" or "total way of life" made up of many parts. It doesn't matter if they are carpenters or prime ministers, where they live in the world, what their educational circumstances are, or where they work. Every person must combine all the different parts of their lives together to create a holistic entity, regardless of whether this is done in terms of their bodies, minds, brains, souls, spirits, and senses or all the economic, social, political, artistic, technological, recreational, spiritual, scientific, and environmental activities they are involved in over the course of their lives. This is a necessity that all people must confront and come to grips with in life. There is no escaping it, regardless of whether this is done well or badly It is this holistic necessity and process that Edward Burnett Tylor, the British anthropologist, may have had in mind when he defined culture formally as "that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man (woman) as a member of society." (Tylor Edward, 1958) Tylor defined culture this way in the latter part of the nineteenth century, although his principal concern at that time was to apply this all-encompassing definition of culture to societies and countries rather than to individuals and institutions which is occurring much more frequently today (Schafer, 2022a).

All this helps us to introduce a very important concept: culture is the foundation of man's existence and without culture there is no life and therefore there is no heritage. Being aware of this assumption is a fundamental step if we intend to continue constructively our path for the development of humanity. In fact, it is difficult to imagine social developments without a cultural basis and history bears witness to this reality. No development will ever be possible without a paradigm shift in human life capable of putting the values of culture back at the center.

As Pope Francis affirms, we must now work for a "culture of encounter", where every community, every person is able to build dialogues, to carry out shared and useful projects for all and above all to broaden our gaze to a broad horizon, as well as to know how to look at and appreciate the world in its extraordinary variety (Galantino, 2015).

All this helps to understand that the main cultural heritage is human life but also to outline the different meanings of this heritage in dialogue with local cultures. So, a topic that is certainly very complex, but fascinating is represented precisely this research that we must undertake to know the new dimension of cultural heritage.

2   Culture and New Paradigms

Werner Heisenberg, Nobel Prize for the Physics in 1932, affirms.

> […] It is probably true quite generally that in the history of human thinking the most fruitful developments frequently take place at those points where two different lines of thought meet. These lines may have their roots in quite different parts of human culture, in different times or different cultural environments or different religious traditions: but if they actually meet, that is, if they are at least so much related to each other that a real interaction can take place, then one may hope that new and interesting developments may follow (Niglio & Fukui, 2021).

This statement is an important example of how culture without encounter cannot produce development. Even the theologian Romano Guardini affirmed that the existence of man has meaning when he is able to open himself to knowledge and sharing; otherwise, man freezes, stiffens and remains closed in on himself with the direct consequence of becoming culturally poorer and poorer (Guardini, 2009).

This implies an important exercise that requires man not to close himself within his own certainties, but to be open and free to know, to create and to develop together with others. This capacity for encounter and freedom of thought helps us not to be colonized, and above all not to colonize because in the last century even the process of cultural colonization that has affected the sector of conservation of inherited heritage has not favored the development of culture.

In fact, an important issue that many countries in the world have addressed in recent years is the full awareness of the value of their cultural heritage, regardless of the international declarations and norms that have imposed a Eurocentric vision. These actions on the one hand have also produced huge losses with destruction especially of tangible heritage, but on the other hand have favored the development of numerous initiatives, both institutional and private, aimed at enhancing local cultures and the different meanings of these cultures.

There is no doubt that especially since the 70 s of the twentieth century also with the publication of the *Convention on the Protection of the World Cultural and Natural Heritage*, adopted by UNESCO in 1972, the indications have been very precise and clear in giving a definition of heritage also related to the political events of the time. Meanwhile, in the last fifty years the geopolitical conditions have changed a lot and with these also the approaches to cultural heritage. Recent studies and research show how conservative procedures and methodologies have evolved and above all how these have contributed to opening new scenarios towards new paradigms (Labadi, 2022).

The theme of heritage has taken on a different dimension; if until a few years ago the reference categories were those of "cultural heritage" (monuments; groups of buildings and sites) and "natural heritage" (natural features, geological and physiographical formations, natural sites or precisely delineated natural areas) to which in 1992 the category of "cultural landscape" was associated, today the latter categories are joined by many other references: living heritage, community, climate, mankind, environment, development, creativity, cultural diversity, sustainability, etc…...

Although lagging behind other countries, the *Convention for the Safeguarding of the Intangible Cultural Heritage* (2003) and the *Convention for the Protection and Promotion of the Diversity of Cultural Expressions* (2005) also laid the foundations for a revision of the concept of cultural heritage in dialogue with the different cultural and methodological approaches that certainly make this field of research very fascinating.

So, in recent years we are witnessing a revision of the concept of heritage in dialogue with local cultures and putting communities at the center.

This different approach demonstrates how successful local policy efforts are when they aim to build on existing cultural elements and creative resources. Knowledge of local creative assets is often held by local communities; thus, local governments should seek out such local and indigenous knowledge to inform policy making.

This new approach helps us to introduce a holistic dimension of the concept of cultural heritage, as a result of a creative process that is based on the intersection of humanities and legal sciences and therefore on a transcultural vision of human heritage. Meanwhile, precisely this transcultural intentionality gathers the different instances of the concept of heritage in the world and opens the doors to the role of cultural diplomacy that must face the intolerances that govern international relations. (Niglio & Lee, 2021).

Thus, cultural diplomacy contributes to protecting the diversity of communities and enhancing their heritage, as already anticipated by the Mexico City Declaration on Cultural Policies (1982) and art. 46 states:

> […] International cultural cooperation must be based on respect for cultural identity, dignity, and value of each culture, independence, national sovereignty, and non-intervention. Consequently, in cooperative relations between nations, any form of subordination or substitution of one culture for another. It is also essential to rebalance cultural exchange and cooperation so that lesser-known cultures, in those of some developing countries, are more widely disseminated in all countries.

Indeed, the cultural diplomacy is the cultural soul of a nation and aims to promote the exchange of research, education, local traditions, and then the culture in all its aspects and thus promote mutual understanding of cultural processes.

The cultural diplomacy is essential so that the people of a foreign nation can learn more about the ideals and cultural policies of the nation they intend to visit in order to also leave broad support for the economic and political objectives of the countries (Lee & Niglio, 2019).

3 Culture as a Sustainable Opportunity

> […] Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a portal, a gateway between one world and the next. We can choose to walk through it, dragging the carcasses of our prejudice and hatred, our avarice, our data banks and dead ideas, our dead rivers and smoky skies behind us. Or we can walk through lightly, with little luggage, ready to imagine another world. And ready to fight for it (Arundhati, 2020).

These words by Suzanna Arundhati Roy introduce other very important concepts: the close link between humanity and nature as well as the role of culture to open up new sustainable opportunities for human life. Aware that the life of communities is an integral part of the natural environment, we cannot exclude this relationship and what results from poor management of this very relationship. In fact, the pandemic represents a dramatic episode, but it is also an opportunity. However, without a cultural basis it is difficult to accept the innovative demands that a period of difficulty offers us.

For some years now, India, Japan and Italy have been developing important research projects aimed at providing concrete answers in dialogue with the points elaborated in the United Nations 2030 Agenda. In particular, the theme focuses on the concept of culture as a sustainable opportunity for local communities. In fact, analyzing the concept of culture in dialogue with the aims of sustainability, it is interesting to find out how this concept is the basis of the development of individual nations.

The diagram represented below analyzed three important objectives of culture elaborated together with the Indian professor Rana P.B. Singh within the international project *Placemaking and Cultural Landscapes*.

Culture in sustainable development vis-à-vis social, environmental, and economic attributes or pillars. This way cultural aspects need to be considered in the development processes alongside the above attributes to fulfil the criteria of sustainability	Culture for sustainable development. Culture is considered a mediating force between the three classical pillars of sustainability (society, environment, and economy). In other words, it is accepted that culture processes, facilitates, and translates sustainable development, and therefore cultural aspects should always be present in the sustainability assessments, policies, and planning	Culture as sustainable development. Implying that culture is an overarching concept, it contains and influences social, environmental, and economic actions within sustainable development. Sustainability needs to be embedded in the culture and cultural transition is needed on our way to a more sustainable society

These three representations provide analytical "lenses" for investigating the multifaceted roles of culture in sustainable development. Of course, in each frame, culture may have different meanings, manifestations, and implications in, for, or as sustainable development, but it would always be a vital force. Furthermore, they also point to different positions of culture in society and to different strategic implications: culture as a fourth pillar or the mediating bridge is linked with a better pondering of culture in any decision making related to sustainable development, while culture as a new paradigm of sustainability suggests a cultural transition towards a society where sustainability is embedded in culture and makes a platform for better future. (Singh et al., 2022).

Thus, these innovative perspectives help us to understand that culture, in this all-encompassing and holistic sense, represents the true foundation of human existence and of our existence. This new perspective, in fact, also helps us to understand that this is the most important step we can take to develop our personality and our life if we have not already done so. It is also the key to countless developments in life because everything emanates from it and depends on it.

Admitting this and taking action on it is imperative if we want to put ourselves in the strongest possible position to deal with the complex problems and limitless opportunities we will be confronted with in life. No other development compares with this since it necessitates a fundamental transformation or paradigm shift in our lives from seeing and developing our personalities and lives in terms of the parts to seeing and developing our personalities and lives in terms of the whole. (Schafer, 2022b)

Fig. 1 The cover of the international guide to the pedagogical program RWYC

All these reflections have materialized in the international pedagogical project "Reconnecting with your culture" (Fig. 1) which during the global pandemic has intended to put back at the center the value of culture and therefore of quality and equitable education. So, culture as an opportunity for everyone and as a tool to develop skills and well-being.

This pedagogical method is aimed at elementary and high schools around the world and students between the ages of 5 and 17. Children, assisted by their teachers, are invited to take an exploratory journey within the cultural heritage of their community, city and country, to draw and share their own experience of knowledge in contact with

historical, artistic and cultural heritage. The international project aims to analyze the different cultural approaches and methods of analysis prepared in the different communities of the world in order to create a network and allow the exchange of experiences and initiatives. This project is also intended to apply a new educational method to introduce schools, colleges and universities, the study of history and cultural heritage, two fundamental themes to achieve an ethically better world. The project is based on the UN-issued 2030 Agenda, a program to generate sustainable development. For this initiative, a particular emphasis is placed on point number 4 on "Quality education", supplemented by the principles of inclusion and equity. This item of the 2030 Agenda aims to achieve important and equitable quality education, promoting the opportunity for lifelong learning for all. That is why the project "Reconnecting with your Culture" is aimed at all school students around the world and aims to generate personalized activities, which require special supports (Niglio, 2021a).

The cultural principles of this project are based on the Tokyo Charter published on 31 July 2021 which in Article 3 highlights the role of cultural education as a fundamental sustainable opportunity for the younger generations to better build their future.

> Education in cultures and heritages requires going far beyond collecting information about past and present accomplishments as well as historical and contemporary realities. The most important objective is to encourage children and young people to joyfully and creatively appreciate their own cultures and heritages and those of others, and not just their material, physical, and technological manifestations. This objective, which emanates from knowledge designed to strengthen personal responsibilities, values, and ideals, requires a pedagogical commitment to enhancing and enriching cultural and heritage education in a conscious, deliberate, and systematic manner. This is imperative in acquiring the knowledge, information, understanding, and insights that are necessary to become conscious, humane, responsible, and reliable citizens at the local, regional, national, and international level (Schafer & Niglio, 2021)

Thus, culture represents the set of intellectual knowledge that everyone acquires during life through study and experience. This knowledge must be reworked through personal thought and converted into useful moral and ethical actions for the community. Each action has a spiritual and aesthetic component that is fundamental to being able to appreciate and enhance the world in which we live. Culture is therefore a fundamental component in building important projects based on a "humanistic conception" of the world (Niglio, 2021b).

4   Conclusion

The word Culture must always be analyzed in its vitality and should not be closed in an abstract contextualization because history evolves and with it also culture, and the expression of communities. It is precisely this vitality of culture that must return to animate our daily actions, often increasingly dry of the misuse of technologies. Differently, wise and conscious use of these information technologies can help to precisely understand the mobility and versatility of different local cultures and therefore our way of expressing ourselves, communicating, and meeting other cultures. The concept of the encounter between cultures has been elaborated by many scholars who expertly analyze the dialogue between culture and community, introducing the concept of Culture with reference to the encounter with each other. In this vision the word Culture means knowing how to meet, knowing how to open dialogues. In fact, the word Culture represents the essence of a people, and thanks to this Culture people dialogue with each other (Niglio, 2021b).

The International Conference of UNESCO Chairs that took place at the University of Jena from 11 to 13 May 2022 (Fig. 2), with the important support of the Jena Declaration (2021) also highlighted the close relationship between culture and sustainability because the.

> […] Humanity is very close to missing a last chance to reach the broadly agreed Sustainable Development Goals (SDGs) in time. This insight is shared by most experts. Top-down approaches often face significant obstacles to implementation. To increase the speed and depth of the needed societal transformations the key change agents must be reached (The Jena Declaration, 2021).

Meanwhile, all the experiences carried out in the world by individual communities are the lifeblood to understand that transculturality is our future, or this will end up crushed by global homologation. The diversity of cultures represents the present of the world, its timeliness and, at the same time, its richness. When we use the adjective "cultural" this is always manifested individually: a language, an era, an environment, a thought, a tradition… (Jullien, 2018).

This well-established singularity is the one that characterizes communities, people and that makes possible the encounter and therefore the dialogue with other cultures. When, on the other hand, homologation is imposed, then conflicts arise. However, to pursue this important transcultural objective it is essential to know how to distinguish the different dimensions of being and logic and above all to get out of a Eurocentric vision by developing, instead, actions that are the result of languages and thoughts received from "elsewhere".

Fig. 2 The international conference of UNESCO chairs that took place at the University of Jena from 11 to 13 May 2022. The transcultural committee dialoguing on culture and sustainability (The Jena Declaration, 2021)

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Life and History: Challenges on Urban Conservation and a Possible Solution: Case Studies on Historic Quarters in Beijing and Shanghai, China

Yanhan Zhu

Abstract

In recent decades, the redevelopment process in Chinese cities has challenged historic quarters. While conservation awareness rises, scholars started to criticise these quarters for being restored in "improper methods". Moreover, property privatisation and tourism development in historic quarters caused dilemmas: the majority of inhabitants were relocated under the monetary compensation system; the overwhelming tourism activities resulted in a significant loss of the uniqueness of living elements. They all pushed the local government and the inhabitants to a deeper collaboration with other stakeholders. This paper first overviewed the approaches to urban conservation, from integrity conservation to the Historic Urban Landscape, and analysed their merits and defects. Focusing on two cases in Beijing and Shanghai, it further illustrated processes of inhabitants' participation and collaboration modes with other stakeholders, including local organisations and authorities, to safeguard the architectural heritage and redevelop the historic quarters. The measures could provide feasible approaches to balance the conflict between urban conservation and redevelopment in the aspect of heritage management.

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1 Introduction

Chinese scholars started to pay attention to urban conservation in 1982 when three of them promoted the "Historic City" title. Architectural history knowledge, conservation legislations, safeguarding methods, and intercultural communications developed rapidly. Nowadays, most of the cities in China are willing to make the proposal of listing a monument or a historic area. However, scholars started to criticise these quarters for being restored in the "improper methods" (González Martínez, 2016) and the urban redevelopment still pressures architectural heritage in most cities (Shan, 2007).

Equipped with insufficient infrastructure, degenerated facilities and dilapidated buildings and possessing a high-density population, historic areas are in danger of being demolished and reconstructed. While the government emphasises architectural preservation, the revenues of land and profits achieved with business interests are at the expense of social improvement (Shin, 2010). The increasing awareness of genius loci encourages maintaining the significance of the place. However, it stimulates nostalgia for antiques, which results in rapid tourism development and radical changes in tangible and intangible elements (Zhu & Zhang, 2012).

The government and planners are accustomed to transforming historic areas into museums or disneyfied historic quarters. For instance, the Kuan-zhai Alley in Chengdu, the Xin-tian-di quarter in Shanghai, and the Dao-wai historic quarter in Harbin have transformed from living neighbourhoods to commercial lands and lost most of their social elements (He & Wu, 2005; Xie & Heath, 2018, 2–3; Yin & Wang, 2014). While the monetary relocation compensation system attempts to move the inhabitants out of these areas, the deficient housing and uneven benefit allocation block the process (He & Wu, 2005).

On the contrary, scholars discussed the significance of the local community. Smith (2006) and Pouilos (2014) argued that maintaining the local community is crucial for sustaining

its living mode, handicrafts, and folklore. In China, it is more remarkable for burdening memories that provide clues for the regional construction techniques for architecture (Wang, 2009). The inhabitants' oral narratives could also supplement the insufficient written records and help recognise the values of historic materials (Wang & Dong, 2018). Therefore, their participation in the conservation process and collaboration with other stakeholders are noteworthy.

Under this circumstance, the paper first overviewed the approaches for urban conservation, from integrity conservation to the Historic Urban Landscape, and analysed their merits and defects. Focusing on two historic quarters in Beijing and Shanghai, it further illustrated the processes of inhabitants' participation and collaboration modes with other stakeholders, including organisations and the local authorities, to safeguard the architectural heritage and redevelop the quarters.

2   Overview of Urban Conservation

2.1   Integrated Conservation

The beginning of urban conservation probably started in the first half of the twentieth century. When Gustavo Giovannoni promoted the idea of thinning out the historical buildings, integrated conservation of historic areas became prevailing. Giovanni Astengo (1915–1990), Luigi Angelini (1884–1969), Giuseppe Campos Venuti (1926–2019), and Pier Luigi Cervellati adopted it to the master plan of several Italian cities and towns. Architects and urban planners also paid attention to the "historic centre" and stimulated the agreement to publish the *Charter of Gubbio* which highlighted the conservation's economic merit and social benefit.

Despite Italy, the idea of integrated conservation widely spread in European countries. The Committee of Ministers of the Council of Europe promulgated the *Declaration of Amsterdam (*1975*)* which stressed the significance of architectural heritage's surroundings and integrating its conservation into urban planning. One year later, the General Conference of the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Nairobi passed the *Recommendation concerning the Safeguarding and Contemporary Role of Historic Areas (*1976*)* which underlined the consideration of safeguarding the historic area into urban revitalisation. Based on the cultural value of architectural heritage and the economic value of land, the historic area was seen as a trigger for urban redevelopment in the following practices.

In addition, the conventions and declarations have already started to consider social factors. Radical changes in "*the social composition of the residents*" was not encouraged (Committee of Ministers of the Council of Europe,

1975), and radical transformation of social activities, and social structure are not appreciated (UNESCO, 1976). The inhabitants' involvement was believed to be an effective method of urban conservation. Then, a comprehensive approach involving stakeholders was promoted and published as 'Historic Urban Landscape'.

2.2   Historic Urban Landscape (HUL) Approach

In the 1970s, urban conservation stood at its turning point when the political situation "*changed from centrally controlled management towards market-oriented economy*" (Jokilehto, 2007). Conservation of historic centres became an investment of private entrepreneurs that the revitalisation and tourism brought them considerable financial benefits (Bonfantini, 2015). The mega-events, like the Olympic Games and the Expo, are probably one of the triggers to improve public spaces, collected services, and living conditions in historic urban areas. However, gentrification, Disneyfication, overwhelming tourists, and unstoppable changes might follow.

The reflections occurred at the beginning of the twentieth century. The requirement of sustainable development stimulated the competition in heritage discourse between the heritage authority and the local community. The integration of heritage preservation and urban development regained attention through the Historical Urban Landscape approach. Following the idea of urban heritage—"*a resource for the entire city and for its sustainable development*" (Bandarin & van Oers, 2015), the approach aims at "*preserving the quality of the human environment, enhancing the productive and sustainable use of urban spaces, while recognising their dynamic character, and promoting social and functional diversity*" (UNESCO, 2011). It involves the planning, regulatory, and financial tools in the conservation process and highlights participation and collaboration between stakeholders, including inhabitants, the local community, NGOs, developers, and local authorities. Moreover, the HUL approach is supposed to combine preservation, management, and regeneration of the historic area.

2.3   Development of Urban Conservation Through Comparison

The integrated conservation method prevailed before the twenty-first century when architects and planners were designated to make the conservation plan, and the authorities controlled and managed the decision on plans. The buffer zone planning method that considered the environment and surrounding areas of urban heritage was widely adopted to make it realise. And it required detailed records of the

buildings and urban fabric, which usually took decades for the field survey.

While the HUL approach involves all the stakeholders in the conservation process, it seems that the responsibility for the conservation of urban heritage is separated partly from the local authority to the other stakeholders. Among these stakeholders, the local community is regarded as a significant participator who could lead the decision-making and assist in implementing plans on their properties. Moreover, after the restoration and rehabilitation, it would still play a significant role in managing the heritage for sustainable development (Table 1).

3 Case Studies on Historic Quarters in Beijing and Shanghai

Several years before, Fan (2014) claimed that in China, stakeholders' participation in preservation preferred donor engagement rather than collaboration under the drastic governmental administration. Significantly, community involvement is not sufficient where top-down decisions were made. Nevertheless, the situation was complex. In the following two cases, the local community managed to participate in the urban conservation process and collaborate with other stakeholders.

3.1 Nan-Luo-Gu-Xiang Historic Quarter, Beijing

Nan-Luo-Gu-Xiang (NLGX) historic quarter is located in the Jiaodaokou zone, Dongcheng district, Beijing. It was one of the oldest areas in the city's historic town and covers an area of 0.84 square kilometres. The quarter was formed more than seven hundred years ago and maintains the fabric of hutong, tens of traditional courtyard houses, Daoist temples, the site of school architecture, the site of commercial buildings, and the site of the imperial hospital (Fig. 1). Due to several reforms on land, the houses were occupied by a large group of inhabitants who could not afford the removal.

There were three phases of urban conservation in the NLGX historic quarter. The 1st stage occurred in the 1980s and the 1990s. The population of inhabitants was extremely high, and the living and hygienic conditions were not livable. Meanwhile, Beijing was put into the first list of Historically and Culturally Famous Cities, which are appreciated on the historical and cultural aspects. To improve the situation and be careful on the historical remains, Liangyong Wu, from Tsinghua University, managed to practice his Organic Regeneration theory in the plot—Ju'er Hutong. The project aimed to maintain the fabric and street structure of the historic remains rather than the total

demolition and reconstruction. The result fulfilled the goals and considered history in the design process, achieving the 'UN-Habitat Award'. After this valorisation, the whole historic quarter was included in the first 25 Historic and Cultural Quarters for Safeguarding. The 2nd step started in 2005. It was a premise and preparation for the 2008 Olympic Games. The goal was to transform the dilapidated quarter into a cultural and leisure zone. Accompanied to conserve the historic features, multiple plans and regulations on planning and management, including *Conservation and Development Plan for Nan-Luo-Gu-Xiang (2006–2020)*, *Regulation on Adapting the Fund Allocation for Commercial Activities in Nan-Luo-Gu-Xiang, Handbook for Training Inhabitants and Operators on Management and Serving in Nan-Luo-Gu-Xiang,* and other regulations from diverse perspectives. The plan stimulated a dramatically increasing number of small businesses operated by external entities or by the local inhabitants in the following years (Figure). The media also publicised the quarter as a worthwhile place for visiting. The result seemed an extraordinary success of the plan. In the extreme case, it attracted 100,000 visitors per day, which excessively overpassed the recommended number of 17,000. The conflict between tourists and the remaining inhabitants became a vital problem. In the 3rd phase, the quarter applied to remove its title of AAA Tourist Attraction[1] in 2016. That is, the quarter no longer encourages a large number of tourists to visit. Besides, the number of visitors is strictly controlled through the reservation and check process. Meantime, *Guidelines for Protecting and Controlling Features of Nan-Luo-Gu-Xiang Historical and Cultural Quarter (2016)* was published for owners to manage the restoration and rehabilitation of their properties. It also designates the Management Committee of NLGX to supervise the implementation, survey the insensible changes of built heritage, hold meetings between stakeholders, and improve the facilities (Fig. 2).

The stakeholders involved in the urban conservation of the NLGX historic quarter played their roles in the dynamic and long-term procedure. Local government plays a decreasing role from the decision-making to the implementation. According to the national and municipal acts on safeguarding historic cities, the Government of Dongcheng district is responsible for organising the making conservation plan for NLGX historic quarter. The local government made the final decision, while it guided the public via regulatory tools for implementation and management. On the other hand, when conflicts occur, the local government can

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[1] The *Classification and Evaluation of the Quality Level of Tourist Attractions (GB/T 17,775–2003)* required a AAA Tourist Attraction to be equipped with satisfying scenes, services, facilities, and so on, as well as the capacity of serving 300,000 individuals per year.

Table 1 Comparison of integrated conservation method and HUL approach through declaration and recommendations (drawn by the author)

	The Declaration of Amsterdam (1975)	Recommendation concerning the Safeguarding and Contemporary Role of Historic Areas (1976)	Recommendation on the Historic Urban Landscape, including a glossary of definitions (2011)
Relationship between conservation and development	**Integrating the conservation** of architectural heritage into urban and regional planning, as well as considering social factors	**Safeguarding monuments with their surrounding** built and natural environment; considering protection and restoration of historic areas with revitalization activities	**Integrating** historic urban area conservation, management and planning strategies into the local development process and urban planning to **realize sustainable development**
Attitude to changes	Inducing new activities to heritage; non-isolation of the monument	Preventing damages caused by misguided or insensitive changes	Accepting new functions through innovations; managing the changes
Stakeholders	Government and population	Government, **citizens in site**, voluntary groups, NPOs, architects and town planners, etc.	Government, **local community**, international organisations, NGOs, etc.
Degree of public participation	**Being informed** of the decision and obeying the plan	**Cooperation** with other stakeholders to realize the plan	**Participating in the whole process** as much as possible
Significances for safeguarding	Cultural value and use-value	Manifestations of all periods	Dynamic nature and cultural diversity
Tools	Planning policies, financial interventions, and restoration and rehabilitation methods	Legal and administrative tools, and technical, economic and social tools	Civic engagement tools, knowledge and planning tools, regulatory systems, and financial tools
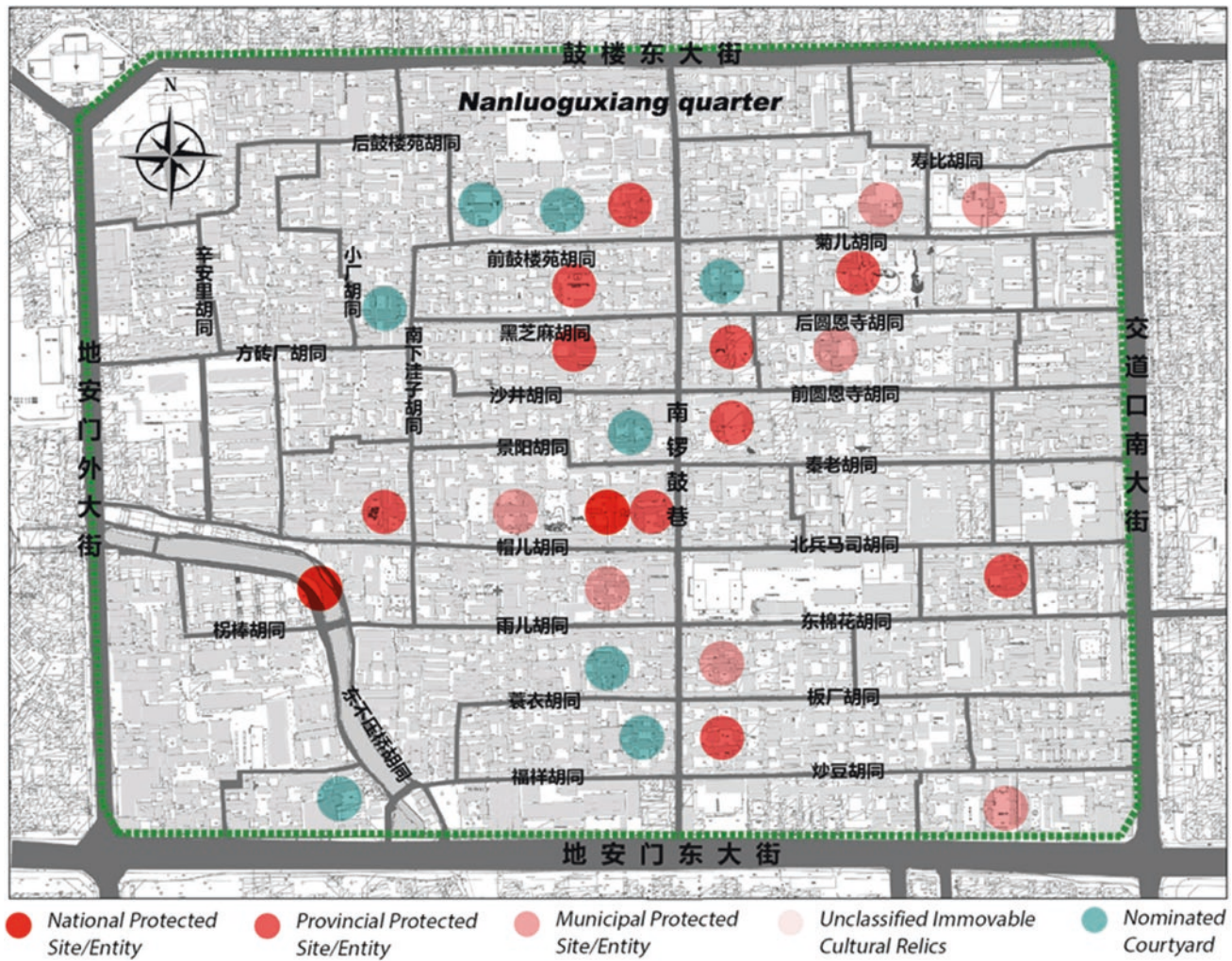
Fig. 1 Distribution of listed heritages in NGLX historic quarter (drawn by the author, the base map is from (Urban Design and Regeneration Institute of Engineer and Technology of Beijing & Architectural Design and Research Limited Company of Beijing, 2016))

collect feedback and adopt or remake the plans for the following decade (Hu & Morales, 2016).

Local inhabitants and introduced groups took part in the implementation and the proposal to improve the plan. They started to participate in the urban conservation process from the implementation phase (Zhang et al., 2012). Following the improvement of public infrastructure and tourism development, the inhabitants could benefit from operating commercial activities. Recently, the voluntary relocation policy provides the inhabitants with considerable compensation for moving out. The policy also provided the possibility of living in a better environment after clearing informal construction.

The Management Committee of NLGX (MCN) became the mediator between the stakeholders in the management phase. The governmental MCN was established to supervise the process and assist in fulfilling the implementation. For example, to organise regular checks with other

governmental offices and adapt the local economy structure by collaborating with the non-governmental Commercial Association of NLGX (CAN). It is noteworthy that most buildings in the quarter belong to public property or the entity's property which has been "occupied" for a long time. In this case, the MCN makes a great effort to communicate with the inhabitants to notice the newest policy, analyse the advantages and weaknesses, and sometimes induce the decision.

The Commercial Association of NLGX played the assistant role in the implementation and management phase. It is composed of the operators of businesses in the quarter and has significant impacts on the management of commercial activities. During the 3rd phase, it collaborated with the MCN to adapt the economic structure. With the agreement through the whole association, upgrading to creative and economic operations became possible. The cooperation mechanism is shown in Fig. 3.

Fig. 2 Streetscape of current NLGX historic quarter (photo by the author)

3.2 Tian-Zi-Fang Historic Quarter, Shanghai

Tian-Zi-Fang (TZF), the No.210 alley (quarter) of Taikang Road, is located in the Dapuqiao zone, Luwan district (a part of the current Huangpu district), Shanghai and covers an area of 7.2 ha. It was formed in the 1920s. Due to the third expansion of the former French concession and the struggle of Chinese merchants and wealthy people, it soon developed into a complex area of small factories, Lilong houses,[2] and stores with features influenced by colonisation and intercultural communication. After the industrial depression and the long-time neglect of property management, the majority of collective buildings were overcrowded, and the factories were abandoned. Nowadays, hundreds of buildings near the TZF quarter have been listed as protected sites or excellent buildings. Yet, the buildings

in the quarter which are believed less significant are not on the list (Fig. 4).

There were three phases of the urban conservation of TZF during the past three decades. The 1st stage began with reusing the abandoned factories in the quarter. In 1998, the local government office of Dapuqiao zone transformed the former Needle Factory of Shanghai into an internal grocery market for the first attempt. Then, it introduced artists, artisans, and designers to operate creative businesses. It soon attracted attention, and around 2002, the factories' tenants reached a saturation point. The 2nd stage began with the conflict between the demolition-reconstruction plan published by the Government of Luwan district and the resistance of introduced artisans and inhabitants. During that time, Yisan Ruan and Shiling Zhen, from Tongji University, provided the *Plan on Conservation and*

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[2]Lilong houses indicate two or three-floor terraced houses which distributed along the alleys.
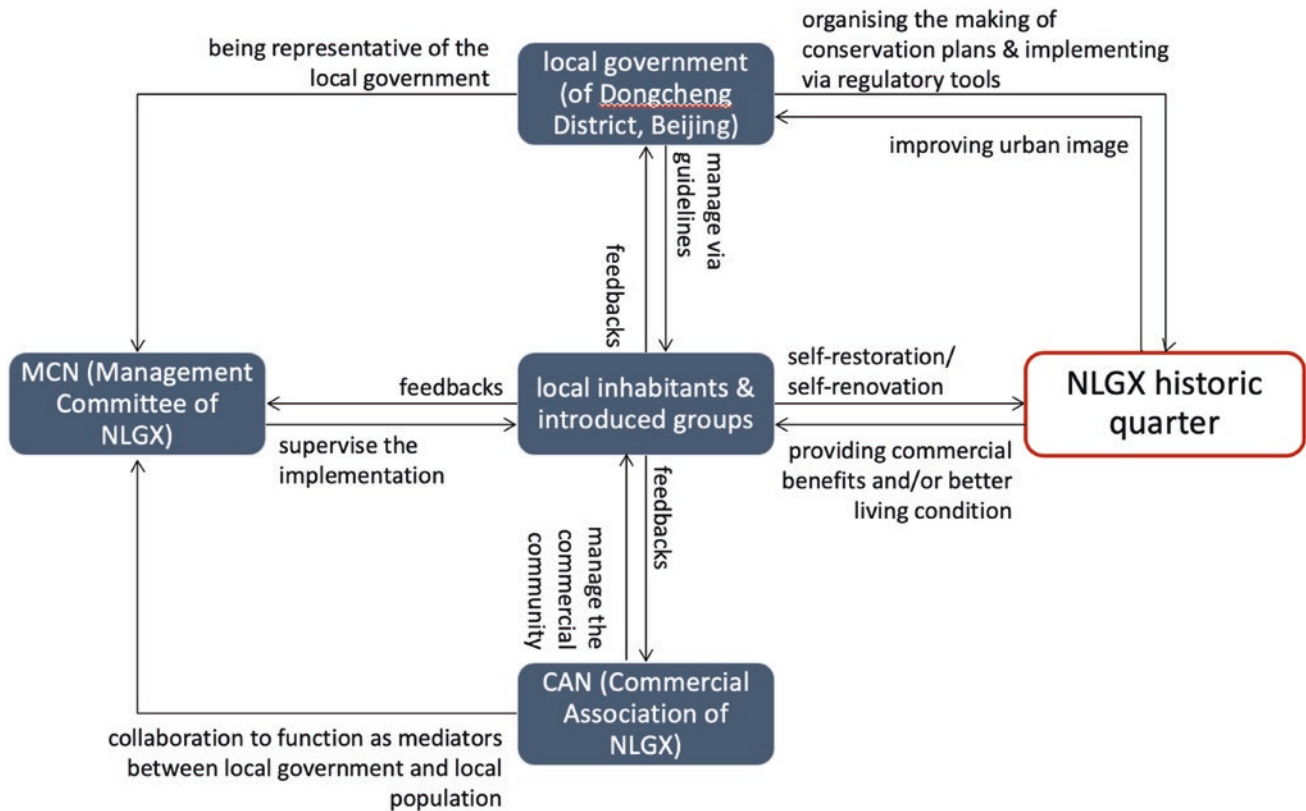
Fig. 3 Cooperation mechanism between main stakeholders in NLGX (drawn by the author)

Reusing of Historically Imaged Quarter of Taikang Road, Shanghai, to stress the integrated conservation of architectural heritage with its surrounding historical quarters. The Shanghai Association for Science and Technology (SAST) promoted the *Proposal on Conservation of Historically Imaged Quarter of Taikang Road, Shanghai: the Museum of Lilong Shikumen Houses in Shanghai (2005)* to attract the municipality's attention to conservation and redevelopment. As a result, the municipal government decided to maintain the whole area of TZF that year. Meantime, the inhabitants attempted to reuse the houses for commercial activities to realise the initiative redevelopment and established their association—Proprietors' Committee on the management of TZF (PCMT)—to strengthen their initiative management. Like other quarters of the commercial transformation, the TZF quarter met the conflict between inhabitants and business operators and the radical transformation that damaged the historic streetscape (Fig. 5). In the 3rd stage, the governmental Management Committee of TZF (MCT) was set up to help the daily management. It managed to improve public spaces and manage changes in the buildings by establishing workflows for each service and guidelines on preventing damages. The inhabitants made

the self-rehabilitation of their houses under the guideline for Lolong houses in Shanghai. Thus, the quarter was put into the first municipal list of *Streetscape to be Safeguarded* (2016).

The roles of stakeholders and their cooperation altered. The local government seemed to step back from the conservation process. The distinction between the governmental decision and the local office's development consideration led to the conflict between them. Compromising the inhabitants' and users' opinions, the local government provided an accessible environment for the creative and commercial transformation of the quarter. Adapted to the contemporary context, the regulation on the use of houses was open to other kinds of activities, while following the strict application procedure.

The local government office and inhabitants collaborated to play a leading role in decision-making and implementation. They presented their power on the redevelopment approach's decision-making, accompanied by technical support provided by academic experts. They organized the Allies on the Protection of Intellectual Property Rights of TZF with the agreement on safeguarding the architectural features and attracting external investment (Zhong, 2016).
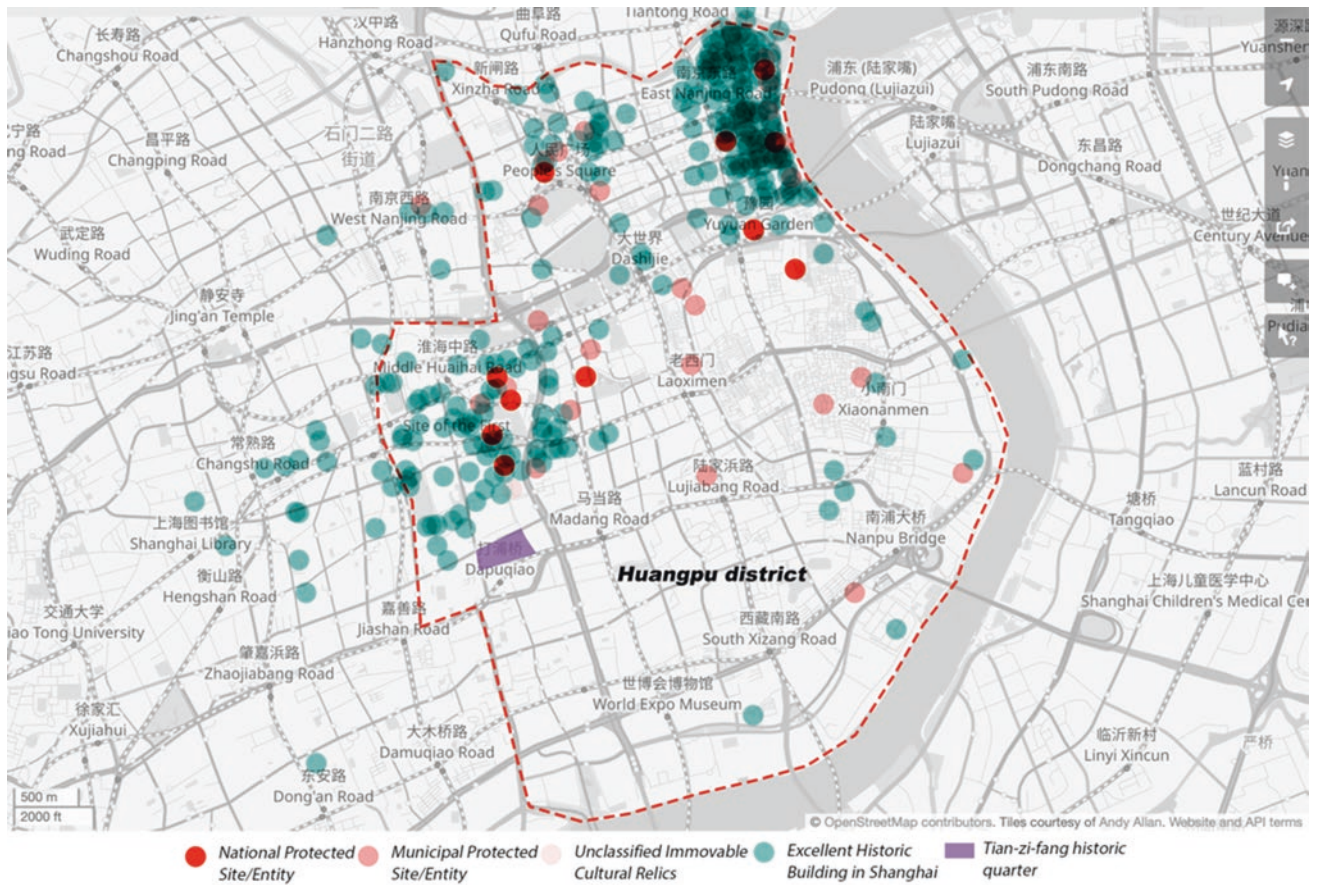
Fig. 4 Distribution of listed heritage in Huangpu District and the location of TZF historic quarter (drawn by the author, the base map is from openstreetmap.org/copyright)

Fig. 5 The local residential space and tourists' space combined in the TZF historic quarter (derived from Yung et al., 2014)
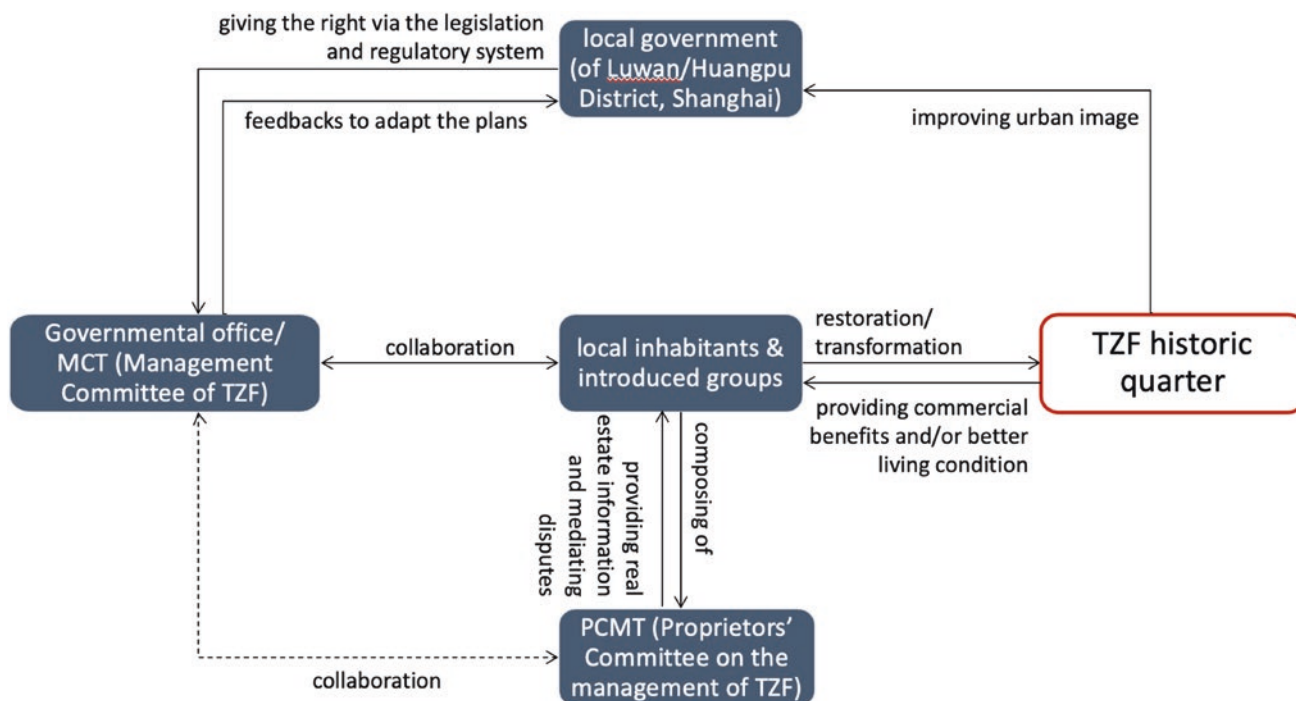
Fig. 6 Cooperation mechanism between main stakeholders in TZF (drawn by the author)

They also made bold attempts at the utility transformation and encouraged the local government to adopt it. The inhabitants benefited from renting or using the houses as ground-floor stores. It is undeniable that the market-led process caused gentrification and the loss of artisans, which stimulated organisations' intervention.

The non-governmental and governmental organisations played as the bridge between inhabitants and the government. The inhabitants and artists who established the PCMT contributed to providing real estate information and mediating disputes, especially between inhabitants and business operators. It has an initiative bond between the owners and gathers the power of each individual. On the contrary, the governmental organisation—MCT had a solid power to keep the operation and relationship between stakeholders in order via the legislation and regulatory system. For example, the agreement on the regeneration of a building must be passed by more than two-thirds of the owners and tenants, and the acts on applying for the transformation from residential use to non-residential use. The cooperation mechanism is shown in Fig. 6.

4   Conclusion and Discussion

This paper aimed to provide alternative methods to manage the historic area via collaboration with stakeholders. The two cases displayed stakeholders' collaboration modes in the whole process of urban conservation. Through the decades of development, stakeholders' participation has changed. The municipal or local government showed increasing concern for the need of inhabitants or individual users of heritages; the current requirement for living and working in historical quarters pushes the inhabitants to present opinions and participate in their initiative. That is, the discourse of other stakeholders, apart from the government, is rising.

Meantime, we should be aware of side effects. Contrary to depopulation, the collaboration might attract more inhabitants and businesses to settle down in historic quarters. For example, the total population in NLGX historic quarter increased from 22,000 in 2002 (Shin, 2010) to 46,000 in 2017 (Chen, 2017). Besides, the commodification and privatization of heritage might lead to emptying the historic

quarters. For instance, about 10% of the original 671 households stayed in TZF historic quarter (Zhong, 2016, 204). Therefore, the contemporary situation requires more measures to fulfil the conservation and redevelopment goals.

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Art as a Main Tool to Expressing Identity in Architectural Heritage: A Case Study of Fatimid Cairo

Samira Mohamed Ahmed Abdullah

Abstract

Art and Architecture, over centuries, have been known to represent a tool through which an artist is able to represent his or her character. More specifically, Architecture not only denotes the character of the architect, but it also tells more about the society and era to which the architect belonged as they are characterized by unique styles. Considered emblems, both Art and Architecture can tell stories of identity and a culture that is associated with people from a specific community. Each of those cultures is marked by certain elements that give its architecture a unique identity, which is manifested through building facades. In this study, the importance of Art in shaping the unique architectural heritage of Egypt is highlighted through a case study on Fatimid Cairo. Fatimid Cairo exemplifies the ways in which Art can represent a tool for heritage conservation to maintain long-lasting architecture and heritage through different ages for future generations. This type of architecture maintains and has the power to deeply influence a whole community and society's identity as well as represent its past, present, and future of architectural heritage accumulation.

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1 Introduction

Architecture is considered to be an open book narrating to the world the greatness of civilizations. Memorable architecture allows us to take a glimpse of, consider, and learn from the built environment assembled by ancestors and exhibiting a great history, Architecture, and Art, all of which recite stories of a past life. When looking at architecture, we directly feel a connection towards our ancestors and can reimagine stories of their lives. as we have traveled back in time, falling in love with every detail in the process. When seen, that legacy gives birth to a strong urge to protect and save this heritage and conserve existing architecture. Established then is a strong commitment to conserving architectural heritage that expresses identity and tells of the greatness of civilizations of the past to the whole world. Feelings stirred resemble those that arise when reading old novels, imagining texts, and falling in love with the images created by one's imagination, giving rise to questions about past cultures such as those of Cleopatra, Julius Caesar, and Alexander the Great.

1.1 Problem

The neglect experienced today towards art in architecture is very dangerous, as art could act as the main tool supporting the conservation of architectural heritage through expressing a society's identity. This lack of cultural representation in architecture and disuse of art as a vital tool in creating architecture that represents culture and civilization is considered in this study to be a pressing issue as it could be utilized as an approach for the conservation of its heritage, rather extending its longevity through the ages. Architecture nowadays has become only about form generation that lacks meaning and depth.

1.2   Research Aim and Objectives

The research aims to draw attention to art and the ways in which it can be used as an approach to express the identity and culture of Islamic Architecture. This will be discussed through the elements of Islamic architecture used in designs as a tool for the conservation of Islamic architectural heritage. That will, in return, successfully revive Islamic Architecture yet again through a new approach that fits today's requirements, which include:

1. Presenting the character of the artist through art
2. Presenting the identity of a certain culture through art
3. Selecting a specific architectural style for each era
4. Presenting culture and identity through architectural style
5. Expressing identity through certain architectural elements relating to a specific culture
6. Analyzing artistic architectural elements in Fatimid Cairo as a case study
7. Shaping unique architectural heritage through art
8. Introducing art as a tool of heritage conservation
9. Using Art as a tool for creating long-lasting architecture
10. Introducing Art as the future of architectural heritage accumulation

1.3   Research Hypothesis and Questions

Art is considered a tool for expressing the culture and identity of a society through Architecture. It presents a way for communities to present themselves and their civilization to the world in today's language.

The main research question posed by this study: How can art help in conserving architectural language?

That generates other sub-questions:

– What is the link between identity and cultural architectural representation?
– What is the relation between art and identity?
– How can cultural identity be expressed through art in architecture?
– Can art be used as a tool for architectural heritage conservation?

1.4   Methodology

This research used a mixed methods approach, starting with the deduction method to highlight the importance of art in architectural heritage conservation. It was then followed by the qualitative content analysis used to evaluate the relationship between the architectural heritage and conservation. Then, a descriptive content analysis was used to describe the art in architectural heritage conservation, followed by the correlational analysis used to assess the relationship between art and architecture to understand how cultural identity, through art in architecture, is produced. Finally, a case study was undertaken to express how art can be used as an approach for the conservation of architectural heritage where art is used to express heritage with architecture.

2   Architectural Heritage Conservation

The architecture of the past is the heritage of today that represents the civilization of a certain society. It shows how great our ancestors were capable of putting the current generation under the pressure of conserving this architectural heritage, not only by conserving the past but also by making it a long-living architectural heritage. This is seen in monuments, buildings, and sites as a whole, like Luxor and Aswan in Egypt which are considered to be locations full of monuments and complete sites full of treasures that need to be conserved, along with the Fatimid Cairo which contains a lot of architectural heritage (Ashurst & Dimes, 2006).

For the conservation concept, it is important to try to reimagine how the world was before us instead of just trying to understand how life was back then. Here comes the role of heritage, as it describes and illustrates the missing pieces and shows the importance of conserving heritage in reflecting the past life. Regarding conservation, there are several means for repairing what is damaged and trying to build an image of how it was and restoring it (Meurs, 2016a, 2016b). Another form of maintenance is to maintain the small but still existing parts and not the missing pieces. In Greece, for instance, the destroyed monuments were repaired and restored according to the belief of how it was before as most of the architectural heritage in ancient civilizations is based on religious beliefs. Generally, conservation is considered to be the protection of heritage as it aims for a long-living heritage in the future (Farhan et al., 2021).

Tackling the conservation point is concerned with protecting the architectural heritage before the nineteenth century. Some factors are used to measure the success of conservation like neglecting erosive aspects and only considering the physical aspects of architectural heritage. For example, grasping the attention towards the aesthetic values, the artistic side, and the symbolic side are the core of this research (Song, 2016). Since the nineteenth century, architects and theorists have had different approaches concerning the significance of conservation and how to manage it, but in the end, they agreed on its necessity (Paul Meurs, 2016a, 2016b).

The conservation process and different ideas, points of view [on subjective and semantic spaces], and theoretical aspects on climate, archaeology, and human conduct in the fields of science, architecture, and natural sciences, have remained points of deliberation for a long time. Such an adjustment of the perspectives has additionally impacted the issue of the conservation of architectural heritage (Djabarouti & O'Flaherty, 2019). This incited the specialists to consider the preservation, not just as an endeavor to streamline and save the actual parts of the structure, but as a cycle that manages the semantic parts of the building legacy. Preservation is classified into two levels: protection of the actual angles and semantic viewpoints (Li et al., 2021).

Preservation, from another perspective, is identified as "calling and information on the reclamation" where a number of measures that depend on unmistakable conditions, whether it is through a change in materials components that in one way or the other aim to preserve the building and the materials previously used. Alternatively, it could also be through the control of other elements in the surrounding environment that could affect the material of the heritage building (Elrasoul, 2016).

3 Art in Architecture

Among the beautification works found in Islamic architecture, the buildings' artistic drawings deserve exceptional consideration, because they are vibrant and have different effects and different influences. Although the historical background of Islamic architecture and structural depiction is complex, it is of crucial importance when revealing the importance of Islamic reinforcement, and this importance is confirmed in Islamic art by various means (Yeomans, 2007). Among the various types of Islamic art mediums created in the Islamic era, calligraphy that conveyed meaning and adorned Islamic buildings and craft objects was the most widely discernible. So, when it comes to Islamic architectural design, the main points essential to this particular style are vaults, minarets, pointed curves, covered courtyards, sporting ornamentation, improved arabesques, muqarnas, and artistic motifs (O'Kane, 2016).

In Islam, according to al-Maqrizi, the doors of Bab al-Futuh, Bab al-Nasr (Gate of Conquest), and Bab Zuweila were made by three Christian Armenians from Edessa in eastern Anatolia (Yeomans, 2007). It also shows part of the Byzantine highlights, although the exact starting points for its scheme cannot be determined in the Edessa region. The peaks and entrances of the Byzantine Edessa were once prestigious, yet the permanent portions of the octagonal development give no indication of the gates of Cairo (O'Kane, 2016; Yeomans, 2007). Byzantine strongholds were viewed as the model for the advancement of Western Islamic military design.

4 Art Presents the Character of the Artist

Every era has its own vibe and style that shapes its architecture. The designers in that specific era were mostly driven by certain beliefs that affected their character and personality in one way or the other, which had been reflected into their work through which they designed buildings to suit the needs and fulfill the requirements of their people. The Fatimid caliphs accepted that main strict symbols were prohibited. Not only on buildings, they also used the crafts of man and other creatures on their cups, perfumes bottles, bowls, plates, and their daily used things. Particularly during the twelfth century, which was affected by Mesopotamian craftsmanship, metaphorical pictures were prevalently utilized, and this propensity turned out to be progressively well known. However, it was confined to mainstream structures and articles (Sedky, 2009).

It is conceivable that the artist was relying on real building models to imitate them while treating synthetic architectural buildings such as those on the dividers of the Damascus Mosque. He took them into account and knew about these treatments from the buildings in his country (Özmen & Polat, 2021). According to Criswell, comparative evidence for architectural buildings on mosque dividers appeared in Hellenistic Syria before their use in Rome. Since there are Hellenistic, Byzantine, and Oriental elements—as anyone from Antioch knows—where so many outstanding monuments were found early in Syria, it is conceivable that the architect-artist came from the most extravagant places of art (Sanders, 2008).

In addition, Oleg Grabar refers to the Syrian beginning of the artist who made the work on the dividers of the mosque with clear Byzantine highlights where he draws attention to the fact that the term Artist of the Sham (the artist of the Levant) does not mean literally from the Byzantine domain, while it is also possible that it is literal in the neighborhood, it was prepared for the practice of Byzantine artist in the Bilad Al-Sham (the Levant) (Rees, 1997).

5 Cultural Identity and Art in Architecture

Before discussing cultural identity through architecture, it is important to first discuss and illustrate how art can relate to cultural identity through architecture.

5.1   Culture

Culture is a set of beliefs, information, instructions, habits, and qualities created by society based on their convictions and at all times intends to achieve an improvement that is characteristic of it and revealed to it by its realistic appearance (Gultekin, 2017). The influence of culture is seen in various everyday issues including art, engineering, urban preparation, gentrification, and lifestyles.

5.2   Identity

Character is an important issue in all areas including architecture. Questions like "Where do we have a place? Who is right? Where are we going?" can arise in different structures to learn about societies, religions, countries, and nations. The idea that design is an impression of culture is and always will be cherished (Ibrahim, 2017). It is a point of view that shows the motivation of the best designers who go back to their origin and upbringing, which is reflected in their art as the human figure appears in art just as it appears in architecture (Worthing, 2008). Human beings have constantly shown devotion to their essential work. Therefore, one can say that each development or ethnic grouping presents a clear architecture that reflects their way of life across the ages. Character in its truest sense refers to personality, embodiment, and presence attributed to the Human being. In a particular dictionary, character can be expressed as supreme being, essence, or being. Character is what distinguishes an individual and refers to what separates a person from others.

5.3   Architecture

Architecture is a logical and imaginative exercise to give space and group it. The lifestyle of the local area was shaped after some time, and then formed a clear reflection of the general public throughout different periods. Architecture is separated from the structure or building as well as how it is assembled and not identified with development materials. However, it is determined by the way home or city is an implicit demand to satisfy non-material human needs. The design was shaped and continues to exist today from a bygone era where construction and management were well known.

5.4   Connecting Culture to Architecture

To understand the relationship between culture and design, one must first refer to the relationship between space and culture. Space, just like culture, has a social development that is developed during the time spent on forming individuals' impressions of themselves. Space plays an important role in the consolidation of social change because normal standards of behavior within a given space reflect the social qualities of individuals. This definition infers the evolution of a psychological space (Worthing, 2008). The effect of mental spaces and the transition from tangible and actual spaces becomes reasonable. This is called the aggregation of the activity of emotional and objective spaces into a coherent structure mixed with design. Proposing a link between culture and architecture, particularly in the field of brain research, demonstrates the need to pay attention to the link between humans and their artificial climate. With this disposition, culture is the component or the method of human contact with a false climate and is concluded in two categories: firstly: standard practices, and secondly: they are the products that are the result or continuation of the behavior and consideration of individuals in a particular society (Ackerman, 1953).

5.5   Cultural Identity Through Architecture

Each general audience has a framework that is moderated, and any philosophy it runs has its own goals and desires. The primary function of culture is to introduce rational ideas by presenting intrinsic architecture. The design assumes an important part during the time spent on this change. According to Herman Motsios, the design was and remains the true proportion of a country's lifestyle (Gultekin, 2017). While a country can make cheerful and glamorous furnishings, the most terrible architecture is assembled every day and generates unusual and boring conditions for the common people resulting in a disfigured general appearance. Geroter sees any architectural buildings as part of compositional culture being excluded to satisfy psychological evaluation through their external structure so that they will stand to define their way of life. Moreover, he alludes to Hans Hollen's definition of architecture which is characterized by the spiritual discipline exemplified by structures, such as that every building is socially monitored whether it is a good or bad idea (Awad & Boudiaf, 2020).

5.6   Role of Culture in Promoting Architectural Identity

What was portrayed as culture (rules, values, etc.) was just part of the way of life in any locality. Culture has another perspective known as the 'materialistic view', which shows structures, product lines, etc. These things, too, are considered to be part of the way of life of common people as they are represented in qualities, beliefs, and more, making the connection between culture and architecture discernable in return. Buildings can be likened to a dusty book that you should attempt to understand. Accordingly, the lifestyle of the individuals and the general population and the environments in which they are born are distinctive (Awad & Boudiaf, 2020). The main variables for the development of different schools of architecture are the decisive moments of the social method and innovation.

Every culture and human progress begins from the point from which ancient civilizations came to a halt in the face of an emergency. In any case, the trajectory is to continue enhancing old and dated titles or potentially re-engineer designs. Because of the direct influence of culture on Architecture, it is usual for social changes to change ideas and speculations communicated through designs. Thus, different ideas in design have emerged and define the relationship between hypothetical ideas, cultural strategies in general, and explicit hypothetical ideas and designs (Gaiani et al., 2021). Every commoner has his way of life, based on which his design was created, and his architecture is the true image of his lifestyle. Truth be told, the design was and still is a true part of the country's lifestyle. The lifestyle of the local area is responsible for the ethics with which the spaces are framed.

5.7   Cultural Identity Through Art in Architecture

In mosques, figurative representation was seen to have been strictly prohibited in each case and decoration was limited to traditional and calligraphic plans. However, each work of art had been highly prized by Muslims. By that time, the Fatimids established their new line in Egypt. The nation was ruled by the Islamic Ikhshidids (935–89 CE), a short dynasty that succeeded the Tulunids (868–905 CE). At the time of the Fatimid conquest, the Coptic component of the local Egyptian population was hitherto well established, and the Copts embarked on the rotten imaginative practices they had acquired from the past. However, the Iraqi-Persian style was the most prevalent in Fatimid Egypt, and the influence of Coptic crafts, which is the basis for decorating the workmanship, cannot be neglected (Yeomans, 2007).

When the Arab armed forces, by order of Amr al-Aas, attacked Egypt in 64–0 AD, the Copts, who made up most of the masses, welcomed the Arab heroes because they were seriously and badly treated under Byzantine rule. The advent of Islam gave them another great opportunity that they had not been happy with for a long time (Ibrahim, 2017). Despite this, Christianity was not attached to the massive masses of the Egyptian people, and many Christians over the years had converted to Islam. However, those who adhered to their religion were treated with dignity, were not harmed and took part in making the country prosperous. Coptic craftsmanship is composed of Greek and Byzantine to rough folkloric obsolescence (Karakul, 2018). Nevertheless, its first period is particularly associated with a strong influence of Hellenistic natural plans where creature figures, such as lions, deer, elephants, camels, and fish were used and human figures, were used in hunting, music production, and movement as a means of decoration (Behrens-Abouseif, 1989).

The most widely recognized subject of the Fatimids is figurative art, which like all manifestations of Islamic art is overwhelmingly recognized by its identity. In light of their social and authentic progress, two important groups influenced Fatimid art: the Sassanid/Persian and Iraqi on one side and the Greek/Coptic on the other side. Through the main creative ideas behind these communities and the ways in which their convictions were communicated through Persian, Christian, and Byzantine themes in the Bathymic realm, they gradually traced their direction towards Fatimid Art (Yeomans, 2007).

Byzantine elements include the use of modified curves, arches, pediments, pillow trays, and doors. The Fatimid doors and partitions visible today are largely known as the best examples of pre-Crusader military design of the Middle East. For example, Bab al-Nasr is flanked by two sturdy rectangular peaks of three tiers that divide 66% of the road with a solid band of decoration. Beneath a Kufic inscription declaring the Shiite martyrdom (a call to confidence) is an overwhelmingly semi-circular entrance that leads to a space surrounded by partitions and a ceiling with a cross-vault, mandated by a rosary crest and enhanced highlights on the facade of the peaks, including a band of Kufic script under the arched decoration and infamous instrumentation as collateral (Behrens-Abouseif, 1989). Both are round and pointed in Byzantine and Norman style, decorated with spurs, forged edges, and serrated edges. In their defensive frontiers, they are the Islamic partner of Byzantine symbols that were often found at city entrances and fortresses. Thick examples of arabesques fill the pillars of the curves with the interior of the arch consisting of palmettes, stems, leaves, and organic products (Antoniou, 2002).

6 Art as a Tool of Heritage Conservation

Culture and personality can be conveyed through architecture. Whereas in design, Art is used along with Architecture, through components that are perceived as synthetic and imaginary. The way of life of each architect and artist is identified through language, art, and Architecture whereas the research on culture is determined by the investigation of social manifestations (Farhan et al., 2021). Design reflects the way of life as it communicates closely with the basic, original, political, monetary, and social features of a society. Individuals in every country try to stick to their features and stay in-line with their own qualities and characteristics in creating architecture through material considerations. Changing social perspectives in networks greatly affects the design. Accordingly, the role of culture in the advancement of architecture appears to be significant (Awad & Boudiaf, 2020).

The search for form in Islamic Architecture is quickly linked, in the mind of the contemporary architect, artist, and society as a whole, to the values and vocabularies of architectural heritage as they are rooted in their conscience despite the economic, social, and technological changes inflicted. These changes also led to alterations in social features, customs, and traditions, as well as kept society away from the spirit of Islamic civilization (Toledo, n.d.).

As a result, Architecture lost its function and form. Society returned to traditional architectural values as a main source of inspiration for architectural thought and form creation, without appreciating the period of civilization that Egypt had been subjected to since Muhammad Ali's rule. The extravagance of valuing heritage architecture, whether linked to Islamic values or not, continued until the dome, vault, arch, and mashrabiya became an official symbol of architectural originality (Ackerman, 1953). Regardless of climate considerations and compatible technology that resulted from these elements in this part of Islamic sciences, many architectural elements are characteristics of Islamic architecture in Central Africa where local building materials were used in construction to match climate conditions, without the use of domes or arches (Elrasoul, 2016). We find several distinctive elements that appeared in Islamic Architecture in India and Southeast Asia, which reflect the requirements of the natural environment and climatic conditions linked to the inherited cultural roots.

The call for rooting cultural values in contemporary Egyptian and Arab architecture began in the early seventies. This had been the Arab architect's intention until the emergence of Western institutions specialized in Islamic Architecture, which were more concerned with form and content mainly related to the values of the Islamic civilization. Some Islamic eras included rulers who exaggerated the construction of their buildings according to artistic standards, where they rise to the top of plastic artworks, although they are based on the doctrinal standards of Islam, we find that they differ in the evaluation criteria for the same origin (Antoniou, 2002). If the plastic aspects are always related to place and time, then their evaluation varies in terms of form. This is reflected in the form. It is necessary to understand that the thought of Islamic architecture is not in the addition of decorative or heritage architectural elements, but is initially in the content, behavior, and activity, which in turn negates or proves the Islamic character of religion in the composition itself and not the decorative or the plastic elements. Therefore, the function can add a physical element (Gulotta & Toniolo, 2019).

7 Case Study "Fatimid Cairo"

Egypt's victory was achieved by the fourth Fatimid Caliph al-Mu'izz (952—755), who was an able lawgiver and a man of great knowledge. His success was aided by a brilliant general, Jawhar the Sicilians, and a Jewish believer, Ya'qub ibn Kilis, who had in the past been of high authority under the former Ikhshidid rule.

Long before the establishment of Al-Qahira (Cairo), north of Fustat in the Nile Valley, AD 969, the Fatimid caliphs began consolidating and strengthening their new capital with various structures, most of which are known only to us. The main building was the so-called East Palace with nine entrances and a core shell which is 345 m long (Williams, 2002). Overlooking the Western Palace, it had two wings and a huge front yard. The main sacred buildings in Cairo were the mosques of Al-Azhar (970–972 AD), Al-Hakim (990–1003 AD), and Al-Aqmar. Due to their structural condition and to preserve them, most of them were reconstructed. As a result, it lost its unique quality more than having lost rich stone, stucco, and wood carvings. Some small places containing statues and mausoleums are worth mentioning because of their ornate architecture (Behrens-Abouseif, 1989).

Al-Qahira is worked out with a rectangular arrangement and facades of clay blocks surrounding the area that forms the heart and center of Old Cairo. We find that the arrangement of the central roads today is the Fatimid, where the north–south axis, Al-Mu'izz Road, ends at the gates of Bab Al-Futuh and Bab Zuweila, and the east–west axis generally follows along the Al-Muski line (Ali & Magdi, 2017).

7.1   Al-Aqmar Mosque

The arising sculptural wealth of Fatimid stone cutting can be seen at its best on the façade of Al-Aqmar (1125) in Al-Mu'izz road on the fundamental north–south pivot of al-Qahira. This façade is a design magnum opus where its right-hand flank was crushed by adjoining structures. However, it has now been remade and the mosque's unique balance was reestablished. The compositional element of the façade is its solid, upward, and three-sided division framed by three fall curved specialties. The taller and more profound specialty at the focal point of the projecting entry has a fluted hood with an emblem in the middle. The flutes are profoundly cut, shaping solid flat ribs at the base which slowly rise and transmit into dawn encompassing the focal emblem (Samir & Ibrahim, 2006). They end at the scalloped edge of the falling curve where they are outlined with finely recorded joining circles. The emblem, with its carefully worried stonework, is one of the most refined and delightfully adjusted themes in Fatimid art. It comprises a progression of circular rings made out of substituting groups of calligraphy and scrollwork. In the middle are Kufic inscriptions with the name of Ali encircled in scrollwork (O'Kane, 2016). The following round band contains a reiteration of Muhammad's name, which is outlined and encompassed with a wide grouped and lavishly cut foliate parchment.

A similar blend of the emblem and the fluted hood is rehashed less extravagantly in the flanking specialties of the façade, and this gadget turns into an element of later Fatimid structures like the Mashhad of Sayyida Ruqayya and the mosque of Al-Salih Tala'i. One more development can be seen at the highest point of the tall square-headed recessed boards on one or the other side of the entry, where muqarnas show up without precedent for Egyptian design as an enhancement on a leveled surface. Over these boards, the entry is additionally expounded with shallow and visual specialties with scalloped curves springing from flanking colonnettes (Williams, 1985).

Al-Aqmar mosque is a masjid (neighborhood mosque) rather than a jamiaa (congregational mosque), the earliest enduring illustration of its kind. It has a twisted arrangement because the pivot of Al-Mu'izz road does not line up with Mecca. The façade veils a construction, wedge-formed in arrangement, consolidating a barrel-vaulted entry, a little space to the right, and a room and a flight of stairs on the left. The square sahn is encircled on three sides by single-aisled fall angled riwaqs and the little supplication corridor is three walkways deep (Sedky, 2009). The walkways of the riwaqs and petition lobby are covered by shallow block arches except for the cross-over qibla walkway which has a leveled wood rooftop (Soliman, 2018).

In the Fatimid time, the types of **oyster energies**, which address semi-ribbed arches, were common. They are finished in the mosque's entryway where they are huge energies tied with a sharp bunch, loaded up with a filler of brilliant ribs where the initial four ribs are horizontal without an angle. The remainder of the ribs transmits from a round gamma involving the middle as if the sun arises with light rays around them as shown in Fig. 1.

Muqarnas: value of redundancy and the connection of the part to the next: the Fatimid designer has applied a strategy by which all pieces of the shape join together to make a continuous association and track down the purported great amiability between these parts during their reiteration and multiplication. The modeler may rely on the arrangement of units while considering certain negative spaces and the equivalent significance between them (Sanders, 2008), proportionality, and the relationship between each piece within the plan in terms of structure, size, shading, and building components all of which is reflected onto the Muqarnas shown in Fig. 1.

Stucco windows "Sunshades": above the dividers are various comparable beautiful windows where every window is characterized by a sharp curve and, from an external perspective, by a band of plant themes within the window. It is filled with trims such as those of a mihrab, while the inside of the mihrab is decorated with mathematical themes (Williams, 1985). The importance of its enrichment, shadow, and light coming out is because of the spaces coming out of the empty parts as shown in Fig. 2, through which it highlights the importance of art in delivering a message and highlighting the elements most commonly used in this era.

Engravings: Kufic calligraphy was utilized as a principal component of the enlivening structure. The curves seen on the mosque's façade are engraved with plaster Quranic references in Kufic script. Notwithstanding its straightforwardness, we are able to observe the Muslim artist who had consolidated such artistic expressions by drawing and creating these adornments as having created the most imaginative works of the Fatimid period (Williams, 2002) as shown in Fig. 3.

The names of "Mohamed and Ali" have been written on numerous mosques in Cairo. They were rehashed in five better places on the primary Façade of "Al-Aqmar" mosque; on the emblem over the fundamental entry of the mosque, on the northern (right) and southern (left) specialties flanking the principal entry of the mosque, on the northern (right) side corner of the fundamental Façade, and inside two circles on the window cut on the two sides of Al-Aqmar fundamental Façade (Samir & Ibrahim, 2006) as shown in Fig. 4.

Fig. 1 The main elevation for Al Aqmar showing Muqarnas and oyster

Fig. 2 Stucco window showing plants and decorations

It is trusted that the ring of El-Imam "Ali Ibn Abi Talib" was cut with "**Al-Molk Lillah**" (The territory for Allah), on 25 wooden pieces that were investigated by the Egyptian excavator "Hassan Abdelwahab" and fixed in the old minbar of "Al-Aqmar" mosque.

The Basil Flowers: (Williams, 1985) suggested that two blossoms - resembling "basil" blossoms in the jar, which is cut on the two sides of the primary Façade of "Al-Aqmar" mosque, may address Ali's children, "Al-Hassan" and "Al-Hussein". Given the prophetic practice, "Al-Hassan and Al-Hussein are my two common life's basil blossoms". While, (O'Kane, 2016) accepted that the two blossoms address the Fatimid Caliph "Al-Amir" and his vizier "Al-Bta'iHy" to show the great relations between them at the beginning of "Al-Amir's" rule as shown in Fig. 5.

Hexagonal star: The hexagonal star is an old enrichment as shown in Fig. 6. It was utilized as a mathematical example through many ages such as the pharaonic, Greco-Roman, Coptic, and Islamic expressions, and afterwards, Jews called it the "Star of David" and embraced it as a symbolic Jewish image beginning around (1948 A.D) (Williams, 2002). While, during the Fatimid period, it was utilized both as a mathematical example and as a Shiite undertone alluding to the possibility of "Azzahir" (the conspicuous importance) and "Al-Batin" (the deeper significance), it comprises of two triangles; one is placed for potential gain towards the sky and is known as "Azzahir" (The self-evident) alluding to the Prophet "Mohamed" (PBUH) and the other is placed at a disadvantageous position towards the earth which would

Fig. 3 Shows the decorations and engravings in Kufic

Fig. 4 The medallion where Mohamed and Ali are written in the center

be translated into "Al-Batin" (The covered up) alluding to "Ali Ibn Abi Talib" (Behrens-Abouseif, 1989). Likewise, it has been cut on the center of the window (Pl.5), and it was also cut on the two sides of "Al-Aqmar" mosque's principal Façade (O'Kane, 2016).

7.2   Sayyida Ruqayya Mashhad

She was the daughter of Ali and came to Egypt with her progressive sister Sayyida Zaynab. This is a Mashhad rather than a burial place, an underlying reaction to a dream as a remembrance of the holy person. Sayyida Ruqayya's Mashhad (1133–53) comprises a rectangular asylum separated into three coves with a ribbed arch conquering an octagonal zone of progress over the middle. Its most particular elements are the three plaster mihrabs in the qibla divider (Williams, 1985). The chief mihrab is a showstopper of plaster plan and it reviews the fluted hood at the focal point of al-Aqmar's mosque façade (Wolper, 2014). However, the plan here gives more accentuation to a strong glass-like course of action of muqarnas outlining a hood that is profoundly emptied with sixteen woodwinds transmitting from a focal emblem containing the names of Ali and Muhammad, cut in interlocking examples of Kufic as shown in Fig. 7.

One of the most significant and unmistakable highlights of this landmark is the center area's progress zone from the square to the drum of the arch. The progress is made by a column of little fall curved specialties taking after **muqarnas**, a gadget that addresses a change in the plan and format of vault engineering, where beforehand the zone of progress consisted of enormous fall angled openings towards the sides of the square as shown in Fig. 8. Following the inventive leap forward of this vault, muqarnas showed up in the arches of the Ayyubid period (Wolper, 2014).

Around the drum of the dome, is an **engraving** band in Kufic script containing Qur'anic refrains. This band is believed to be the most established epigraphic engraving to

Fig. 5 The basil flowers

Fig. 6 Hexagonal stars on the window

be seen on a mosque in Egypt. The foundation of the octagonal vault is portrayed by eight windows in plaster; there are two windows on each side. The lower portions of these windows are adorned with excellent plaster work and are viewed as an interesting illustration of arabesque beautification from the Fatimid period as shown in Fig. 9. The arch from the outside is lobed in shape (Project, 2017).

The Mashhad is noted in addition to other things for its focal and main mihrab, probably the best piece of **stucco decoration** in Egypt (Yeomans, 2007). It involves a specialty overcome by a shell which is encircled with an external scalloped edge as shown in Fig. 9. The ribs, which emanate from an emblem in a manner reviewing the

specialties, adorn the veneer of the al-Aqmar Mosque oyster (O'Kane, 2016).

The names of "**Mohamed and Ali"** have been cut together on numerous Islamic tombs in Cairo. They were engraved on the top focal piece of the main mihrab.

Furthermore, a **hexagonal star** has been cut on the main mihrab, the two specialties flanking the fundamental entry of "Al-Sayyeda Roqayiah" Mashhad.

8 Conclusion

It is then concluded that Art is a tool that can be used to preserve and conserve heritage and architecture. Using art allows coming generations to know more about the heritage that architectural buildings hide between their walls. Everything is then unveiled to the world through the art used in a building. Therefore, art can be used to help in conserving the heritage of architectural buildings. Art is a very important tool, it tells us of what the past had been, tells us of the present, and enlightens us on the future. It gives history and heritage life once again with the help of architecture.

An indication of a flourishing local area could be seen in its capacity to protect its way of life, and guard its heritage and legacy, while simultaneously fostering appreciation in modern generations and occurrences. Imaginative, social, and innovative procedures help uncover and improve the personality of exceptional importance, its worth, and the character that underlies the physical and social type of a local area.

Fatimids utilized their structures in Cairo to engrave their Shiite musings for Egyptians indirectly, such as "Ali is the gatekeeper of Allah" and numerous repeated sayings and verses of the blessed Quran, numbers, color, etc. Such happenings demonstrate that Fatimids were keen on drawing in new Egyptian devotees to the Shiite convention by repeating to them Shiite sayings everywhere, even by reflecting them on Sunni structures. The "Ibn Tulun" mosque provides a clear example of similar inscriptions.

It is seen that the majority of the Shiite sayings on Islamic design in Cairo are intended to insinuate that "Ali Ibn Abi Talib" is legitimate of the Imamate after the prophet and the authenticity of the Fatimid Caliphs' Imamate, taking into account that they are the relatives of El-Imam "Ali" and his better half "Fatima". Moreover, the tombs that were worked on by Fatimids for individuals from the prophet's family in Egypt had less immediate Shiite implications than mosques because Fatimids were anticipating gaining the Sunnis' compassion towards them, particularly during the shortcoming of the Fatimid state. The vast majority of the heavenly Quran refrains, which have been cut on the Fatimid engineering in Cairo, were picked cautiously to

Fig. 7 Sayyida Ruqayya Mashhad's exterior view
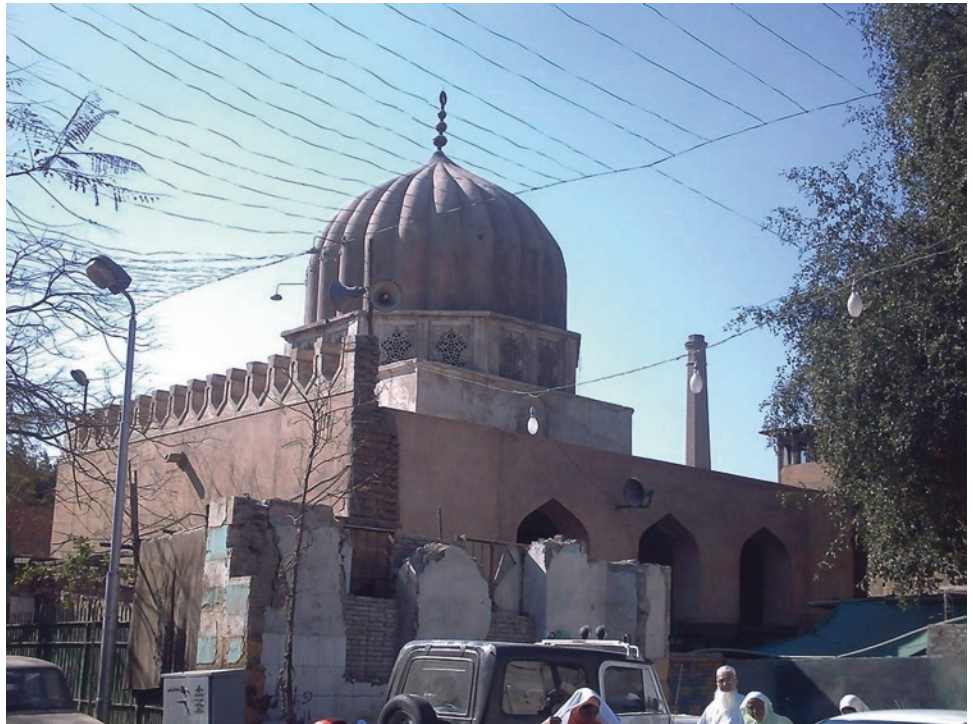
Fig. 8 Muqarnas as a base for the dome

be founded on the Shiite understanding of such sections as indicated by the possibility of "Al-zahir" (the conspicuous significance) and "Al-Batin" (the profound significance), to unite the origination of the Fatimids' right in Imamate.

The period of the Fatimids' rule and the Mamluks era in Egypt is considered as one of the most glorious Islamic eras during which a great architectural renaissance had appeared. The importance of Islamic architecture in Egypt

Fig. 9 Engravings of Kufic and Oysters radiating with Mohamed and Ali in the middle

does not take into account other ancient styles such as Pharaonic architecture, Coptic architecture, and others. This is for several reasons, the most important of which are: the architecture of Islamic eras in Egypt contained, while immutably original, influences from all heritages that preceded it, and it embraced what was appropriate for it as it is or developed it in a way that does not conflict with the Islamic faith. It continues to be suitable for man, place, and time, with the exception of Westernization which was imposed on us during colonial times. Besides, there were no radical climatic differences in the Islamic world from those that prevailed in the architecture of Islamic times, which makes it difficult to radically change the form and the content of our architecture to be similar to those prevailing in Western countries. It is also found that the economic conditions are very different from the economic conditions of Western countries, which makes it difficult to keep pace with the great technological progress that has taken place in the field of construction in those countries. In turn, this leads to thinking about how to take advantage of the available local materials in construction and the available human energies, and as far as possible from importing materials and raw materials that cost the state and society great burdens that it cannot bear.

9   Results and Recommendations

Al-Aqmar Mosque is the principal investigator of the veneers in the Fatimid time. It was the start of the utilization of muqarnas, pediments, and arches in the halls and interestingly utilizing the entry into the Islamic mosques in Cairo. It is a significant source of motivation for the mosques at that time with its artistic details which award it an identity. The Fatimid architecture is directly related to fixed standards and qualities. Additionally, the significance of mirroring the legacy of culture and its motivation in the outside plan is to genuinely reflect intellect, personality, and innovation.

Art in the Islamic era is linked to architectural thought, principles, and foundations that consider all aspects of our social, psychological, and cultural lives, thus linking all Islamic heritage across different environments. Thus, art in the Islamic era is characterized by architectural thought that is inseparable from man and the environment and has a major influence on contemporary architecture, which is believed to not have been linked to a specific time or certain elements. Contrary to this belief, there exists a link to fixed principles and reliance on elements that are developed with time as well, depending on each environment.

Therefore, it is recommended to highlight the role of art in Egyptian Islamic landmarks and their effect on tourist destinations through exposing and highlighting Fatimid art and buildings. It is also recommended to promote thought and discourse surrounding the benefits of the ways in which it had been influenced by Al-Aqmar Mosque and connecting it with appropriate and sustainable building materials. It is important to apply the principles in art derived from Islamic architecture while taking into consideration contemporary requirements and utilizing today's advanced tools, technologies, and architectural thought to preserve architectural heritage.

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Framing a Conceptual Approach for Urban Conservation in Historic Cities- A Case of Kuttichira, Kerala

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Abstract

Urban heritage is a source of identity and pride and can drive sustainable and equitable economic and social development. It represents an opportunity to build upon local traditions, skills, crafts, and techniques, helping conserve our natural resources. It also holds the potential to connect people with their past and build understanding among communities through shared experience. India's conservation movement has evolved from emphasizing prominent buildings to focusing on area-specific conservation efforts. Urban heritage conservation in India is a significant subject that can seldom be ignored. Urban heritage includes physical, commemorative, social, and economic aspects of the heritage interwoven with each other. The conservation movement has also come a long way with its changing focus—from the conservation of tangible objects to the conservation of intangible cultural heritage, from protection to participation, from control to encouragement, and from a single-purpose preservation-driven approach to a multiple-use approach. The paper aims to investigate the importance and conduct of a community-oriented approach in urban heritage conservation in India through which we can understand its role in the urban development of historic precincts. The study proposes a community-oriented conceptual methodology that can further achieve sustainable goals within the community, strengthening community participation and involvement. The proposed framework recognizes and emphasizes the community as the key stakeholder in their locality. The paper attempts to comprehend the sensitivity achieved in urban development through a community-oriented approach. The study has future scope for the conceptual approach to be explored multi-dimensionally. The methodology can assist policymakers in developing case-sensitive policies for historic urban areas.

1 Introduction

In recent years, there has been a paradigm shift from emphasizing monumental heritage to a broader recognition of the conservation of the urban realm. This article suggests a need to adapt to existing policies and frameworks to address this vision. Modern urban conservation policies require an approach to support communities to adapt to the current times while retaining the values linked to their collective heritage. The article attempts to understand and emphasize the relevance of how implementing a community-centred approach is not merely a suggestion for increasing community participation within a management system but is also about addressing it as a core component of heritage management driven by the people who are associated with their heritage. The article a community-driven theoretical framework that focuses on three mutually interdependent aspects—the city, the community, and the heritage. The practical implementation of this framework offers an opportunity to reconnect the urban realm with the communities through its interaction with the embedded heritage

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fabric and vice-versa. With this, the article proposes three levels of interaction between the three mutually dependent aspects, and actions at each level between the two aspects will have a voluntary effect on the third aspect. The attributes that constitute these aspects are beyond the scope of this paper, but various contextual models that can facilitate this framework have been suggested for the case example.

2   Literature Background

The recommendation by UNESCO on Historic Urban Landscapes defines an urban area being understood as "the result of a historic layering of cultural and natural values and attributes, extending beyond the notion of 'historic centre' or 'ensemble' to include the broader urban context and its geographical setting (UNESCO, 2011)." It reflects environmental concerns, economic development, and habitability of an urban area and the relevance of integrating them with urban heritage. It recognized the significance of the cultural heritage and its setting, i.e. the landscape for attaining sustainable development at the local level (Angrisano et al., 2016; Bandarin & van Oers, 2012; Ginzarly et al., 2019; Guzman, Pereira Roders, & Colenbrander, 2018; Van Oers, 2010; Veldpaus & Roders, 2020; Veldpaus et al., 2013). The Historic Urban Landscape (HUL) approach is considered an umbrella for the "living" heritage, which encompasses both the tangible and intangible characteristics of the cultural heritage within the built environment or cultural landscape. The tangible heritage includes the physical expanse, while the intangible cultural heritage deals with values associated with the place, the local perception, and local standards of the respective local communities settled within the region (Biancamano & Bosone, 2017; Onesti & Biancamano, 2017; Poulios, 2010). The tangible entities are not limited to the built structures but also public open spaces, markets, streets, water bodies, and landscapes. The current state of heritage protection in India revolves majorly around the Archaeological Survey of India (ASI) and its divisional state counterparts. The National Policy for the Conservation of the Ancient Monuments, Archaeological Sites and Remains (NPC-AMASR) has set objectives to safeguard monuments and archaeological sites of national importance. It envisages updating and contextualizing India's conservation approach with particular regard to effective management of the physical sustenance of the built fabric. ASI projects are monument-centric and tourism-driven, seldom considering the unprotected components of urban heritage and the community and lacking an influential role in policymaking. Modern heritage policies demand the urban conservation approach to be an integral part of the planning framework. Urban conservation is an approach to indulging and managing historic urban precincts for future generations in a sustainable way (Whitehand & Gu, 2007).

3   Conceptual Approach

The proposed conceptual approach is a three-level community-driven framework that focuses on three mutually interdependent aspects—the city, the community, and the heritage. The first level of interaction is between the heritage assets with the urban fabric determining the historical and cultural significance the city imbibes within itself through its tangible and intangible heritage resources. The second level of interaction is between the heritage resources and the community. This level focuses on creating awareness and engaging the community in identifying and valuing their heritage resources to create sustainable strategies for enriching their lifestyle while conserving the assets. The third level of interaction is between the community and the city. This level helps understand the needs and demands of the community from the concerned city officials. Policies and strategies are focused exclusively on each level determining and proposing context-specific guidelines. Figure 1 shows a schematic diagram of the three levels.

4   Case Study: Kuttchira Precinct

Kuttichira is one of the oldest historic settlements in Kozhikode's district within the Malabar region of Kerala. The settlement lies within a larger region known as the Thekkepuram region, the residential district of merchants

Fig. 1 Conceptual framework (*Source* Authors)

handling sea trade during the Zamorin reign. Figure 2 shows the location map of Kuttichira. The area is predominantly a Muslim settlement that the Arabian Sea geographically bounds in the west, the Kallazi river in the south, and the Valiyangadi (big bazaar) in the north. These merchants mainly comprised Arab Muslim traders and their support groups dealing with the spice trade under the patronage of the Zamorins during the medieval period. Figure 3 shows an aerial view of Kuttichira within the urban fabric of Calicut city.

Kuttichira accommodates most of the Muslim community, which was formed by adapting the native communities to Islam and the matrimonial bonds between the Arab traders and local women. Kuttichira also accommodates merchant traders from other regions of India, mainly the Gujaratis and Jains, who have migrated and settled here with their families to carry on with their trade business. The *chira* (pond) is the heart and nucleus of the precinct. The central portion of the Kuttichira precinct constitutes the Muslim community, while the northwest and northeast portions constitute the Gujaratis and Jains, respectively. Figure 4 shows a map of the location of communities residing in the Kuttichira region around the chira (pond) in the centre.

Kuttichira is one of the unique areas in Calicut, imbibed with heritage values that showcase multiculturalism and communal coexistence. The heritage of Kuttichira is a
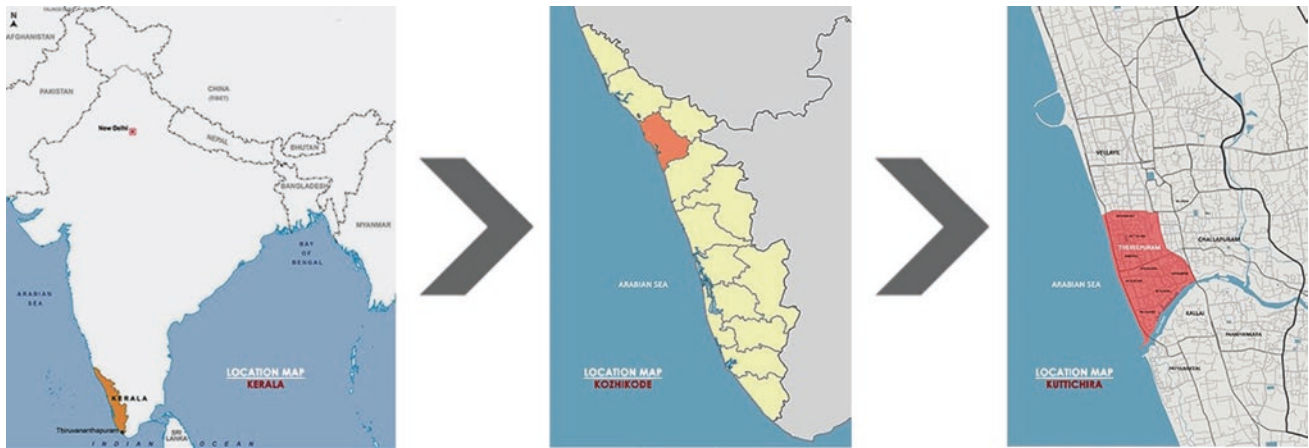
Fig. 2 Location map of Kuttichira (*Source* Authors)
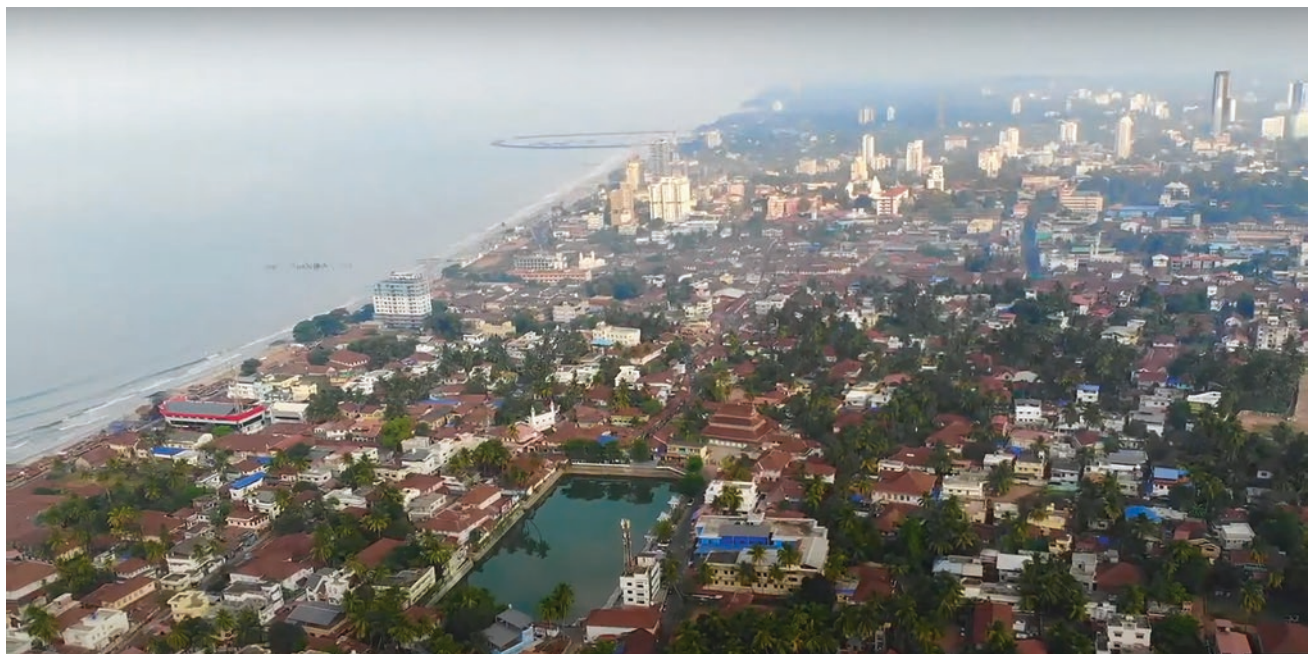
Fig. 3 Aerial view of Kuttichira

Fig. 4 Communities residing in the Kuttichira precinct (*Source* Authors)
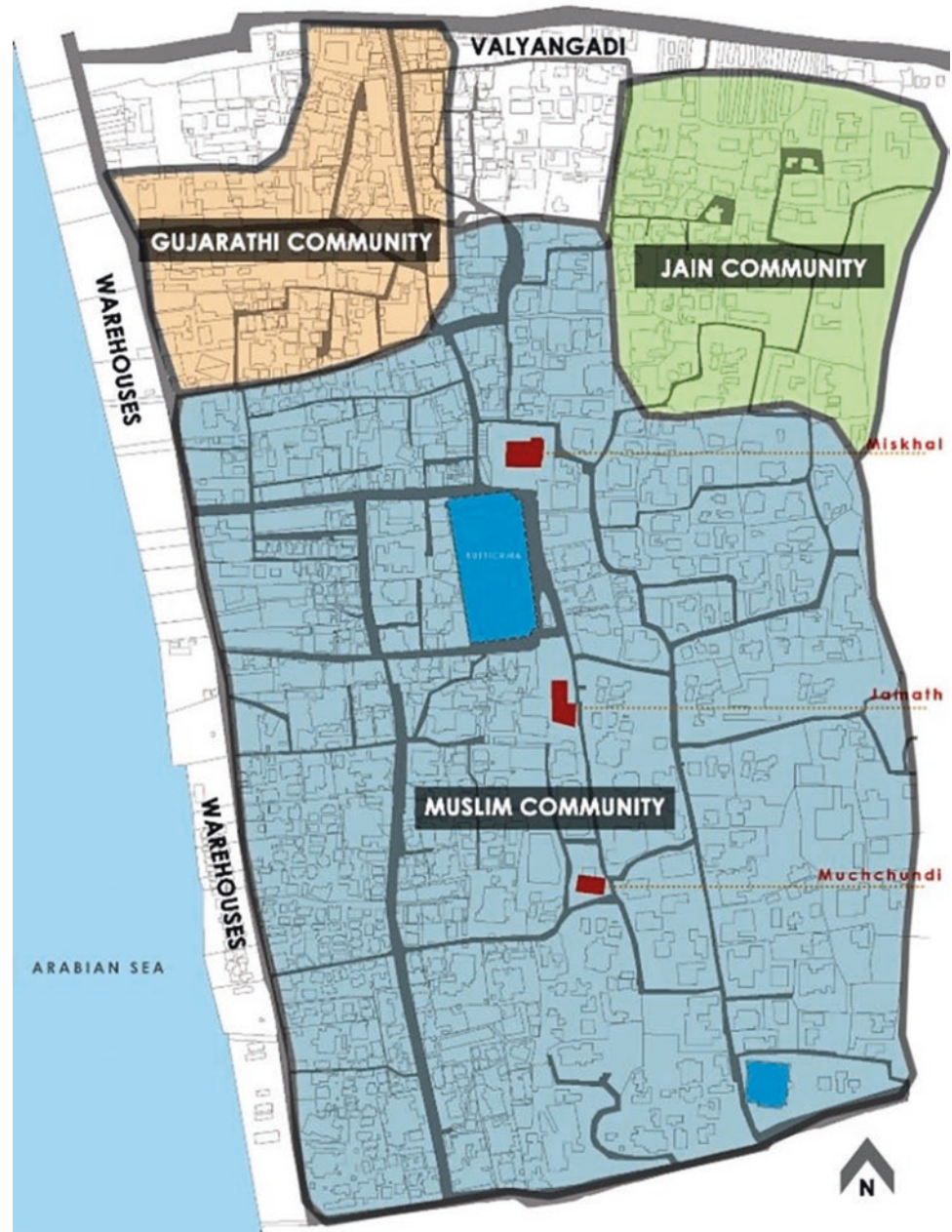
culmination of the cultural identity of all the communities. The chira is the key urban spot for social and cultural interaction among locals of various age groups. The various streets that create the network in the precinct hold a unique name, which depicts its heritage value through its historical relevance. The architecture of Kuttichira showcases a unique character and identity that is a fusion of local vernacular architecture and Arabic traditions. The area is very well known for its mosque architecture, which follows the construction techniques adopted in the local Hindu temples of Kerala. The built heritage of the Kuttichira area lies in the dominant architectural marvels such as the mosques.

The region comprises urban elements that contribute to the tangible and intangible values of the community residing and vice-versa.

5 Analysis

The proposed three aspects of the framework are conceptualized in the presented case study of the Kuttichira precinct. The level 01 interaction focused on establishing the notion of Kuttichira as a historical or heritage city concerning its heritage assets, helping identify the scope of heritage

Fig. 5 Verandah of Tharavad (*Source* S. Ramesh Kurup)

character and values imbibed in the city, and rediscovering the 'unrecognized' assets. It eventually aids the local communities in understanding the prominence of their locality and promotes it to support their well-being through local self-employment. Organizations dedicated to cultural heritage conservation, such as INTACH and architectural educational institutions, have studied, researched, documented, and prepared inventories for the identified tangible and intangible cultural heritage in the Kuttichira region. The tangible assets include all the built heritage structures, such as the residential *tharavads* (Fig. 5), the mosques (Fig. 6), the pond (*chira*), and the public spaces. The intangible aspects cover the local cuisine, the Mappila music and dance forms such as Kolakali, Oppana, and Duff Muttu (Fig. 7).

The level 02 interaction focused on the community's perception of their local heritage assets. The communities residing in the precinct include the Muslim Mappilas, the Gujaratis, and the Jains. These communities are the primary stakeholders for the urban heritage assets embodied in their respective areas. During the research this paper draws on, participatory models were applied at this level for consulting with different stakeholder groups, such as socio-economic surveys, focused group discussions with all the communities combined, and consultation with government officers and local authorities. Figure 8 shows a photograph of a conducted stakeholder meeting before the commencement of the Kuttichira revitalization project. A series of events, such as exhibitions, participatory workshops, and presentations engaging these stakeholders, was conducted to recognize the potential for caring for heritage; acknowledging the local values of the communities and other stakeholders, such as economic and socio-cultural values (Abdurahiman et al., 2022). Participation tools such as capacity-building programs, stakeholder analysis, and

cultural mapping were implemented to enable active community engagement.

Level 03 focuses on the existing government policies, proposals, and incentives that facilitate uplifting the community's well-being and development within the historic precincts. The heritage assets associated with the respective communities can be seen as a resource to support their well-being and facilitate heritage-sensitive development, hence demanding the need for conservation measures. As a part of this measure, in the year 2022, the chira (pond), which is spread over two acres in the heart of the Kuttichira region, was given a face-lift and renovated under the heritage conservation project at the cost of ₹2 crores with funding from the District Tourism Promotion Council (DTPC) and local Member of Legislative Assembly (MLA). Figure 9 shows the chira undergoing renovation, and Fig. 10 shows the renovated Kuttichira pond.

The three levels can be systematically approached as an eleven-step methodological approach (Abdurahiman & Kasthurba, 2022), as shown in Fig. 11. The first eight steps document the heritage assets to establish their value. The value is assessed by understanding the urban context, recognizing and categorizing the urban heritage assets and further establishing the significance. The last three steps deal with integrating heritage assets within the urban planning framework, establishing an institutional setup for the heritage area/precinct, and developing context-specific policies and strategies.

6   Discussion and Conclusions

The research study conceptualized a methodological framework that integrates community stakeholders with the cultural heritage fabric and government policies. The first level of the conceptual framework established heritage resources

Fig. 6 Mosques in Kuttichira **a** Miskhal Palli **b** Jami Palli **c** Mucchundi Palli (*Source* Authors)

Fig. 7 Intangible heritage: **a** Kolkali, **b** Oppana, and **c** Duff Muttu (*Source* AramcoWorld)

Fig. 8 Stakeholder meeting (*Source* Authors)

Fig. 9 The historical Kuttichira pond undergoing renovation. (*Source* K. Ragesh)

as an integral part of the community's culture. The interaction establishes heritage resources as a 'potential community well-being and upliftment' tool. The allocated funding from the DTPC and the MLA for the Kuttichira revitalization project shows the active involvement of the government both at the state level and local levels in enriching the precinct by making use of the heritage resources in its urban development proposals. Level 02 of the conceptual framework focuses on the community. The local communities are the primary stakeholders in managing, protecting, and maintaining their local heritage entities, but recognition and awareness of their local heritage are seldom done voluntarily. The community needs to be aware of the

architectural value of heritage assets to minimize imposing insensitive interventions in the name of development. The people ought to be aware of the prospects to achieve an improved quality of life symbiotically with heritage fabric. There is scope for expediting public debates, consultations, and discussions regarding the value and potential of local urban heritage. Community involvement should be invigorated with heritage education and awareness programs. Informed decisions can be driven from the framework in level 03 to reduce drastic developmental impacts on the existing heritage fabric. The three-level conceptual framework is devised contextually to aid in understanding what the community demands more while intervening

Fig. 10 **a, b** The Kuttichira pond after renovation (*Source* Authors)

Fig. 11 Step-wise
methodological approach (*Source*
Authors)

01 • Understanding the Urban context

02 • Identifying Urban Heritage Assets

03 • Establishing its Significance: Authenticity and Integrity

04 • Generating Awareness of Heritage Assets

05 • Integrated Stakeholder/Community Participation Approach

06 • Preparation and Periodical Updation of Inventories

07 • Mapping of Heritage Assets

08 • Value Assessment of Assets

09 • Integration of Urban Heritage Conservation in Urban Planning Framework

10 • Establishing Institutional Setup

11 • Formulating Policies and Strategies

in the historic urban fabric and understanding the scope for the government to intervene to bring upliftment and development within the heritage precinct. The concept of the three-level management can be a paradigm shift in shaping a novel prototype for heritage-sensitive urban development and local heritage management. Heritage is often seen as a prospect to drive-in economic benefits for the tourism industry, wherein the values associated with the heritage asset are often tampered with to suit tourism demands. This perspective needs to be gone beyond tourism and be integrated with community upliftment to facilitate community-oriented development.

The adopted framework serves as a contextual methodology based on the HUL approach that recognizes tangible and intangible heritage components as key urban resources in enhancing urban livability and promoting economic development and social cohesion. All three levels

are exclusively significant and mutually interdependent. The coexistence and codependence of the three levels make way for a more sensitive urban development and conservation approach in historic precincts. Effective planning and management of resources is a key aspect that needs to be taken care of in the future, and conservation can be seen as a strategy to balance quality of life and urban development. The engagement and participatory approach of the project enables the local communities to rediscover the heritage values of their neighbourhood. The HUL approach includes a holistic and value-based approach, but there is a need to have contextualized local endeavours and policies. The theoretical framework needs to be adapted to the local context to operationalize this approach by involving the native communities as key stakeholders in conservation and development processes. The three levels discussed in the framework, i.e. the city, the community, and the heritage

and their respective parameters, depend on the area's scale and context, hence demanding further research on determining qualitative and quantitative aspects of various historic landscapes. Also, the interrelation between the three levels must be analyzed from all dimensions, i.e. social, cultural, environmental, and economic. The framework could serve as an assessment tool for conservation architects, architects, urban designers, and planners to bring about heritage-sensitive proposals and design strategies. The assessment tool can aid in framing and scrutinizing development policies in historic precincts, through which context-specific policies can be formulated that could monitor and manage developmental proposals. The study provides future scope and motivation for exploring new approaches for practicing urban conservation in historic urban precincts.

Conflicts of Interest The authors declare no conflict of interest.

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Revitalizing Historic Plazas for Integrated Urban Conservation

Mona Helmy

Abstract

Historic plazas play a major role in improving or creating place identity, place memory, and belonging of heritage areas. They maintain elements of tangible and intangible heritage, such as accommodating social networks, traditions, lifestyles, traditional crafts, festivals, or rituals. Above all, they manifest a unique sense of place, and collective memory of cities to local communities, contributing to the historical character of heritage areas. The paper claims that the revitalization of historic plazas intends to reconcile conserving their historical urban landscape (HUL) to meet the changing requirements of local communities. It argues that revitalizing historical plazas is an innovative approach that helps to overcome the current urban conservation gaps in many heritage areas. Likewise, it strengthens the perceptions of the built heritage and historic buildings, while retaining their historic character and increasing their social vitality and performance. Furthermore, the distinctiveness of historic plazas can uncover the hidden forms and fabrics in historic areas and inspire their future development. This review paper aims to describe how historical public spaces as places of social interactions and traditional cultural activities are significant in conserving historic living areas. It aims to investigate a variety of approaches to the conservation of historical buildings/sites through the revitalization of historic plazas as multidimensional spaces in selected case studies. The methodology used is to study the usage of current patterns of selected historic public places; to analyze various strategies implemented to revitalize those patterns. The main objective is to contribute in formulating a practical approach to enhance the liveliness and the quality of life of historic plazas; to fit the residents' culture as an integral part of urban conservation.

1   Introduction

Several approaches were adopted by different countries to keep their heritage well maintained, which is often done according to their history, contexts, circumstances, and visions. Hence, decisions between restoration, renovation, reconstruction, or preservation were adopted in many countries around the world. In a country like Italy, which has 58 listed sites as world heritage sites (UNESCO 2021), many approaches and theories were adopted towards a successful and efficient practice of heritage conservation. Several traditional approaches, such as complex methods of restoration promoted by Cesare Brandi, and conservation supported by Marco Dezzi, among other approaches. In addition, new approaches, such as the "Preventive conservation", as a pro-active approach of urban conservation was suggested to be adopted in Italy (Della Torre, 2020).

In recent years, the growing practice of urban conservation in many cities around the world reveals that the concepts and the practical experiences of conservation have been reformed. They have been expanded from focusing only on the conventional limited architectural restoration of historic buildings and sites to embracing a wider scope of urban intervention, i.e., revitalization of the historic urban fabric in which those buildings and sites are located in. The developed practices centered on enhancing the socio-economic conditions of the historic buildings' surrounding areas, improvement of infrastructure, and enhancing the

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public amenities, among other related aspects, as a process of achieving an "integrated urban conservation". The emerged integrated urban conservation has been widely developed and advanced following the UNESCO 2013 recommendation on adopting the Historic Urban Landscape (HUL) approach to be a holistic development strategy.

This paper argues that there is a strong interaction and a mutual relationship between heritage buildings and public places around them in their urban contexts in tangible and intangible qualities.

2 Historic Urban Landscape

The Historic Urban Landscape (HUL) is an approach that combines and integrates the entire tangible and intangible components of heritage environments. According to UNESCO's recommendation, a holistic approach "..integrates the goals of urban heritage conservation and those of social and economic development..". It deals with urban heritage as a social, cultural, and a financial resource for cities' development. The UNESCO recommendation in 2011 regarding the HUL, promotes that the historic urban landscape approach "..moves beyond the preservation of the physical environment and focuses on the entire human environment with all of its tangible and intangible qualities..". (UNESCO 2013, p. 5). It seeks to enhance planning and design sustainability by considering the built environment current conditions, together with the historical sites' intangible aspects of heritage, e.g., socio-cultural diversity, community values, along with socio-economic and environmental factors. Thus, those elements of the historic urban landscape vary between built and unbuilt/tangible and intangible components of heritage sites. Those comprise historical buildings, open public places, natural landscape, socio-cultural qualities, and authentic activities related to the site, among others, in which those elements have dynamic forces that shape and re-shape their development, vitality, meaning, and urban and mental images.

In many countries, the historical city centers have been always a main stage for urban revitalization initiatives, from a historical conservation point of view. In this context, Ebbe claims that the conservation of cultural heritage through urban revitalization approaches leads to "..preserving city livability, increasing competitiveness, and creating a wide range of income-earning opportunities..". From a different perspective, it can be also seen on an aterritorial scale as a new approach to deal with properties, which can be considered a dynamic approach in dealing with cultural and urban heritage (Ebbe, 2009).

Other concepts, such as historical architecture, monuments, or tangible/intangible heritage are used in the literature, to define or discuss the cultural heritage in an area.

The conventional concept of looking at heritage sites as a representation of monument, or as a complex of buildings is no further sufficient to protect and conserve the qualities of heritage from deterioration, decay, or exclusion of historical significance. (Ruoss and Alfar, 2013). Hence, the HUL as a holistic approach is being adopted as an efficient approach of conserving the historic urban landscape.

3 Urban Plazas

Urban plazas are places for several human activities, such as relaxation, socialization, and mobility, among others (Cooper and Francis, 1990). Urban plazas are not only functional and aesthetical public places, yet they often represent the culture and the identity of their cities (Krier, 1979). Many scholars consider urban plazas as Cities' Living Rooms, or as a symbol that creates an important part of the city mental image (Lynch, 1981).

Although scholars, such as (Stanley et al., 2012) defined plazas, as part of the urban open spaces, as a non-roofed grounded space, other scholars connected urban plazas with socio-cultural/socio-economic activities (Gehl & Gemzoe, 2001; Krier, 1979), or to focus on its visual and image aspects, such as (Lynch, 1960). As per Merriam-webster. com, an urban plaza is an "open area usually located near urban buildings and often featuring walkways, trees and shrubs, places to sit, and sometimes shops".

Urban plazas' typologies vary between their form or their function. Form oriented typology of plazas fluctuates among the enclosure of the plaza, its urban surrounding, its geometric shape, or its components. In that typology, closed, dominated, linked, nuclear, and amorphous plazas are good examples (Helmy, 2005). Functional typologies of plazas are mainly categorized under residential, religious, market, or plazas connected to public buildings (French, 1978). From a usage perspective, plazas can be categorized into pedestrian, traffic, or mixed.

4 Historical Plazas

Public places are a fundamental feature of historic areas in which they are centers of livability, sociability, and collective memory. As Litva et al. (2002) assert, "…. they represent sites of interactive settings in which social relations and a sense of place are constituted, developed, and contested".

This research focuses on historic plazas as a representative to the historic public places. In the scope of this research, those plazas are linked or connected to historical buildings, or they are part of the historical urban landscape at large. As a part of enhancing, conserving, revitalizing, or

Fig. 1 Tangible and intangible components of Historical Plazas. By the author

developing the HUL, some interventions are taking place in historical plazas to maintain and develop or represent them. Hence, many historical plazas are nowadays perceived as experience places, venues for urban life, meeting spaces, convivial spaces, or creative places.

The Historic public places provide free access and common space for people in an equitable way, in terms of age, gender, income, or ability, allowing everyone to live in a quality neighborhood.

Historical plazas, like other plazas, vary in terms of their tangible and intangible components and qualities. Yet, historical plazas are unique in terms of their historical or symbolic values that are interconnected to their historic urban landscape at large. Variables of historic plazas depend on tangible or physical aspects, such as their surrounding heritage building(s)/monuments and their type and value, the physical structure of the plaza, and its included urban elements. Other intangible or non-physical variables in historic plazas could be various activities practiced in the plazas, whether it is spiritual or physical. According to Elbeah et al. (2022), "the livability of places is set by many factors, which are in turn influenced by a variety of tangible and intangible elements..". In this context, UNESCO defines intangible heritage as the traditions or the inherited "living expressions". Those living expressions could be events, rituals, oral traditions, performing arts, or socio-cultural experiences, such as social traditions or demonstrating authentic crafts (UNESCO, 2004). Figure 1 illustrates the tangible and the intangible components of historic plazas.

5 The Role of Historic Public Places in Conserving Historic Living Areas

Public places are catalysts of social life, culture, and traditions of cities. They contribute and reinforce cities' identities at large. The importance of public space for boosting sense of places as well as a sense of community is evident in many historic cities. Historical public places are not only hubs for human activities, yet they manifest collective memories that are accumulated over time. Cattella et al. (2008) pointed out that "spaces can contribute to meeting needs for security, identity, and a sense of place". Authentic activities that represent the local culture, and special events are important intangible components of urban heritage that revitalize the city. Ehrenreich (2007) has argued that traditional social events and festivals are attracting people over the centuries, in which historical plazas are playing a big role in staging those events.

The general characteristics of historical areas are portrayed through their public places, such as streets, alleys, parks, squares, and plazas, and the surrounding historic fabric, and significant sites, such as monumental buildings and structures. The current changes and transformation in the urban form of those areas are due to several urban interventions. Nowadays, those interventions consider the role of public places to maintain a livable, and community-oriented urban development.

Over the course of this research, historic plazas are studied in several examples that represent various contexts, physical shapes, urban components, and activities, which are packaged within different approaches of conserving the HUL.

6 Urban Revitalization

Urban revitalization can be defined as a process that improves economic, social, environmental, cultural, and historical (re)development of deteriorated, and neglected historical areas. It involves various urban strategies that should lead to the livability of historic places, which in return, contributes to the overall conservation and sustainability of historic areas. As Cantacuzino pointed out "Conservation means the act or process of preserving something, which already exists, of keeping something alive.." (Cantacuzino, 1990).

In this context, Tiesdell et al. define the urban revitalization as: "The process through which the mismatch between
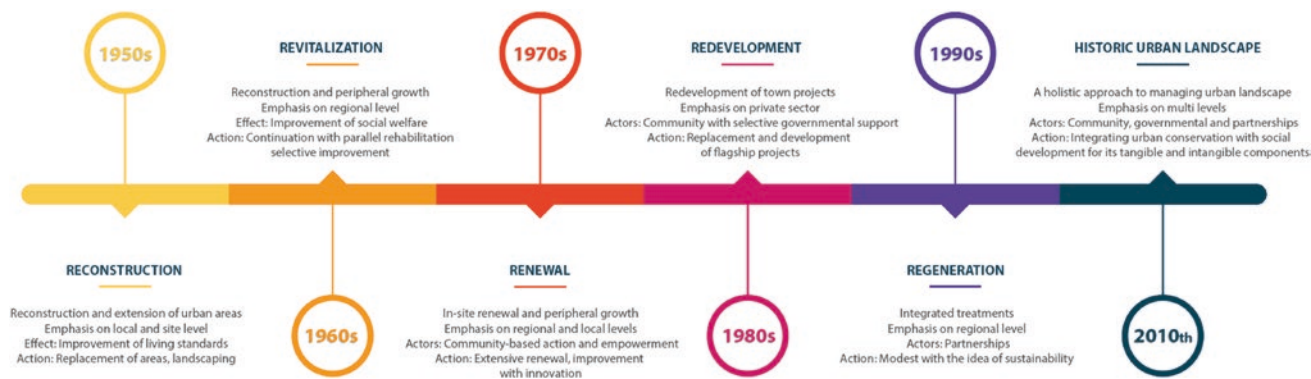
Fig. 2 Chandan and Kumar (2019) & UNESCO (2013)

the services offered by the fabric of the historic quarters and the contemporary needs can be reconciled" (Tiesdell et al., 1996). Holcomb and Beauregard (1981) claim that "..urban revitalization implies growth, progress, and infusion of new economic activities into stagnant or declining cities that are no longer attractive to investors or middle-class households..". Revitalization can be dealt with as a "process through which the deterioration and decay of historic urban quarter can be addressed, terminated or reversed". According to Couch (1990), urban regeneration is "seeking to bring back investment, employment, and consumption and to enhance the quality of life" within the historic urban areas.

Urban revitalization is a process of retrieving livability of historic areas. It involves several oriented interventions, such as the regeneration, renewal, redevelopment, and rehabilitation, among other interventions, e.g., programs that attract, encourage, and facilitate private and public investments. These interventions can include activities designed to improve historical areas, strengthen existing economic activities, attract new opportunities, support renovation, and most importantly, enhance public places and amenities.

The urban revitalization, as an umbrella for various strategies or actions, is being seen, discussed, and practiced differently in various contexts, cultures, and in the light of local visions and policies. Sutton and Fahmi (2001) claim that approaches to the urban conservation are restoration, renovation, and rehabilitation. Chandan and Kumar (2019) argue that urban conservation has gone through different strategies over the past decades. For example, it focused on the "Re-construction and Revitalization" in the 1950s and 1960s as a strategy for growth, we find that it was shifted in the 1970s to the "Renewal" as a strategy for development in historic sites.

This research argues that urban conservation trends that are linked to a certain period of time exists. Yet, using certain trend(s) for urban conservation is a response to various views, or problems to the historic areas, people's needs, or

governmental decisions. It is also argued that a combination of more than one trend or strategy can be used. Figure 2 shows a cross-section in the history of the urban revitalization and its main paradigm shifts until the UHL concept as an approach to urban conservation and revitalization.

7 Typologies of Revitalizing Historic Plazas

Among the various conservation approaches to revitalize historic plazas, a set of historic plazas' examples representing those approaches are selected based on certain criteria. Those criteria are: their historical value, cultural context due to diverse geographical locations, and the existence of their liveliness. Typologies of selected plazas, either form oriented or functional oriented weren't a criterion of selecting the examples of conserved historic plazas; as the research focuses on tracing the intervention approach of revitalizing the plaza in response to its history, physical structure, and context. Examples of historic plazas are also examined in terms of their accessibility, and events/activities pattern(s) taking place in their current status. Figure 3 shows the analysis criteria of the selected historic plazas.

The selected historic plazas are examined and analyzed as shown in Figs. 4, 5, 6 and 7; to represent different tools and methods of reviving the historic plazas within the same intervention approach. Through a cross-sectional view of those examples, the research portrays various practical approaches of revitalizing and enhancing historic plazas.

8 Discussion

As shown in Figs. 4, 5, 6 and 7, urban revitalization of historic plazas has been achieved through a multiplicity of approaches that vary between the following:
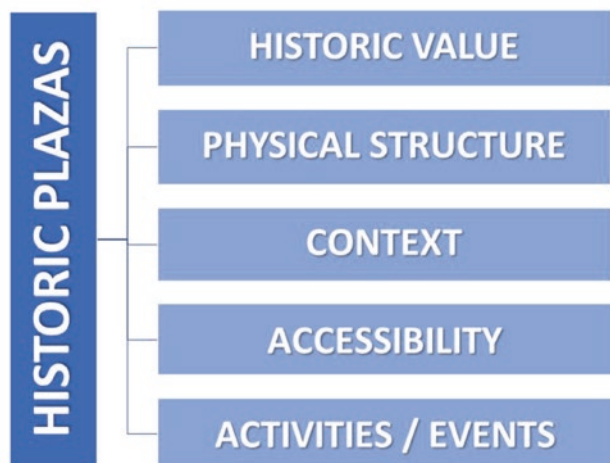
Fig. 3 Criteria of analyzing the selected examples of historic plazas. By the author

- **Extreme conservation**: Usually used in historic plazas that were not exposed to robust vandalism or decay. The conserved historic plazas relatively maintain their original identity and sense of place, which is being done through their tangible and intangible spatial aspects, e.g., Bait Nassif historic plaza, located in Jeddah, KSA is an extreme example of conserving, not only the physical plaza, but also it has planned activities and events that showcase the history of the plaza, which recall the place historical memory.
- **Reconstruction/Renovation**: While renovation is often used to fit new needs for the users, we find that its extreme implementation, which is the reconstruction is often used in response to a certain decay that took place in historic plazas. Reconstruction of historic plazas is done due to several reasons, such as complete intentional or unintentional decay of the plaza, or due to massive contextual change. The reconstruction approach often replicates the original plaza, e.g., as in the Commerce Square in Lisbon, or in the historic center of Warsaw, Poland.

  Renovation is used in plazas where they are located in a historical context, in which it can enhance the quality and the liveliness of the plaza through a partial or a whole renovation. The degree of the intervention of this approach is related to the possible changes in the urban context. Pompidou plaza in Paris, France is an example of high degree of renovation due to the construction of Pompidou Cultural Center in the heart of the historic part of Paris.
- **Renewal/Redevelopment**: Both related approaches are done in historic plazas to implement new objectives that vary between functional, visual, or aesthetic, among other objectives. As shown in Fig. 6, the

Gendarmenmarkt in Berlin, Germany was redeveloped to allow visual consistency of the three historic buildings included in the plaza by creating a connected platform as an integrated base. The San Martin Plaza of Cordoba in Argentina has gone in a renewal project to draw and reflect the historic buildings on the plaza, in which the history and the plaza's sense of place are manifested.
- **Regeneration/Rehabilitation**: both approaches are being implemented in historic plazas for different objectives that aim to add value and quality to the place. They often add remarkable changes, yet maintain authentic place characteristics. For example, adding the huge wooden canopy-like structure in Metropol Parasol Plaza of Seville in Spain has resulted in a comprehensive sustainable development, reflected in place social liveliness, enhanced economy, and added environmental and climatic mitigation. Moreover, the top of the wooden structure, which is called as "City Terrace" offered new sceneries and visual perspectives of the city. The added huge glass Pyramid to the ancient Louvre Plaza in Paris made a whole new vital experience above and under the ground floor.

9   Conclusion

Urban revitalization of historic plazas is a very important component of the overall conservation of heritage areas. Recent holistic concepts and approaches that aim to integrate the goals of urban heritage conservation, such as HUL, are evidence of such importance.

This research claims that the delimited notion of conserving historic buildings in the segregation of their historic urban context is no longer valid. It states that revitalizing historic plazas is significant in urban conservation as an integrated approach. As reflected in the discussion, this proposed approach can be reached through different strategies and tools.

By examining and analyzing various examples of successful conserved urban plazas, the research highlights a phenomenon that links using divers conservation intervention approaches of historic plazas with certain motivators and objectives to each approach. It argues that several practical approaches can be followed to enhance the liveliness and the quality of life of historic plazas. Although those approaches are diverse and may follow complex or overlapped motivators and objectives, they should consider the history, context, structure, and function of historic plazas in the light of contemporary human and urban needs. Table 1 shows a suggested model for the most used conservation practical approaches of historic plazas as part of their urban context.

Bait Nassif Plaza, Jeddah Saudi Arabia	Plaza Mayor, Madrid Spain	Marienplatz, Munich Germany	Schlossplatz, Stuttgart Germany
Location: Historic Jeddah Constructed: 16th century Conservation: Inscribed in the World Heritage List. Type: Pedestrian plaza Physical Form: An interrupted rectilinear shape.	Location: City center Constructed: 1617- 1619 Conservation: Inscribed in the World Heritage List. Type: Pedestrian plaza Physical Form: Pure rectangular shape 120X86 m.	Location: City center Constructed: 1158 Conservation: Inscribed in the World Heritage List. Type: Pedestrian plaza Physical Form: A combined rectilinear shape.	Location: City center Constructed: 1775 - 1778 Extreme conservation. Type: Pedestrian plaza & park Physical Form: A combined rectilinear shape with an area of 51000m2.

Historical Plaza

Physical Structure

Context and Accesibility

Events/Activities' Pattern

Current Plaza

Livability through Conservation	Livability through Extreme Conservation	Livability through Conservation	Livability through Conservation

Fig. 4 Examples on revitalizing urban plazas using the conservation approach. By the author

	Commerce Square, Lisbon Portugal	Place de L'Homme de Fer Strasbourg, France	Pompidou Plaza Paris, France	Historic Center of Warsaw Poland
	Location: City center Construction: Completely remodeled after the great 1755 Lisbon earthquake. Type: Harbour-facing plaza Physical Form: A large square shape 175X175 m.	Location: City center Construction: 1994 Type: Traffic square Physical Form: A triangular shape that is covered by a new ring-shaped central glass roof.	Location: City center, les Halles Construction: 1971 Type: Pedestrian plaza Physical Form: A rectangular shape that is was a former market area, and a parking lot.	Location: Historic center Construction: Completely reconstructed after the destroy by Nazi troops in 1944. Type: Pedestrian plaza Physical Form: Complex

Fig. 5 Examples on revitalizing urban plazas using the re-construction/renovation approach(s). By the author

	Gendarmenmarkt, Berlin Germany	Al Manchia Plaza, Alexandria, Egypt	Plaza San Martin, Cordoda Argentina	Place Maison Carree, Nimes, France
	Location: City center, Development Phases: 1688, 1733, 1976. Type: Pedestrian plaza Physical Form: Rectangle with a dimensions of 329mX153m	Location: City Center Development Phases: 1886, 1999. Type: Mixed/traffic Physical Form: Rectangle with a dimensions of 450mX100m	Location: City Center Development Phases: 1577, 1850, 1921, 1945, 2000. Inscribed in the World Heritage List. Type: Traffic	Location: City Center Development Phases: XXXX, 1993. Type: Pedestrian Physical Form: Rectangle XXXXXXX

Fig. 6 Examples on revitalizing urban plazas using the renewal/redevelopment approach(s). By the author

Fig. 7 Examples on revitalizing urban plazas using the regeneration/rehabilitation approach(s). By the author

Table 1 Approaches of conserving historic plazas. By the author

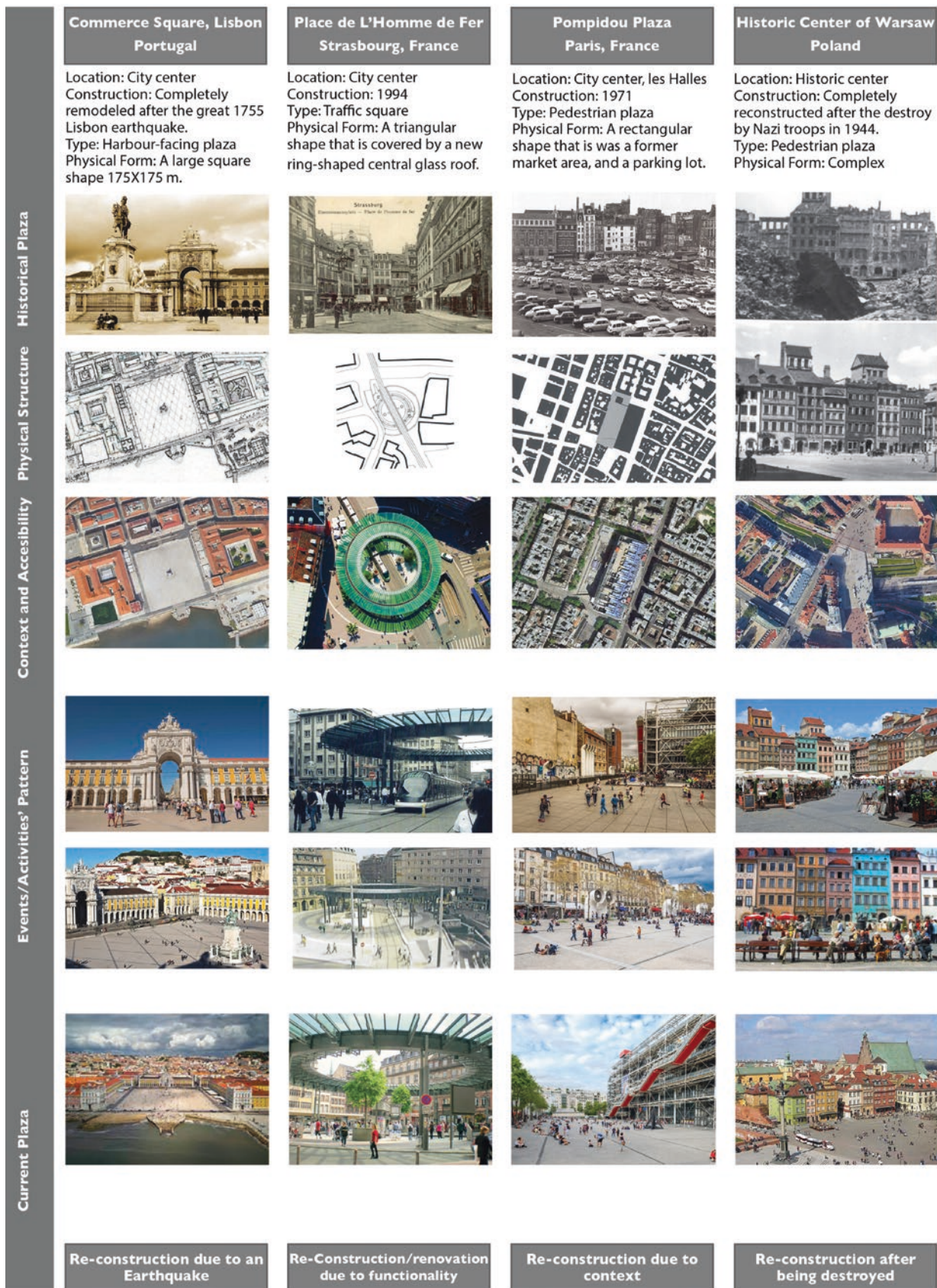| Approaches	Where	Why
Conservation	Sites not exposed to robust vandalism	To maintain the same condition
Reconstruction	Sites with complete or partial decay	To recall the same condition, or to add
Renovation		To maintain or to fit new needs
Renewal		
Redevelopment	Any types of sites	To fit new aims or objectives
Regeneration		
Rehabilitation		

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Virtual Museumification to Protect and Transmit the Paleo-Christian Heritage of the East Algerian Region

Fatima Zahra Boughanem and Etienne Wolff

Abstract

The conservation of monuments and ruins, which are already exposed in their sites, needs a huge budget and skilled labor. How can we transmit this heritage to future generations when its conservation is not the government's priority, or when the competent authorities do not allocate the required budget for conservation? If the conservation of cultural heritage is mainly the competent authorities' task, its transmission is the citizens' responsibility. This paper suggests the use of virtual exhibitions to ensure the sound conservation of the Paleo-Christian heritage of the East Algerian region and its transmission to coming generations. The lack of interest in this heritage and the absence of research and studies still exist, despite the archaeological and artistic values this heritage has. Thus, the focal point of this paper is to highlight such idiosyncracies. We present in this article, mainly, the results of a field study on visiting these basilicas, supported by a survey on social media, Instagram in our case, to reach a greater number of probable visitors.

Keywords

Virtual restitution · Virtual museumification · Paleo-Christian heritage · Algerian heritage

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1 Introduction

Algeria has become a civilizational land across millennia; it is a shelter for various prehistorical monuments and archeological sites. However, only seven ancient sites are nowadays registered in UNESCO's World Heritage List, and 443 monuments are classified at the national level. This richness can be the scaffold of Algerian tourism, as envisioned by the Ministry of Tourism in its national scheme for territory development by 2030, opting for development as one of the main strategic orientations. This strategy is not innovative, for there are neighboring and overseas countries that have already adopted it, and that can be role models for us. The enthusiasm for this strategy challenges us to propose new tools for safeguarding, enhancement, and transmission of such vulnerable heritage.

In this research, we are mainly interested in highlighting the Paleo-Christian heritage of the eastern region of Algeria through exposing it out of its original context. This article focuses mainly on two main parts:

a. The actual situation of the Paleo-Christian heritage in Algeria
b. The role of virtual exhibition as a tool for enhancing and transmitting this heritage

2 Diagnosis and Proposal

The state of Paleo-Christian vestiges in Algeria is, nowadays, quite alarming. Despite their relatively good conservation, they are constantly exposed to the hazards of the climate (bad weather, earthquakes, …etc.) and people (looting, vandalism, ignorance, etc.), which can engender the disappearance of this heritage in the absence of a collective will to preserve it.

Winston Churchill said: "The people that forgets its past mustn't have a future". Memory is such a powerful

double-edged sword. If we forget our heritage, it disappears; if we venerate it more than necessary, we fall in the trap of nostalgia and hypermnesia, and we may risk detaching ourselves from the contemporary era. To avoid falling into hypermnesia, we can meditate on the following quote from Viollet Le Duc in his book "Interviews on Architecture": "The past has gone, but it must be searched carefully, with sincerity, attach to it, not to revive it, but to know it, in order to use it." Establishing equilibrium between the different practices of conservation, development, and transmission allows us to keep track of our roots and to use them to develop our societies. We cannot underestimate/overestimate the vestiges of a particular heritage in accordance with traces of a great turning point in history, which is in this case the introduction and practice of Christianity in the African land. Thus, allowing such a testimony to perish would undervalue the history of Algeria.

The conservation, valorization, and transmission of heritage are not simple tasks. Besides, they are not the responsibility of the government only, but people are concerned as well. In his diagnosis, Jean Davallon said that: "[…] the notion of heritage had blown scrambly the border between the role of the State (national heritage) and that of communities, even that of individuals attached to valuing and conserving material or immaterial proofs worthy of preservation." (Le Marec, Schiele, & Luckerhoff, 2019). If material action (shoring, restoration, restructuring, restitution, … etc.) can be undertaken by competent authorities only (after authorization from the high authorities), valorization and transmission are missions that concern us all as citizens. Nowadays, with the expansion and democratization of the digital, we can all participate in heritage promotion, with different formats, through our social networks, blogs, websites, etc.

The relation we can have with heritage differs from one person to another, as Davallon points out: "Since people have different forms of heritage, the relationship they are going to maintain with them is itself diversified" (Le Marec, Schiele, & Luckerhoff, 2019). Therefore, the strategies adopted vary from one country to another. In Algeria, the material and immaterial heritage is managed by the 98–04 law of June 15, 1998, concerning the protection of cultural heritage.

Protection of the cultural heritage at the local level is the primary mission of the national offices of management and exploitation of cultural goods (OGEBC) that must develop and animate archaeological parks, historical monuments, and museums.

From the perspective of preserving and promoting heritage, Algeria organizes every year, from April 18th to May 18th, a patrimonial appointment called "The month of heritage". It is a number of cultural events that take place in each city of the territory in order to raise citizens'

awareness of the importance of heritage and the necessity of its conservation.

Algeria possesses a huge and diversified Paleo-Christian heritage, including approximately 300 sites (basilicas, churches, Christian sets) throughout the territory. In addition to their exceptional artistic, historical, and archaeological values that they present, the vestiges tell us the adventures of a revolutionary era when the Christian faith has conquered Africa. Furthermore, the absence of research and recent scientific events about these vestiges justifies our choice of Paleo-Christian basilicas, which seem to raise less interest than other types of ancient monuments.

Awareness of heritage as a factor of tourism development in Algeria is recent, and its application can take more time. Nevertheless, there are some local travel agencies that practice cultural tourism. This practice should be associated to maintenance and good practices to avoid the fallouts of the real museumification of historic centers. In our case, the vestiges of Paleo-Christian basilicas are mostly situated in archaeological sites; however, some exceptions include the basilica of Saint Crispina of Theveste, which is located outside the walls of the ancient city, and which we qualify as open-air museum.

There are many operations to develop the ancient heritage, from lighting […] to the classification and protection of elements and remarkable sets, going through different operations of restoration and conversion, to embellishing the historic centers (Gintrand, 2019). Accordingly, a corresponding budget must be allocated for better conservation of heritage. Alas, this funding is not always provided, which urges us to search for, and to experiment, new, less costly methods whose aim is to transmit our heritage to future generations.

From this perspective, focusing on digital technology, particularly on Web 2.0, opens up some promising perspectives to preserve heritage, whatever its specificities (Severo, 2016). This field is, to some extent, still virgin and not exploited in Algeria, except for the remarkable work done by some Algerian content creators on social media platforms (mainly Instagram and YouTube) to promote cultural heritage and cultural tourism in the country. Indeed, we have never heard about virtual exhibitions or virtual restitutions, let alone virtual museums.

Museums and art galleries around the world already use digital technologies for the collection, preservation, exploration, and diffusion of arts and cultural heritage. However, […] the virtual reconstruction of historical monuments helps curators, archaeologists, or historians to reproduce on-site historical places as they were in their golden period (Fritz, Susperregui, & Linaza, 2005).

The contribution of multimedia and digital technology in the development of heritage today is so important and indispensable that it has become a cultural priority. A study

carried out by the British insurance company (Ecclesiastical of nearly 500 decision-makers who work in museums, galleries, etc.) on the role of digital technology in the economic recovery of cultural venues showed that 87% of cultural institutions in Great Britain started offering digital attractions following the arrival of the pandemic (Online exhibitions, virtual museum visits, etc.). 87% of the decision-makers surveyed agreed on the importance of digital technology in the field of culture, and 44% plan to organize virtual visits (Luczak-Rougeaux, 2020).

Valorization of heritage through multimedia began with the simultaneous emergence of computing tools, digitization, and the Internet. The digitization of archival funds was one of the triggering facts encouraging the introduction of multimedia into exhibition spaces.

In almost every facet of modern life, digital technology offers us many comfortable solutions to our daily efforts. Besides, it provides a genuine solution to the preservation of cultural heritage and its protection from the deterioration or degradation caused by weather and man. Indeed, given the easy access to the Internet, notably in Algeria, a project of virtual museumification of the Algerian heritage seems to attract the attention of a great number of young people, who do not have direct access to monuments and their history. As we can see in Figs. 1 and 2, a 24-h survey on the Instagram platform of the Algerian architect and content

Do you have easy access to archaeological sites?

■ Yes ■ No ■ Neutral
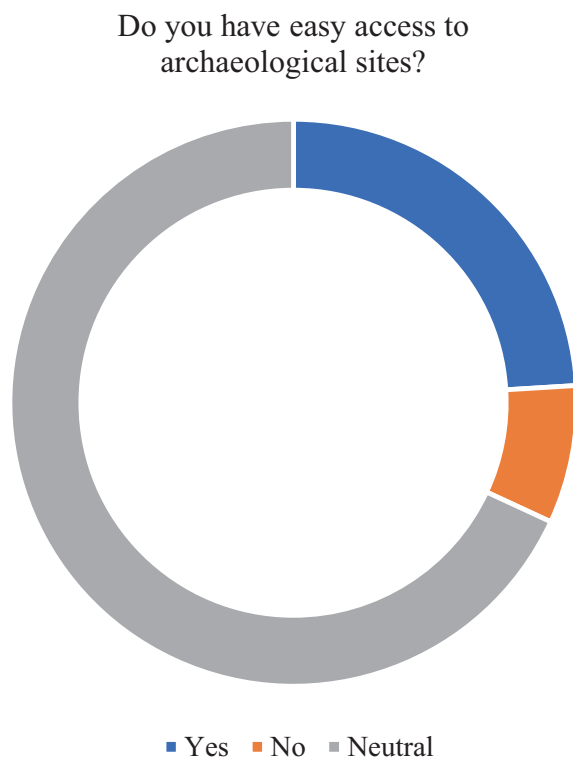
Fig. 1 Survey of easy access to archaeological sites

Are you interested in virtual tours of the various archaeological sites?

■ Yes ■ No ■ Neutral
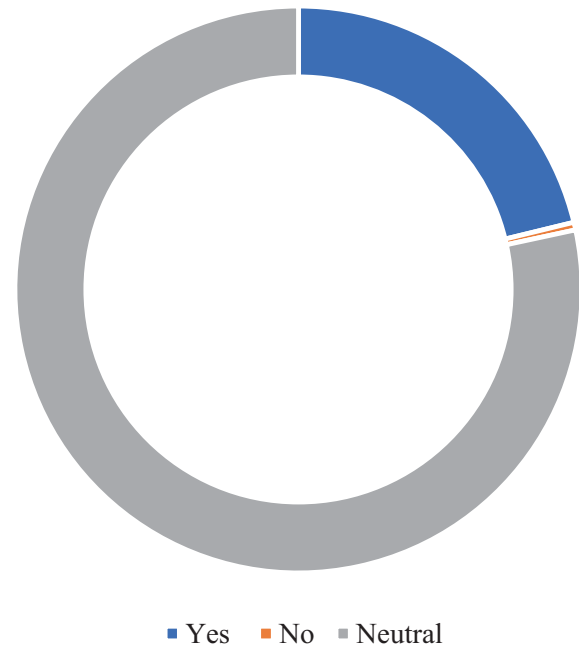
Fig. 2 Survey of people's interest in virtual visits

creator Reyad Belkacem confirms this hypothesis. Out of 2067 users, 438 people voted interested in virtual tours of archaeological sites. On the same platform, 788 people out of 3279 voted on the difficulty of accessing archaeological sites.

We can mention the user's experience with the travel agency Fleggy, whose main customers are Chinese. Fleggy has succeeded, in the Covid-19 context, in bringing together more than 500 million spectators around more than 36,000 livestreams in which it presented cultural sites, museums, …etc. (Pellegrin, 2020).

Accordingly, the virtual museumification of the Algerian heritage in general, and of the Paleo-Christian one in particular, is proposed within Peggy's perspective. Indeed, creating and exhibiting a digital replica of monuments is a sterling idea to keep their traces, to promote them among notified and non-notified visitors, to retrace and teach the history of these monuments, and especially to meet the needs of visitors who cannot travel to visit these sites (Baujard, 2012). The major challenge of exhibiting this heritage is to allow the audience to see the monuments through their representations (drawings, digital models, photographs, multimedia tools, …etc.).

The architectural element is by its nature displayed in its site of construction. Over time, especially when it is integrated in an urban network, it becomes part of the

landscape and loses, visually, its singularity in the urban area's inhabitants' eyes. It's inevitably subject to the gaze, which implies that it can only take on meaning and value through and in the exhibition (Amphoux, 2004). The over-exposure of historical monuments is a sound alternative for the protection of an existing heritage after it has been put off the public for various reasons (its restoration, its promotion, …etc.). This overexposure seems to be one of the best development methods; it "can make them accessible to a wider audience while preserving the often fragile originals" (Jacobsen, & Holden, 2007), such as the cave of Lascaux as well as the Louvre Museum in Paris. For the Lascaux cave, the creation of an artificial site and the virtual restitution of the cave have not had a negative impact on visitors' interests; visitors were rather allowed to relive the same experience of the original cave. For the Louvre Museum, which has a virtual museum where the majority of its works are exhibited, it has not witnessed any negative repercussions on its visitors' attendance or on its notoriety; it has rather democratized access to art.

Concerning the archaeological sites in Algeria, after a general diagnostic, we have noted the following anomalies:

– The sites are not equipped to welcome all types of public: the elderly, short-sighted, visually-impaired, or people with reduced mobility seem to be excluded from visits due to the lack of suitable equipment to take them in charge, or to give them genuine autonomy during visits;

– The total or partial absence of tour guides in the sites, in addition to the false information that certain individuals may convey to visitors by pretending to be knowledgeable experts;
– The absence of signs makes non-notified visitors feel lost when there are no descriptive leaflets or tourist guides familiar with the site;
– The weak interest in archaeological heritage in general, which varies from one site to another. Comparatively, the diagram below (Fig. 5) shows us the large gap between the number of visitors per year, for the two east Algerian sites of Hippone (Fig. 4) and Theveste (Fig. 3).

The purpose of this diagnosis is neither to criticize nor to denigrate the work done by the competent authorities to conserve and transmit the Algerian heritage, but it is to shed light on some deficiencies or gaps that visitors can observe once on the site, and to propose suitable tools for remedy.

The principal problem with the archaeological sites in Algeria lies in the lack of maintenance and attractiveness. Concerning attractiveness, if we compare the number of visitors yearly in the two early Christian sites, Annaba (a coastal and tourist town) and Tebessa (a frontier town and commercial crossroads), we quickly note one striking difference. According to the statistics that have been sent to us by the Directorate of Culture in Annaba and the OGBEC of Tebessa, the Christian suburb of Hippone receives an average of 8,000 visitors per year, among whom 1,000 are foreigners. Nonetheless, the Paleo-Christian Basilica of Saint Crispine in Thevest receives about 2,000 visitors each year,

Fig. 3 Saint Crispina Basilica of Theveste

Fig. 4 Christian suburb of Hippo Regius

Fig. 5 Statistics of the number of visitors per site

- Total number of visitors
- Foreign visitors
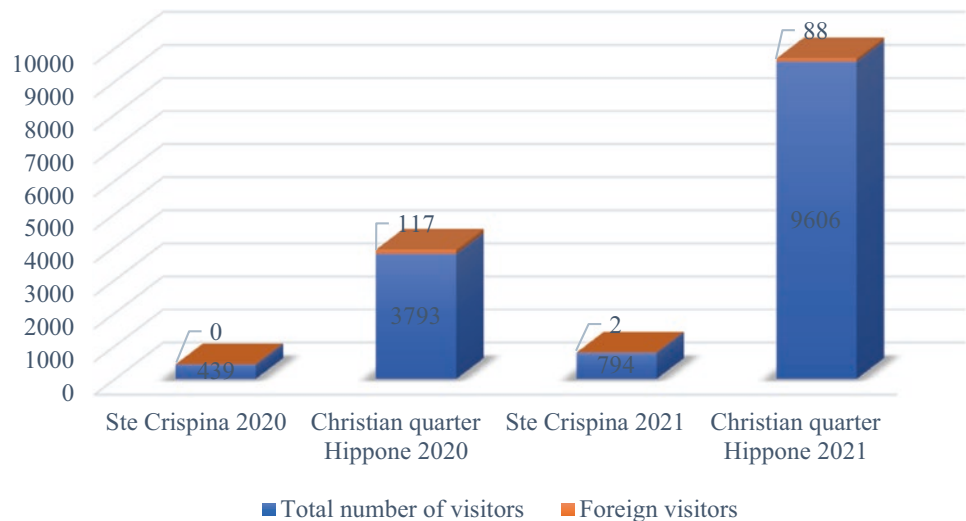
including around a hundred foreigners. These statistics are calculated between the years 2019–2021, when the sanitary context linked to Covid-19 has strongly impacted the number of visitors, due to the closing of the sites for several months, the lockdown, and the borders closure.

If each representation of heritage out of its location is defined as "virtual," virtual restitution is, thus, a practice that dates back to Renaissance, with relief plans of fortified cities, in addition to moldings of fragments, archaeological sites, or others. Virtual restitution has also been practiced, in the nineteenth century, in the form of drawings and watercolor paintings by the students Prix de Rome of the Villa Medicis.

Architectural restitution is the privileged axis of the proposed virtual museumification project, which focuses on some Paleo-Christian basilicas of the eastern region of Algeria. It is worth highlighting some basic notions concerning this practice.

Restitution has long been assimilated as restoration and reconstruction, but these three interventions are not interchangeably used as they are different in nature.

First, restoration is a material intervention in direct contact with the monument; it is to rebuild, repair, or even remake. Therefore, restoration is "an action in favr of the work sustainability to improve its physical state, and if possible its comprehension at the same time" (Golvin, 2007). Nowadays, the meaning of this intervention seems to revolve around material restorations only (De Bideran, 2016).

Second, restitution is defined by Jean-Claude Golvin (2007): "[…] it is, of course, to revive the idea of an ancient monument (of a site, of an object). Nevertheless, to restitute the idea of this monument refers to by and large reviving its image. […] Restitution infers comprehension of "the intelligence of the conception" of the monument, of its program, and of its creators' intentions". It is explained by Jeffrey Jacobsen and Lynn Holden as well: "The larger goal of virtual restitution is to recreate ancient cultures, not as dead simulations, but as living museums where students/users can enter and understand a culture that is different from their own" (Jacobsen, & Holden, 2007). Therefore, it is not about regaining the esthetic appearance of the restituted object, but it rather stands for meticulously studying it and for rethinking the establishment of its lost parts.

Restitution, in most cases, is no more than a graphic support, for it revives in drawings a monument whose vestiges are still in place or insignificant, indeed inexistent, but which is considered part of a typological series that allows analogous borrowings (De Bideran, 2016).

Third, according to Golvin, reconstruction consists of "replacing, after research and in the relevant position, the scattered elements of which a monument was made (or constituted)" (De Bideran, 2016).

In the end, Jessica de Bideran (2016) explains the difference between restitution and reconstitution in the museological context: "While restitution would therefore consist in reassembling identically a heritage displaced from its original context, the 'traces', reconstruction would rather address past deficiencies by adding external but coherent elements, […]".

The virtual museumification of the Paleo-Christian heritage that interests us is discussed to ensure its transmission to future generations. If the last decade had witnessed the proliferation of projects of virtual restitution of monuments and sites, this practice would have emerged for more than 30 years today (Beer, 2020). The combination between archeology and virtual environments actually dates back to the early 1990s with EDF's technical sponsoring projects on the Karnak site in Egypt (Albouy, Boccon-Gibod, Golvin, Martinez, & Goyon, 1989).

Since the 2000s, the use of digital technology has been steadily increasing. The museum offer is increasingly present on the Internet. In addition to their in situ actions, museums now have websites to inform visitors, offer virtual exhibitions, …etc. (Soulier, & Roigé, 2022).

During an interview, the director of the Art and History museums of the city of Geneva said that: "The capital of a museum consists, in the first place, of its collection which should be preserved, studied, developed and diffused" (Baujard, 2012). This citation is perfectly applicable to the archaeological sites subject to our research, which are open-air museums that need our conservation, protection, research, and promotion.

Virtual museumification is a genuine scientific tool of heritage conservation and transmission, for "a restitution cannot be documentation for the public, but it must be the public version of a scientific restitution" (DjinDjian, 2013), (Jacobsen, & Holden, 2007). Restituted images and 3D models promote visual understanding of an archaeological site that has now been greatly destroyed (Vergnieux, 2011). To promote the virtual exhibition of a heritage, but not the creation of a website (which is an infographic work), the methodology used in this study is the same one used for a classical exhibition in a museum.

To achieve the desired virtual restitution, various steps are necessary. They are briefly explained by François DjinDjian (2013) in his work "Manuel d'archéologie":

– The first step is the in-depth analysis of archaeological sources, archaeological ruins in situ, architectural elements found on the ground, lapidary vestiges, photographs, architectural plans, relative texts, …etc. The comparison between these sources permits us, on the one hand, to identify anomalies or mistakes in the interpretation of an archeological sign or to verify its veracity, and to retrace the history of the monument or the studied site, on the other hand.
– The second step consists of digital acquisition of sources, which is the base for the following steps. The interpretation of archaeological sources into graphics and digital sources using CAD (a drawing software), or any other tool, is a necessary step in creating a virtual model of the concerned monument or archaeological site, which is the third step.
– Creating the virtual model (restitution) by constructing a mesh-patterned model, and/or by laser station scanning, or by photo-modeling. There are different techniques depending on preferences, feasibility, and competences. One of the techniques that we prefer is the three-dimensional modeling of the desired site, depending on architectural and archaeological plans and records.

– After that, the stage of managing shadows and lights creates some effects of perspective and realism, after choosing a date and a place of sunlight.
– Next, the textures and side colors are restituted.
– Missing data are processed and restituted.
– The archaeological objects represented in the model are classified, and choices of restitution (references of the objects, iconography, statements, architectural logic, etc.) are scientifically justified.
– Interactivity in the restitution represents the state of knowledge on the restitution at a given instant T.

Projects supported by cultural authorities require other steps, such as the proposal of augmented alternative models, external validation of the model, testing the immersion in an immersive room, archiving the restitution, and broadcasting it to the public. In our case, the project is a research that stops at the step of treatment restoration of missing data.

Nevertheless, we suggest, besides the virtual restitution of many Paleo-Christian sites, the creation of an interactive and instructive platform as a virtual museum of the Paleo-Christian heritage in Algeria. It would encompass various portals accessible to the public: a portal on history, another on architecture, a third on the evolution and the different significant periods of each site, in addition to a guided virtual visit of each of the monuments. This virtual museum library would group together databases that are specific to each era. The databases would be updated as needed, and would serve above all as the archive and the starting point for future research on the subject. This virtual museum would play an important role in the popularization of the Algerian heritage, not only at the local level but cross-borders as well.

3   Conclusion

This research revolves around the way digital technology contributes to developing and transmitting heritage, and the means used for such a purpose. These interventions on heritage come back to tell a history, a place, a monument.

The architecture is pervasive around us; we live it ignorantly without considering its presence or its particularity on a daily basis. The exhibition of such architecture and heritage in an environment other than its location is a form of common value, and above all a kind of raising awareness. It offers us the necessary hindsight to appreciate these monuments and their value in their absence.

Introducing heritage into the museum environment was a huge step to its democratization, and is a giant leap towards its popularization because this art is often qualified as difficult and incomprehensive once we transcend the esthetical and physical sides.

Since the beginning of this kind of cultural event, the way of exhibiting heritage has evolved from the mere presentation of heritage in its purely visual descriptive context (the static image of the object) to the presentation of its pluridisciplinarity that spotlights its components.

Valuing heritage through digital technology addresses and solicits the public, the principal actor. As heritage is an integral part of our life experience, it must benefit all people, regardless of their relation to this field, and all age groups, especially children who must be trained to get a critical mind about this discipline, which is intimately linked to human beings since antiquity.

The contribution of digital technology to developing heritage is undeniable, for it evidently, genuinely, and remarkably participates in its valuation. However, the anticipated final result regarding its impact on the public remains ill-defined though it is undeniably ubiquitous. The challenge is to make digital technology bear fruit by investing in the most efficient tools and means.

We believe that the best way to promote and transmit heritage is by making it comprehensible, concrete, interesting, interactive, why not fun, and accessible to all the public; and by using all the resources available, possible, and adequate for contemporary developments, particularly multimedia, the web, IT, and social media.

At the end, the exhibition of heritage never replaces, under any circumstances, the necessary physical interventions for its conservation and protection, but it remarkably contributes to its valorization, its promotion, and its transmission to future generations.

It should be noted that this article is part of a doctoral thesis that investigates the Paleo-Christian monuments of the Eastern region of Algeria in general. An in-depth study tackles specifically the following vestiges: The Basilica of Saint Crispina of Theveste, the Christian suburb of Hippo Regius, the donatist church of Thamugadi, and the Episcopal group of Cuicul.

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Design Technics for the Intervention on Architectural Heritage. The Case of the Partial Recomposition of Vaulted Spaces

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Abstract

This article aims to research the design techniques used in heritage works publicly recognised through awards and publications. Specifically, it studies the case of interventions that seek to recompose vaulted spaces that have partially disappeared. In order to carry out the research, four works have been selected and analysed and studied both individually and comparatively to understand the benefits of each one of them: San Filippo Neri Oratory in Bologna, Chapel of the Counts of Fuensaldaña in Valladolid, Church of the Pious Schools of the College of San Fernando in Madrid and St. Peter's Basilica in Syracuse. The result obtained is the recognition of a set of techniques of great design interest that, when properly applied, can be extrapolated to future interventions.

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1 Introduction

In the present research, we will focus on the case of partially destroyed monuments in which the restoration of the loss is proposed. Therefore, the aim is to partially complete the monument in order to restore its value as architecture. These actions imply a transformation of its state of ruin but, at the same time, the permanence of the monument in the future.

The premise of acting on buildings that have suffered a partial loss entails considering how to cover the construction of this missing part, either by focusing on the evocation of the missing elements or by creating new forms inspired by the possibilities offered by the pre-existence in order to create a new architectural balance.

On the other hand, the choice of the vaulted space as a case study involves covering buildings covered by an element of a certain formal complexity, which makes the project particularly interesting as it poses the challenge of reinterpreting a form used throughout history from the present day. Moreover, this reinterpretation makes it possible to maintain a relationship with the specific history of the building and, at the same time, establish a relationship with the history of architecture. In any case, as in any architectural operation, the multiple sources that have been produced throughout history are used as a basis for the definition of the new elements.

2 Case Studies

The four cases analysed are the "San Filippo Neri Oratory" in Bologna, the "Chapel of the Counts of Fuensaldaña" in Valladolid, the "Church of the Pious Schools of the College of San Fernando" in Madrid and the "St. Peter's Basilica" in Syracuse.

2.1 San Filippo Neri Oratory

The Oratory of San Filippo Neri, built in the first half of the eighteenth century in the rococo style, is located in the historic centre of Bologna, next to the church of the Madonna di Galliera, and is accessed through an interior passageway in the city block, thus eliminating the presence of the main façade on the street. The building comprises a longitudinal nave and a presbytery which crowns the composition, covered by a succession of vaults which create a space of a certain dynamism (Fig. 1).

Throughout its history, the building underwent various changes of use. Still, the most decisive episode was the bombing in 1944, which destroyed the north wall of the nave, the barrel vault, the vault and part of the dome that covered the altar area. In 1949 Alfredo Barbacci completed a partial restoration of the space consisting of the reconstruction in brick and concrete of the chancel arch and the north wall, with lower thicknesses than the original ones, perhaps to allow for later cladding. The restoration was interrupted, producing an image of a strong contrast between the refined rococo architecture and the roughness of the new elements. In 1997 the architect Pier Luigi Cervellati was commissioned to restore the monument and convert it into an auditorium, thus ensuring its permanence over time (Fig. 2).

The main objective of the intervention is to restore the monument and adapt it to new use in order to ensure its
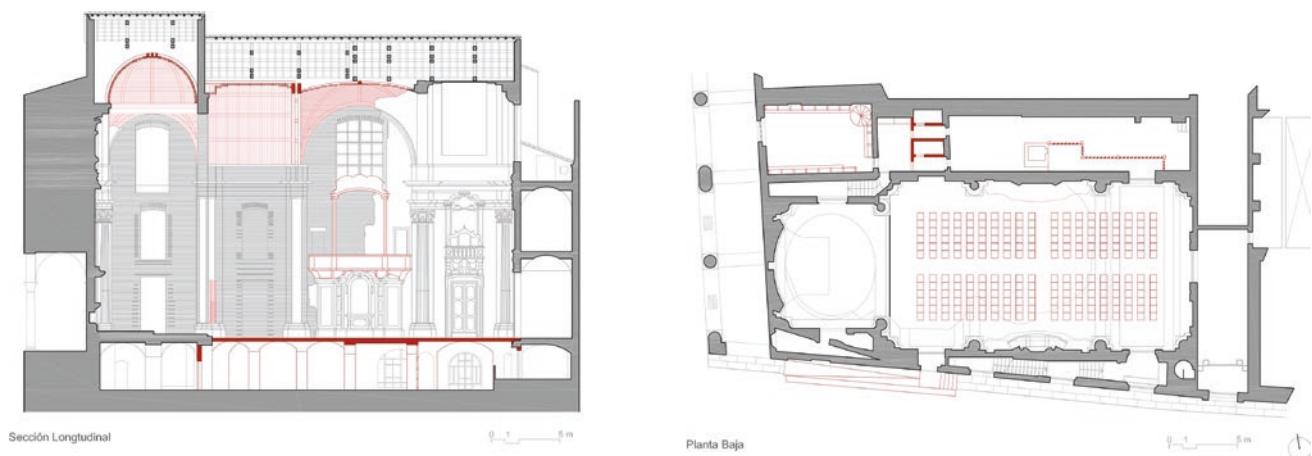
Fig. 1 Longitudinal section and ground floor plan. Red lines stand for the new intervention. Author's own, *2013*

Fig. 2 View of the building after the bombing in 1944; Cervellati (1999). View of the building after Barbacci restoration; Cervellati (2009)

survival over time while leaving a record of the historical events to which it has been subjected throughout its existence. The solution adopted seeks firstly not to eliminate or arbitrarily complete the restoration carried out in 1949 but to maintain it as a testimony to the dramatic nature of the war; secondly, to restore the pre-existing rococo part to restore its original splendour; thirdly, to reconstruct the elements destroyed by the war by means of a reinterpretation that shows how contemporary they are; and fourthly to add the new elements derived from functional needs using a modern language.

The functional adaptation is significantly simplified thanks to the fact that the planned use as an auditorium is compatible with its original use as an oratory. The new necessary elements such as toilets, library and offices are located in those spaces adjacent to the central nave that had lost their function of supporting religious celebrations.

With regard to the access, Cervellati proposes to recover the entrance route through the interior passage of the block, giving the Auditorium a foyer use, thus resuming an interesting transition route from the exterior space to the interior of the church (Fig. 3).

The work on the original part of the monument seeks to restore its original splendour, restoring the damaged ornamentation with the highest possible quality craftsmanship and recovering the entry of natural light through the four large existing windows. The reconstruction of the 49th seeks to attenuate its presence by inserting specific elements that seek to recover the missing ornamentation, reinterpreted materially and simplified formally (Fig. 4).

The action on the missing vaults is proposed by completing the envelope using an openwork surface, which is set back from the original finishing face, constituting an imaginary support structure for the cladding material, an element
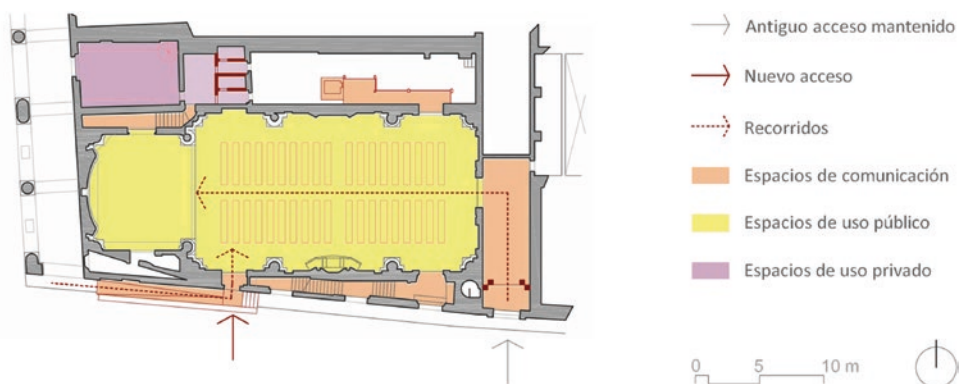
Fig. 3 Ground floor plan showing the functional organisation and entrances. Author's own, *2013*

Fig. 4 Views of the Oratory interior space before and after the intervention; Cervellati (1999). Transversal Section showing the natural light; Author's own, *2013*

Fig. 5 Transversal section; author's own, *2013*. Pictures showing the new vaults; Serafini (2002)

with a provisional and incomplete character that makes the destruction of the pre-existing elements evident (Fig. 5).

From the material point of view, the work is divided into two types of intervention: on the one hand, the use of traditional techniques and materials identical to the originals in the restoration and repristination of the rococo-style parts; and on the other hand, the use of modern construction solutions in the missing vaults and the new elements, using the same material, spruce wood, to identify the work, but without the intention of distorting the whole.

The constructive solution used in the vaults intentionally seeks the effect of unfinished construction, in process, with delicate materiality, insofar as it is reversible and seeks adjustment with the formal definition of the restored elements. The solution is possibly inspired by the original formwork used to construct the vaults, but the exploded view and arrangement of the elements that make it up, avoid a literal translation of this reference (Fig. 6).

The work on the vaults seeks a compromise between historical and contemporary architecture, through a light,
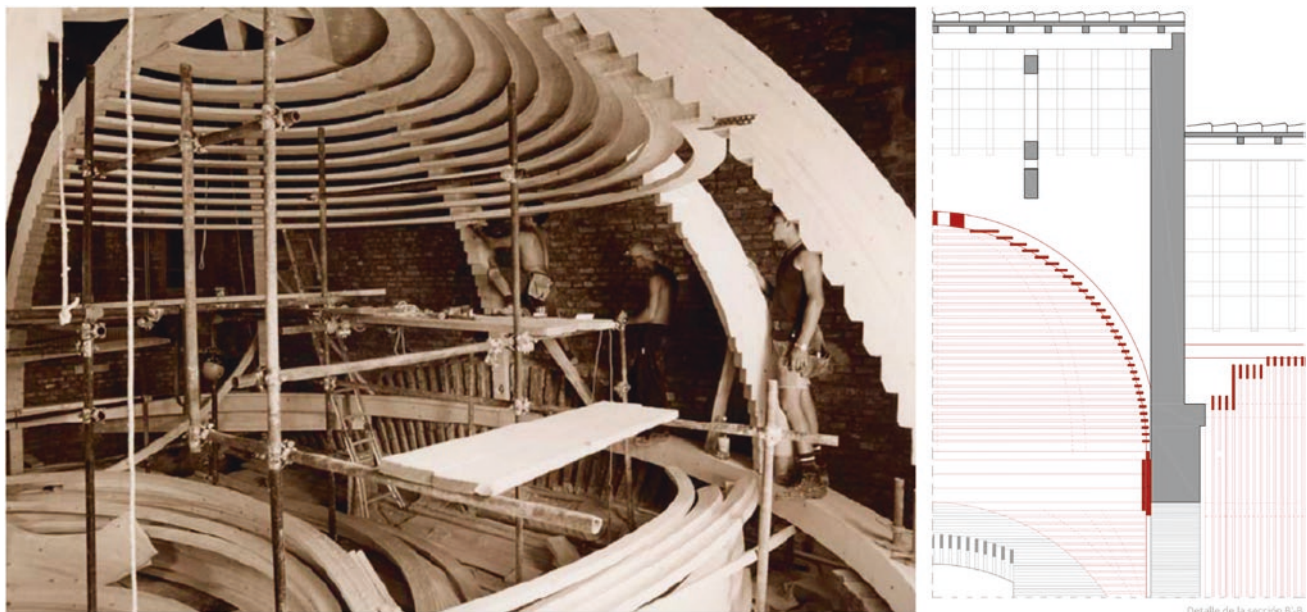
Fig. 6 Picture of the construction process; Cervellati (2009). Detailed section of the vaults; author's own, *2013*

warm, openwork envelope that mediates between the luminous and complete architecture of the rococo and the harshness of the restoration of 1949, without erasing the drama produced by the bombs of the war.

It relies on the reconstruction of the original form to guarantee a good result, but with a material reworking that brings innovation. This solution was inspired by historical works such as those of Valadier or Stern in the Coliseum or the Arch of Titus at the beginning of the nineteenth century.

The formal language adopted in the vaults can be related to the process of sedimentation of strata present in nature; to the traditional constructions of wooden vaults, which in turn refer to structures of naval elements; to the simplified representations of complex elements used in various artistic currents such as op-art, and present in architects such as Portoghesi, Botta or Navarro Baldeweg; which produce attractive plays of light and shadow which give greater or lesser solidity and depth to the element depending on the observer's point of view.

2.2 Chapel of the Counts of Fuensaldaña

The Chapel of the Counts of Fuensaldaña was built in the mid-fifteenth century, in the Gothic style, in the surroundings of what would later become the Monastery of San Benito de Valladolid. The space of a single nave was organised into two sections, the octagonal-shaped chevet and the square-shaped body, covered by two ribbed vaults, the two sections being separated by a powerful perpendicular arch. It was made of stone ashlars with a lime and stone core (Fig. 7).

Throughout its history, it has undergone various transformations, the most important of which are: the construction of the monastery in the sixteenth century, which led to the partial enclosure of the chapel and the opening of direct access between the two; the restructuring of the original access in the seventeenth century with the superimposition of a Baroque doorway; and in the nineteenth century the military occupation of the complex which led to the ruin of
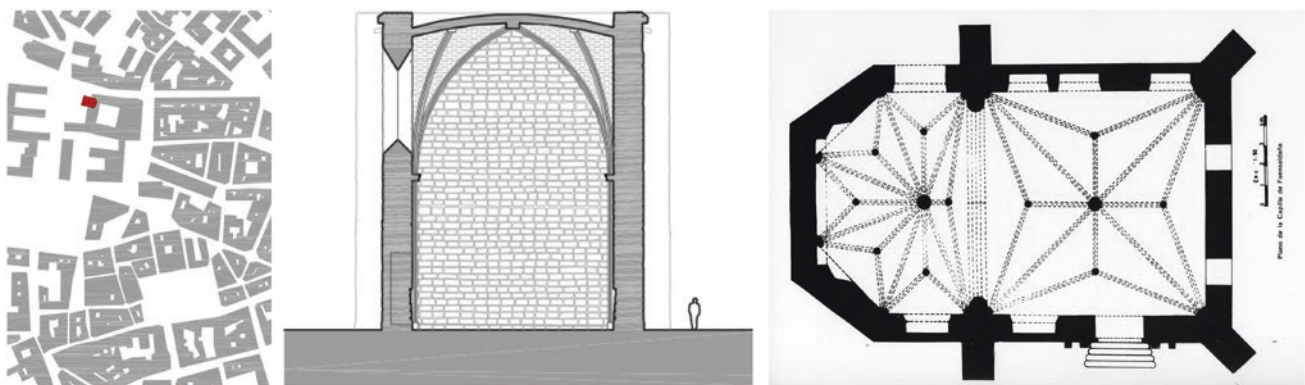
Fig. 7 Site plan and section; Author's own, *2013*. Plan of the original configuration of the chapel; Rodriguez, *1981*
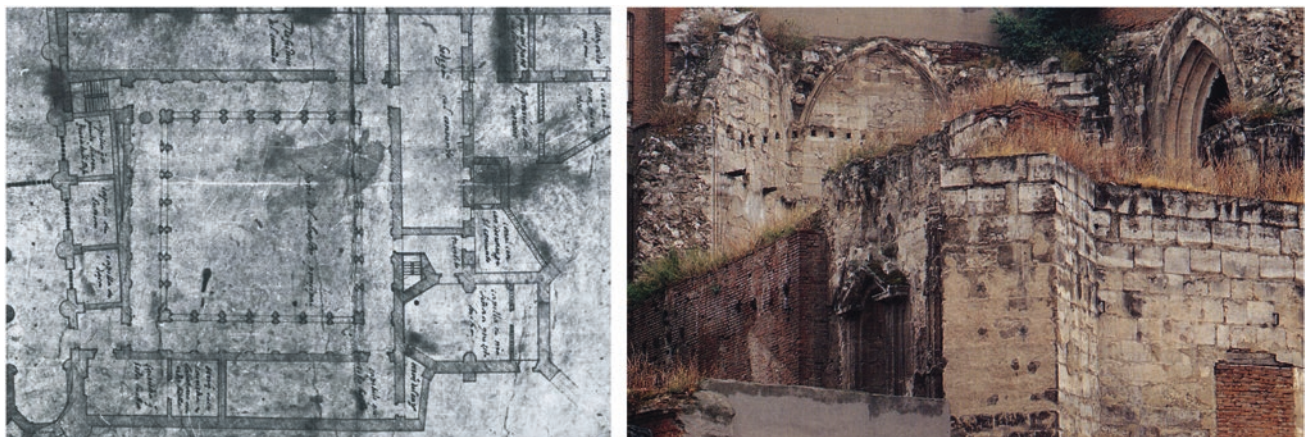
Fig. 8 General plan of the monastery and the chapel; Rodriguez, *1981*. Picture of the chapel before the intervention; Andrés (1990)

the Gothic building, maintaining only part of its wall structure, and completely losing its vaulted roof (Fig. 8).

In 1996, a team of architects led by Juan Carlos Arnuncio won the competition to adapt the monastery complex and the chapel as a Museum of Contemporary Art, a new functional content that gives a new life to the historic buildings.

The main objective of the intervention is to restore dignity to the monument both in the interior space and in the urban space, incorporating it as part of the new contemporary art museum. To this end, it is proposed the creation of an access plaza to resolve the existing unevenness and generate a place to prepare the visitor before accessing the museum; the construction of a new volume to finish shaping the plaza, conceal the inadequate presence of the pre-existing block of flats, and at the same time provide the museum with the spaces necessary for the new functional development of the complex; the reconstruction of the volume of the chapel to recover its historical value in the city and to shape the limits that define the square and the access to the museum; the creation of a new interior space in the ruins of the chapel to convert them into an exhibition hall for the museum, but maintaining its image as a ruin, in such a way that the new intervention is differentiated from the existing, thereby generating a new stratum in the history of the monument (Fig. 9).

From the functional point of view, the use as a museum implies the creation of two different types of spaces: static spaces, where the works of art can be contemplated, and dynamic spaces, which house the routes connecting the spaces for contemplation. In this sense, it is proposed to use the most significant historical elements for the dynamic spaces in such a way that the exhibition spaces can be configured as neutral elements in which the work on display is the protagonist. The chapel space is shown as a singular element, housing an exhibition use but whose historical value

and strong material character require the artist to establish a particular dialogue between the work and the space.

The work on the chapel is approached on the outside as an abstract and introverted piece that seeks to complete the ruin, retaking the original height of the monument, seeking to mark the difference of the addition but without producing violent contrasts, but instead seeking to harmonise chromatically different materials and textures to achieve homogeneity in the intervention. The surface defining the new element is set back, leaving the image of the ruin in the foreground. And it is finished off with a plane of continuous glass that culminates in a subtle cornice, reduced to the minimum expression, in a great constructive effort that enunciates the effect that will be produced in the interior.

Inside, an abstract white concave surface seems to levitate in space. The thickness of the element is intentionally concealed, seeking to produce the fiction that the ceiling is an extremely light curved sheet that floats in the air and envelops you. The light filters between the curved plane and the walls, illuminating the space with an indirect light that emphasises the sensation of lightness of the sheet. This generates in the observer a feeling of great emotion, where time stands still and invites the enjoyment of the senses (Fig. 10).

The new volume is resolved by means of a structure of metal porticos supported on a concrete strip located at the top of the stone walls but hidden from view by the interior lime and stone core. Prefabricated concrete panels with a texture of vertical strips are hung on the exterior of the metal structure, and white plasterboard panels are on the interior, producing a smooth and continuous finish.

A paradox is produced between the image of the external solidity of the new prism, which "reintegrates" in a certain way the volume of the chapel, and its construction through the assembly of light elements, giving priority to the materialisation of an effect as opposed to constructive sincerity.
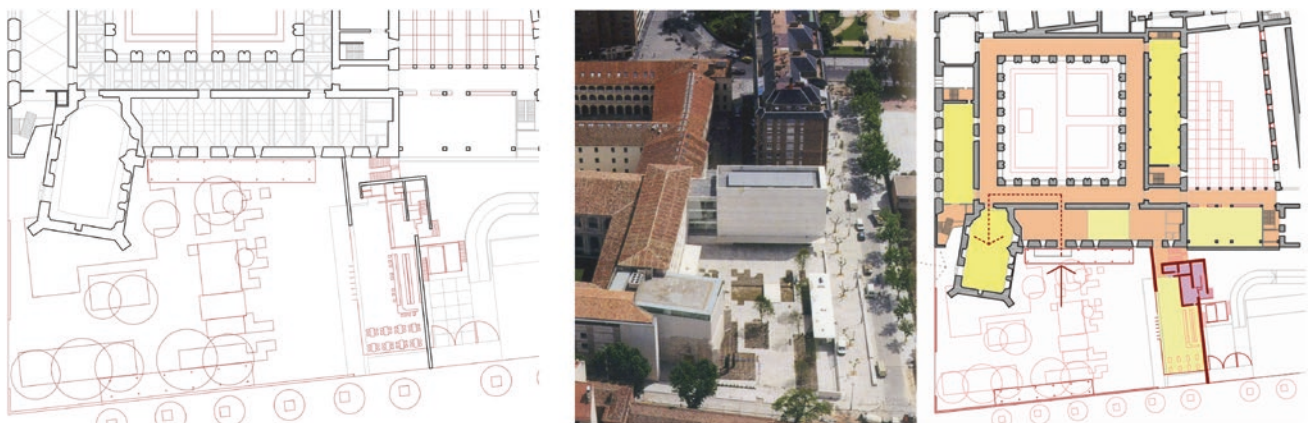
Fig. 9 Plan of the chapel, the building extension and the surrounding square; plan of the functional organisation; author's own, *2013*. Picture of the whole intervention after completion; Arnuncio (2012)
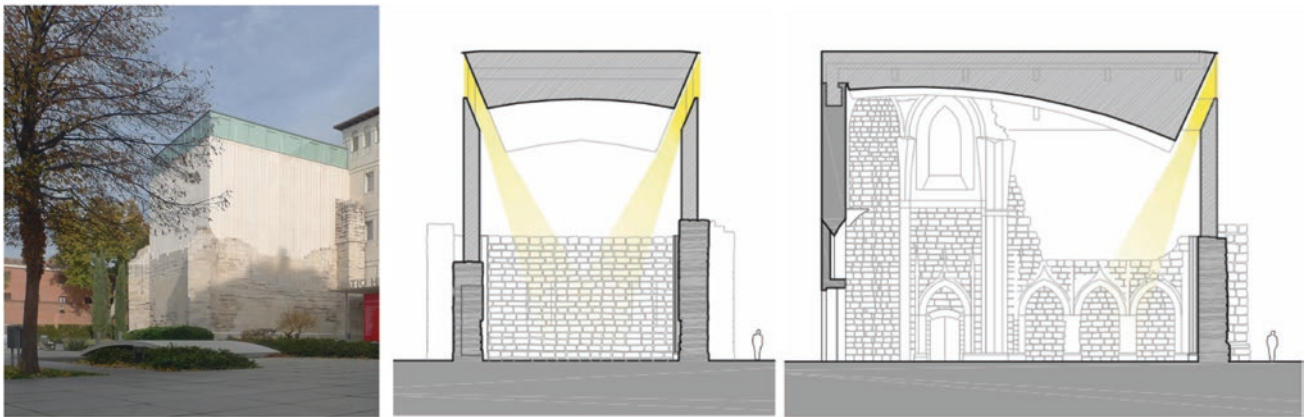
Fig. 10 Exterior view; Author's own, *2009*. Transversal and a longitudinal section showing the entrance of natural light. Author's own, *2013*
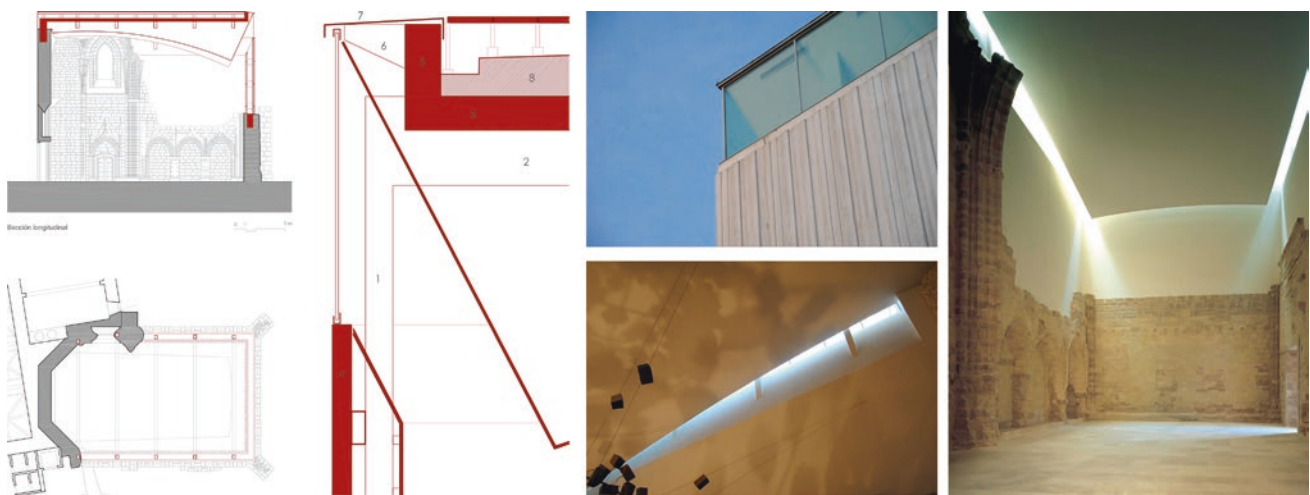
Fig. 11 Plan, section, detail and pictures showing the construction system of the chapel; author's own, *2013*. View of the chapel's interior space; Arnuncio (2007)

However, the whole effect is not hidden, rather the aim is to show something of its explanation in order to make the spectator an accomplice of the trick (Fig. 11).

Juan Carlos Arnuncio's performance in the chapel of the Counts of Fuensaldaña results from an architectural project that seeks to establish a dialogue between the old and the new through balance and harmony between the parts. A project that seeks to restore the space to its grandeur, replacing the cult of the Christian religion with the cult of contemporary art, where modernity and evocation combine to create a new balanced ensemble. This achieves a middle way between contrast and analogy through a compositional unity based on different parts that constitute a new whole, where one part cannot be explained without the other.

Arnuncio tries to fix the concept of ruin under the open sky. To do so, he seeks to materialise a representation of the sky abstractly through a mechanism of contraposition between weight and lightness, which produces a play between the protection of an interior space and connection with an exterior space, between introspection and reflection on belonging to the world. A play of opposites present throughout the history of architecture, either through the play of light and shadow, or through pictorial effects that seek to modify the interior condition of the space to turn it into an exterior, or by speculating on the limit between feigned architecture and built architecture, or through formal definition through the loss of thickness, material abstraction or its vaulted geometry.

2.3   Church of the Pious Schools of the College of San Fernando

The church of the Escuelas Pías del Colegio de San Fernando is located on the corner of Calle Mesón de Paredes and Plaza de Agustín Lara, in the Lavapiés district of Madrid. The building was constructed in the eighteenth century in the Baroque style, with a certain monumentality. With a longitudinal floor plan, it consisted of an entrance area, a rectangular nave covered with a barrel vault, a circular transept covered with a dome and the altar area that crowned the whole complex. The old church building was accessed from the northeast through an imposing façade. The large dome and the powerful pillars of the rotunda subdivided the space into two adjacent hierarchical areas, with the transept space becoming the centre of gravity of the composition (Fig. 12).

The building remained in good condition until 1936, when it was burnt down during the civil war, losing its roofs, part of its walls and almost all its decoration, giving it a decadent appearance but at the same time evoking the grandeur of the past. In 1996 José Ignacio Linazasoro won the competition to transform the ruins of the church into a library, as well as the urbanisation of the square on which it stands and the construction of a new annexe building as a university lecture hall.

The project seeks to respond appropriately to the character of the place where it is located, a neighbourhood where there is a mixture of different social strata and ethnic groups and where the city's public space is experienced with great intensity. A place where the great solidity and bareness of the ruins of the old church of the Colegio de las Escuelas Pías emerges with a certain harmony and naturalness. It is the learning of these ruins that is sought to transfer to the project in order to maintain this adaptation to the place. Instead of opting for an artificial attitude of stylistic contrast with the pre-existing architecture or for the recovery of the interesting original baroque building, it is proposed to appropriate the constructive and material value of the ruin,

Fig. 12 Site plan; author's own, *2013*. Plan of the original building; COAM (1982). Picture of the original building; Passaporte, *1927–36*. Picture of the building after the civil war; Jimenez (1977)

Fig. 13 General plan, elevation, and external view of the new intervention; author's own, *2013*

thus respecting the history of the monument that, over time has violently marked its architecture.

The project, in addition to converting the old church into a library, also includes the redevelopment of the square overlooking it and the construction of a new classroom on the adjacent site. In addition to the change of use of the church, there is also the need to change the position of the access to the building, suggested by modifying the urban environment and replacing the original access located on the northeast façade (Fig. 13).

These changes in access and use entail the configuration of a new route that modifies the original sequence of perception of the space. In contrast to the axial route along the nave, a transversal route is proposed that begins in a new lateral piece that houses the access control, lending and book consultation area, and ends in the nave, reconverted into a large reading room. On the other hand, the new use also produces a change of scale. The sacred scale of the church is transformed into a more human scale where reading takes place, supported by furniture and a plane of artificial light located at the height of 2.3 m (Fig. 14).

The new elements are integrated with the pre-existing elements, adopting a provisional or permanent character depending on their role in the definition of the space. In such a way the building is composed based on three different levels of superimposed strata: firstly, there are the walls, which constitute a stratum of an immutable time; secondly, there are the new horizontal limits that are proposed as light elements, which constitute a stratum of a current and active time; and finally, there are the furniture and the user, to whom an ephemeral temporality corresponds.

On the outside, the immutable stratum is expressed in creating the new façade, which is subordinated to the ruin, seeking to establish harmony with it. Meanwhile, a stratum of a more contemporary time can be seen in the new roof element of the naves, which is resolved as an inclined plane with an industrial appearance, which is superimposed on the remains in the manner of a provisional roof over the ruins. Finally, the new access element is conceived as part of the urban furniture of the square and acts as a transition atrium between the ample open space of the square and the reduced shaded area of the vestibule (Fig. 15).

Fig. 14 Plan of the functional organisation; author's own, *2013*. Picture of the interior space; Presi (2007)
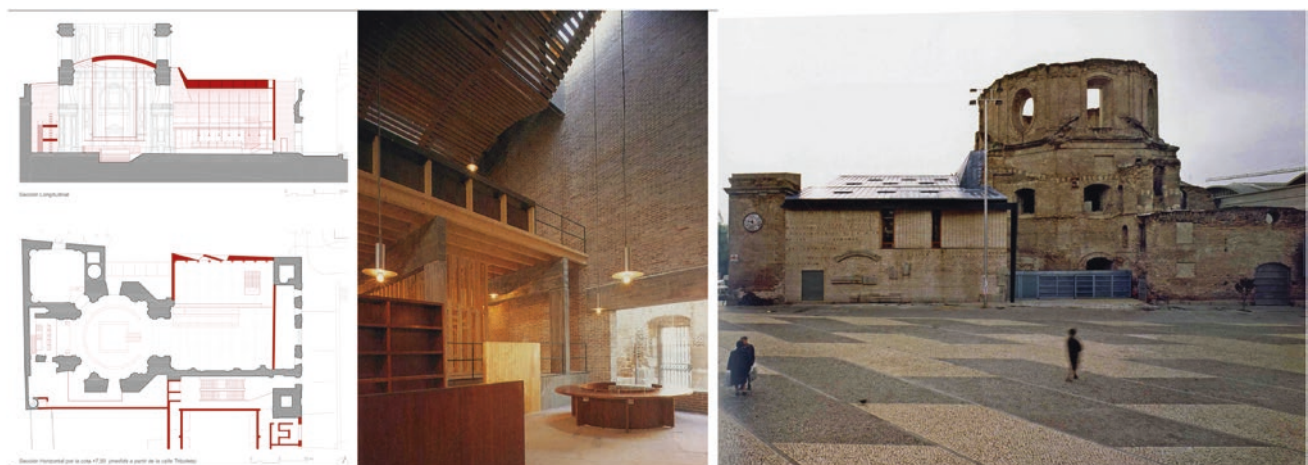
Fig. 15 Plan and section of the building; author's own, *2013*. Interior and exterior view; Linazasoro (2004)

In the interior, Linazasoro proposes, for the definition of the current stratum, two mechanisms of action derived from the relationship between the structure and the support in history: on the one hand, the tectonic sense of superimposition of supported elements, and on the other hand the sense of weightlessness of superimposing an element that floats in space. The tectonic sense of tectonics can be seen in the construction of the mezzanines. The new concrete porticoes and wooden structures recall an elementary game of constructive superimposition of linear elements, which has a sense of temporal accumulation, where in the first place would be the support, originally made of wood, which solidifies with the passage of time until it becomes a stone material, recalled through the traces of wood in the concrete.

The weightlessness can be seen in the construction of the vault, conceived as a large shady shelter whose materiality seeks to create an atmosphere of mysticism and whose shape refers to natural protection from the elements (Fig. 16).

The definition of the interior space seeks to create an atmosphere of more horizontal proportions compared to the original space of the church in response to the scale of the new use. The new aisle, the staggering of the levels and the new concatenated lowered vaults contribute to this effect by producing a transversal tension. The new lighting of the space seeks to maintain the uncovered and incomplete atmosphere inherited from its period as a ruin using small, scattered skylights in the roof, which emit light filtered through the openwork vaults. The vaults are cut away to allow more light through and thus reinforce the reading of the wall fragments, helping to break up the space and add drama to the atmosphere. The flashes of artificial light produce contrasts that enhance the atmosphere of half-light (Fig. 17).

Linazasoro is firm in his quest to fix the image of ruin that time has produced, renouncing in this way to recover the past splendour but confronting this nostalgic incomplete vision as an opportunity to create a new architecture
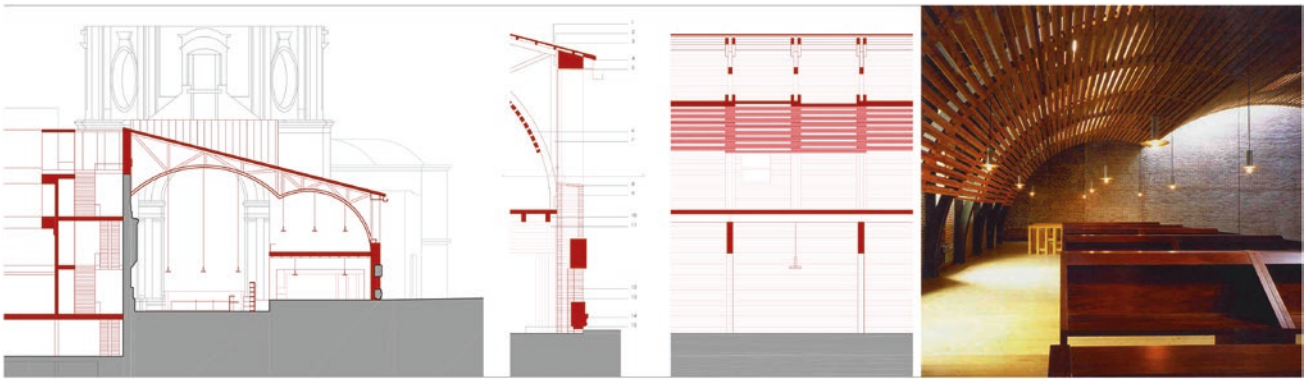
Fig. 16 Transversal section and plans of new vaults; author's own, *2013*. Interior view of the wooden vaults, Linazasoro (2006)
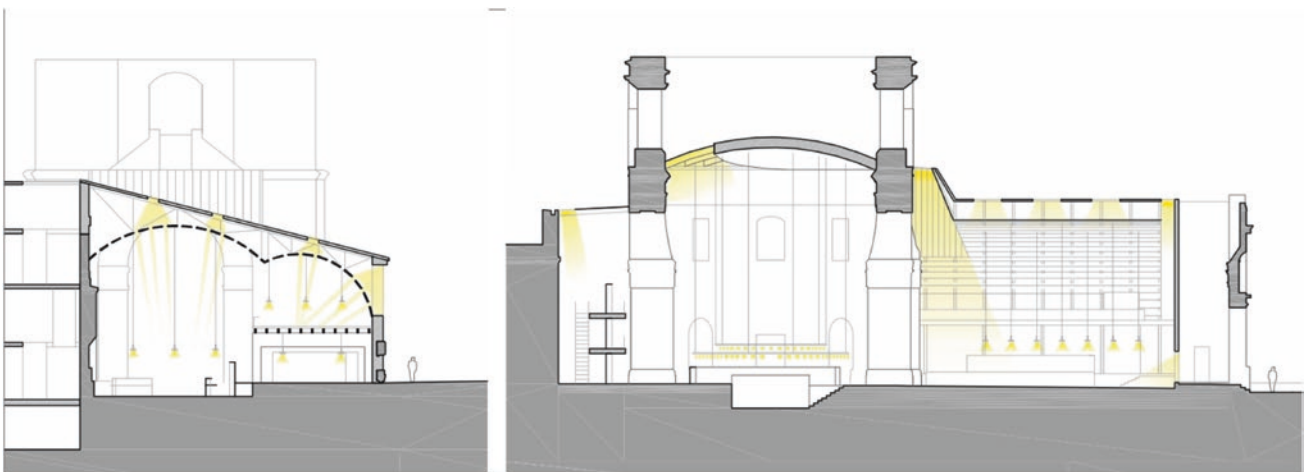
Fig. 17 Transversal and longitudinal sections showing the entrance of the natural light; author's own, *2013*

born of the addition of fragments. In this way, he interprets the remains as material to be used in the project, configuring a work whose objectives have to do with questions inherent to architecture, such as the relationship with the place, materiality, space or light. Linazasoro reinterprets the monument's history through the references suggested by its ruins and the references to architecture that he has accumulated over time in his background as an architect. In the Escuelas Pías, one can recognise different and distant influences such as the ruins of the Minerva Medica, the crypt of the Viipuri library, the fragmented pavements of Pikionis, the brickwork of Alvar Aalto or Lewerentz, the concrete porticoes of Van der Laan… As well as the vaults of Lewerentz, Utzon, or Celsing.

With his work, Linazasoro manages to keep alive the memory of the original baroque vault but reinterpreted it from his subjective memory. In a way, Linazasoro "reconstructs this memory", enriching it with his gaze and experiences, which he incorporates into the project.

2.4   St. Peter's Basilica

The Basilica of St. Peter in Syracuse is located on the island of Ortigia on the corner of a block in the dense urban fabric. Built in 363 AD, it is one of the first Christian churches after the edict of Constantine. The church originally consisted of a central nave with a west-facing apse and two side naves, all covered with stone barrel vaults.

Between the seventh and eighth centuries, a new body of masonry was added to the east side of the church as a transept, changing the orientation of the apse and thus modifying the original apse and the access to the building. Between the twelfth and thirteenth centuries, the original orientation was restored, as well as the access and the position of the apse. A wooden truss structure replaced the badly deteriorated vault. Between the fifteenth and sixteenth centuries, the order of the building was changed to a new north–south axis, transversal to the original order.

This transformation involved the creation of a new access in Catalan Gothic style and a new chapel, aligned with the new axis, as well as the alteration of the walls that delimit the central nave, modifying the original rhythm of five openings to create larger openings to support the new axis.

In the Baroque period, the central nave was raised, and four new lateral openings were opened to allow light into the space. In addition, stucco decorations were added to the church, as well as new plaster vaults at a greater height than the original stone vault.

In the following centuries, the building was surrounded by residential buildings attached to it and colonised, even losing its original use, which led to a degradation process (Fig. 18).

In the twentieth century, restoration work was carried out to restore the supposedly original appearance of the church, consisting of the reconstruction of the apse, the removal of the Baroque vault, leaving the wooden trusses that support the roof visible, and the reopening of the access through the transept. However, this action led to a distortion of the building's identity due to the banal wooden roof in the central nave and the new access gate, which did not consider the representative value and scale of the façade in relation to the new context.

Finally, in 2002, the architect Emanuele Fidone was commissioned to restore the monument.

The main objective of the project was to restore the dignity of the sacred space, which had been lost after the last interventions. To this end, Fidone proposed to respect the various historical phases present in the monument and to approach the new intervention as a new layer in the history of the building. The additions seek to bring new values to the building, in continuity with the pre-existing ones, trying to develop its potential. To this end, Fidone relies on analysing the different configurations of the building throughout its history and on the language inherited from modernity oriented towards abstraction, capable of highlighting essential architectural themes such as space, matter and light. From the functional point of view, the project is approached
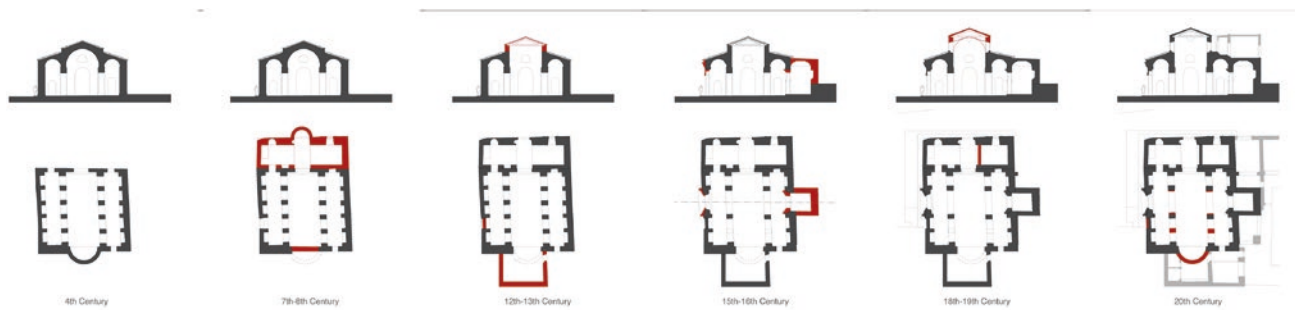
Fig. 18 Successive phases of the church's evolution over time; author's own, *2013*
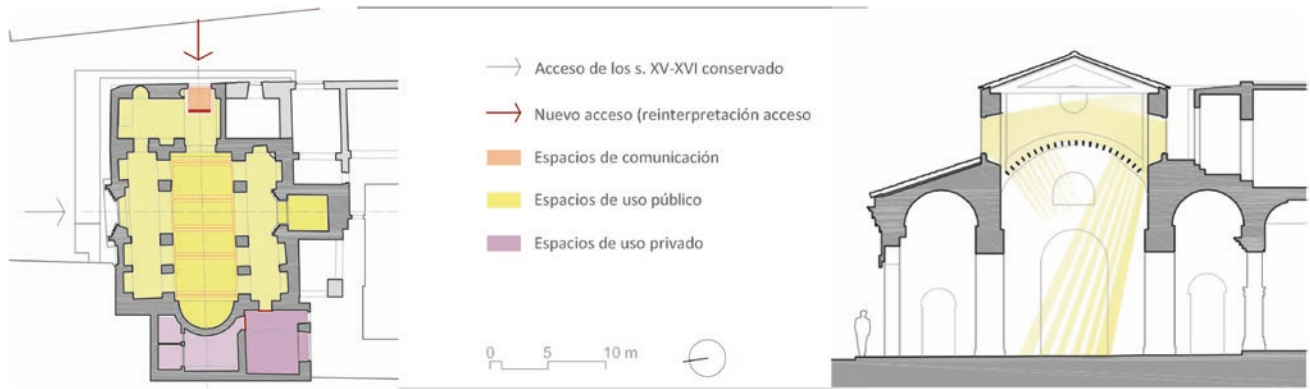
Fig. 19 Plan of the functional organisation. Transversal Section with the entrance of natural light. Author's own, *2013*
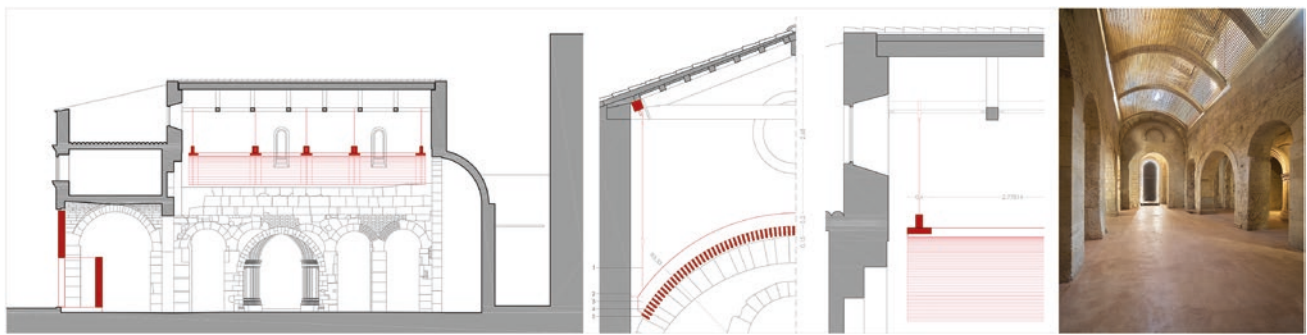
Fig. 20 Longitudinal section and details of the new vault; author's own, *2013*. Interior view; Fidone (2012)
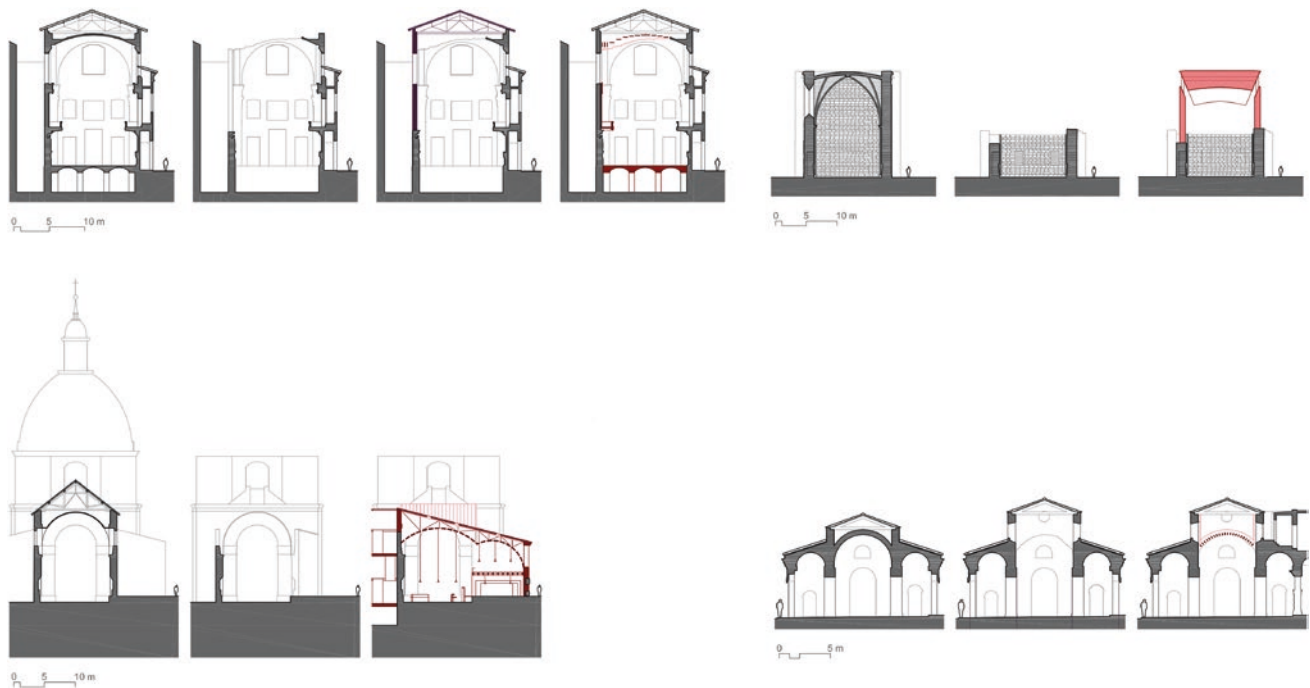
Fig. 21 Transversal sections of the building's transformation over time. Author's own, *2013*

without a clear programmatic definition, so the project focuses on the material and spatial recovery of the building in an attempt to create a space with a certain degree of flexibility capable of accommodating various uses in the future.

On the one hand, the proposal seeks to resolve the spatial and lighting distortion between the central nave and the side naves, from the baroque reform and the twentieth-century restoration, giving it a more horizontal scale and a particular atmosphere of gloom that refers to the original early Christian space. To this end, the level of the original pavement, 40 cm deeper, has been recovered, and a new element has been introduced that reinterprets the original stone vault but at the same time allows the reading of the pre-existing space to be maintained. This new element adopts an openwork surface based on linear elements suspended from the upper roof, filtering both the light coming from the windows and the view of the space behind them (Fig. 19).

On the other hand, the solution proposed for the "East" access seeks to capture the duality present in the monument's history, evoking the transformations of this space, which was born as a place of transit and undergoes its closure and reopening over time. To this end, the access opening is closed off with a very thick abstract plane separated along its entire perimeter by a line of glass, and its opening form is achieved using a frontal displacement. The opening system refers to the transition space between the exterior and the interior sacral space. Its great thickness is a reference to the walling of the opening produced at a later date. Finally, the tonality and the light silhouette recall the reopening of the entrance and, at the same time, support the importance of the original axis.

The work on the surfaces of the walls and floors is aimed at highlighting the different phases to which the building has been subjected, generating a sum of different textures that give character to the space. The surfaces of elements reconstructed with different materials in previous periods, such as the apse and some walls and pillars, are made uniform without losing the texture and chromatism of the historical material. The floor is finished with a continuous coating of lime and clay, known as cocciopesto, a technique already used by the Phoenicians and Romans.

The vault is built using eight laminated wooden beams in the shape of the arched section of the vault, supported by braces hung from the roof that encloses the space.

Under these beams, rectangular wooden slats are fastened, arranged radially and spaced apart in a longitudinal direction, following the main axis of the space.

The closing element of the original access is resolved with a 20 cm thick Corten steel plane, subdivided into two panels, whose texture and imperfection generate a living element insofar as its oxidation process evolves over time.

Fidone assumes that the building is the result of a series of phases that have been modifying the building, which must be studied in order to decipher what they have meant for its architecture, in the process of reading and creative reinterpretation, in such a way that those episodes that distort the quality of its architectural values are suitably reworked. But respecting, in any case, the sum of the strata as part of the monument's history, and therefore as defining the identity of the building.

The new elements added do not respond to basic functional needs but to questions of enhancing the value of the building, capable of restoring unity and meaning that the whole had been losing. To this end, the aim is not to make a firm commitment to one phase of history but rather to try to respond with a certain ambiguity simultaneously to different readings, thereby achieving a large number of links between old and new. This ambiguity is achieved through the play of duality between the permanent and the ephemeral, where the pre-existence is reinforced as a solid element, and the new additions are presented as light elements inserted between its walls.

3 Comparative Study

From the point of view of the historical evolution of monuments, it can be seen that over time they have been subjected to various transformations that have modified their original conditions in different ways. Although the four examples initially responded to a longitudinal typology enveloped by walls and covered with vaults to respond to a religious programme, each one is specified differently according to the needs and style of each period. Recognition of this original configuration of the monument helps to clarify the initial raison d'être of the pre-existing elements, which may be of interest in order to establish a good relationship with the new elements.

But this reflection on its original configuration should not be blindly imposed on the reality of the monument at the time of the intervention, as its transformations may have brought new conditions to be taken into account. In our case, the difference in the scale of the loss of each of the examples is striking. This difference affects the solutions adopted, being closer to the original conformation when the losses are smaller and more distant when the part to be repurposed is large. Another interesting issue to note is related to the age of destruction. In all cases, the loss had occurred sufficiently in advance for reconstruction anxiety, which arises in the face of a more or less violent transformation, to impose itself as the only solution in response to the restitution of a piece of the collective's memory.

From the point of view of intervention criteria, each of the architects analysed presents different peculiarities in their way of understanding architecture and, by extension, in interventions on historical pre-existences. Although they defend the need to act through an architectural project with a certain creative character, each interprets this premise through a different relationship with the monument. In summary, it can be concluded that Cervellati relies on the mechanisms of restoration, Linazasoro on the recomposition of fragments in harmony, Arnuncio on balance, introversion and the production of effects, and Fidone on the relationship with the degraded material of the pre-existence. Different ways of dealing with heritage intervention, but with the same objective: to produce quality architecture with a profound relationship between the old and the new.

In the four works analysed, a series of common objectives can be observed: respect for the different phases of history that have survived to the present day, the contribution of new values through new elements with a modern language, and the search for a relationship between the pre-existence and the new elements, through a certain reflection on the monument. The reassignment of a new function to the pre-existence is considered fundamental for its survival in the present, but at the same time, it is understood that this function must be compatible with the original, partially sharing some common meanings.

Special mention should be made of the work carried out by each architect concerning the main entrances and routes of the monuments. While some are committed to recovering the importance of the original access to a certain degree, others are committed to promoting other secondary accesses or even creating new accesses in response to new needs. In any case, there is an interest in promoting a certain transition between exterior and interior. An exterior that is covered, more emphatically, as part of the intervention project, in Valladolid and Madrid and in a more limited way in the Bologna and Syracuse projects.

From the formal point of view, the solutions vary according to the interpretation of the monument's history and, therefore, the value given to each of its phases. In some cases, a greater literalness of the historical forms that have disappeared is sought. In contrast, in other cases, the opposite is sought without losing a certain relationship with the original elements in order to maintain a dialogue with the history of the monument. On the other hand, different actions are taken depending on the needs of each element, trying to provide an appropriate response to each one without imposing inflexible criteria that would produce inadequate solutions. Solutions that move between analogy and contrast, trying to maintain a balance in the whole, where in general terms, there is a tendency towards a contemporary language based on simplification and formal abstraction.

From the point of view of materiality, it is worth mentioning the use of wood in three of the four examples for the resolution of the vaults, although resolved in different ways. A historical, natural, light, warm material, which is used to reinterpret the traditional construction system. In contrast, the fourth case opts for an abstract and immaterial solution that gives all the protagonism to express an idea and the materialisation of light. On the other hand, the materiality of the new elements that delimit the space shows a tendency towards opaque, textured materials that express a certain value of antiquity, avoiding transparent and reflective elements.

4   Conclusions

The assessment of a pre-existence within the framework of an architectural heritage intervention project can take into account three moments: the restoration of its partially disappeared past, which can be deduced from the study of the building itself, documentary sources and other architectures; the conservation of its present with values that have been more or less consolidated over time; and the adaptation to new needs to provide it with renewed vitality and thus ensure its permanence in the future.

These three aspects can be looked at through the three fundamental aspects of architecture -firmitas, utilitas and venustas-: functional aspects, which range from questions of use to significant and symbolic issues; formal aspects, which relate to compositional and spatial issues; and material aspects, which relate to issues of physical concreteness. These three aspects should be considered not only in terms of the pre-existence itself but also in relation to its surroundings, taking into account the monument's presence in the configuration of the city space.

In short, through a complex work of balance using analogies and contrasts, the aim will be to establish an appropriate dialogue between old and new for the shaping of an architectural space. A dialogue that will take into account both the monument and the place on which we are acting, as well as the numerous architectures produced throughout history, in such a way that through a process of contemporary reinterpretation, the necessary mechanisms are acquired to achieve the balance sought.

Intervention in heritage involves a reflection on historical architecture. This, in turn, produces a reflection of our architecture, that of our time. There is a transfer, a dialogue between what the ancients tell us and what we want to tell them. The ancients, like our grandparents, have a lot to teach us. They have lived a long life, and they have the value of experience, an extended reflection, consolidated over time. We, the younger ones, want to listen to them but

also tell them that things have changed. The experience of an old architect, the enthusiasm of a young architect. Together we must compose a coherent story.

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Preservation and Innovation of the Rinnovata Pizzigoni School, a Symbolic Place of the Early 20th-Century Experimental Pedagogy in Milan

Maria Fianchini, Nicola Berlucchi, Franca Zuccoli and Flavia Mainardi

Abstract

In the early 1900s, Giuseppina Pizzigoni launched an experimental pedagogical programme in Milan based on the reform of teaching methods and the design and construction of a new school in keeping with her innovative educational principles. Today, the Pizzigoni method is still implemented in this school, whose special spaces are still in use. However, a lack of investment in maintenance and retrofitting and the emergence of new educational needs and requirements over time has led the building to deteriorate and become functionally inadequate. In 2020, a set of interventions was initiated with a view to conserving this architectural heritage asset. The restoration project demanded an innovative and multidisciplinary approach given its aims of conserving original materials, enhancing the building's energy and seismic performances, updating its systems, and adapting its layout to meet the current needs of the school community. In this paper, we first present the key features of both the Pizzigoni method and the school building. Then we outline the technical issues with the building and the main intervention strategies. Finally, we focus on the co-design process brought to bear on the functional layout of the school building, and the outcomes of this process, which was implemented with the participation of the school principal and teaching staff and the involvement of the other stakeholders, including the main sponsor of the intervention.

1 Introduction

At the beginning of the 1900s, Giuseppina Pizzigoni launched an experimental education programme in Milan, aimed at reforming teaching methods. Based on her innovative principles, a new school was built on the outskirts of the city. The functional organization of the building's internal and external spaces, as well as its interior decoration, were carefully designed to encourage the pupils to be independent, engage in direct experimentation, and perceive beauty.

Since then, the school's teaching staff has always followed the Pizzigoni method and made use of the school's special spaces, such as the farm and the science labs. This means that it is fully aligned with new contemporary educational approaches that assume school places to play a key role in the activation of learning processes.

However, a lack of investment in maintenance and retrofitting and the emergence of new educational needs and requirements over time has led the building to deteriorate and become functionally inadequate.

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In 2020, a plan of interventions was launched with a view to conserving this architectural heritage asset—which is so valuable in both social and cultural terms—and ensuring that it continues to be used with future generations of children.

Through an invitation-only call, Studio Berlucchi Design Company was selected to develop the restoration project. This project was expected to meet a variety of goals, including conserving original materials, enhancing the building's energy and seismic performances, updating its systems, and adapting its layout to meet the current needs of the school community.

The project process was developed with an innovative approach by a multidisciplinary group of experts with the participation of users and stakeholders. Complex issues were addressed following a schedule, with constant attention to both tangible and untangible aspects, at each stage and task, in keeping with the specificity of the place. This meant seeking out solutions that could fulfil the aim to enhance the building's functionality and performance, while respecting the architectural characteristics of the building and Pizzigoni's principles concerning the organization of school space.

2 The Theoretical and Methodological Approaches

2.1 Giuseppina Pizzigoni: A Visionary Educator. The Role of the Archive in Supporting the Project

Before exploring the architectural and restoration interventions implemented at the school, it is essential that we first thoroughly—albeit briefly—examine the work of Giuseppina Pizzigoni (1870–1947). Born in the same year as Maria Montessori and Carolina Agazzi, like these two women, she proposed major educational changes in relation to, relating to the Italian school of the time. Her contribution was not limited to the transformative design of educational action and teaching–learning activities, but also concerned the educational setting: indoor and outdoor. She was undoubtedly one of the first educationalists to have an input in the design and construction of the school building itself (Pizzigoni, 1914).

Pizzigoni's method emphasizes direct action by children, scientific observation, the construction of knowledge from action stimulated by a blend of experimentation, study, and teaching. Pizzigoni never broke away from the praxis of educational and teaching practice to develop theories; rather, her thought was inspired by practical

experimentation in her school (Pizzigoni, 1921). Precisely for this reason, Pizzigoni appreciated—from the outset of her work as a teacher—the importance of the environment (both indoor and outdoor) in which the children lived. She viewed the school building as a complex whole and as providing fundamental support to the teaching–learning trajectory. A place where every detail was designed to facilitate learning and at the same time to enhance quality of life, with a specific focus on the bodily needs of children and adults. The school features a diversity of green spaces (the grove, the vegetable gardens and the spaces for animals) designed for outdoor teaching. She dreamed of a school where the indoors would remain in constant dialogue with the outside, and this is still the case today. Furthermore, all the architectural details of the building were meticulously thought out.

In Pizzigoni's own words.

> In fact, the school, seen in terms of its external appearance, is beautiful: its architectural lines are beautiful; its wall decorations are beautiful; its layout, with pavilions rising up amongst the green of the meadows, fields, flower beds, and kiosks is beautiful; as is beautiful the decoration of the bright corridors, and that of all the classrooms. For those who know my spirit, this is not surprising. I inherited a taste for art; I would not be able to live and work in an ugly environment, and so it was natural that, in creating my own school, a school according to my spirit, I would create a beautiful one. But my concern was not only with the architectural lines and the decoration of the rooms: it extended to the child's right to joy; and because joy comes to man from all forms of beauty, I sensed the child's right to a true aesthetic education. (Pizzigoni, 1931, pp.85–86)

In addition to bringing a pedagogical approach to bear on building her own school, so that she could apply her educational method as fully as possible, Pizzigoni was also a scrupulous documenter. From the earliest years of her educational work, she built up a body of documentation comprising photographs, writings, papers, journal articles, and so on, which she collected in the Historical Archive of the Opera Pizzigoni, which was set up by Royal decree in 1927. These documents, as well as maps of the site, served as a valuable resource throughout the entire process of renovating and adapting the layout of the school, as described later in the chapter.

2.2 The Participatory Process for Improving the School's Functional Layout

According to the guideline principles for renovating learning environments issued by international organizations such as the OECD (2019) and implemented in many international projects (Fianchini, 2019), when planning to renovate existing schools, the process for defining modifications to

physical environments should be collaborative and based on exploration of educational practices at the school. The main goals should be to modify traditional building layouts designed for transmissive education and promote new—potentially transformative—visions of how to organize space via lengthy participatory processes. An interesting example of the application of this methodology to a historic building is the renovation conducted by the Foundation for the School and the Compagnia di San Paolo on the Pascoli School in Turin in 2015 (Fondazione Giovanni Agnelli, 2019).

Participatory methodologies with the involvement of the members of the school community were also adopted with a view to enhancing the functional organization of the Rinnovata Pizzigoni school; nevertheless, the objectives of the renovation process were modulated in keeping with the specific context, in which the original experimental pedagogical principles are still considered valid and remain foundational to the school's educational approach.

More specifically, the large school complex is characterized by a series of different buildings (See Figs. 1, 2, 3, 4 and 5), with additional spaces for special activities (such as the swimming pool, the agricultural pavilion, etc.) and

by the close relationship between the indoor and outdoor environments, both viewed as fundamental for learning. However, its functional organization has undergone modifications over time, in the absence of an overarching plan. These modifications were carried out to meet needs that emerged due to changing conditions, such as the increase in the number of classes with respect to the original plan, the integration of the school into a larger group of schools, the transfer of some of the original spaces to external organizations to be used as a large school catering kitchen and for educational services for adolescents. All this has led to a series of functional inadequacies, with some rooms over or underused, as well as issues with coordinating the activities and trajectories of the internal and external users.

More recently, this situation has been further worsened by the impact of social distancing requirements due to the COVID-19 pandemic, when all suitable available spaces were transformed into classrooms and the other spaces coopted for the storage of unused furniture and materials.

In this context, the objectives agreed with the school principal and the president of the Opera Pizzigoni Foundation were: to preserve (and where possible restore)

Fig. 1 Primary school

Fig. 2 Nursery

the original design, in keeping with the need to adequately cater for current usage needs, at both the quantitative and qualitative levels, and the mandatory technical requirements; to exploit spaces no longer in use or are due to become available to the school again; overcome the relational and logistical issues generated by the concurrent presence of different organizations; improve the spatial layout of the Opera Pizzigoni archive to facilitate the collection of documents and materials and increase their accessibility to scholars and external students.

The methodological approach drew on the principles of post-occupancy evaluation (Watson, 2003), and the main techniques used were walk-through and focus group discussion (Baird et al., 1996). Thanks to the walk-through sessions, the design team accompanied by the principal was able to observe the features, the operating conditions, and the appearance of all the school environments and also collect information from people in charge and/or users of the different functional areas. It was possible to observe the visible evidence of physical decay and failures, especially those with the greatest impact on user activities and on comfort and safety.

Despite the public health emergency, it was decided to carry out the focus groups in person with the school staff, but limiting the number of participants. The permanent participants in the groups were the principal, the president of the Opera Pizzigoni and a school design advisor to assist with the process of translating organizational needs into spatial requirements. Conversely, different subsets of the teaching staff were invited to each of the sessions, with a view to exploring specific problems related to the different subject areas, especially those with a laboratory component, in addition to generic issues. The in-person meetings made it possible to discuss the issues in light of the floor plans of the buildings, a fundamental condition for enabling the focus group participants who had no architectural expertise to interpret space. In contrast, online meetings were held with the representatives of the external bodies and stakeholders, namely, the representatives of the technical office and educational services of the City Council and of CityLife jsc, the main sponsor of the renovation project. Between one meeting and another, the staff in charge of the restoration project worked hard to sum up the group's thoughts and proposals, assess them from a technical view,

Fig. 3 Agricultural pavilion

discuss them with the project sponsor, update the plans, flag any critical issues, and draft possible solutions for the next steps. This approach was effective and allowed the overall new functional layout to be defined in a very short time. The final proposed plan was submitted for approval to the technical office of Milan City Council and the Superintendency for Architectonic and Landscape Heritage. Indeed, like all Italian public buildings over 70 years old, this building has been listed as a cultural heritage asset.

2.3 The Framework of the Technical Issues and the Main Intervention Strategies

The project for the Rinnovata Pizzigoni school complex was developed using a consolidated methodological approach to the restoration of cultural heritage.

All the planned interventions were intended to have a recognizable but muted impact, whereby the constraints imposed by the intrinsic historical value of the monument were respected and, at the same time, the efficiency lost over the years would be restored (The Venice Charter, 1964).

The adopted approach consisted of aiming for maximum preservation of historical structures (Berlucchi, 2018), while adding new elements, preferably using dry technologies (and therefore easily removable and demountable) and concentrating efforts on those parts that had already been extensively reworked or totally lost. The guiding principle underlying the design work was to focus on integrating architecture, structures, and mechanical and electrical installations to yield technical solutions with a simple design and a quiet aesthetic outcome. (Carbonara, 2003; MiBACT, 2018).

The first phase of the project that involved the school, the "knowledge-gathering phase", required an investigative effort to systematize and interpret data from different areas of diagnostics for architectural restoration. The purpose of this first step was to take a snapshot of the current state of conservation of the complex, but also to build up an accurate and detailed historical record (Musso, 2016).

A complete architectural survey was carried out by laser scanner, with the performance of detailed assessments using a navigable and interrogatable model based on a point cloud (Barber et al., 2006).

Fig. 4 Farmer's house

Historical-archival research allowed us to reconstruct the main phases in the construction of the complex, but above all to identify in detail the historical finishes and decorations in some areas of the complex, thanks to a rich and valuable historical photographic archive made available by the Opera Pizzigoni Foundation. The period photographs and archival documentation allowed us to carry out a targeted diagnostic survey of the structures and their internal finishes, thus minimizing both expenditure on diagnostics and disruption of school activities. Continuity in the activities of the school was guaranteed during the design phase and will be guaranteed during the construction phase.

The inspections revealed, in addition to the need to rationalize the use of space, some critical issues relating to the state of conservation of the buildings. A detailed map was put together of changes in the facades, which are in brick, decorative cement (Giola, 2009) and serizzo antigorio (Fig. 6): mainly surface deposits, crusts, biological decay, gaps and cracks (Figs. 7, 8, 9 and 10).

All the roofs displayed extensive signs of leaking, certainly due to the technique used to build them - they are formed by a series of wooden structures and Marseilles tiles without any type of waterproofing—but also to a lack of regular maintenance over the years. This has caused the deterioration of part of the wooden roofing structures, also damaging the attic floor (partly in wood and partly in brick and concrete) and, consequently, the ceilings of all the spaces in the school which bear evident stains of moisture and, in some cases, portions of plaster have peeled off.

The architecture of the buildings, designed to ensure a synergistic relationship between the indoor and outdoor environments within the children's education, has large windows which, together with the absence of thermal insulation, cause significant thermal dispersion from all the surfaces of the casing (Figs. 11 and 12). Very high ceilings lend great airiness to the indoor spaces, but they also represent substantial volumes to be heated and cause annoying phenomena of internal reverberation of sound. The interior spaces require general maintenance; the toilets are outdated and in poor condition; the technical systems are outdated and now need to conform to current fire prevention regulations.
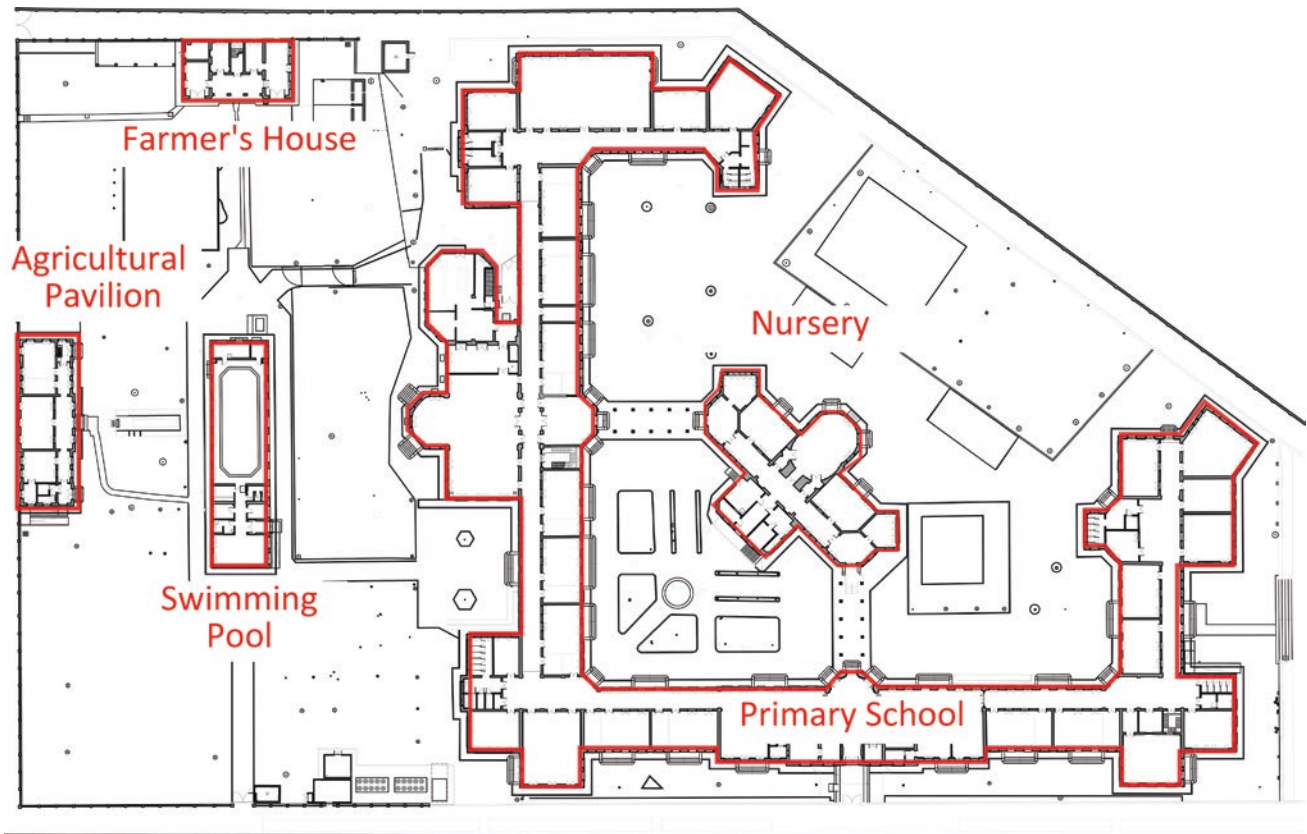
Fig. 5 Overall plan of the school complex

Fig. 6 Sample map of alterations to facades (UNI, 2006)

The structural diagnostics pointed up some critical issues that will be resolved via an overall intervention aimed at improving the buildings' seismic performance. The diagnostic testing of finishes (chemical-physical and stratigraphic investigations) brought to light, in some school spaces, meaningful original decorative stencils and mezzofrescoes (Menicali, 1992). The mapping of the floors showed that the cement finishes of 1927 have mainly been preserved, while the systematic cataloguing of the windows identified several phases of replacement and the need to adapt the glazed surfaces to the minimum current safety standards. Another aspect to be improved is the accessibility of the school to vulnerable users, including blind people.

3 Results

3.1 Preservation and Innovation in the Functional Layout

In the main building, the most important decisions concerned the representational spaces and classrooms. Specifically, it is planned to reorganize Giuseppina Pizzigoni's personal office and make it into the principal's office, while the Pizzigoni hall will be used for meetings and performances as in the past, with interventions to improve the acoustics and air conditioning.

Fig. 7 Biological alteration

Fig. 8 Expulsion of the iron cover

Fig. 9 Lack of bricks

Fig. 10 Lack of mortar joints

Fig. 11 Typical classroom in the Rinnovata Pizzigoni

Classrooms were at the core of the group reflections, in relation to improving their overall condition and solving the present difficulties. The original layout included twenty classrooms, each with doors to the outside and a cloakroom nearby (Figs. 13 and 14). Over time, these accessory spaces were assigned different functions, losing their relationship with the classrooms, and many of the latter are now undersized by current standards. It was therefore decided to reconnect cloakrooms to classrooms by knocking down the partition wall, to increase the available area and allow more flexible layouts, as is expected in innovative learning environments.

Then, a debate took place about the classrooms now located on the first floor (with no direct access to the outdoors) as a consequence of the increase in the number of classes. Although, no proper solutions were found to relocate them to the ground floor, accessibility will be improved via the installation of an elevator in the stairwell and modification of the layout, thanks to extra space gained from the original caretaker's living quarters. Finally, all other available environments not planned to be used as classrooms will continue to be used for educational activities as dedicated inter-cycle spaces with different functions and set-ups (singing room, multimedia room, library, etc.).

The agricultural pavilion (see Fig. 3) is a single-storey building with a basement. Originally intended for activities relating to the educational farm, it has over time taken on the broader function of an experimental scientific laboratory. Also in this case, the requests of the teachers were taken on board, leading to the partial reconfiguration of the internal layout (to enhance functionality and bring it into line with standard measurements for labs), and new laboratory furniture and equipment.

Finally, special attention was paid to the former Farmer's House (see back Fig. 4), a two-storey pavilion with a porch, a loggia and a narrow stairwell that precluded the installation of an elevator without severely impacting the building. Here, an educational service for adolescents and the Historical Archive of the Pizzigoni Opera in Milan are located; the latter occupies two rooms on the upper floor and is protected by the Ministry for Cultural Heritage and Activities. The renovation project envisages the redevelopment of some underused spaces on the ground floor, which are to be annexed to the archive to facilitate the conservation and exhibition of the collected materials and to ensure barrier-free access to interested scholars and schools.

Fig. 13 An example of the former cloakrooms

3.2 Technical Solutions for Restoration and Upgrading

The architectural characteristics of these buildings are repetitive, especially in the primary school. It was thus possible to draw a typological section (Fig. 15) that included the main interventions foreseen in most of the building. The roofing issues will be addressed by inserting a layer of waterproofing. Structural consolidation will also be carried out.

Energy dispersion will be reduced on several fronts. The bottom surface of the floor in the basement (which mainly houses electro-technical systems) and the extrados of the roof slab will be insulated. A counterwall applied internally to the perimeter walls will not only provide greater thermal comfort but also hide the electrical system, thus removing the need to cut into historic masonry. These counterwalls, placed on some of the partition walls between classrooms, will also be useful for sound insulation purposes. The windows will be replaced for the most part with new wooden windows with thermal breaks and the shutter boxes will be properly insulated.

Fig. 14 The nearby classroom

The historical flooring in concrete tiles will be restored. The internal doors and windows will also be restored and all glass panes will be replaced for safety reasons.

The radiator heating system currently present, now obsolete, will be replaced in the classrooms with a radiant ceiling system that will ensure adequate levels of comfort for children. The radiant ceiling, which is also sound absorbing, placed at 4.10 m in height and above the shutter boxes, will mask the system that regulates the exchange of air in the classrooms, the fire resistance protection of the ceiling (consisting of a plating in calcium silicate), and the tie rods that serve for structural consolidation. The work on the false ceiling will be preceded by the stripping out of all the existing systems, false ceilings (present in some areas) and ceiling tiles in straw and plaster, which have been irreparably damaged by infiltrations of moisture. This operation will also allow the conditions of the wooden slab between the ground floor and the attic to be verified. On the first
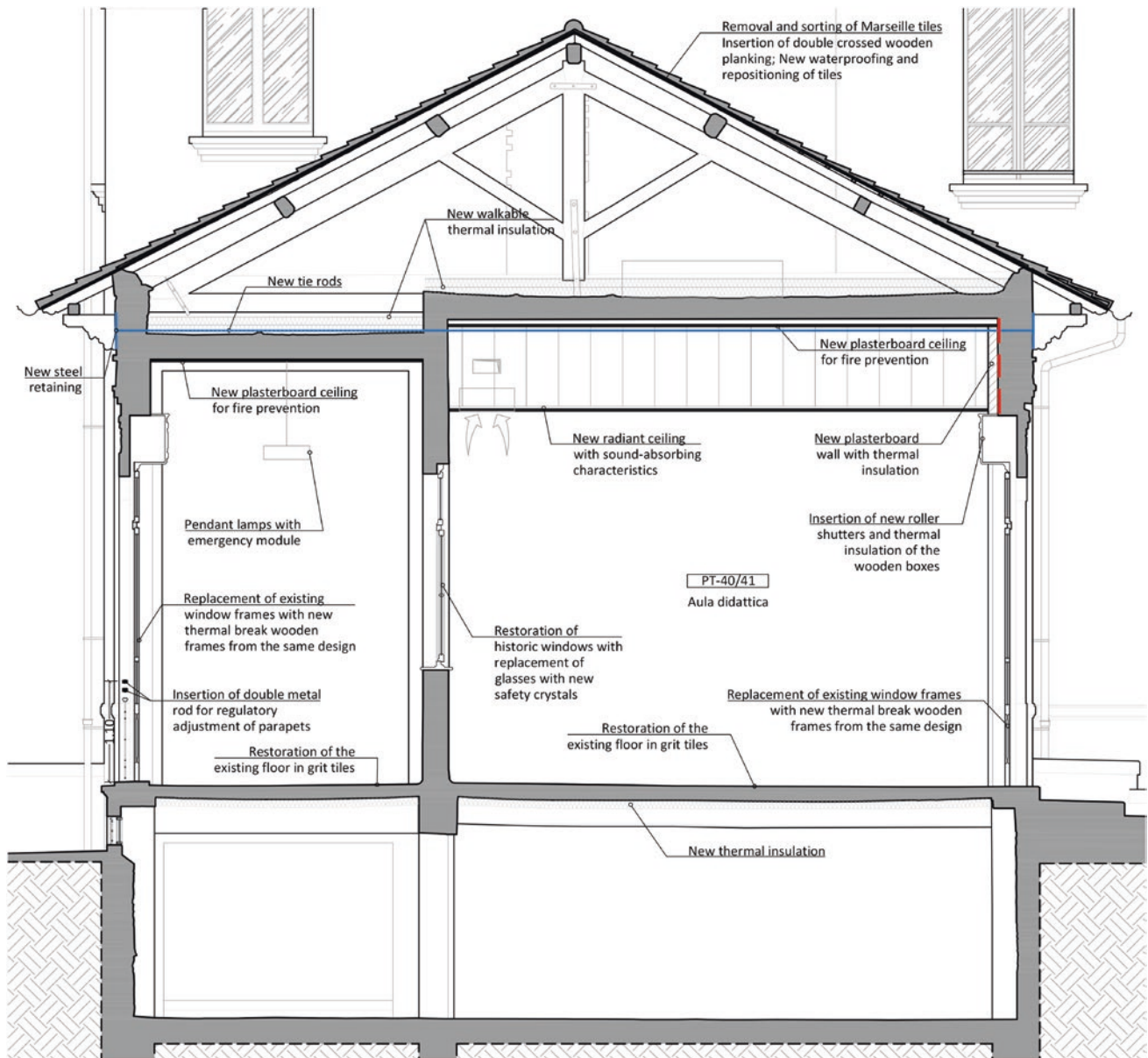
Fig. 15 Typological section of the interventions

floor, given that the ceilings are not high enough to install a radiant system, the floors will be disassembled, catalogued, and properly cleaned, a radiant system installed by milling it directly into the screed, and the floors put back in place. The corridors, where people are not expected to stay for long periods, will keep the historic heating system, but with new heaters. The only two spaces where the various systems will be visible are the refectory and the gym, because the architecture of these spaces, with pillars and coffered ceilings in concrete, and with a vaulted pavilion, respectively, does not allow effective masking. Therefore, a visible solution was chosen, with microperforated channels, which can be made of any colour.

Conservative restoration themes.

The technical expertise brought to bear and the diagnostics carried out on the main building facilitated the identification of a wing where many elements of the original architecture are preserved: the floors in concrete tiles are almost all well preserved; the restorer's stratigraphic essays detected (in the masonry of the corridor) a geometric decoration that changes abruptly just before the refectory; the surviving groove windows still have the original closing systems.

This portion of the building will be subjected to a conservative restoration intervention (red areas in Fig. 16). Specifically, the windows will be restored, except for
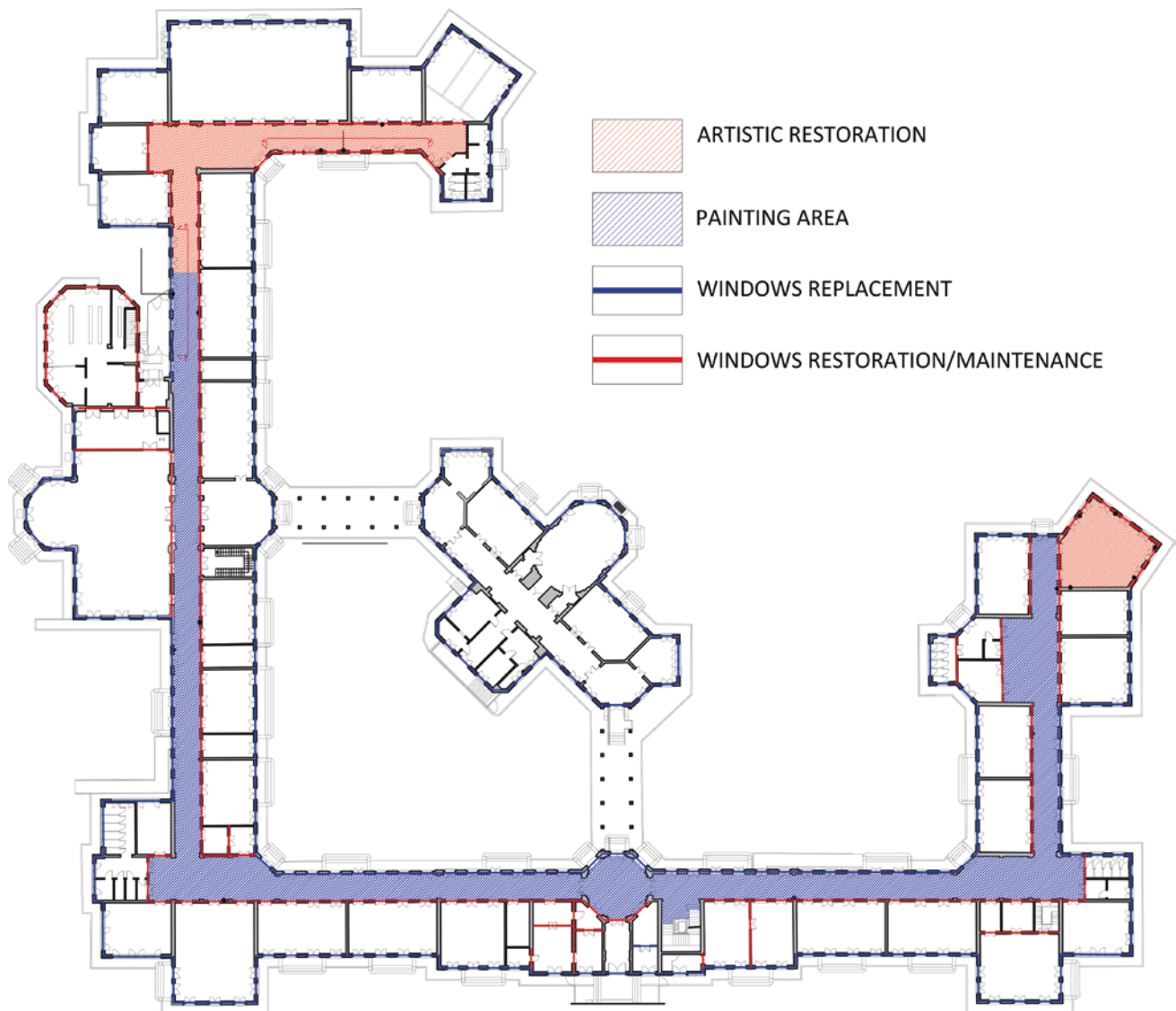
Fig. 16 Restoration project: synoptic table of the restoration of internal surfaces and windows

specific situations in which they were already replaced or bear too much damage; the decorations in the corridor will be restored, following the removal of the white paint covering, and connected with the subsequent decoration which—in contrast—will be replicated on top of the current finishing layers (blue areas in Fig. 16).

In the long corridor, the transition between the area selected for restoration and that selected for replication of the decorations will occur at the point where the stratigraphic essays identified a change in pattern (Fig. 17).

The investigations brought to light a valuable decoration under the white paintwork in one of the classrooms (Figs. 18 and 19), which was once used for the laboratory of plastic design. Here too a conservative restoration intervention will be carried out.

Because all the internal decorations are covered with a layer of white paint, the restoration techniques envisaged in the project will necessarily first be trialled on a sample surface. Following careful removal of the paintwork, which will be done manually with scalpels and small hammers. After the removal, all surfaces will be cleaned using a manual dry cleaning technique with brushes and wishab sponges. Then, different kinds of consolidation techniques will be applied: micro-injection of mortars, if the painted surface detaches from the plaster base, and localized application of ethyl silicate using brushes, if the paint film is pulverized. The cement grouts will be removed and replaced with new compatible mortars. The artistic reintegration of the paintings will be executed according to the principle of distinguishability of the intervention. In the
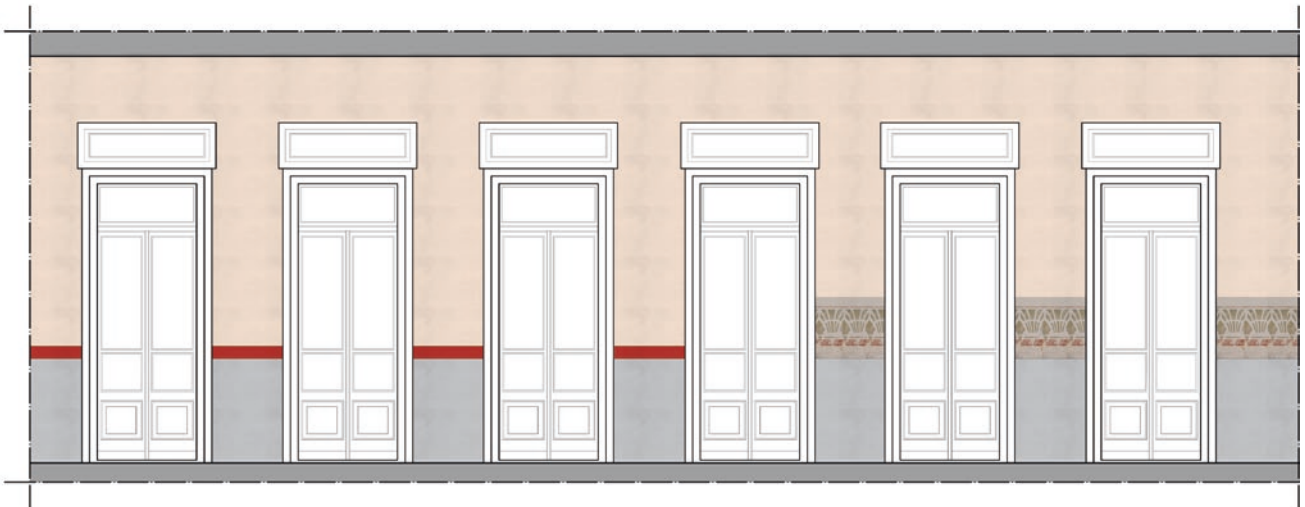
Fig. 17 Restoration project: photographic simulation of the connection point of the two decorations

Fig. 18 Historical image from Archivio Storico Opera Pizzigoni (AF442)

Fig. 19 Stratigraphic test

presence of geometric or architectural shapes, the aim will be to reproduce the volumes via the main geometrical lines. The replacement of plastic elements will be evaluated on-site in order to identify the most suitable way to mitigate the lacunas.

The facades, mainly in brick with decorative concrete basements (in the main building, Fig. 1) and in serizzo antigorio stone (in the agrarian pavilion and farmhouse, Figs. 3 and 4), and a plastered band on top, will undergo conservative restoration, as will the numerous staircases in serizzo.

The restoration work on the facades is summarized in the overall map of the alterations and interventions (see Fig. 20 and also Fig. 6) that lists the alterations, by material. Thus each type of batch is associated with a single sequence of restoration processes that makes it measurable and costable..

In relation to the top band, the integrity and adherence of the plaster will be verified manually and any portions to be peeled off will be identified. The surface will be cleaned using a low-pressure hydrowash technique in combination with manual cleaning. Eroded and peeled portions of plaster will be consolidated via the localized application of ethyl silicate. The cracks will be opened and cleaned and

the boundaries will be consolidated. The replacement of the plasters that are removed, and that already missing, will be effected using new plaster with new mortars whose chemical-physical characteristics are compatible with the historical mortars. A final lime glaze will be applied to soften any discontinuities.

The masonry also requires a general cleaning of all surfaces via low-pressure hydrowashing and manual techniques, preceded, where necessary, by the application of a broad-spectrum biocidal treatment spray and manual removal of shrubby vegetation. The masonry displays various alterations that need to be addressed. Missing bricks in the curtain wall will be replaced with others similar to the original ones, recovered from the construction site itself, if possible. Missing mortar joints will be addressed by conducting in-depth manual cleaning of the joints and grouting them with new mortars that are compatible with the historical ones. Cement patches will be removed and replaced with compatible materials and saline efflorescences will be removed using localized compresses with deionized water.

The decorative cements will be treated similarly to the plasters, with the due differences in the chemical and physical characteristics of the restoration mortars. In addition, black crusts will be removed using ammonium carbonate compresses. The restoration mortars should have thixotropic properties, in particular in the reintegration of small losses in volume (mainly in cornices with simple geometric outlines), following the insertion of stainless steel pins. Where the infiltration of moisture has compromised the reinforcement irons and clearly rusted them, before any replacement is carried out, they should be thoroughly sanded, blasted and primed with protective products.

The stone elements mainly comprise ashlars above the windows, the skirting in the Farmer's House and the Agricultural Pavilion which is made of serizzo antigorio, staircases, and entrance slabs. For these elements, it will be necessary to verify their degree of adhesion to the masonry and to resolve any issues identified with a new bonding using suitable and compatible mortars, following thorough cleaning of the elements. The principal cleaning system will be low-pressure hydrowashing followed by manual cleaning techniques. Where areas of scaling or erosion are present, ethyl silicate will be applied locally using brushes. In the case of deposits that are particularly difficult to remove, compresses soaked in ammonium carbonate will be applied.

Architectural barrier themes.

Addressing architectural barriers was another key theme explored during the design process The technical solutions required to satisfy the guidelines issued by Milan City Council for the design of signals and tactile paths for users of the complex were adopted, while also taking into account the buildings' protected status as cultural heritage assets and the type of users that would actually be the beneficiaries.

Fig. 20 Map of alterations, materials, and interventions on the principal façade of the Farmer's House

DECORATIVE CEMENT					
		Decorative concrete surfaces with surface deposits, flows, encrustations and stains of various nature	CD 01	1. 2. 3.	Cleaning by removal of consistent surface deposits by low pressure water washing and manual completion by broom brushes, sprayers and sponges Removal of consistent deposits and scaling by ammonium carbonate tablets (if any) Consolidation of the portions eroded by ethyl silicate applied by brush
		Decorative concrete surfaces with surface deposits	CD 02	1. 2.	Cleaning by removal of consistent surface deposits by low pressure water washing and manual completion by broom brushes, sprayers and sponges Reintegrations and small grouting by mortar with similar chemical-physical characteristics and compatible with the existing ones
		Superficial lesions and micro-cracks	CD 03	1. 2. 3.	Crack opening and removal of all consistent and inconsistent surface deposits by manual cleaning with broom brushes, sprayers and sponges Edge consolidation through the application of ethyl silicate and mortar compatible with the existing Reintegration and grouting of lesions by mortar with similar chemical and physical characteristics compatible with the existing one
		Losses of decorative concrete elements and improper patches	CD 04	1. 2. 3.	Deep cleaning using brushes and sprayers of the area to be replenished, removal of all surface deposits and inconsistent materials. (if any) scarifying, blasting and passivation of oxidized reinforcement irons, accurate manual cleaning. Reintegration of missing molded parts by applying mortars compatible with the existing one, including the use of stainless steel or epoxy resin pins.
		Biological patina	CD 05	1. 2. 3.	Application of broad spectrum biocidal treatment, spray or brush applied, for two cycles Cleaning by removal of consistent surface deposits by low pressure water washing and manual completion by broom brushes, sprayers and sponges Localized consolidation by brush application of ethyl silicate

Fig. 21 Extract from the restoration legend

The design was therefore based on the assumption that paths for the visually impaired would most likely be needed by visually impaired adults (e.g., parents) who attend school occasionally. Children (up to 10/11 years of age) cannot in any case make independent use of these paths and must necessarily be assisted by school staff. Taking into account all these factors, maps and tactile plates are envisaged only where strictly necessary, and primarily for use by visually impaired adults (mainly in selected classrooms, the offices, and the Pizzigoni hall). Together they will form an LVE route that extends to the kindergarten pavilion. This path will be in PVC and glued onto the existing flooring to ensure its preservation.

4   Conclusions

The architectural restoration of a complex such as the Rinnovata Pizzigoni, built as a school and still used today as such, raises numerous technical and technological issues, given the need to adapt the structure to new increasingly stringent regulations and new uses and needs associated with contemporary life. The in-depth study of this complex has pointed up the great practicality inherent in Giuseppina Pizzigoni's thinking, including in terms of how she guided the design of spaces for her school. The result was a forward-looking architecture that can be updated to cater for contemporary needs without distorting its historical-artistic and functional features. About 100 years after its construction, the Renovated Pizzigoni school still contains all that is required to carry out school activities today, with five more classes than originally foreseen. The techniques used to construct it and the simple but extremely effective technological original solutions such as the ventilation guaranteed by a large basement, as well as the well-aired spaces (with ceilings up to six meters high), have now made it possible to replace all the electro-technical systems with modern equipment that offers contemporary standards of indoor comfort, without sacrificing the size of the spaces, but rather now exploiting spaces that were previously underutilized.

From the point of view of the restoration of the indoor surfaces, it was necessary to find a meeting point between the effective everyday use of school and the need to tell the story of this complex. On the one hand, it was fundamental to consider the intensive use of the buildings, and on the other hand, the highly evocative potential of some of the spaces. Hence, the artistic restoration of some portions of the building, while taking into account how they are used, as well as the need to optimize public spending on school buildings. In the future, however, it will be possible to expand the areas of artistic restoration to other parts of the buildings, given favourable circumstances.

Finally, following the participatory process, the school staff reported that their thinking about school spaces had greatly expanded, from their previous focus on the areas they used themselves directly (their own assigned classroom or laboratory) to a more general vision of the entire school environment, as well as aspects such as the movement of classes from one space to another, the usability of internal and external space, and so on. In sum, the participatory trajectory drew the attention of the members of the school community to the specific dimension of Giuseppina Pizzigoni's approach that combines educational thinking and the design of spaces, allowing them to share their experiences and needs and steer the definition of transformative actions.

The paper is the result of multidisciplinary work undertaken by the authors. Nevertheless, Sects. 1 and 4 were edited by Maria Fianchini, Franca Zuccoli, Nicola Berlucchi and Flavia Mainardi; subsection 2.1 was edited by Franca Zuccoli; subsections 2.2 and 3.1 were edited by Maria Fianchini; subsections 2.3 and 3.2 were edited by Nicola Berlucchi and Flavia Mainardi.

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The Sub-City: Architectural Conservation as a Series of Experiential Spaces Drawing in Historical Memory in Salvador De Bahia, Brazil

Asil Y. Zureigat

Abstract

The sub-city is the underlying historical narrative of every city in the world. Specific to every city, the story is a struggle, an accomplishment, or a tragedy, and in all cases, is a series of events the city and its people underwent or performed that constitute the sub-city. Given the layers that modernity added to cities, it has become significant to peal some of those layers to preserve and conserve history. This paper proposes to translate the narrative of the sub-city, or the historical memory of Salvador De Bahia to user-space experiences via architectural conservation and intervention. The city of Salvador De Bahia in Brazil served as a case study and a demonstration of design methodologies that could be implemented in architecturally conserving abandoned or old sites in the city.

Keywords

Architectural conservation · Historical memory · City identity · Adaptive re-use · Memorial design

1 Introduction

Salvador De Bahia, founded in 1549 as the first capital of colonial Brazil by the Portuguese, is situated in the northeast region of Brazil overlooking a massive bay on the Brazilian coast. This strategic location aided in facilitating trade with Africa and the Far East and specifically slave trade which started in the sixteenth century (Adams, 1925).

The city is imbued with a historical dynamic of racial exclusion and inclusion. Its heterogeneous social structure of European, American and African lends itself to it being the major slave trade center in the sixteenth century. Two thirds of the 110,000 population in Bahia were enslaved in the first decade of the nineteenth century (Alexander, 1922). After the abolishment of slavery in 1880 (Schultz, 2018), the African community integrated into the society to form their own communities with cultural, social, and religious structures.

The eminent and exceptionally important historical happenings of that period, which have not only made the present but also influenced the development of the city, are now being replaced by private establishments for tourism and leisure with disregard to the historical memory of the city. Though the historic center—The Pelourinho—and its neighboring regions were declared a UNESCO world heritage site in 1985 (Nobre, 2002), continuous development plans to exploit tourism and increase economic potential of the area led to exodus of many African residents from the historic center. This resulted in a plethora of vacant buildings echoing the memory of what used to be. The Pelourinho district became a stage set for the commodification of "blackness" or "Africanness" for tourism purposes (Marchant, 2005).

This triggered the idea of proposing a more historically sensitive approach to city intervention and building conservation, and a balanced link between the past, the present, and the future. In this paper, a number of conservation and intervention methods specific to the city of Salvador De Bahia are introduced and demonstrated, as a way to preserve its historical memory. The proposed interventions presented in this paper, translate historical happenings to spatial experiences. Derived from the historical narrative of the enslaved community in Colonial Brazil, the happenings are made spatial via building organization, circulation and programmatic implications. The narrative of the enslaved community could be considered as "uncomfortable" or "dark

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heritage" (Pendlebury et al., 2018) where the term "dark heritage" refers to places of death, suffering, and disaster (Thomas et al., 2019), which include natural disasters, concentration camps, or battlefields.

Logan and Reeves (2008) highlight the growing interest in places of "past pain, shame and humiliation" by both visitors and authorities due to a phenomenon they described as "atrocity tourism." This could be due to listing several atrocity sites as heritage by the UNESCO such as listing Auschwitz a world heritage site in 1997, the Hiroshima Atomic Bomb Dome listing in 1997 and Robben Island listing in 1999. As mentioned earlier, the Pelourinho was also listed a world heritage site in 1985. These sites witnessed the failure of humanity, the loss of lives, values, places, and traditions. To conserve the uncomfortable memory associated with these sites is to merely document history and present a set of examples for the future generations to learn from. Humans' existence did not only involve positive achievements but it certainly included war, destruction, and atrocity. Conserving dark heritage is narrating history of human existence on earth where the events aid in understanding the values and principles humanity seemed to forget at that time. From an ethical standpoint, according to Sandis (2014), preserving something in memory stems from the duty to remember it and it must not be conflated with the duty to preserve its actual existence in the world. Structures remembering victims become methods for understanding and learning compassion. The Sites of Memory: The Slave Trade and Abolition research project organized by English Heritage and developed by historians Angelina Osborne and S. I. Martin (Osborne & Martin, 2007) is an example of a written memorial of the history of slave trade in the eighteenth and nineteenth centuries in Britian, which explored narratives of the built environment and actual sites of memory. This project served to document and remember both perpetrators and victims for each left their mark on history, one way or another.

Moreover, Nabas (2019) suggests that the conservation of sites of uncomfortable heritage through adaptive reuse allows for the cultural identity to be constantly reified and for the site to have "continuing social relevance in addition to the continuing use," which is a form of cultural sustainability. Nabas also emphasizes the importance of uncomfortable heritage for the collective memory of mankind. This memory not only builds on cultural sustainability but also social and urban. Meutia et al. (2021) ran a survey asking 50 Tsunami survivors on their views regarding the preservation of the memory of the city of Banda Aceh, which was victim to a tsunami in 2004. The survivors emphasized the practical role of the memory of the Tsunami on sustainable heritage planning where the chance to rebuild anew involved a revision of the past. Though this is a case of a natural disaster and not a system of racial discrimination, the same concept applies. The past instructed the developments and changes of the present. Memorials commemorating the dead were set up in the city of Aceh, building strategies were developed, and knowledge of social, religious and life values emerged. These values, according to Meutia et al. (2021), are significant for the practice of urban heritage planning because they are packed with meaning and cultural heritage which in turn change traditions and lifestyles for the better without forgetting history. Social sustainability is achieved through reiterating instances where human rights were disregarded and in turn emphasized their importance for the present and the future. Adaptive reuse projects and memorials become present manifestations of past lessons transforming the future for the better. In the context of this paper, dark heritage is approached as a significant component of city identity and memory and a revelation of what built and continues to build the religious, social, and racial structure of the city of Bahia.

2   Memorials

The most direct method for conserving memory in a city is through building a memorial. A memorial is a present construct that carries a story of the past. Several examples of memorials include the 9/11 memorial in New York City, or Maya Lin's 1982 Vietnam Veterans Memorial in Washington D.C., where in these memorials a story was narrated, a memory was preserved and the dead were honored. The design of the 9/11 memorial consists of two large recessions echoing the location of the twin towers. Water falling on all sides into the abyss could signify the falling of the towers. Names inscribed on the edges honor the victims and a neighboring museum narrates history through text and visuals. These memorials rely on visuals and text and maintain a subtle and almost melancholy feel yet they narrate loss and suffering.

The story of Salvador De Bahia shares that notion of loss and suffering but also of long-term oppression and dehumanization. A memorial most relevant to the happenings in Salvador De Bahia is The National Memorial for Peace and Justice in Montgomery, Alabama, which connects America to its dark history of slave trade and lynching (Hasian & Paliewicz, 2020). A tight hall containing 800, 6-foot tall rusted steel blocks—symbolizing bodies—that appear to gradually ascend as visitors proceed down a ramp (Cotter, 2018), represent the act of lynching, and translate it into a user-space experience (Fig. 1).

Distinct about this design strategy is that it does not rely solely on visuals and text, on the contrary, it appeals to visitors' experience of space. This is the design methodology that could be implemented in the design of memorials or memory spaces, a focus on experience rather than visuals.

2.1 The Pelourinho

The Pelourinho (meaning pillory) or Pelo is the historic center of Salvador De Bahia, and it is a site that witnessed the dehumanization and humiliation of the enslaved African community. The pillory is a construct that began in Europe's middle ages as a post for whipping/punishment (Marchant, 2005). It is a colonial tool for "reform" and reinforcement of jurisdiction and power over a community in question. An approximately two-meter pillar raised on a platform three steps from the ground, with two chain attachment points represent an inescapable symbol of the act of violence. Violence in this context is a discourse between the colonial officer and the enslaved African and is understood as an act against humanity, social inequality, and the principles that distinguish man from barbarian but more specifically, an act against the body.

The main site in question in the area of Pelourinho is called Largo Do Pelourinho meaning "long at the pillory" and is an open-air public space, covered with cobblestone and overlooked by a museum on the south and tourist-targeted shops on the east and west (Fig. 2). The site continues north to eventually terminate at a street intersection. Vehicles and pedestrians circulate up and down the sloped site and the museum's stairs provide seating.

With reference to the previous discussion and the subject matter of this paper on narrating history through visitor experience, a possible intervention in this site would bring about a subtle and an indirect spatial experience on the violence the site witnessed. Figure 3 illustrates a site-specific proposed intervention consisting of two walls that meet halfway at a distance of 80 cm in the proposed location of the pillory.

Enclosing a staircase for pedestrian circulation, the two walls invite the public to pass through a symbolic point of spatial difficulty that targets the body in space (Fig. 4). Simultaneously the memorial organizes vehicular and pedestrian circulation on site and the staircase serves as public seating space. The idea is to translate a historical happening into a memorable experience that involves the body via architectural intervention. In this case, the violence the enslaved body was subjected to is implied subtly through creating a condition of spatial and circulatory difficulty where the walls become 80 cm apart. Interaction with the construct instigates questions, answers, or conversations among visitors on why the walls appear to converge and result in a bottleneck effect. Once understood, the memorial will not only have succeeded in remembering the victims but also in revealing part of the sub-city's story.

Fig. 1 Steel blocks symbolizing bodies (Mass Design Group, 2018)

Fig. 2 Site of Largo Do Pelourinho
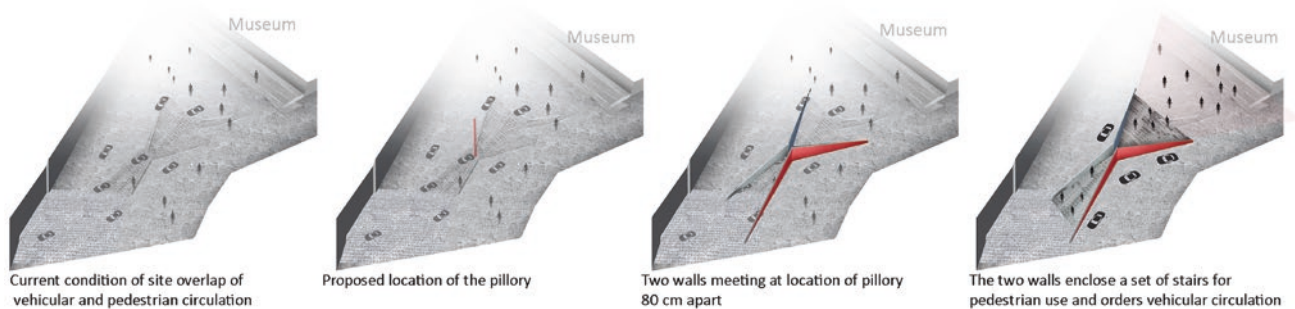
Fig. 3 Memorial design process diagrams

3 Adaptive Re-Use

The most challenging form of conservation is the adaptive re-use of historical buildings. Different from a memorial, a historical building is built in the past and exemplifies the craftsmanship, the materials, and methods of the old ways. It stands as a reminder of past cultures, lives, and historical events. Therefore, in assigning a new use to an old building, designers must be considerate of the importance of preserving heritage or as Bullen and Love (2011) stated: "The most successful adaptive reuse projects are those that respect and retain a building's heritage significance as well as add a contemporary layer that provides value for the future." This could be understood as a restoration whereby, some aspects of history are restored or a process of selective remembrance (Pendlebury et al., 2018) is applied. However, buildings with a sensitive history set a task that requires careful weighing of the advantages of preserving original features (Blueprint Magazine, 2014). While building and designing for the future entail new materials and building construction techniques, designing for the past requires careful consideration in linking between the past, the present, and the future. Through a building, the new use must subtly tell a story of the past, provide a solution for the present, and plan for the future.
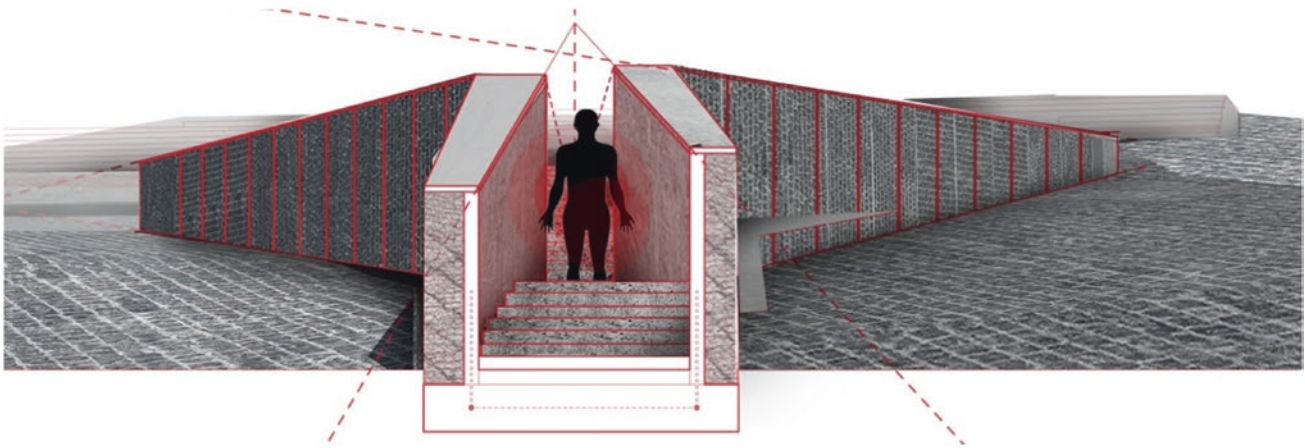
Fig. 4 Memorial design section

Narration of the past can be achieved via the design of user experiences. In appealing to a user's experience of space through subjecting the body to subtle implications of historical happenings via the specific articulation of program, organization and circulation, memory starts to communicate, not visually, but experientially.

Sensitive adaptive reuse projects include the restoration or rehabilitation of prisons to hotels such as the Oxford Jail in England where many of the cells' original structures and components were maintained with few spatial adjustments. The materials, feel and visuals were changed but the memory was preserved through mere user experience of tight spaces and overall program of daily inhabitation. In Salvador De Bahia, several eighteenth-century colonial houses were abandoned by residents, resulting in many possible restoration projects that could narrate the struggle of the formerly enslaved community in the city.

3.1 Sugar Plantations

Brazil was transformed socially and economically in the 1530 s with the introduction of the sugar cane industry. Concentrated in the cities of Salvador De Bahia and Pernamubuco, there were around 18 engenhos or sugar cane mills in Bahia in 1570, which increased to 36 mills in 1585 (Schwartz, 2005). From around 1570 to the middle of the seventeenth century, Brazilian sugar dominated the European market. The process relied heavily on manual work where agricultural labor, heating, and clarification and purging were all done by hand. Machinery was involved only in the crushing of the cane and the extraction of the juice. This led to large waves of slave importation and consequent exploitation where continuous labor was demanded.

This constituted a major fragment of the city's historical narrative or aspects of the sub-city being discussed from the perspective of the enslaved community.

3.1.1 Colonial House 1

Located on Alfredo De Brito Street in the district of Pelourinho, this old abandoned colonial house dates back to the eighteenth century. Enclosed by two neighboring buildings, it maintains the Portuguese fenestrations in the façade and two interior walls, while the rest of the building has fallen victim to time (Fig. 5).

The house is currently owned by the government and is undergoing renovation as part of the Growth Acceleration Program in Bahia to house displaced families. This triggered the speculation on how a renovation project, targeting the exploitation of slaves on sugar plantations, could be designed.

Figure 6 illustrates a proposed intervention where a series of bridges penetrate the facade and the successive wall for pedestrian circulation, and a number of large planters are added between or next to the bridges. The planters are where local vegetables could be planted and picked by visitors. The building would be transformed into an open-air vegetable market and maintained/owned by two to three families residing in the unit.

The proposal is additive since it does not remove any of the components present on site. Given the fragility of the existing walls, a sub-structure consisting of steel I-beams spanning the width of the walls and attached to the neighboring buildings' walls on either side, would carry the bridges and planters. The unit provides displaced families in Bahia with residence and a source of income while simultaneously narrating the story of the enslaved community's exploitation at sugar plantation sites. The visitor circulating

Fig. 5 Colonial House 1 street and satellite images
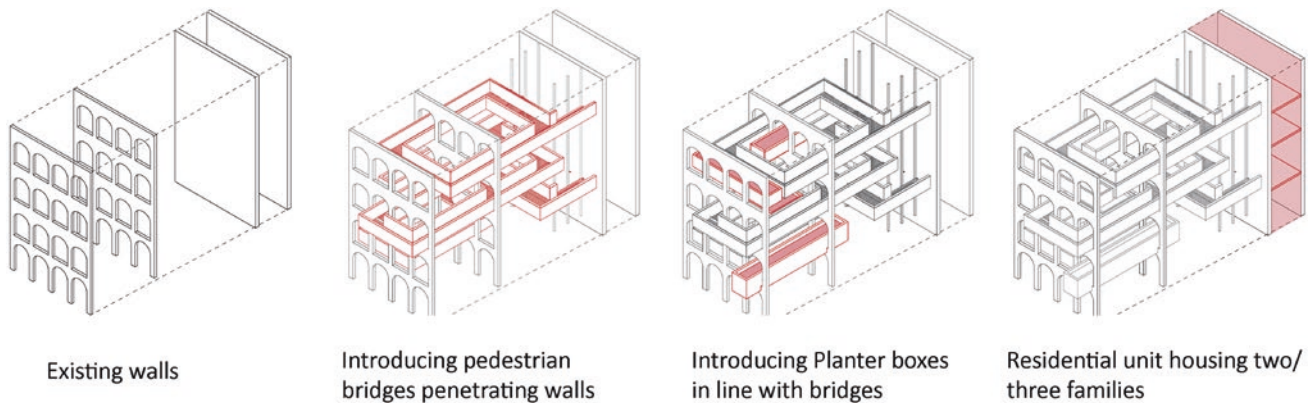
Fig. 6 Intervention 1 design process diagrams

within the specific bridges and manually picking vegetables is a subtle act of remembering the enslaved community's struggle at sugar plantations (Fig. 7). The past is implied, the present is accommodated, and the future is planned for.

3.2 Quilombos

Quilombos (meaning "hide-out") or mocambos were communities formed by runaway/freed slaves that carved space for their autonomy and freedom (Reis, 1988). Quilombos were set up in remote areas within forests/jungles or near plantation sites due to the dependency of the members on agriculture and found resources. In the beginning of the nineteenth century, the outskirts of Bahia hid numerous small quilombos that served as places of refuge or respite (Reis et al., 2001). Palmares was the largest known quilombo with a population of around 10,000–30,000 people and was located in a mountain block northeast of Pernambuco.

The idea of finding respite, seeking refuge or searching for seclusion inspired the next intervention which again demonstrates the conservation of memory via the design of user-space experience.
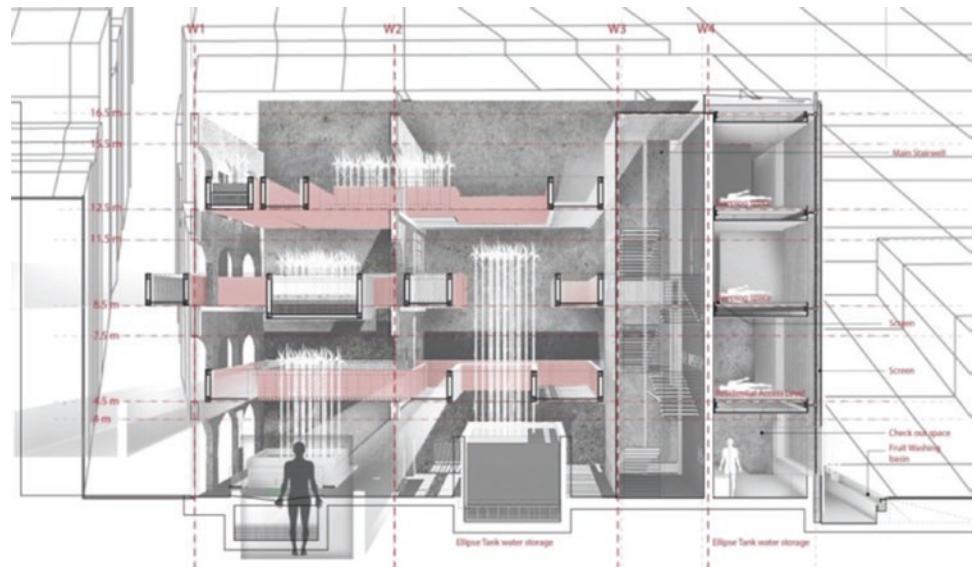
3.2.1 Colonial House 2

Found on Tabuao Street, this old colonial house (Fig. 8) is in a rundown state. The façade is stabilized with a steel structure and no visible traces of its previous state are evident. Barren on the interior with the exception of vegetation crawling from the inside out, this enclosure served as yet another possible renovation project that could narrate another aspect of the sub-city. It is significant to mention that the notion of the sub-city discussed in this paper tackles the underlying city identity that is not advertised and that is revealed through these proposed interventions.

The enslaved community's resort to seclusion signified an important period in history. Those quilombos grew to become their only refuge, their peaceful haven. Translating this to a program, the proposed intervention is to house a secluded public gathering space(s). Accessed through a staircase from the street or the hill above, the construct consists of a series of walls raised one meter from the ground. The hovering walls divide the main space into a number of sub spaces. Access to the spaces will require crawling or bending below the walls to reach the skylight lit spaces. A green roof covers the construct, which allows
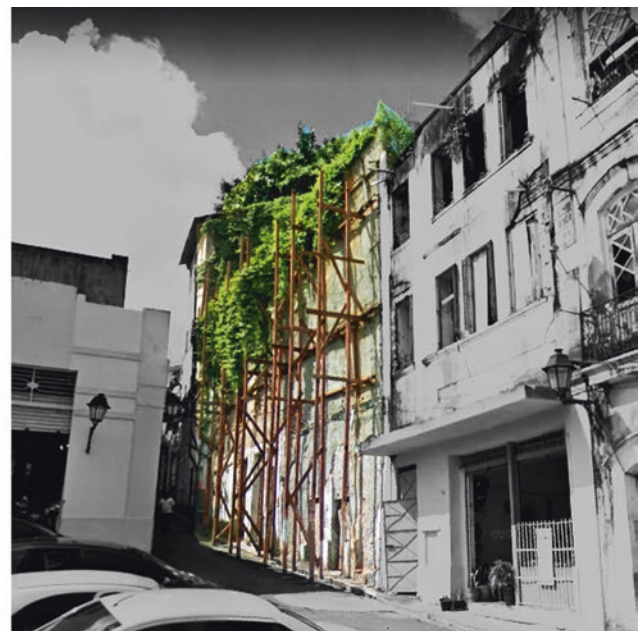
Fig. 8 Colonial House 2 street and satellite images

for vegetation to project into the spaces below in a homogenous jungle-like quality. This borrows the concealment strategies of quilombos in adopting the visuals of the jungles they inhabit. Seclusion becomes the procession or the act of finding it through maneuvering around or below walls (Fig. 9).

The hovering walls integrate seating conditions and are supported by structural walls via steel I-beams. The resort to safety and seclusion is the experience the visitor will manifest in interacting with the space, which in turn will preserve the memory of the creation of the Quilombos (Fig. 10).

Initital condition - An empty encoulusre

Staircase for lower and upper access. Accessible floor is elevated 2 m to reduce noise

Structural walls added

Thick walls hovering above ground with integrated seating conditions
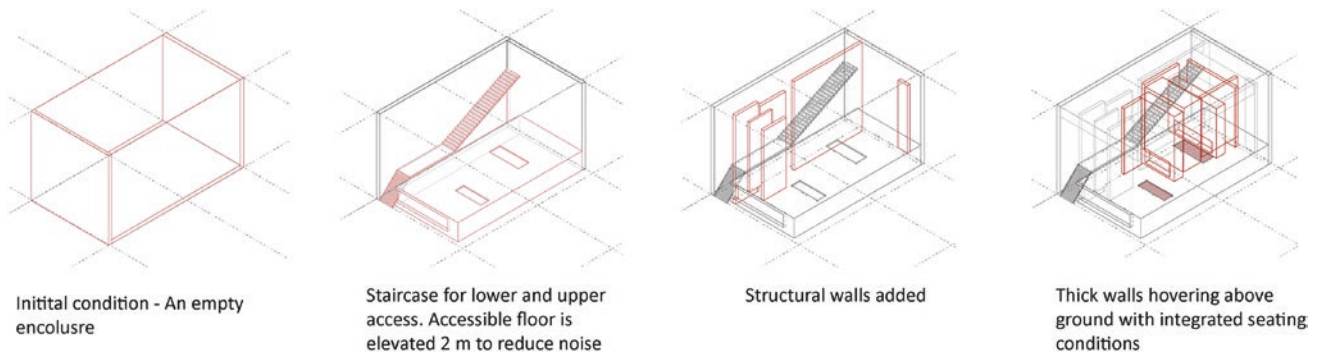
Fig. 9 Intervention 2 Design process diagrams

Day Time Seclusion

Ground Integrated light fixture
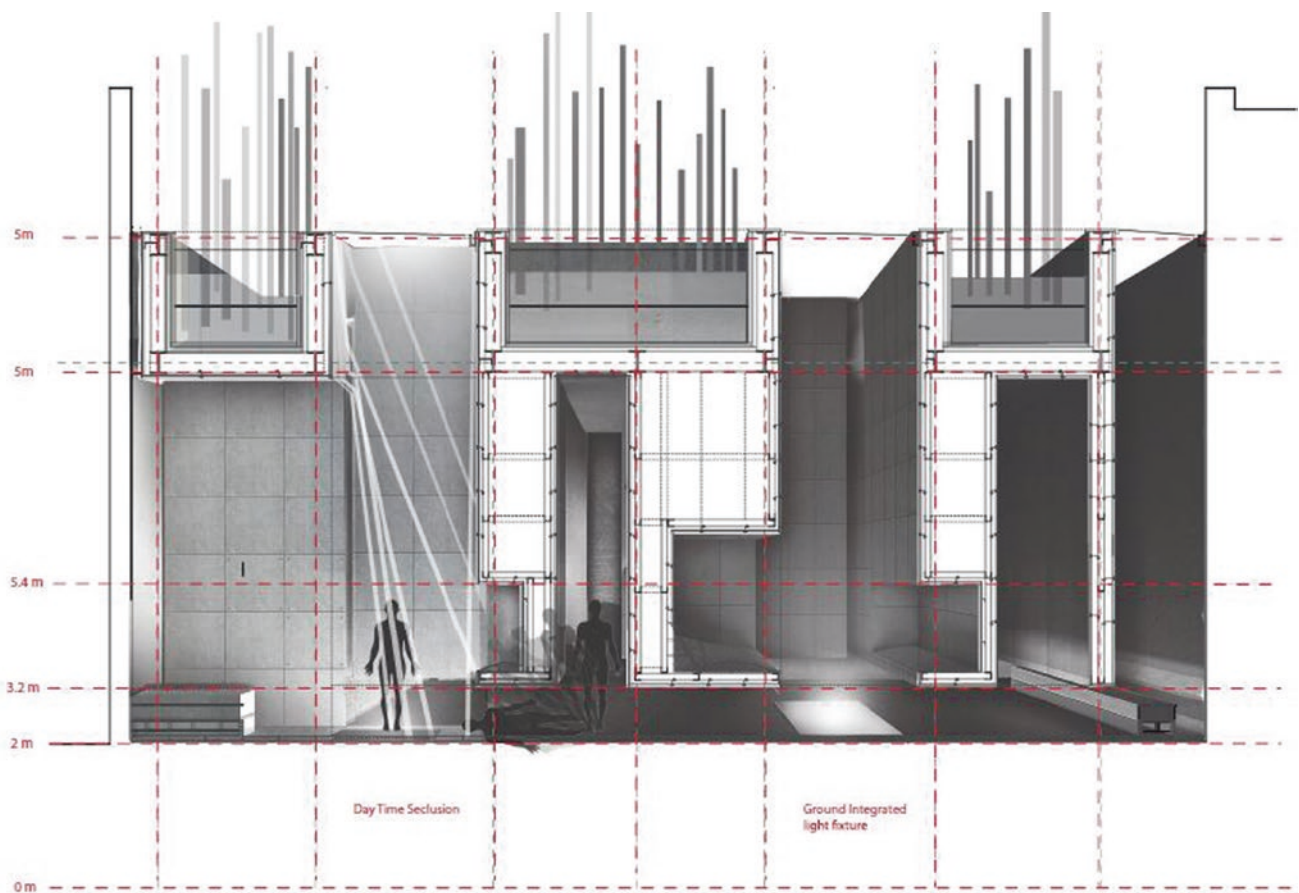
Fig. 10 Intervention 2 design section

4 Conclusion

The interventions presented in this paper within the framework of memorials or adaptive re-use projects serve as present acts of past events, and they realize the nature of the events as a relationship between body and space; the way the user occupies or circulates within the space. The programs within those spaces reference some historical events undergone by the enslaved community of Bahia. The acts of the sub-city are fragments of the city's memory or are architectural interventions that draw historical memory via spatial events. This is to propose a new strategy at historical conservation, one that translates remembering to experience without solely relying on visuals, materiality, or text. The sub-city is the sedimentation of memory, history, and heritage and through conservation, restoration, or renovation, designers are able to reveal fragments of the sub-city that are solid constituents of city identity. There remain multiple aspects of the city to be revealed.

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Documenting the Works of the Philippine National Artists in Architecture

Jocelyn A. Rivera-Lutap and John Benedict A. Castillo

Abstract

The Philippines has trailblazed in recognizing its artists who have championed its culture, heritage, and tradition. Proclamation No. 1001, s. 1972, signed by then President Ferdinand E. Marcos, aims to give the highest distinction to Filipino Artists who have exemplarily promoted the identity of the country with utmost dignity and integrity. The National Artist Award covers the areas of music, dance, theatre, visual arts, literature, film and media, arts, architecture, and design. Over time, the preservation of the arts has been perfected by law, awareness of the people, and advancement of technology. However, the field of architecture has become a challenge due to its cost and ownership of the structures. To date, there are six National Artists in Architecture, namely Juan F. Nakpil, Pablo S. Antonio, Leandro V. Locsin, Ildefonso P. Santos, Jr., Jose Maria V. Zaragoza, and Francisco T. Mañosa, who have all passed away. This study aims to document the works of these National Artists and identify the buildings that are still in physical existence, as a means of providing clearer public perception, which in turn can contribute to the protection and preservation of their legacy. Descriptive and archival methodologies were utilized. It is notable that some of the structures that were created by these prominent architects have since been demolished. The purview of the research takes into consideration the laws that protect the heritage of the country. Investigative findings revealed that demolitions of such heritage architecture can sometimes be inevitable because there are contributing factors, like economic, lifespan, and urbanization, to name a few. Despite this predicament, intervention is still viable . Technology, specifically digitalization or Virtual Reality, is a key channel so that the next generation will still be able to appreciate, enjoy, and comprehend the works of the National Artists, even those not existing in the physical world anymore.

1 Introduction

The race to protect heritage by the citizens of the world has been a lengthy battle of preservation cost and the economic returns specifically from the built heritage. The question is whether to preserve the built heritage or to demolish it and give way to new developments perceived to provide higher revenue not just for the owners but for the community. The heritage conservators are fighting for the protection and preservation of tangible and intangible assets that they deem priceless. This process has been termed as "collective memory." A community's collective memory is a shared representation of the past that helps define its collective identity (Halbwachs, 1950).

However, because of the transition of the built heritage, identifying what represents a collective memory must be established. A memory can only be considered collective if it is widely shared, as well as if it aids in identifying and unifying a group that dwells it to the malleability of one's remembrance and recollection (Brown, 2012; Assmann, 1999). Our history, legacy, the way we interact our thoughts, and creativity all represent our culture, and this is strengthened by how we preserve our traditions and heritage.

Architecture is more challenging to preserve than other forms of art. The evaluation of heritage values is a crucial

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activity such tenets have a massive impact on conservation efforts and decision-making processes of the stakeholders (Dela Torre, 2002). In the report of the Getty Conservation Institute entitled "Assessing the Values of Cultural Heritage," it was explicitly laid out that the questions on how a heritage structure/s can be assessed are as follows:

1. Characterizing values involves the identity of the heritage under review and its relevance to the stakeholders.
2. Methodological issues and strategies for assessing heritage values are important decision that has to be made by the stakeholders.
3. Aids for inducing heritage values: How can the opinions of several people having interest in a heritage site be adapted in the conservation planning stage, including its specific value-assessment phase?
4. Unifying appraisals and charting decision-making: When the scope of heritage values has been enunciated, how can they apprise decision-making?

On April 27, 1972, President Ferdinand E. Marcos signed Proclamation No. 1001, s. 1972, declaring Fernando Amorsolo a National Artist. This was followed by Proclamation No. 1144, s. 1973, on 15 May, naming the Cultural Center of the Philippines (CCP) Board of Trustees as the National Awards Committee Secretariat. The Philippine government, in its predilection to celebrate its people who have contributed to promoting the culture and heritage through their arts, passed Presidential Decree No. 208 on June 7, 1973, granting certain privileges and honor to the National Artist. On April 3, 1992, Republic Act No. 7356 created the National Commission for Culture and the Arts (NCCA), upon the recommendation of the two institutions to the President of the Philippines, conferring the rank and title in the fields of Music, Dance, Theater, Visual Arts, Literature, Film and Broadcast Arts, and Architecture or Allied Arts.

The preservation of architectural structures is arguably the most pressing and demanding to address because of the usual substantial space it occupies and as it is constantly exposed to elements that affect the wear and tear of the edifices (Berg, 2018; Giulani et al., 2021). The challenges in documenting the work of the National Artists are exemplified in the works of AbdelNaby in 2017. As further support, the Republic Act 10,066, s. 2010, otherwise known as "An act of providing the conservation of the National Cultural Heritage, Strengthening the National Commission for the Culture and the Arts (NCCA), and its Affiliated Cultural Agencies and for other purposes" was signed into law.

1.1   Objectives and Methodology

The Philippines, through the Republic Act No. 10066 known as the National Heritage Act of 2009, under Article V Section 14, created the Philippine Registry of Cultural Property (PRECUP). Such a database is a live record wherein updating is a must. Through this, the study aims to:

1. Recognize the influence of the work of the National Artists in the field of architecture.
2. Identify the works of the National Artist and classify the status of the structure.
3. Provide alternatives in documenting the works of the National Artist.
4. Utilize descriptive methods and assess extant archival materials pertaining to the National Artists in architecture of the Philippines.

1.2   Scope and Delimitations of the Study

The general works of the six Philippine National Artists in Architecture are the prime focus of this study. The current mobility restrictions in the country have resulted in most library and archival facilities to migrate to online modality, thus impeding the full accessibility of information. As such, temporary creations such as installations, theatrical sets, exhibition pieces, privately-owned dwellings that are not historic houses, smaller scale works on structures are not included in the analysis.

2   Literature Review

The Philippines has long been a sanctuary of diversity with the emergence of numerous sub-cultures being a celebrated norm. Tracing back to the precolonial era, people in the archipelago had a building style that shared a tight resemblance with their Southeast Asian neighbors. The natives were creative, having the ability to design a structure even with limited materials, all while adapting to a harsh equatorial environment and complying with the traditions necessary to consider such structures acceptable to the community. The most prominent product of this norm is the *bahay kubo* or nipa hut, which since then has become an inspiration, prototype, and symbol in defining what Philippine architecture is like (Cabalfin, 2020). Vital information, in this case, the native architectural ideologies, flowed freely throughout the region via trade. It, however, slowed down and was effectively overshadowed by the ruling colonial influence for about 384 years.

2.1 An Architectural Renewal

The native-based progress was rekindled gradually in the 1900s, with the more libertarian approach to governance by the United States (US). The situation also promptly became evident in various professional fields including Architecture, through the ratification of Act No. 854, entitled "Pensionado Act" by the US Congress, which gave better educational access to aspiring Filipinos by means of sending them to complete higher degree studies in various affiliated colleges and universities in the US mainland (Teodoro, 1999). The first Filipino architects were a product of this scholarship program, as there were no established architecture schools yet in the country at the time. The Second World War forced the execution of architecture to a halt. Interestingly, despite the said case of foreground inactivity, the field's growth did, in fact, not stop, as some aspiring architects were still able to study abroad, while others inside the country utilized available circulating media, such as architectural digest magazines and books, among others. (Lico, 2021). Eventually, the Philippine Republic reached the golden age of its arts and sciences after the culmination of the Second World War. The economy began to recover and was even seen to be one of the fastest to do so among the developing nations (Overholt, 1986). The peak of Philippine architecture was in full swing soon thereafter, coinciding with the modernist architectural period. As independence and stability ensued, the opportunity for a proper discussion regarding the Filipino cultural heritage and the realization of a national identity finally came.

2.2 Digitally Documenting Architectural Heritage

The only thing constant is change. It is a cliché; however, this cannot be more factual in the built heritage (UNESCO, Bokova, 2016; Rogers, 2017). Due to these changes, while there are deliberate efforts to protect and preserve the architectural heritage, there is a need to document the structure in order to ensure that the next generation will be fully aware of their past. The most traditional forms of documentation are drawings, recordings, and prints. The world has witnessed the effect of technology on the lives of people in the documentation of the structures, from the engravings of the buildings and communities to photographs and eventually saving it through digitalization. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) recognized the contribution of digitizing and usage of computer-based materials to ensure that future generations will be able to understand their heritage. As technological advancement has exponentially grown in recent decades, digital documentation has already become widely accepted as an indispensable part of the present heritage conservation process (Danesh & Rajabi, 2022). It is fueled by its great capacity to translate physical architectural form into a highly comprehensive and immersive medium that can be readily available to a wide variety of audiences. The same also allows for a more in-depth study of either specific components or the total whole of the structure in a non-destructive manner because its execution does not really require direct contact. Another advantage of digital documentation is that it can easily be employed in urban-scale digital heritage production involving several buildings because each digital building data can be successively compiled to create a more extensive group model.

Digital documentation is an evidently all-encompassing subject as it can be taken and tapped from numerous sides: first is for matters concerning efficient data acquisition and preservation of a multitude of technical information, both qualitative and quantitative, that would then be organized for a better understanding of stakeholders regarding the history of the building (Khalil et al., 2020). There would be instances wherein a heritage structure does not have any surviving information; hence digital documentation can prove itself useful for immediately providing particulars of the building based on highly technological analysis. Second, is the showcasing of building features and parts for public and/or private consumption to expand the understanding regarding the nature of the structure. Third is for pre-intervention studies, most especially those issues beyond the superficial level, wherein digital documentation can be employed to come up with an objective intervention model perfect for the specific case of the structure (Zhao et al., 2019). Fourth is for comparative studies, as in the work of Mori et al. (2018), wherein 3D digital data were utilized to juxtapose as-is qualities of certain parts of the Barbar temple against photographs from the past to realize the natural and man-made changes that transpired and its consequence to the aesthetic and stability of the architecture.

2.3 On Digital Materials Associated with Architectural Documentation

The digital platform has also been positively recognized for its capability and efficient applicability for cultural heritage preservation, as applied in various independent scientific studies (Agosto & Bornaz, 2017). Banfi et al. (2017) discuss how the latest information technology developments have enabled the creation of novel virtual experiences favoring an increasingly higher level of information connected to the 3D reconstruction. Building Information Modelling (BIM), 3D cloud services, and virtual/

augmented reality (AR-VR) projects are the frequently used procedures to convey the treasure of built heritage from both the dimensional and educational perspectives of one of the predominant places of worship in Milan—the Basilica of Sant'Ambrogio. The Basilica exemplified the most successful use of digital technology in preserving the structure for the appreciation of future generations. Various techniques and technological materials make the digital approach to recording possible. One is photogrammetry which, as defined by Schenk in 2005, is a scientific process of obtaining precise data and evaluating of physical surfaces and objects in their totality, even without establishing physical contact. The process may further be categorized according to proximity, including Aerial, Terrestrial, Close Range, and Space Photogrammetry. The third one produces the highest definition output and is performed by the utilization of unmanned aerial vehicles (UAVs) such as drones. Nowadays, a photogrammetry survey is regarded as a simple and cost-effective mapping solution, thus becoming an increasingly common procedure for exterior documentation (Steinicke & Feller, 2008).

Other subsequent processes and materials involved with digital documentation and production of 3D immersive structural replica include: point-cloud to 3D model, BIM through specialized software like Autodesk Revit, texture wrapping, and image processing procedures (e.g. colorization of model and color grading of the generated environment), digital rendering via rendering software integrated with BIM, high accurate laser scanning, X-Ray tied with digital platforms for viewing and analysis, Light Detection and Ranging (LiDAR), which are now extremely accessible via cameras of mobile devices, as well as supplementary materials for establishing an environment in line with anthropometry like head-mounted devices (HMD) and handheld devices for accessible computing (Desai, 2018).

2.4   Integrating with Digital Platform

The digital documentation should not terminate with the actual documentation process. It is ideal to be paired with synchronized digital repositories that would make it easily accessible to enthusiasts and experts alike. This fulfills the accessibility aspect of digital documents, ensures that the said documents remain valued, and strengthens the functionality of digital platform as a form of high-impact learning material and environment, mainly for education (Fortenberry, 2019). The increasing shift of teaching towards online setup could also suggest a benefit for students, particularly those in specialized programs such as architecture and heritage conservation if the digital heritage records are to be highly integrated with institutional platforms or portals.

The museums are also going with the trend of using digital means to showcase artifacts for a more experiential tour and retelling of historical information to their audience. Hence, the idea of using digital museums and even the translation of technical data into mobile-based applications can result in a unique knowledge enrichment, highly appropriate for the present time (Koukoulis & Koukopoulos, 2016).

2.5   Architectural Digitalization Trends in the Philippines

In the Philippines, the current trends in digital methodologies in relation to the conservation of built heritage and its legacy are observed to still be in a developing phase. The major utilization of such technology in the field is aligned with purposes concerning architectural information recording, specifically the formation of synchronized databases or repositories, with one of the timely examples being the recently launched PRECUP. On the other hand, the application of various digital functions to actual conservation works is still relatively limited. An example would be the extensive restoration works performed at the Manila Cathedral in the historic Intramuros district from 2012 to 2014. In this project, digital tools such as High Definition (HD) 3D-Laser Scanning were employed to generate a 3D model of the said architecture, thus acquiring in the process accurate as-built plans which served as one of the main references for the restoration works (Lao, 2013; Tumang, 2017). Other tools that were utilized are Scanning Electron Microscopy (SEM) for proper digital imaging, X-Ray Fluorescence Analysis (XRF), and Energy Dispersive X-Ray Spectroscopy (EDX) to picture the structure's elemental composition and translate it to quantitative data for in-depth assessment (Malicse et al., n.d.). Furthermore, studies concerning the capability development of digital platforms for national conservation use are widely uncultivated and still remain ambiguous to non-specialized professions due to the high equipment cost in the past. This resulted in a lag in the development of the area and its corresponding application to heritage projects.

There also has been a rising local awareness of digital documentation as proper mitigation for events that may endanger heritage architectures, may it be foreseen or not. In the project of Febro in 2020, a photogrammetry technique was conducted on four UNESCO-recognized Baroque churches, namely the San Agustin Church in Manila, Paoay Church in Ilocos Norte, Sta. Maria Church in Ilocos Sur, and Miag-ao Church in Iloilo, to pursue proper 3D architectural documentation. The initiative was able to successfully present 3D HD digital visualization in a relatively cheap method using only one drone and camera. The

pandemic has also encouraged the widespread migration away from manual means, thus a bigger role and prospect in addressing the previously stated gaps of providing a continuous and future-proof flow of information regarding historical architecture through the maximization of digital platforms.

3 Analysis

The documentation process of this study is methodically presented in a synthesized graphical approach, following the cataloging of significant works by the Philippine National Artists in Architecture, referenced from both personal accounts as well as the PRECUP. Devised as support to the Philippine Republic Act 10,066, otherwise known as the National Heritage Act of 2009, it is a comprehensive database of cultural heritage, which can serve as an established reference tool in retrieving vital cultural artifacts, and as a prerequisite to further studies and possible future works concerning them (NCCA, 2018). The agency responsible for the management and maintenance of the registry is the NCCA, together with other heritage agencies, specifically the National Archives of the Philippines (NAP), the National Library (NLP), the National Historical Commission of the Philippines (NHCP), the National Museum (NM), and local government units. The analysis proper was divided into six subparts, examining the individual accounts and contributions of each National Artist. It began with a biographical analysis to comprehend how each of the six architects arrived at their triumphant career, to understand how they have been exposed to the global architectural scene, to grasp how each of them interpreted their learnings and translated them to the unique sociocultural context of the country, and to view what architectural period/s did their careers coincide with. Afterward, the results of the tabulation of their works were laid down and assessed to establish a realization regarding their current state and heritage value. In this part, four parameters were shown, namely: typology, location, current status, and heritage designation. These parameters serve as the classifications that can efficiently present relevant information regarding their documented works, all adopted from the registry, as well as the common heritage indexing method done by the International Council on Monuments and Sites (ICOMOS, 1996). The heritage status parameter was further sub-categorized below to have a glimpse of the prospect that the specific National Artist's legacy may have in the future:

– Unlisted and unmarked—identity does not reflect on the PRECUP, the site does not have a heritage marker, but upon further research of archival records, including anecdotes, biographies, and/or other verifiable documents, the architecture was proven to be tied with the respective National Artist.
– Listed but unmarked—identity reflects on the PRECUP, but a heritage marker is not present on the site.
– Marked and identified structure—the building has an official marker and reflects on the PRECUP.
– Marked, identified, and recognized with cultural significance—the building has an official marker, reflects on the PRECUP, and is given a heritage distinction by either a local heritage conservation agency or an international heritage conservation body, thus solidifying the role and importance to the culture of the country, which may either be: National Cultural Treasures, Important Cultural Property, National Historical Shrines, National Historical Landmarks, National Historical Monuments, and UNESCO World Heritage Sites.

3.1 Juan Felipe De Jesus Nakpil

The first recipient of the National Artist in Architecture award in 1973 was a pillar of both pre-war and post-war architecture in the Philippines. As the rebuilding and rehabilitation period, along with the state's overall renewal, commenced, he pioneered the idea of the existence of a so-called Filipino Architecture. Notably, Nakpil also established the betterment of the national architectural profession and its wider integration into society because, through his voice, the involvement of private Filipino architects with government projects, which was not possible before, was finally allowed (NCCA, n.d.).

According to biographical records, Nakpil was incredibly inclined to the creative world. He was both a civil engineer and an architect. He originally took his civil engineering studies at the University of the Philippines (UP) but left to continue in the US at the University of Kansas, finishing the program in 1922. He continued studying the field of construction, as he finally pursued the Architectural program at Fontainebleau School of Fine Arts in France, and afterward returned to the US, completing his master's degree at Harvard University in 1926. Such exploration proved useful as he was greatly exposed to the timely and innovative architectural norms, theories, and practices, which he brought with him as he returned to the archipelago and took part in revolutionizing its built environment (Nakpil & Nakpil-Tañada, 2010).

Nakpil was able to collaborate closely with other Filipino architects of the twentieth century, performing collaborative projects with Andres Luna de San Pedro during the early phase of their career, producing buildings such as the Perez-Samanillo Building, the Crystal Arcade, etc. Moreover, Nakpil, Luna, and Arellano witnessed first-hand the introduction of a then-newly emerging architectural

style at the 1925 Paris International Exhibition of Modern and Industrial Arts. The said design approach was later named Art Deco and became a defining period in Philippine architecture, as these three architects began propagating it to the country (Chua, 2021). The career of Nakpil comprises public, private, as well as teaching practice, for he also served in the first architectural schools in the country, teaching another breed of designers and even students who would later become the deans of those institutions (Nakpil & Nakpil-Tañada, 2010). The architect became synonymous with Philippine Art Deco, as the majority of his works were built in this style, specifically the sub-style called "Tropical Art Deco"—an adaptation of the traditional western Art Deco period style to the hot and humid climatic context of the Philippines (Almario, 2003) (Figs. 1, 2 and 3).

A total of 68 architectural works of Nakpil were able to be documented in this study, and upon analysis, the architect has mostly designed offices and then independent theaters in various parts of Manila. At first, it may seem like this is a good sign; however, these buildings are in

an undermaintained state, most of which are occupied by retail vendors particularly his buildings around Binondo, Sta. Cruz, and Ermita districts. While these are the trends, there are buildings, as depicted in Figs. 4 and 5, which have missing data, impeding their identification. Moreover, Fig. 6 illustrates that there is a considerable number of marked structures by Nakpil, but the majority are still unmarked and often unrecognized by the public. Nakpil was a renowned designer of theaters but most of these were already lost, demolished, and are now either vacant or replaced by a contemporary structure. His religious buildings are still intact, with the Basilica of the Black Nazarene still in a good state, well-visited by tourists, visitors, and devotees alike. The Quezon Institute—an old tuberculosis facility largest in the metro featuring a beautiful execution of Art Deco, is still in a considerable state, with some of its portion being adaptively reused as an orphanage.

3.2 Pablo Sebero Antonio

Born in 1902, Pablo Antonio grew up in the historic Binondo district of the country's capital city. He became well-known for his simple yet bold style of design, aligning himself towards the then-new facets of modernism instead of the high ornamentations of preceding academic styles like that of the Beaux Arts. Antonio was able to aptly facilitate the expansion of the then still relatively young architectural profession in the Philippines, serving as a professor in various architectural schools, as an official of several organizations, and as a member of the professional board, along with Nakpil, tasked to oversee the local architectural board exam.

He attended the Mapua Institute of Technology; however, he discontinued due to financial challenges. Antonio's career, especially public service, began so early, as he became a draftsman for the Bureau of Public Works, then worked at the Sta. Clara Lumber and Construction, Co., which was responsible for supervising the creation of several civic structures, like the neoclassical edifices of the Legislative Building and Post Office Building. The company's owner, Don Ramon Arevalo, supported his formal studies abroad at the University of London. After impressively finishing his 5-year program in just 3 years, he further toured the said continent and, in 1932, returned to the Philippines with fresh ideas in mind (Barrera, 2021).

Antonio was highly regarded as an architect because he introduced to the lands a more conventional means of building and designing. In his works, he employed formal symmetry, the slickness of elements and lines, and plain masses often shaped in a rectangular manner, thus creating a new sense of both strength and elegance. His chosen materials also expressed his practicality as he was one of

Fig. 1 Capitol theater. *Source* Fmgverson (2014)

Fig. 2 Quiapo Church façade. *Source* Quesada (2013)

the first Filipino architects to fully utilize the capabilities of concrete and steel in construction (Perez III, 1994). In his later years, he was a decorated professional, gaining several awards, including the National Artist Award in Architecture, posthumously given to him in 1976.

The country's largest ensemble of Art Deco structures under one ownership is the Far Eastern University Manila Campus. The very first building (Fig. 7) was commissioned in 1939, and among his 82 documented buildings in this study, it was determined that the complex is by far the most well-preserved. This is further supported by the fact that it garnered the Asia Pacific Heritage Award for Cultural Heritage from UNESCO in 2005, for the administration's effort in properly maintaining and securing the integrity of these heritage structures, even in the case of inevitable expansion of the campus and modernization of its other parts (Fig. 8) (Ortiz, 2007).

The majority of his documented designs, 58 to be exact, are listed in either the PRECUP or on verified reports; however, they are not protected by the presence of a heritage marker. Antonio's Ideal Theater—one of his most celebrated structures was not able to withstand

modernization and was superseded by an establishment. It is sufficient to say that the reason behind it is the deliberate execution of alterations and interventions in favor of contemporary designs, thus creating a hindrance in determining or cross-checking old records (e.g. photographs and plans) with the current appearance and space planning of such buildings. As a support to the former, if the no data available criterion is to be excluded, Figs. 9, 10 and 11 clearly show that most of the buildings by Antonio, which are offices and theaters around Manila, were modified. Manifestation of this trend is expected in those buildings with missing data. A key finding in his works is that those typologies grounded on stability due to their long-time existence in society, like education use, are those still surviving. This is as opposed to his theaters which serve as a channel for pleasure—a subject that is and will always remain transitory and ever-changing along with time. Architecture housing ephemeral subjects such as those mentioned are more prone to adjustment and exposure to change, hence a consequent added difficulty in securing its genuineness against losing to newer styles, ideologies, and social movements.
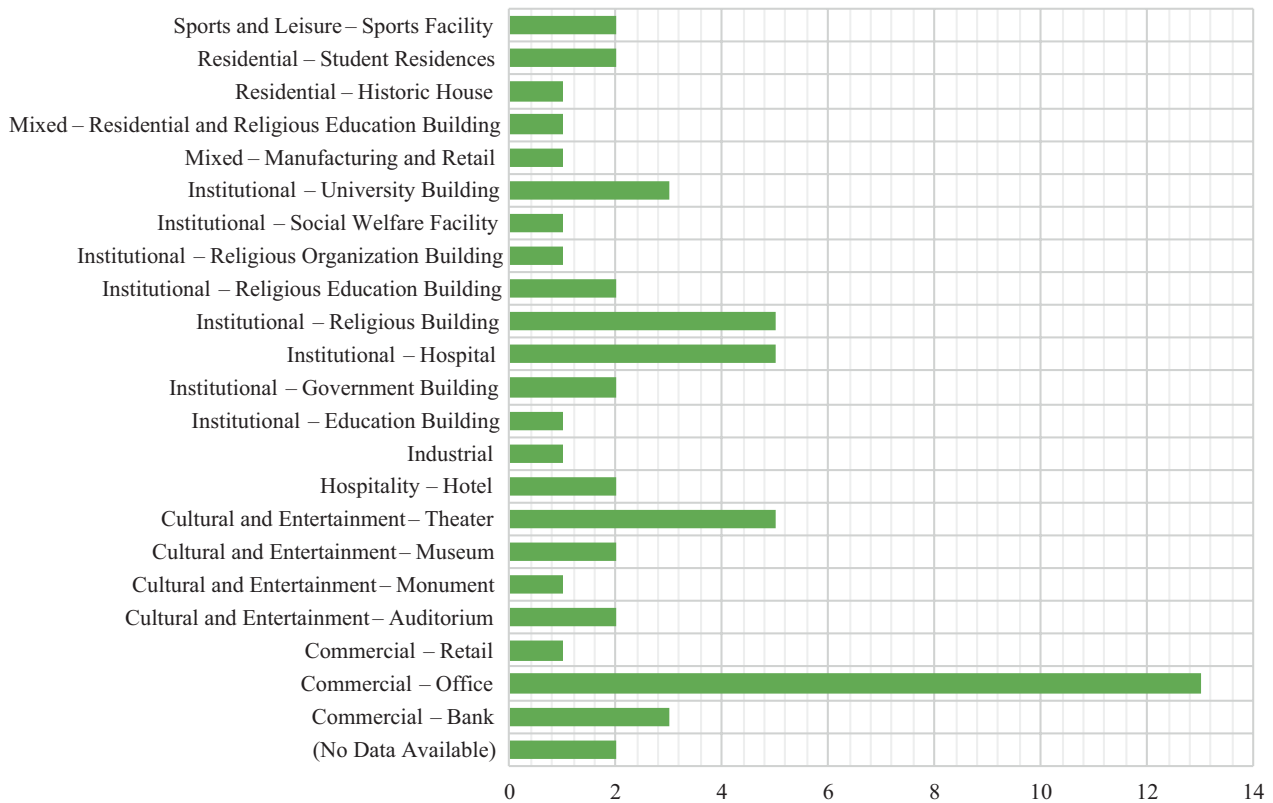
Fig. 3 Documentation of Nakpil's architectural typology

3.3   Leandro Valencia Locsin

The unity of the great occidental and oriental cultures produces a profound harmony called Philippine Architecture. Leandro V. Locsin brought such a vision and utilized it as his design philosophy. He was a prominent designer in the 1980s that produced numerous huge-scale buildings. He undertook his higher studies in music at the University of Santo Tomas (UST) Conservatory of Music but afterward transferred to its Architecture school. He finished the program in 1953. Locsin worked as a draftsman for the Ayala Corporation—one of the biggest land developers in the country. He also initially did theatrical set designs, and in 1954, he was commissioned to create a chapel inside the University of the Philippines (UP)—Diliman campus, which would have the capability to express openness, celebrate the passion of youth, as well as reflect back the holiness of God. Locsin achieved these by ingeniously utilizing thick concrete, which would later become his primary material of choice for the rest of his projects, and manipulating it to a saucer-shaped form, with a space plan deviating from the traditional cruciform, in favor of uniformity and openness, especially with the lack of dividing walls and doors (Paredes-Santillan, 2009).

Locsin was able to get a sense of the architectural trends right inside the country and took inspiration from traditional heritage models, translating them into a modernist manner characterized by rigidity, strength, stability, and uniqueness (Perez III, 1994). His buildings are easily identifiable by his brutalist designs. A play of heavy and light, sunken and floating, he would often stylize his architecture as a daring big mass that is seemingly buoyant in spite of such solidity, consequently giving a curious impression as to how it happens and how its structural design works (NCCA, n.d.). Such signature architectural characteristic is immediately seen in his most majestic work inside the country—the Cultural Center of the Philippines (CCP) Complex, which is an 88-ha reclaimed development that gave a face to the country's pursuit of celebrating its diverse heritage. The edificial National Theater (Fig. 13) is its centerpiece, again showing how Locsin played with the illusion of floating. Another is the Philippine International Convention Center (PICC) (Fig. 14), which then demonstrates the monumentality brought by a huge rectangular structure, supplemented by the horizontal spacings that bring about a state of dynamism. The said complex, specifically Locsin's works, is in a considerable state of maintenance, albeit some, such as the Philippine Center for International Trade and Exhibition
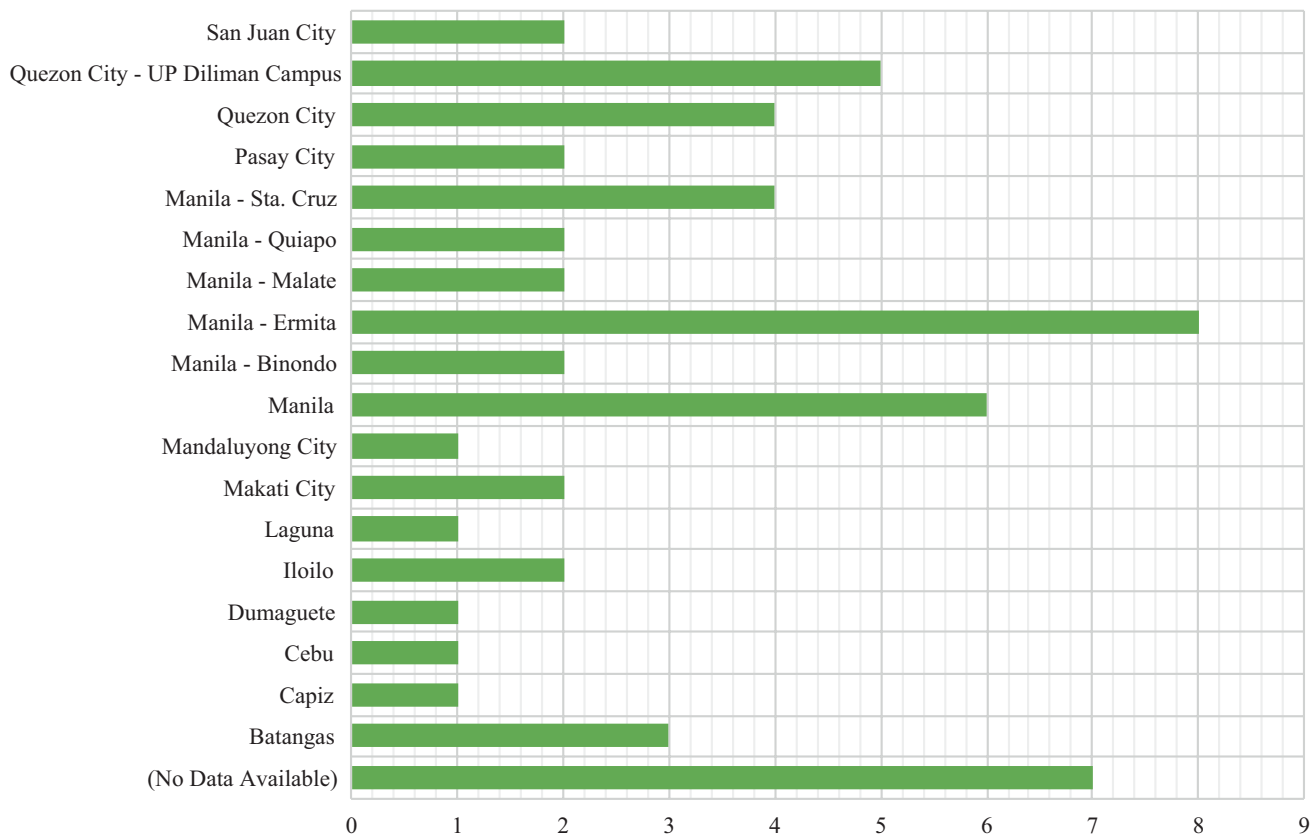
Fig. 4 Documentation of Nakpil's lcation of works
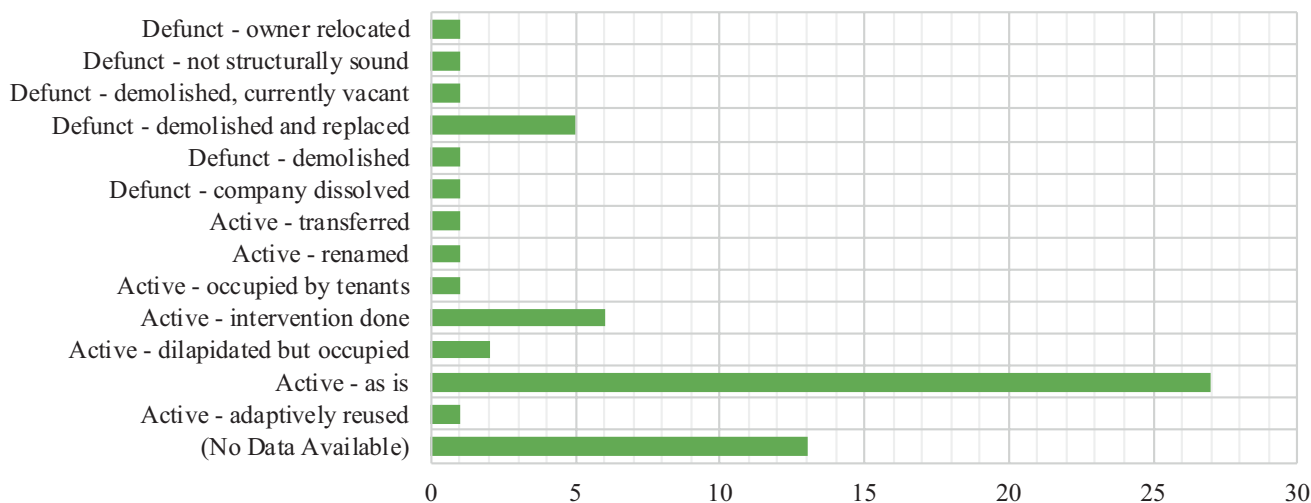
Fig. 5 Documentation of the current status of Nakpil's works

(PhilCITE) demolished, and the prototypical Folk Arts Theater being endangered to arrive in a similar circumstance. On the other hand, Locsin's biggest project was the Istana Nurul Imam in Brunei Darussalam, covering an expanse of 204,386m^2, commissioned by the Sultan of Brunei as his palatial residence and seat of government. Later in his career, he was a highly respected icon in the field, having received numerous prestigious awards.
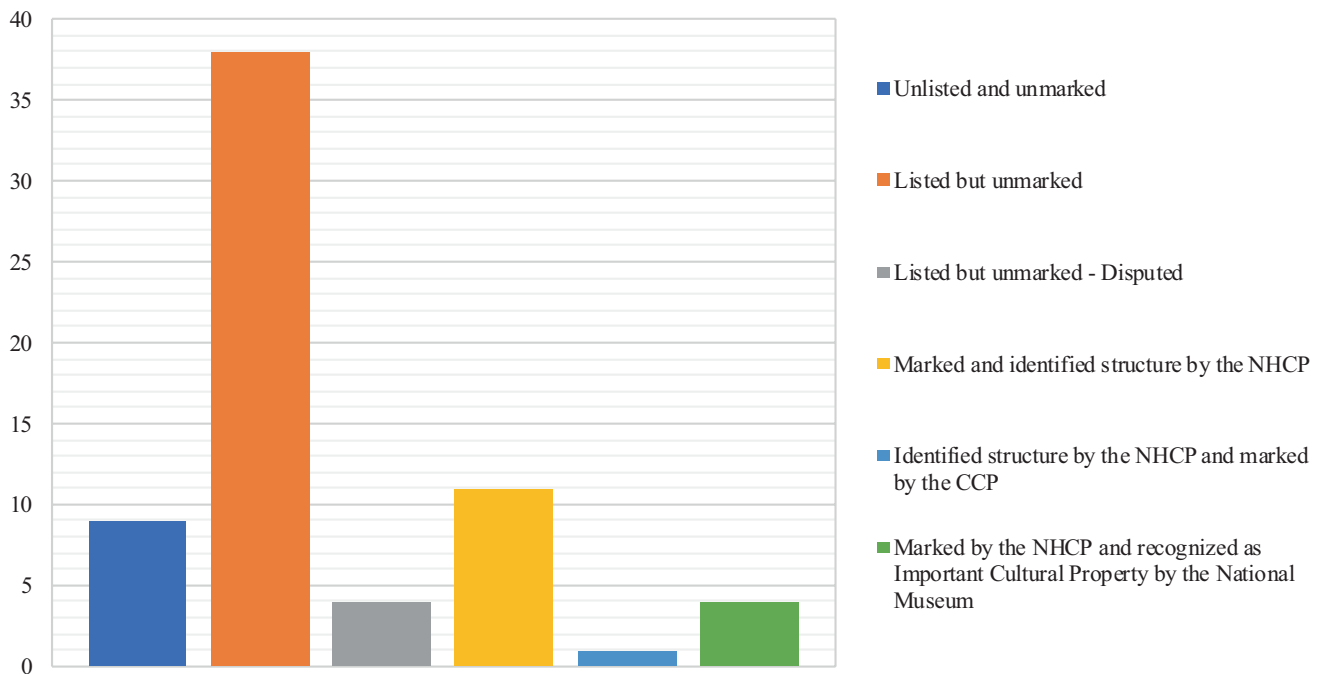
Fig. 6 Heritage designation of Nakpil's works

Fig. 7 FEU Nicanor Reyes, Sr. Hall. *Source* Rivera-Lutap (2022)

The study was able to document 80 of Locsin's brutalist buildings, and they were observed to be still very much active, as well as mostly architecturally genuine. Analysis of Figs. 15 and 16 corresponds to Locsin's mark in the metro, as he was able to design high-rise offices and other structures in the Makati Central Business District (CBD), totaling 25. The offices were also the most buildings appearing in the PRECUP. The structural style of Locsin's buildings served as their literal strength because such solidity proved useful against the earthquake-prone context of the country, hence less maintenance, and ensured longevity for the years to come.

3.4   Ildefonso Paez Santos, Jr.

Born in 1929, Santos, Jr. is the father of Philippine Landscape Architecture. He started his tertiary studies at UP College of Medicine but had a change of heart, entered the halls of UST, and eventually finished architecture in 1954. He pursued landscape architecture in the US by taking the program at the University of Southern California and finishing it with a master's degree in 1960. With the belief that landscape architecture was relatively unknown in the country, he went back to the Philippines, eventually becoming the first registered Filipino Landscape Architect, the first head at UP upon the opening of its Tropical Landscape Architecture program in 1971, and the first president of the association facilitating the said profession (Santos, 2009). His breakthrough project, the Makati Commercial Center, effectively introduced a more active outdoor lifestyle, encouraged by architectural elements such as tropical foliage, fountains, and water features for dynamic effect, as well as various degrees of feel and textures, which may be expressed through walls, paving or simple natural rocks. "*Malamig sa mata*" (literal translation: "cool to the eyes") was an architectural philosophy that Santos devised and fondly used, indicating that landscaping should have a light atmosphere that would bring about relaxation and ease of mind and body. (Quiocho, 2020).

Fig. 8 Renovated FEU Tech building. *Source* Rivera-Lutap (2022)

Santos, with his works focusing on landscape, has a quite different scenario if compared to the other five architects. His works were the most documented by the study, at 180 works, due to the abundance of information about them. The majority of it is also reflected in the PRECUP, but despite being plenty, only a few were protected by a marker. A key finding to the documentation of Santos's works is that it is still rare for a landscape design to be marked and recognized for its significance in the country unless it is a site where a historical event happened. Built structures are more recognized (though they are still lacking, based on the preceding work analysis). Santos argued about Landscape Architecture being a young and relatively unknown field in the country, and it seems that the very same argument is still manifesting at present. A causative factor attributed to this is landscape being easier to manipulate and/or integrate into an architectural period, as they are more natural and flexible than built structures, thus a bigger chance of survivability against time.

3.5 Jose Maria Velez Zaragoza

Born in Manila in 1912, Jose Maria Zaragoza was a member of a distinguished family of professionals, businessmen, and artists. Zaragoza was also notably a descendant of Felix Roxas, a critically acclaimed first-generation architect who designed several ecclesiastical buildings inside historic Intramuros. Interestingly, Zaragoza would be known and equated to modern Philippine church design later in his career. He accomplished his architectural degree at UST in 1936 and became a licensed professional, specifically as
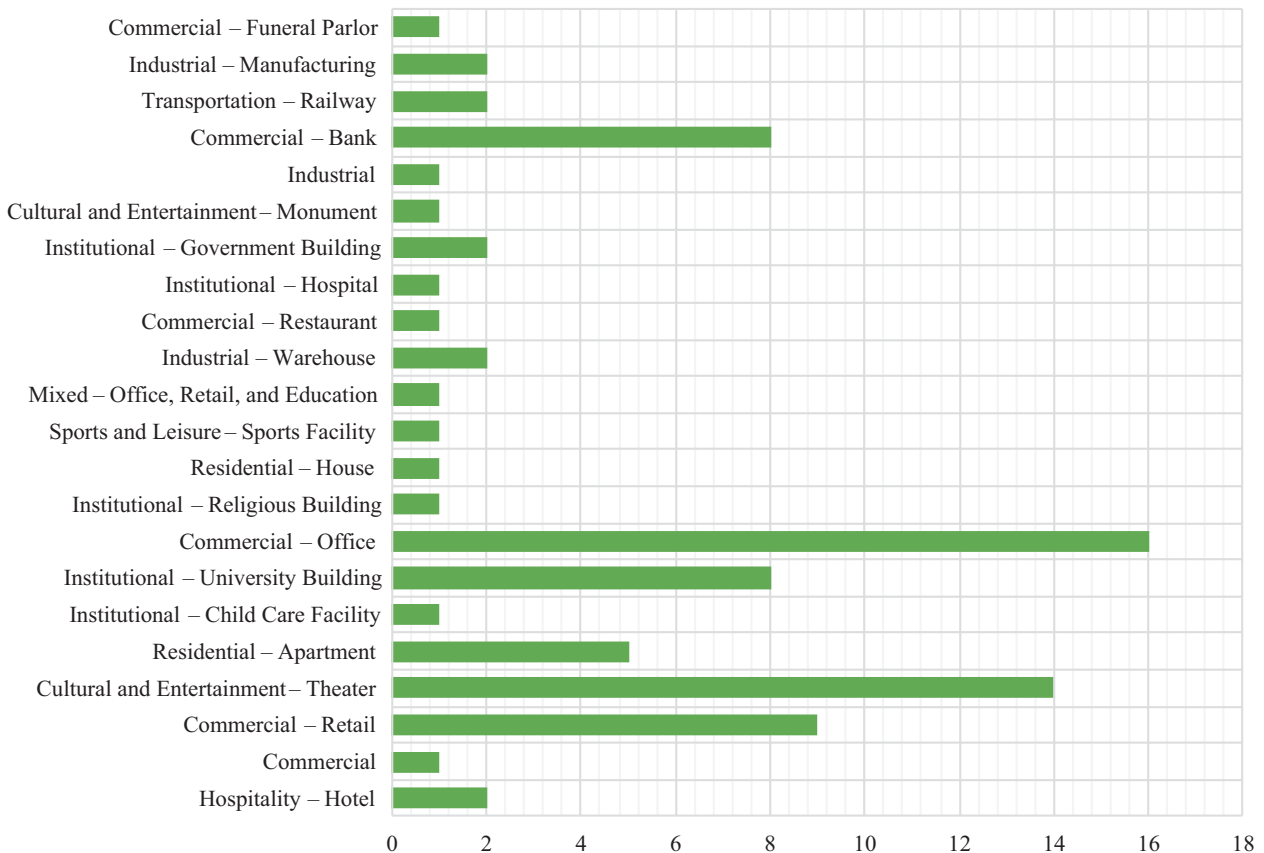
Fig. 9 Documentation of Antonio's architectural typology
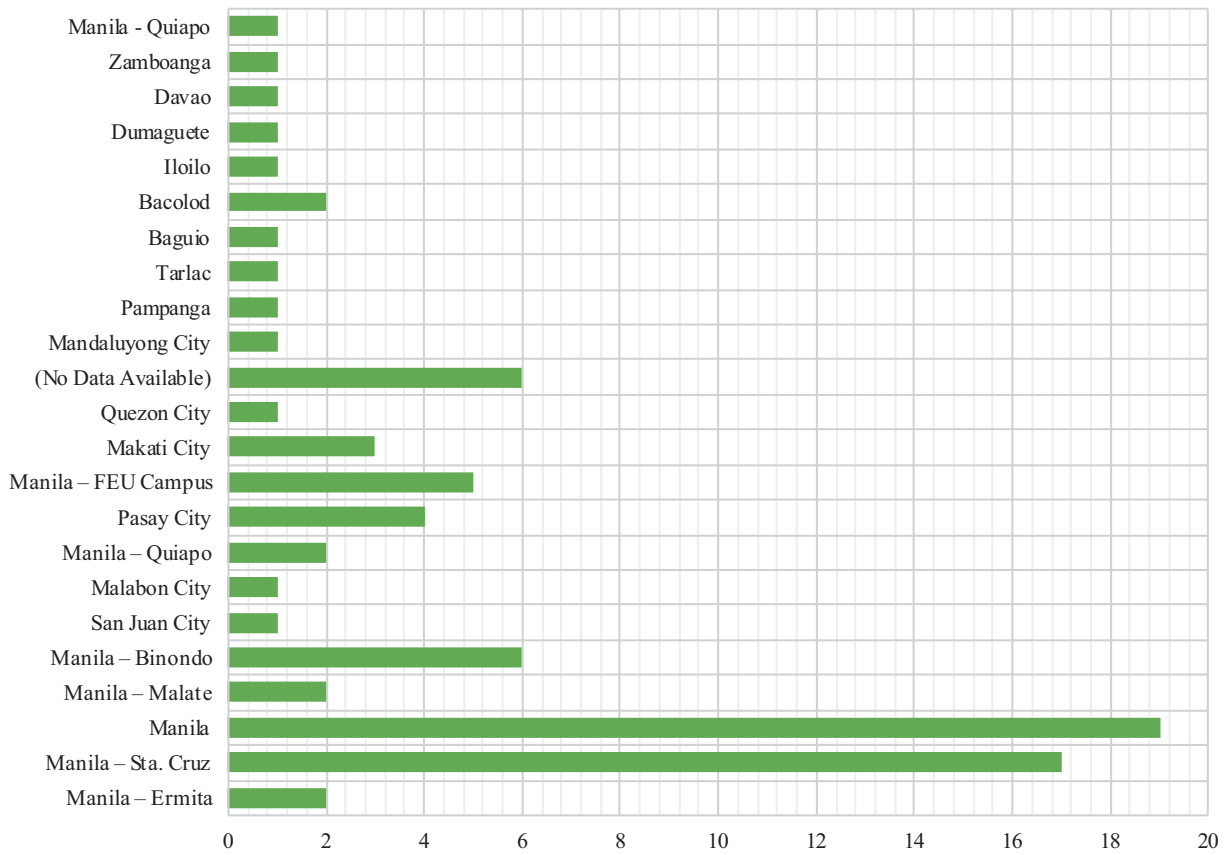
Fig. 10 Documentation of Antonio's location of works
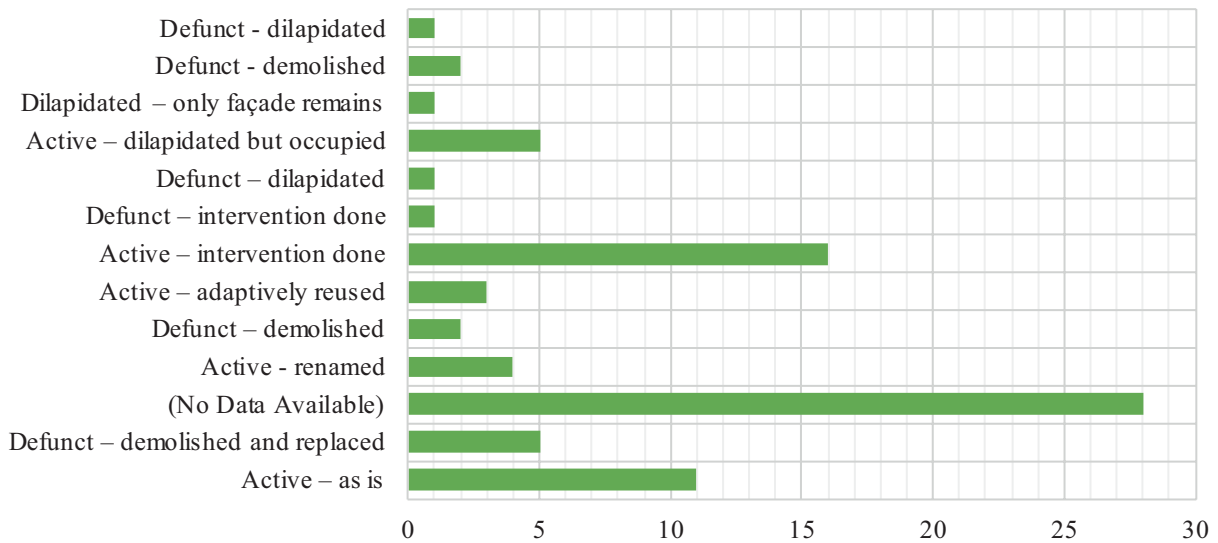
Fig. 11 Documentation of the current status of Antonio's works

the 82nd architect of the country in 1938. Zaragoza's passion for liturgical architecture made him pursue further specialization studies in 1950 at the International Institute of Liturgical Art (IILA).

Zaragoza brought back his contribution to the country after his exploration in Italy, which in this case is the modern methodologies and ideologies regarding ecclesiastical buildings. It was a highly relevant subject, as most of
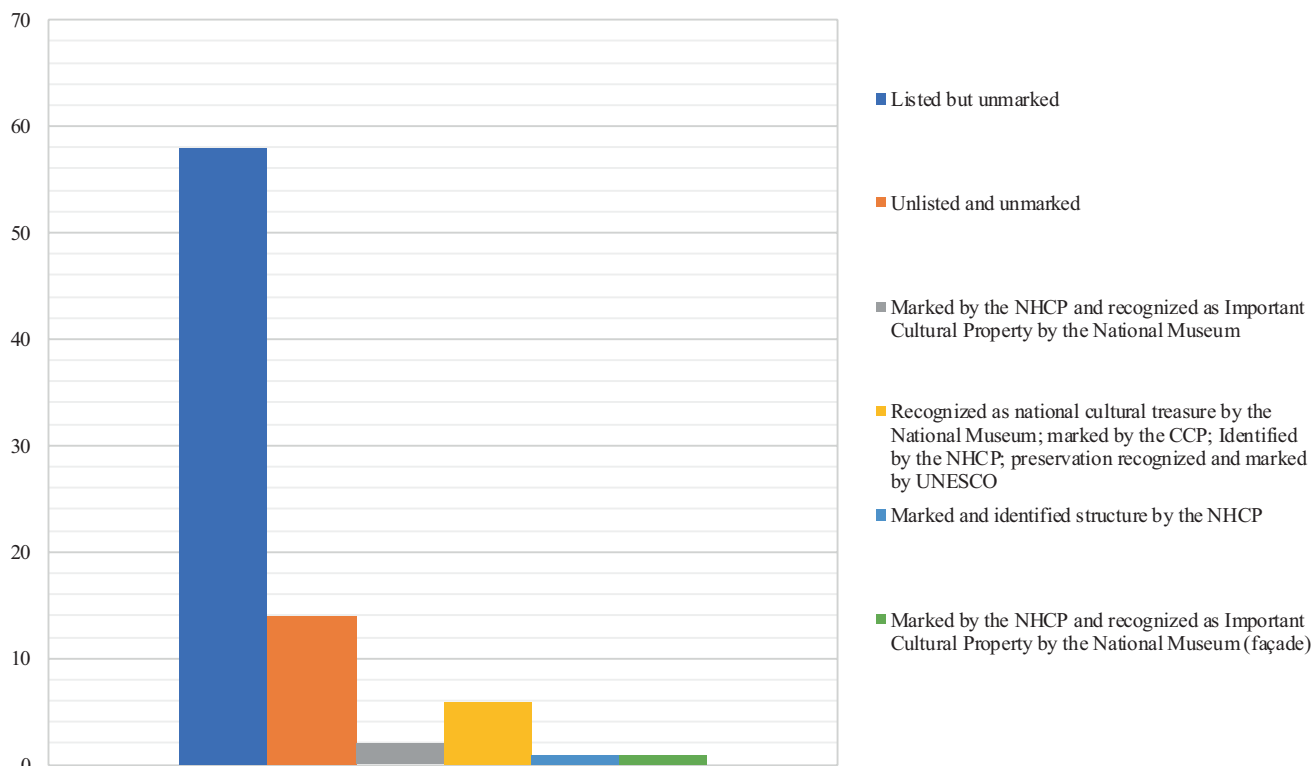
Fig. 12 Heritage designation of Antonio's works

Fig. 13 The highly imposing national theater at the CCP complex. *Source* Castillo (2022)

the church designs were still based on the bygone Spanish era, and there were no proper models for a modern place of worship during this period of rebuilding (NCCA, n.d.). Zaragoza's career spanned from 1938 to 1994, guided by his mentor Nakpil in his formative years of work. The said architect's most famous project was the rebuilding of the Santo Domingo Church and Convent at its present location in Quezon City. It is a fusion of Art Deco, Spanish Moderne, and Mission style church that employs the latest techniques at the time concerning natural ventilation, as well as reinforced concrete that allowed the possibility of an extremely wide nave, free of columns on the aisles (Defeo, 2004). The said church is a declared National Cultural Treasure. Zaragoza was also a decorated architect, having been recognized for his contribution to the height of the Philippine modern period. At one point in his career, Oscar Niemeyer and Luciano Costa even invited him to take part in designing the vast development of Brazil's new capital city—Brasilia. Here, Zaragoza was able to fully execute his extensive knowledge of Spanish, Mission, Latino-rooted architectural styles (Villalón, 2015).

The philosophy of Zaragoza was "Architecture for God and man." Such was heavily reflected in his work, which were mostly ecclesiastical buildings (Fig. 26). The study was able to document 28 of his works, which are centered in Manila and its neighboring Quezon City. Most of his structures are well-preserved. This can be attributed to the previous argument in 3.2 regarding permanence. Places of worship tend to remain the same and untouched, hence a bigger chance of survivability and protection against architectural change, as depicted in the data in Fig. 28.

Fig. 14 The spacious main entrance to the PICC at the CCP complex. *Source* Castillo (2022)

3.6   Francisco Tronqued Mañosa

A prime mover and defender of the vernacular Filipino sense, Francisco Mañosa, was born in 1931 to a well-off family residing in central Manila. Mañosa took up his architectural studies at UST and upon finishing, he, along with his brothers, who were also architects, formed the firm Mañosa Brothers and Associates. They formally launched their career with the Mindanao-inspired Sulo Hotel and Restaurant, which became a hotspot in the Makati CBD for its uniquely Filipino character. He eventually separated and opened his own office in 1976 to undertake independent practice (Caruncho, 2019).

Mañosa has a penchant for vernacular forms and methods, being strongly inspired by the *bahay kubo* archetype. He also supposes that the utilization of native design elements and materials, such as bamboo, coconut, rattan, thatch, etc. would then reveal the true Filipino sense and spirit (Sorilla IV, 2019). Mañosa also actively introduced
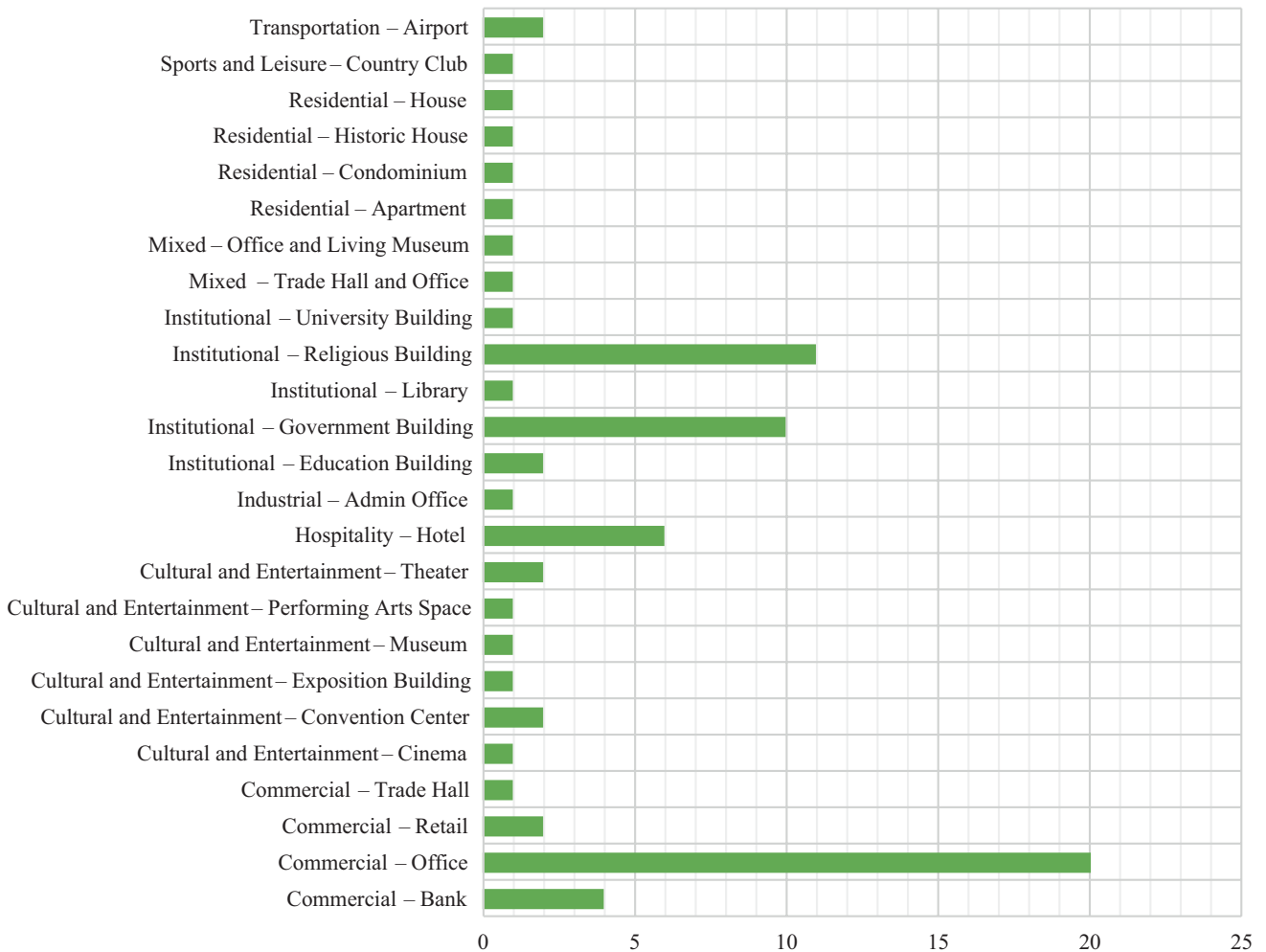
Fig. 15 Documentation of Locsin's architectural typology
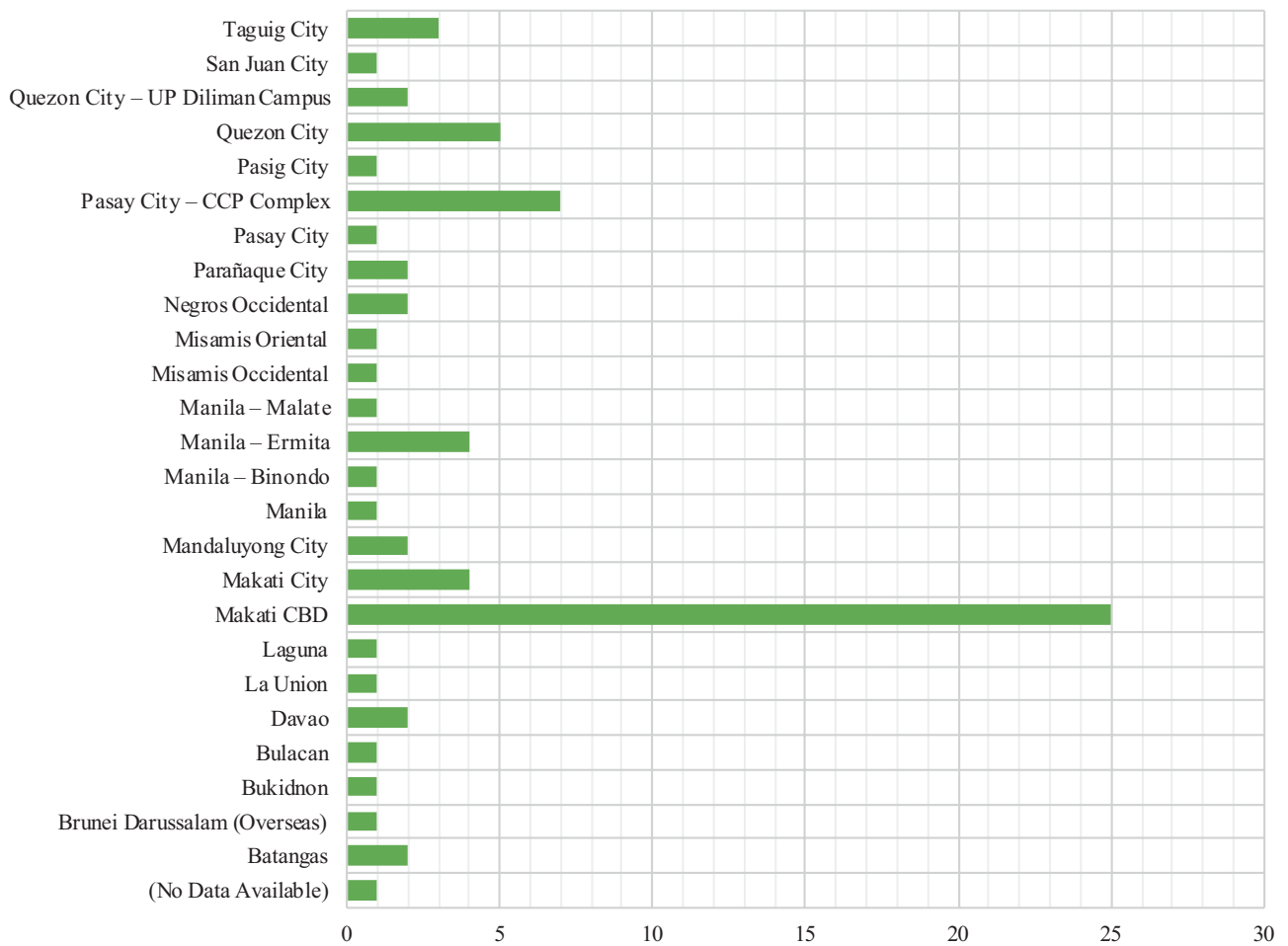
Fig. 16 Documentation of Locsin's location of works
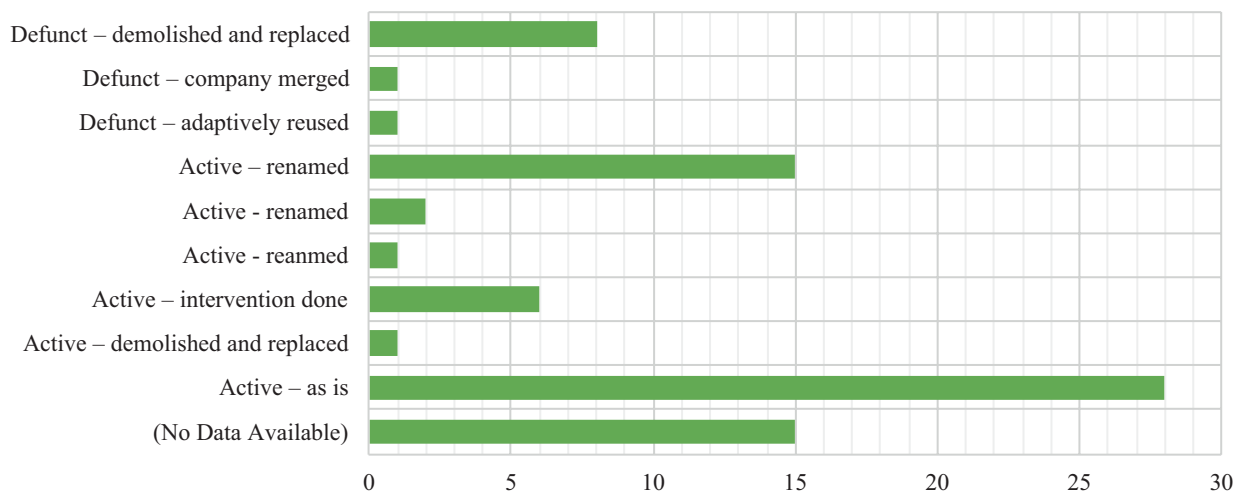
Fig. 17 Documentation of the current status of Locsin's works
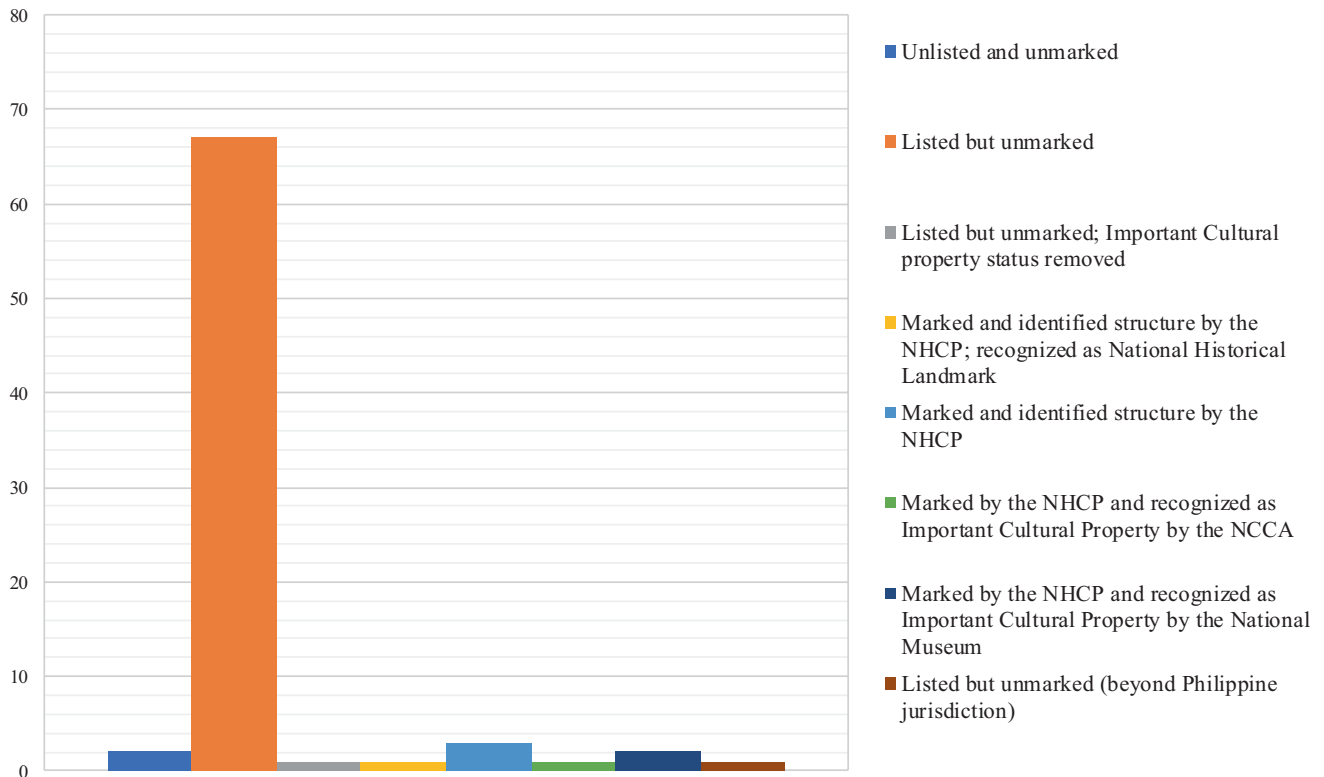
Fig. 18 Heritage designation of Locsin's works

Fig. 19 Paco Park landscaping. *Source* Marquez (2014)

new concepts, such as passive cooling design and sustainability, long before it even became a trend in the Philippines. These were exemplified in his San Miguel Corporation Building through the inclusion of a sustainable garden wrapped around the building, vegetative elements, and protrusion of the building form that slants the windows inward (vernacularly termed as *tukod*), coherently materializing

the stacked form resembling the wonder of the great rice terraces—a UNESCO world heritage site in North Luzon (Sorilla IV, 2019).

The fight for architectural Filipinism spanned the entirety of Mañosa's career from 1955 to 2015. Recognized as one of the most influential Filipino architects of the twentieth century, he was able to produce a highly relatable face of Philippine Architecture that is extremely applicable to the contemporary world. His vision of neo-vernacularism was effectively transferred and became highly appreciated by the Filipino youth of today, hence solidifying the Filipino heritage legacy, through architectural means, for years to come (Lico, 2021).

The study documented 85 works of Mañosa, with most, as shown in Fig. 32, being composed of restaurants, religious buildings, and housing. Like Locsin, Mañosa appears to have a huge concentration of work in Makati City (Fig. 33), which just shows his established reputation with the huge companies of the CBD. Most of his buildings, at 56, are still surviving, with their architectural character still genuine. His most celebrated work was the Tahanang Pilipino, also known as the Coconut Palace, situated at the CCP Complex. Mañosa's works are the youngest and most

Fig. 20 Burnham Park landscaping. *Source* gelomaics photography (2018)

intact at present. A similar scenario with the rest of the architects was also seen with his works (Fig. 35). Almost all of his buildings appear in the PRECUP because they are recognized as his work but are not protected from change by heritage markers.

4 Conclusion and Recommendation

Throughout the course of this study, it was a primary finding that each Philippine National Artist in Architecture has truly revolutionized various phases in Philippine Architecture and allowed for the development of the country's globalized but, at the same time, socio-culturally-aware contemporary architecture. From the grasps of the colonizers for almost 430 years and from the inquiry of an existence of the idea called "Filipino architecture" during the country's transition period, Juan Nakpil in the 1920s was able to not only propagate the Art Deco movement but more importantly contextualize it to the environmental setting of the Philippines, hence the exquisite but tropically suitable Tropical Art Deco; Pablo Antonio was able to push on the movement of Art Deco and continue further the architectural timeline with his application of practical and conventional modernist principles; Leandro Locsin, expressed the wonders of solid forms through concrete building material, and was able to develop the curiosity and strength embodied in brutalism, even becoming synonymous to such architectural style; Ildefonso Santos,
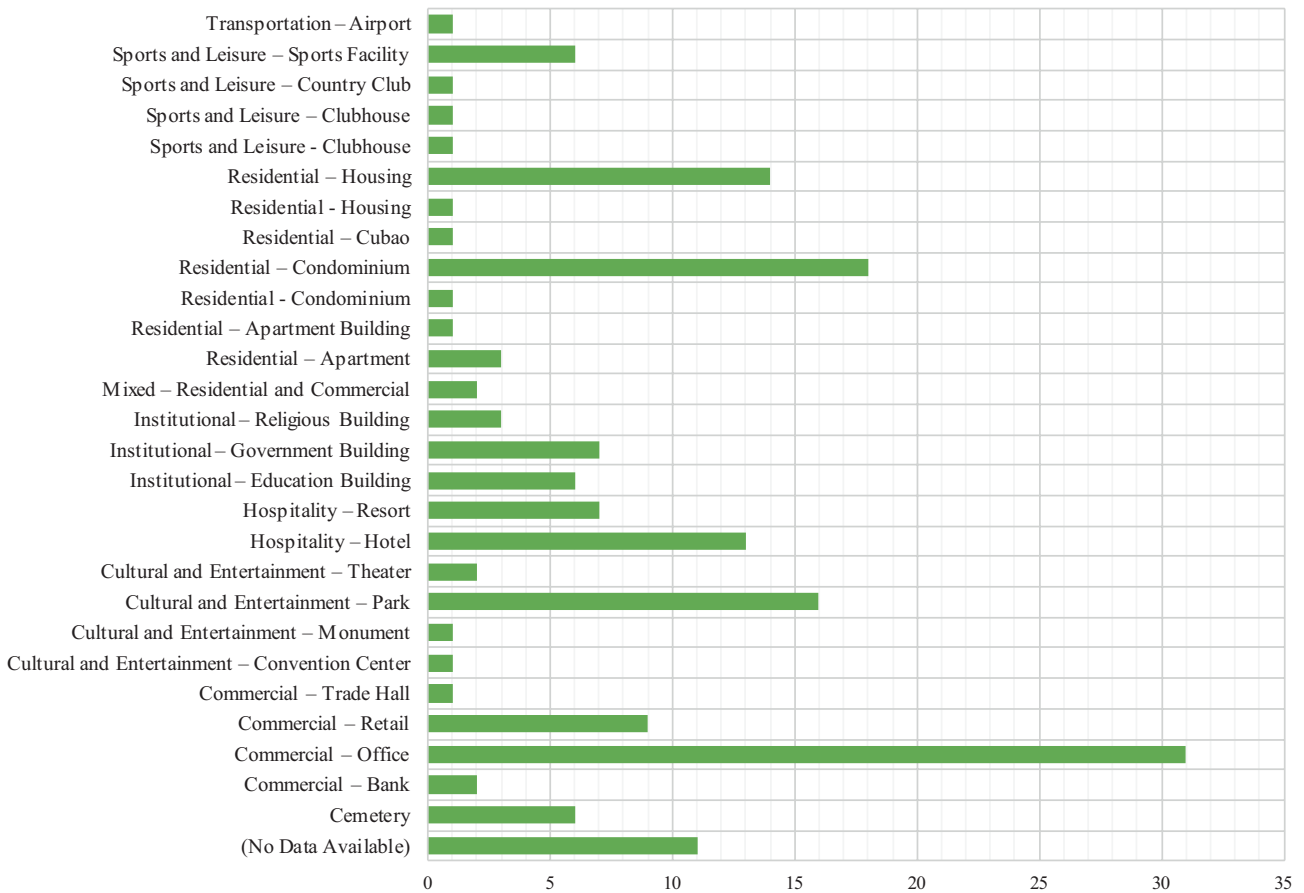
Fig. 21 Documentation of Santos's architectural typology
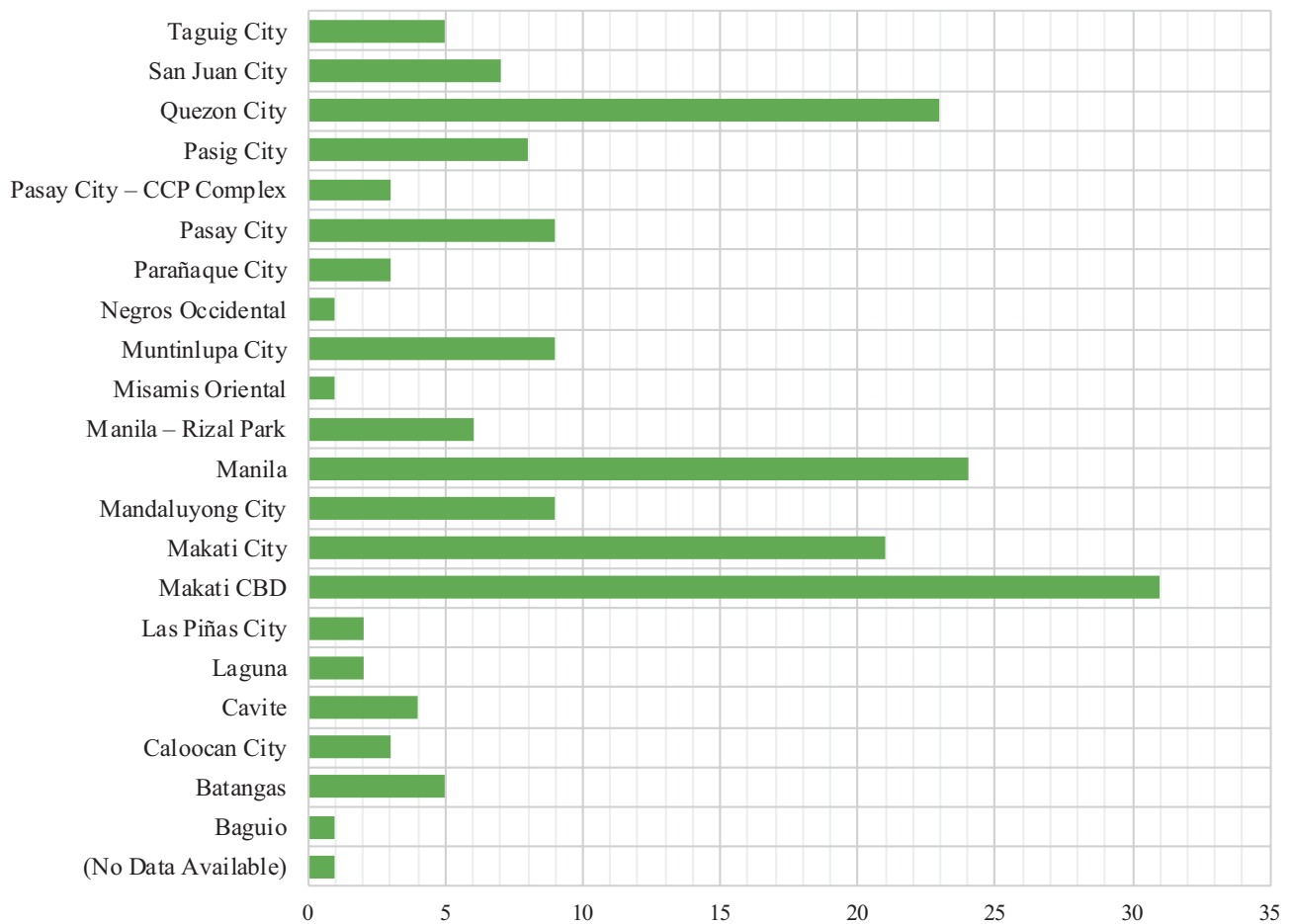
Fig. 22 Documentation of Santos's location of works

Jr. was able to make Philippine Architecture more comprehensive, by the inclusion of a very important major element—landscape, hence changing Philippine urban planning and environmental planning for the better; Jose Maria Zaragoza, in the mid-twenty-first century, was able to address the issue on the lack of a more timely prototype for Philippine ecclesiastical architecture, as well as introducing of a more relaxed residential approach, through the mission style; and lastly, Francisco Mañosa instigated the protection for Philippine vernacular architecture and reintroduced the relevance and endurance of native building construction to the country, even homogenizing it with the contemporary, hence the neo-vernacular architecture. It is worth noting that as encompassed in the National Heritage Act of 2009, all architectures designed by the National Artists are automatically considered "Presumed Important Cultural Property," hence the recognition by the state that these buildings are indeed important to the national heritage. However, in the succeeding findings, it was realized

that there are complex circumstances that surround these heritage structures, which may even result in their demise.

The study yielded 518 designs that were completed by the six Philippine National Artists for Architecture. Table 1 shows that there is a significant number of structures that have not been marked despite their heritage significance which would mean that the structure can and may be demolished anytime. There is a need to have an in-depth study of the archival documents to ensure that all the works of the National Artists for Architecture are accounted for, be they standing, renovated, or demolished, since there are strong indicators that there are more buildings that are not in the registry.

It was a major and, at the same time, disturbing discovery that some of these architectural legacies, which are fragments of the nation's identity, have to fight against continuous development. There are harsh circumstances wherein even these heritage structures would meet the wrecking ball. Such may be caused by reasons which
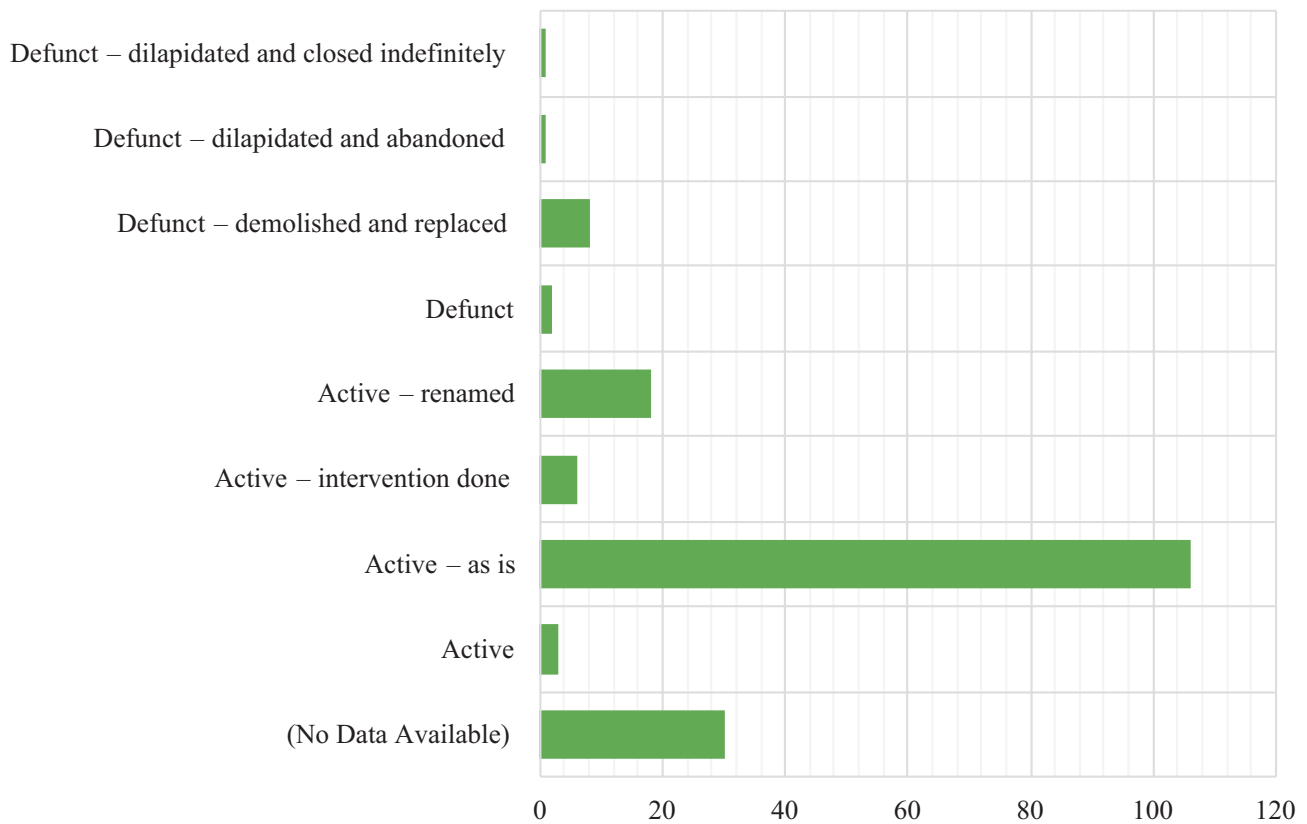
Fig. 23 Documentation of the current status of Santos's works

may include but are not limited to not being structurally sound, that the new owners of the buildings would deem it financially viable if replaced, that the next of kin of the National Artist approves for its destruction, hence the ceding of the "Presumed Important Cultural Property" status, and the increasing occurrence of gentrification. In the site survey conducted in the old districts of Binondo and Sta. Cruz, where most of the buildings of the National Artists in Architecture are situated, there is really a prevalence of "destroy and replace" instead of "preserve and reuse" practice to reiterate, destruction in some cases is inevitable. Hence, there should be anticipative measures for architectural legacies, more so that these buildings could lastingly survive in memory even if not in the physical world.

Digitizing heritage is a significant development that is key to advancing the race for heritage awareness. It will inevitably become part of how humanity can preserve the structures that are significantly important to our existence.

To holistically fulfill this move, it is recommended that a digitally inclined workflow of documentation must first be devised, which may generally center on the processes of:

1. Preliminary study and surveying of the site/structure—to analyze the best possible approach in acquiring images of the physical elements (may it be through techniques such as photogrammetry via UAV, hand-held devices, lasers, X-ray, or others), to ensure that the succeeding processes will be effective and that the cost of the project can be minimized as best as possible.
2. Execution of the actual surveying—the actual process of obtaining images of the structure, following an established schematic movement pattern (e.g. the flight pattern that the recording UAV will undertake, in consideration of the obstacles around the structure) and sub-workflow specifications (e.g. what time of the day will the survey be performed, what obstructions or unwanted elements are to be removed, etc.).

Legend:
- Listed but unmarked
- Unlisted and unmarked
- Marked and identified structure by the NHCP
- Marked by the NHCP and recognized as Important Cultural Property by the National Museum
- Marked and identified as National Historical Landmark by the NHCP
- Recognized as Archaeological and Anthropological Sites/Reservations by the National Museum; identified by the NHCP
- Recognized as National Cultural Treasure by the National Museum; recognized as National Historical Shrine by the Office of the President; identified by the NHCP

Fig. 24 Heritage designation of Santos's works

Fig. 25 Santo Domingo Church (Source: Roque, 2021)

3. Processing of documentation towards a workable digital model—this may include the point-cloud to 3D model procedure, utilization of BIM software, performance of texture wrapping, color grading of the model, and environment simulation to match the look of the documented architecture.

4. Cross-checking of the digital model with the actual structure—to ensure that the digital counterpart of the documented structure is indeed with the highest accuracy with its physical form, down to the minuscule architectural details, before performing the final exportation process.

5. Exporting a backup copy of the parent model and storing it in a safe archive—this is an extremely critical step to prevent defeating the purpose of digital documentation, which can be done through cloud back-up or hard drive back-up.

Fig. 26 Documentation of Zaragoza's architectural typology

6. Duplication of parent model to various files according to use—it is suggested that the parent model be left out as it is and instead, the customization of the model be performed on a duplicate file to reduce the chance of corrupting the main file.
7. Formation of a synchronized connection with the web—to provide real-time accessibility for public use.

Establishing a three-dimensional or even four-dimensional immersive documentation of a specific architecture, by means of various mapping and modeling techniques and materials, such as hand-held devices and HMD paired with augmented reality, in addition to the cloud, can greatly revolutionize the retelling of the cultural significance of architectures, because there is a recognized visualization through depth of perception, hence more relatable to the senses of a human person. At the same time, this digitizing will be greatly beneficial to conservationists, as the spatial and elemental features of a specific structure can be preserved and viewed as they were or even be modified for various study purposes, such as displaying an important feature that is no longer existing or even exhibiting an architectural evolution through timeline presentation or digital image superimposition for comprehensive comparative analysis.
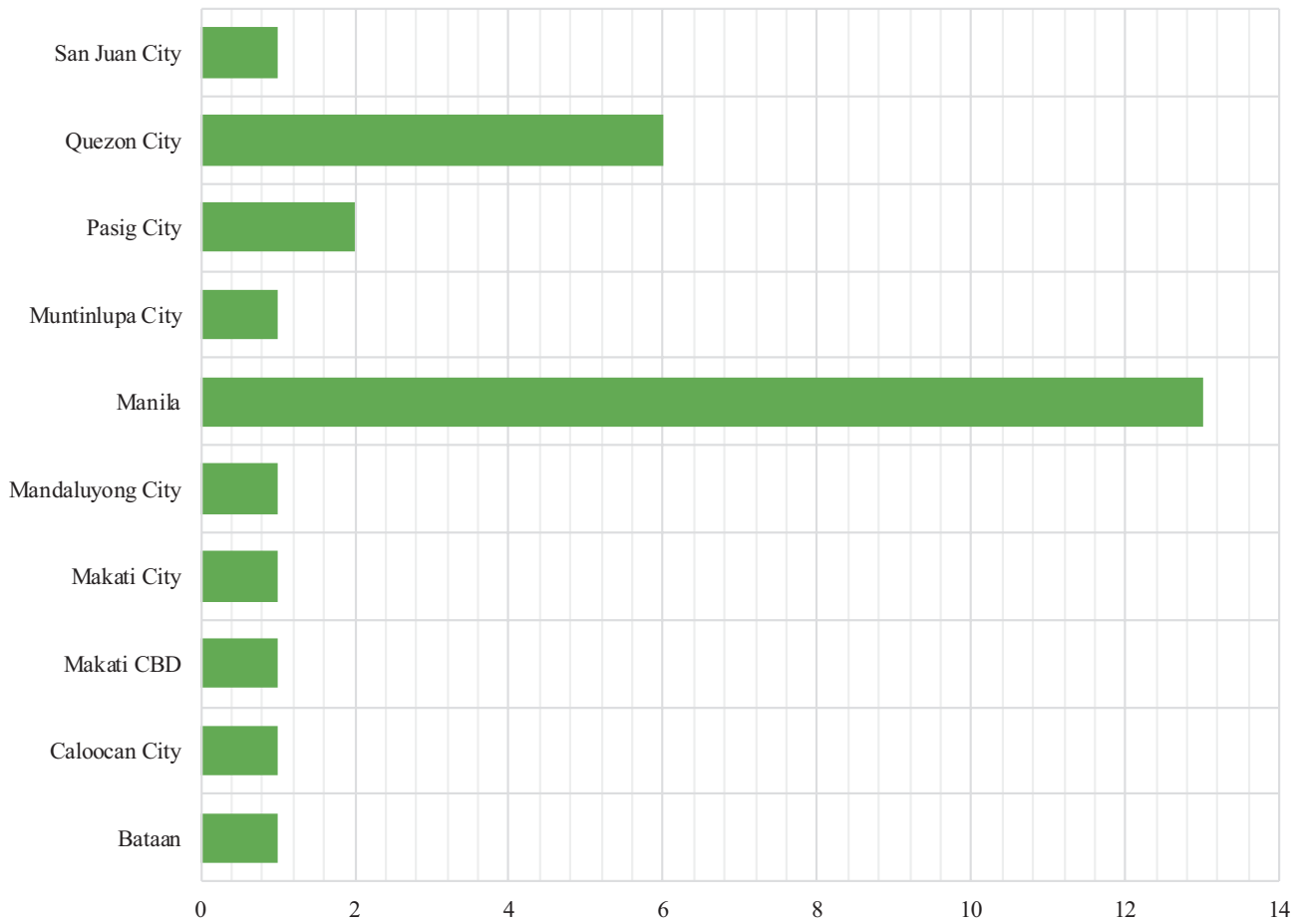
Fig. 27 Documentation of Zaragoza's location of works
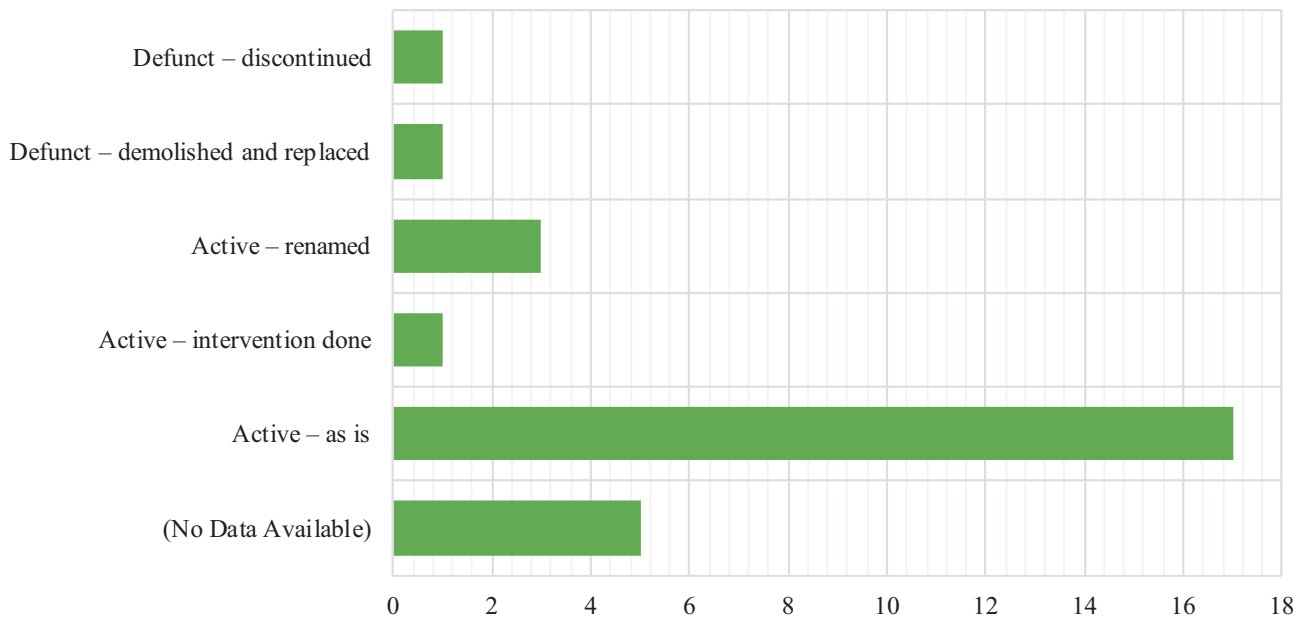
Fig. 28 Documentation of the current status of Zaragoza's works
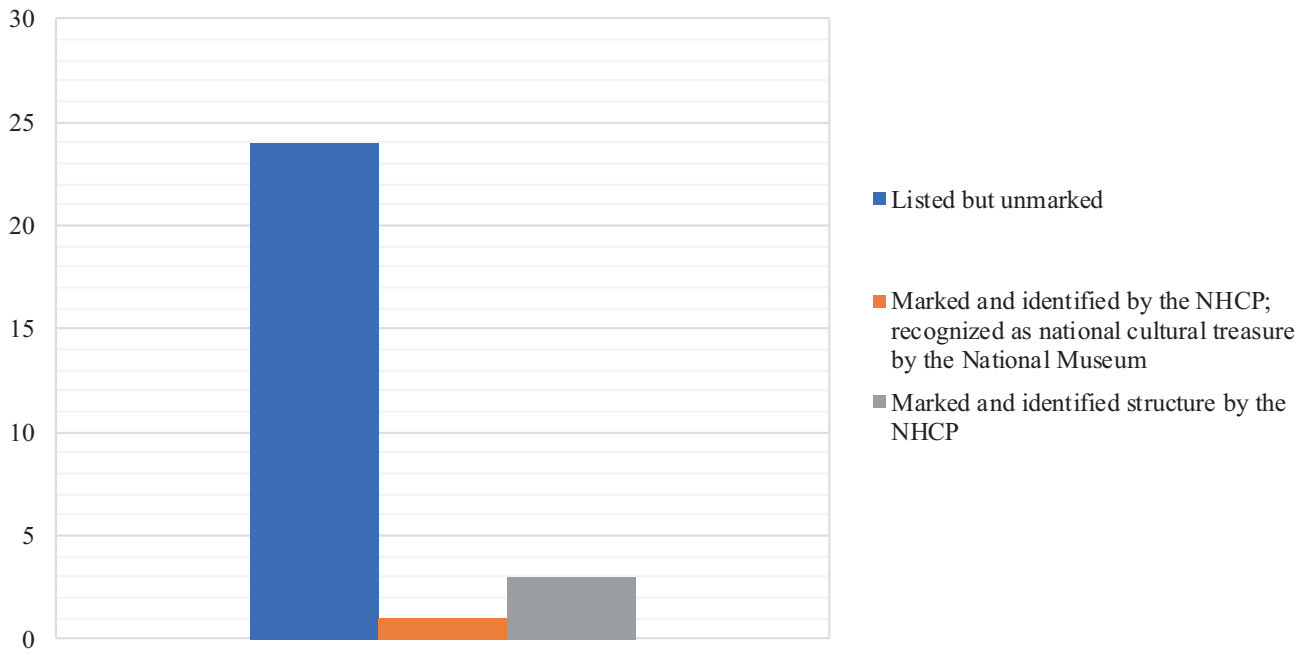
Fig. 29 Heritage designation of Zaragoza's works

Fig. 30 The coconut palace grounds. *Source* Shaffner (2007)
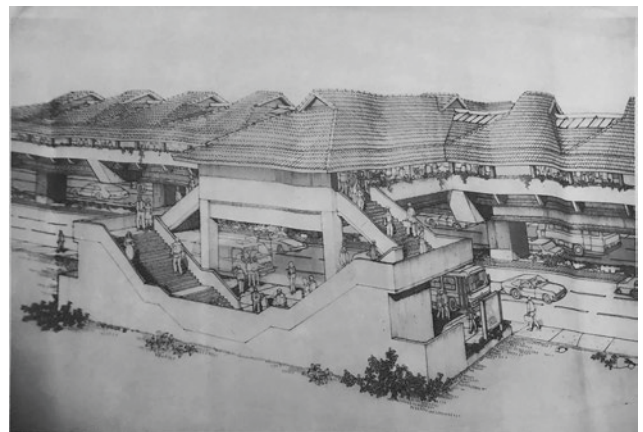
Fig. 31 Mañosa's Light Rail Transit prototypical drawing. *Source* Castillo (2022)

Fig. 32 Documentation of Mañosa's architectural typology

New forms of articulation and transmission have sprouted that were not in existence before. The Internet is a classic example of this phenomenon. With the digital platform and technology continuously surging throughout the world, this entails that there will be better opportunities for the years to come, hence a guaranteed safety in this documentation method. Digitizing means that there will be an assurance that the people of today and the generations to come can experience, re-imagine, and pass on the full legacy of architecture in infinite ways they want to.
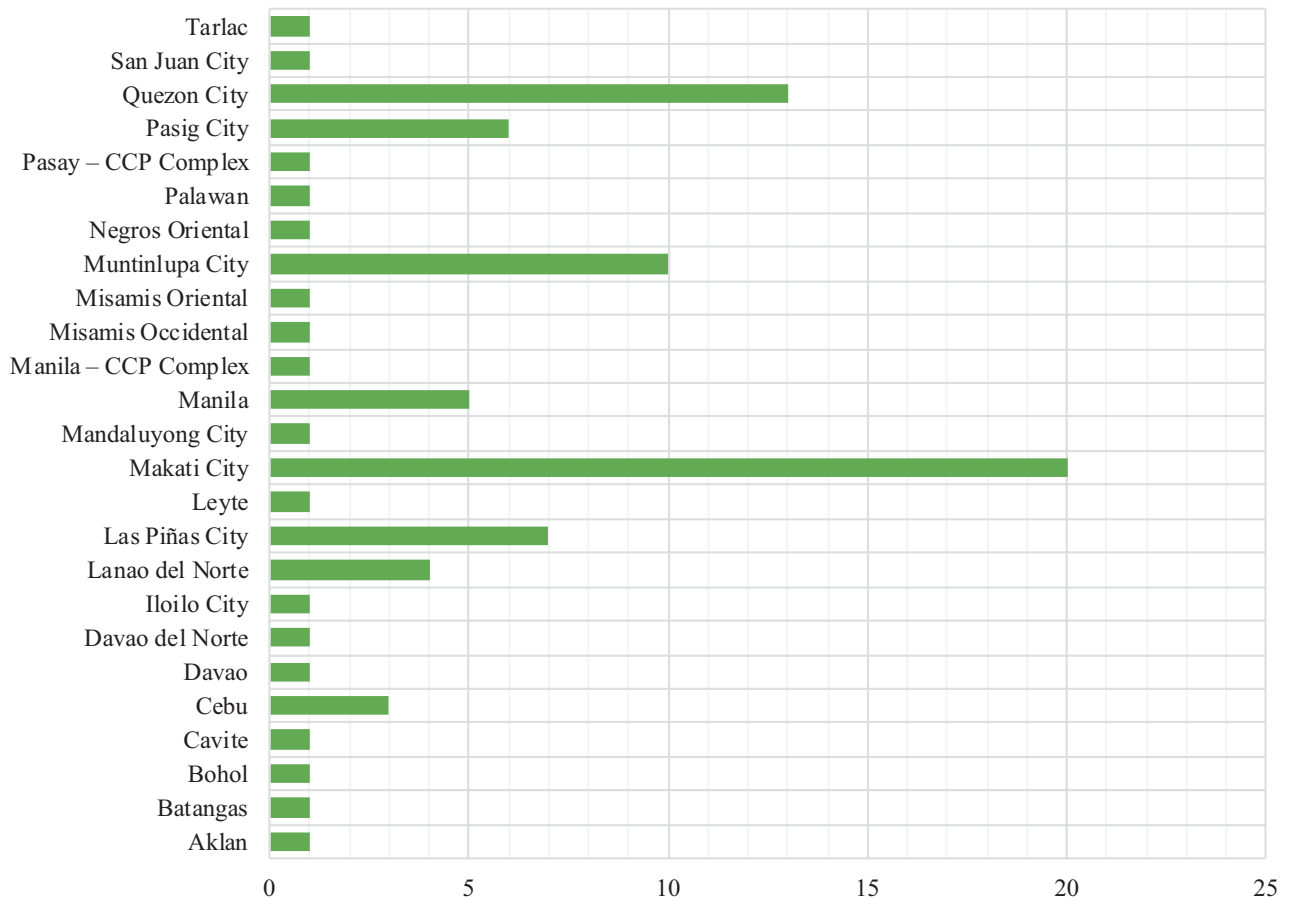
Fig. 33 Documentation of Mañosa's location of works
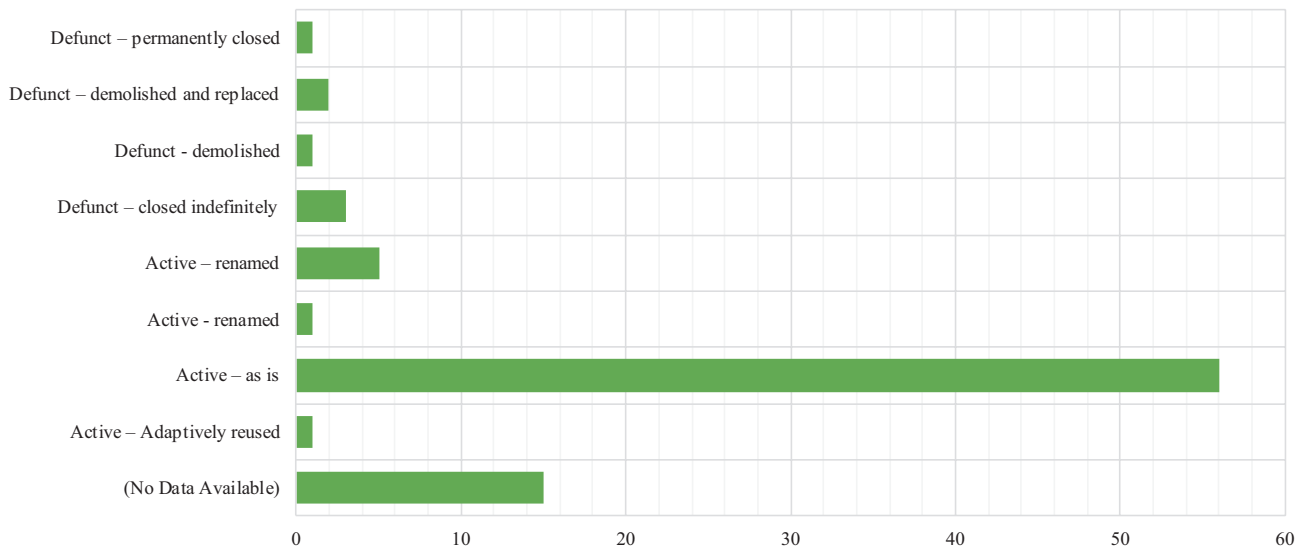
Fig. 34 Documentation of the current status of Mañosa's works
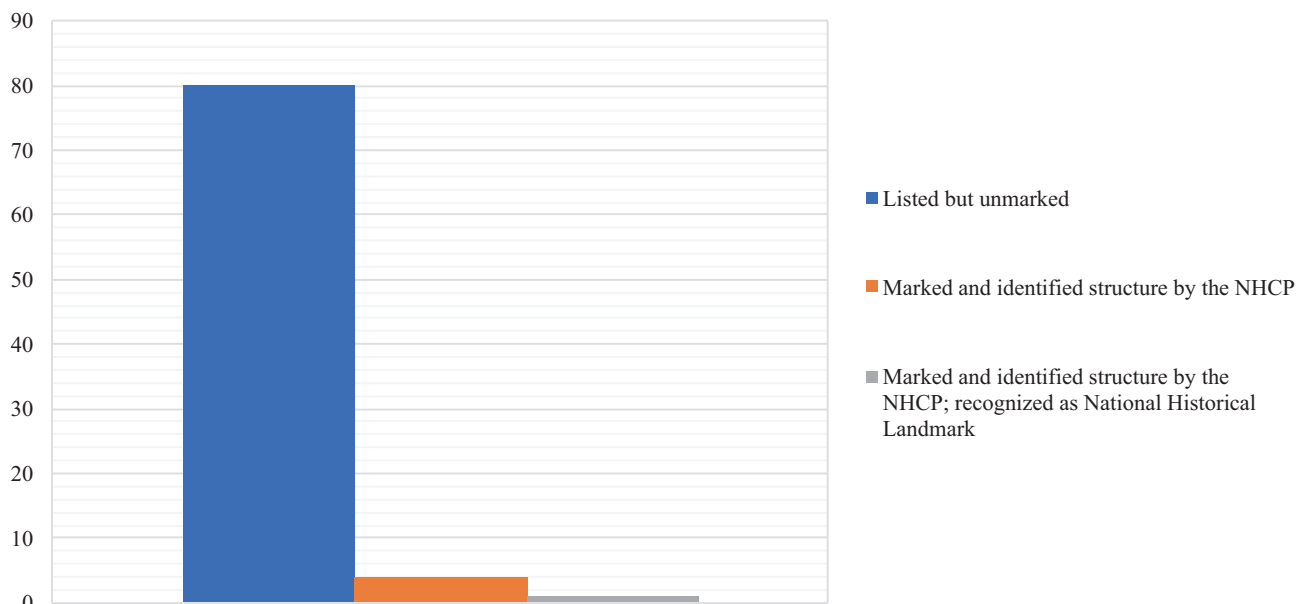
Fig. 35 Heritage designation of Mañosa's works

Table 1 The current heritage designation of the documented works made by the six Philippine national artists in architecture

Heritage status	Count	Equivalent percentage (%)
Listed but unmarked	427	82.432
Unlisted and unmarked	32	6.178
Marked and identified structure by the NHCP	29	5.598
Marked by the NHCP and recognized as Important Cultural Property by the NM	9	1.73
Others (with distinction)	9	1.737
Recognized as national cultural treasure by the NM, marked by the CCP, identified by the NHCP, with its preservation recognized and marked by UNESCO	6	1.158
Others (without distinction)	6	1.158

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Restoration and Arrangement of Archaeological Remains in the Mediterranean: The Protection of the Testimonies Between Past and Contemporary Experiences

Rosario Scaduto

Abstract

In general, the need to provide for the protection of archaeological remains has always been a priority in the work of archaeologists and architects. In the past, the work of Italian archaeologists and architects in the Mediterranean has been remarkable, engaged, even outside the territory of our country, as in the island of Crete and in particular in Gortina, Festòs, and Haghìa Triàda (late nineteenth century and early decades of the twentieth century), in the restoration, accommodation and protection of archaeological remains brought to light. While in Italy, and particularly in Sicily, for example, the case of the protection, with de-restoration operations, of the Villa Romana del Casale in Piazza Armerina (2015) remains exemplary and even problematic today, in Malta (2010) and Turkey (2019). We witness the protection of archaeological remains with the construction of tensile structures that compromise the basic relationship with the surrounding environment. My talk explores the theme of the protection of archaeological remains starting from the past experiences of Italian archaeologists and architects, in the Mediterranean, and comparing these interventions with recent ones both in Italy and in countries such as Greece, Malta, and Turkey, in order to offer food for thought useful to identify suitable activities for the conservation, use and enhancement of the archaeological heritage, essential for our lives.

1 Introduction of Italian Archaeological Investigations in the Mediterranean (Late Nineteenth Century–Beginning of Twentieth Century)

In the nineteenth century, there were various Italian studies of Antiquities abroad and in particular in the Mediterranean, such as, for example, between 1813 and 20, Giovan B. Belzoni for Egypt, in 1842, Paolo E. Botta for Mesopotamia and, between 1865 and 77, L. Palma di Cesnola for the island of Cyprus. To these sporadic and disjointed activities, only between 1883 and 84, the Institute of Sciences, letters and Arts of Venice, wanted to promote an organic research activity, in the epigraphic field, and above all to find the remains of the *Great Inscription*, with the laws of Gortina. The link between Italy and in particular between Venice and the island of Crete, called Candia, had always been very strong, in view of the fact that from 1204 to 1669, the island was a possession of the Serenissima. In fact, the Venetian Institute to confirm and exalt this link began to send scholars to investigate specifically the monuments that the Republic of Venice had built over the centuries. In particular, the *Great Inscription* was also known through the manuscript of Francesco Barozzi (1537–1604), of 1587, which reported transcripts of some ancient epigraphs of Crete (Barozzi, 1587). In the nineteenth century, some scholars had gone to Crete based on some historical sources, and in fact, the French epigraphist Luis Thenon (1812–1881) found and purchased an ashlar engraved with some articles of the laws of Gortina for the Louvre Museum in Paris. In 1879, Bernard Hausoullier (1853–1927), also a French

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epigraphist, found another block, larger than Thenon's, with articles from the *Great Inscription*. In 1884, The Venetian Institute of Sciences, Letters and Arts of Venice sent, according to the recommendation of his teacher Domenico Comparetti (1835–1927), the epigraphist Federico Halbherr (1857–1930) to Crete. Halbherr, in the same 1884, found, with the help of the German epigrapher Ernest Fabrizius (1857–1942), the *Great Inscription* of Gortina, of the VI–V century B.C., containing the rules on family, inheritance and civil rights of the ancient Cretan civilization and therefore of ancient Greece and in fact of the whole western culture. The city of Gortina in 68 BC had passed under Roman control which enriched and enlarged it. The Romans on a preexisting Greek structure installed the Odeon that incorporated the ashlars where there was the *Great inscription* carved. After the initial discovery, funded by the Venetian Institute, the Italian government set up a scientific mission in Crete, to complete the archaeological excavation and detect the *Great Inscription*, and deliver extraordinary results to the international scientific community. After several interruptions, in 1886, Halbherr concluded the transcription of the Inscription (8.71 m wide and 1.72 m high) and had survey done of the Odeon, at a 1:200 scale, by the engineer Raimondo Rava, and published it together with the hypotheses of the reconstruction of the ambulatory, above the inscription and the steps (Halbherr et al., 1885). Thanks also to the international scientific successes of the discovery, the Italian government in 1899, established the Italian archaeological mission of Crete, with first director the epigraphist that became also an archaeologist, Halbherr. The Italian government, wanting to increase the opportunities for training archaeologists and architects, in the field of the history of Antiquities, excavations and accommodation, in 1909, founded the Italian Archaeological School of Athens, with the first director the archaeologist Luigi Pernier (1874–1936). In Gortina, in 1911, the architect Enrico Stefani (1869–1955) carried out the survey of the excavation with the Odeon. Between 1914–18, to preserve the important monument, Halbherr wanted to protect "the Great inscription of the laws by covering it with a vault and closing its entries" (Pernier, 1922). The works were carried out by the Hellenic government, according to the project drawn up by the architect Enrico Stefani. The vault built to guard the large inscription "is made out of brick, it was set above the perimeter wall of the Odeum and on the concentric one, supported by the brick pillars that divide the two ambulatories below the cavea. The vault corresponds to the ancient roof of the Ambulacrum, in which the Large Inscription was visible" (Pernier, 1922). The missing parts of the ashlars with the 12 columns of the engraved laws were completed with blocks of calcarenite similar to the original, but with the machined surface, while the new masonry of terra

Fig. 1 Gortina, ambulatory of the Odeon with the *Great Inscription*, Scaduto (2008)

Fig. 2 Gortina, Odeon with the protection of the *Great Inscription*, Scaduto (2008)

cotta bricks was set back a few centimeters from the existing brick walls, to distinguish themselves from the ancient (Scaduto, 2013) (Figs. 1 and 2).

2 Laws and Papers of Restoration Valid in Italy (End of Nineteenth Century–Half of Twentieth Century)

Italy has a long tradition in the field of legislation for the protection and restoration of archaeological, architectural, and landscape heritage. In fact, some years after the unification of Italy (1861) the "general instructions for the conduct of excavations of antiquity" (17.10.1875) were issued, containing the rules to be followed to carry out the excavations,

arrangement and protection of archaeological remains, present throughout the Italian territory, especially in the South Center. The "regulation for the service of the excavations of antiquity" was linked to this norm; (22.12.1876) which certified precise rules in the archaeological sector, which starting from the Preunitary states, such as the Papal and the Kingdom of the "Due Sicilie", was remarkable and already subjected to protection and restoration. In fact, we remember the early protection of the remains of the Antiquities of Taormina and the unique protection of monumental trees such as the "chestnut of the hundred horses" of Etna, already carried out since 1745 (Scaduto, 2017). In Sicily, ancient monuments will be classified, protected, and restored as early as 1778, and for example, it is recalled that the first monument on which a restoration, modernly understood, was conducted is the Doric temple of Segesta, in the province of Trapani. In order to have in Italy a law "Sui restauri degli Edifizi monumentali" it will be necessary to reach 1882, with the decree and the circular 21.07.1882, n. 683 bis, containing even the graphic and accounting works that were to form the restoration project. Together law of 12.06.1902, n. 185, for the "Tutela delle Antichità e Belle Arti"; and law 20.06.1909, n. 364 (establishment of the monumental bond and opinion on new buildings in ancient cities), the regulatory framework for the protection of monuments in Italy, between the end of the nineteenth century and the beginning of the twentieth century, is completed with the birth of the service of monuments, the service of excavations and archaeological museums and the service of galleries, medieval and modern museums and art objects (l. 07.06.1907, n. 386). The specific protection of natural beauty is added to this standard: "Per la tutela delle bellezze naturali e degli immobili di particolare interesse storico" (l. 11.06.1922, n. 778). In the international field, the Congress acquired great renown that led to the promulgation of the Charter of the restoration of Athens (1931), to which contributed the qualified and listened Italian delegation, led by Gustavo Giovannoni (1873–1947). It was Giovannoni himself who declined in Italy the Charter of Athens, having the government approve, in 1932, the Italian Charter of Restoration (Giovannoni, 1932a). In both papers, the archaeological restoration is traced back to safe guidelines of absolute scientific rigor, against completions and generalized falsifications and with the prevalence given to anastylosis and the use of hidden reinforced concrete for consolidations. The Italian standards of 1932 will be made even more strict, in 1938, with the "Istruzioni per il restauro dei monumenti" of the Ministry of National Education. Just before the outbreak of the second World War, Italy will have the most complete and organic rules in the field of protection of historical, artistic, monumental, and landscape heritage of the time, with the law 01.06.1939, n. 1089,

"protection of things of artistic and historical interest"; and the law 09.06.1939, 1497, for the "protection of natural beauty". These charters and rules for restoration were in force in Italy and were therefore also applied by the Italian archaeological missions such as that of Crete and Athens or in the "possessions", such as that of Rhodes and the Italian Aegean islands (1912–1945), where even since 1914 a Superintendence was active for monuments and excavations and antiquities (Scaduto, 2010).

3 Excavations and Protection of Archaeological Remains in Crete: Gortina, Festòs, and Haghìa Triàda (1884–1930)

After the discovery and arrangement of the Odeon with the Large Inscription by means of a brick vault, the archaeological mission of Crete moved to the area where, in 1900, the Palace of Festos was discovered. The first palace was built in 2000 BC, was destroyed in 1628 BC by the earthquake triggered by the eruption of the volcano Thera (on the island of Santorini), and rebuilt in 1450 BC, and later devastated, like the others, by a violent fire followed by another earthquake. The excavation of the palace was carried out, according to the scientific technique of stratigraphic excavation (Boni, 1913), by Federico Halbherr and by Luigi Pernier, while the surveys were carried out by the architect Enrico Stefani. To preserve the rooms below, reinforced concrete slabs were made, designed, and built by Pernier and Stefani in order to cover the lower compartments that still contained numerous pitoi–large vases where cereals were once stored. Also, some of the stairs that connected the floors of the building were designed and built by the architect Stefani with reinforced concrete. In Festòs, Pernier recalled, "modern roofs have restored the ancient floors, whose level has been found, and have sheltered the vases and what was still left from the rooms" (Pernier, 1933). In the restoration of the walls made with stones, the clay mortar still present was removed and replaced with hydraulic lime "crushed thoroughly in the interstices", while the still fresh lime was coated with clay "in order to keep the appearance of the wall primitive structured" (Scaduto, 2014). In general, the restoration of the walls to large square blocks took place with the use of reinforced concrete to reconstruct missing parts, anchored with non-oxidizable metal grappa. In Festos, the concrete floors of reinforced concrete protect the ruins of the first Palace, with their large vases, which in many cases, are left partly open, to allow the vision of the preserved finds. In this way, we refer to the collapse of the floors, made with wooden beams, then charred as a result of the fires that followed the earthquakes

and destruction, and on the other hand we allow the use of the upper floors with the remains of the walls that defined the various rooms of the building. A few kilometers from Festòs, Halbherr and Pernier also found in 1902 the small Minoan Palace-villa (1800–1450 BC), most likely linked to the same palace of Festòs and which was almost contemporary. In 1905, the *Megaron*–hall was excavated, while the restoration was carried out by Pernier, and the architect E. Stefani also took care of the reliefs. In 1936, Pernier and Stefani had a roof made of reinforced concrete, to protect the restored *megaron*, covered with alabaster gypsum slabs, which adorned the floors and walls. Such protection does not interfere with: "the general appearance of the ruins because they do not rise above the height of the ruins themselves and the natural terrace, to which the building leans (Pernier, 1937). Giovannoni, in 1932, reiterated the importance of the use in the restoration and consolidation of reinforced concrete, which can be described, for its strength and plasticity, as the most valuable of the assistive products brought by modern technology" (Giovannoni, 1932b, p. 408). In Haghìa Triàda, the new roof, that guards the *megaron*, does not exceed the remains of the walls, but on the contrary, it is connected with the dimensions, it integrates with the surrounding landscape. The reinforced concrete beams evoke the wooden elements that formed part of the supporting structure. The void left by Italian archaeologists and architects refers to the full of the wooden pillars that supported the beams on which the attic rested (Scaduto, 2015) (Figs. 3 and 4).

Fig. 4 Greece, Aghìa Triàda, the *megaron* with protection, Scaduto (2008)

4 Comparisons with Contemporary Excavations and Accommodation at Cnossos by Arthur Evans

Arthur John Evans (1851–1941), English historian, epigraphist and archaeologist, began digging in Crete in 1893. In 1900, he brought to light the remains of the Minoan Palace of Cnossos, but above all he dedicated himself to an "architectural super-production" that was expressed in "fantastic reconstructions, where entire buildings, complete even in the flamboyant decorative paintings, arise from a few supports of columns, from scarce surviving fragments" (Giovannoni, 1932a). Pernier, speaking of the careful results of the Italian mission in Crete in the excavations of the Minoan palace of Festòs and Haghìa Triàda, and of the concepts followed in the arrangement of the ruins, declared that the scientific severity of the Italian restoration was more evident, from the comparison with the fantastic architectural reconstructions carried out in the same period by the English mission directed by Evans in the other Great Palace of Cnossos: "maximum example of what the reconstruction of monuments can reach when the scenographic trend is not controlled and limited by the strict norms of authenticity". In the Palace of Festòs and Aghìa Triàda, the archaeological excavation is simple and sincere, without any addition that is not simply constructive. Instead, the restoration of the Palace of Cnossos (more, for example, in the Megara and the northern loggia), is "certainly anti-historical and anti-scientific, in its exuberant insincerity"

Fig. 3 Greece, Festòs, view of the west side of the Minoan palace, Scaduto (2008)

Fig. 5 Greece, Cnossos, Northern Loggia, Schillaci (2008)

Fig. 6 Greece, Cnossos, Throne room, Schillaci (2008)

(Giovannoni, 1932a). Instead, in general, the works carried out according to the Italian "ethics of restoration" respected the principles of authenticity that came to us and continue, even today, to document the peculiarity of the Italian culture of restoration (Figs. 5 and 6).

5   Comparisons Between Contemporary Protection of Archaeological Remains in Italy, Greece, Malta, and Turkey

Between 1957 and 63, the architect Franco Minissi (1919–1996), commissioned by Cesare Brandi (1906–1988) director of the Central Institute of Restoration in Rome, planned and carried out the restoration and protection of the mosaics of the Roman Villa del Casale in Piazza Armerina (first half of the fourth to fifth centuries AD), in the province of Enna. The Archaeological Protection designed by Minissi,

consisting of metal elements covered with transparent perspex slab plates, was: "integrally modern, integrally modest, which remains exemplary" (Brandi, 1957), where the "charm of ruins is replaced by a complex of modelled volumes, variously illuminated and transparent, whose vision can suggest to the visitors a picture not far from what could have been the complex of the Villa, even if translated into modern term" (Minissi, 1957). The Villa, with the masterful protection that communicated with the surrounding landscape and allowed a view from the top of the mosaics, without using the walking surface of the same, since 1997 has been included in the World Heritage List (UNESCO). Between 2007 and 12, the guilty lack of maintenance, and suitable "updates" of the protection of Minissi, decreed the elimination and construction of a new roof (Commissioner Vittorio Sgarbi and project architect Guido Meli), with laminated wood structures, multilayer wooden panels covered with lime mortar, steel tie rods, and copper plates for the roof of the volumes. With this new intervention, we have lost an exemplary protection and arrangement of archaeological remains, while today the monument is imprisoned in a structure that refers much more to warehouses or deposits (Fig. 7).

In Màlia, in the island of Crete, there is a Minoan palace built between 2000 B.C. and 1900 B.C., destroyed like those of Cnossos and Festòs and Haghìa Triàda in 1700 B.C., and rebuilt in 1628 B.C., to be destroyed again in 1450 B.C. In 1915, began the excavations of the palace under the direction of the Cretan archaeologist Joseph Chartzidakis (1848–1936) that brought to light the remains of the west wing of the palace. In the twentieth century, excavation work continued with the direction of the French Archaeological School in Athens. The founding materials are limestone and calcarenite, in irregular ashlars, bonded

Fig. 7 Italy, Piazza Armerina, Villa del Casale, interior "Basilica", after 2007 Scaduto (2015)

Fig. 8 Greece, Màlia, Minoan palace with protection, Schillaci (2008)

Fig. 9 Greece, Akrotiri, the ancient city with the new protection, from Discorgreece.com, Greek Tourism Industry (2022)

by raw earth mortar: highly degradable materials. In 1991, the French Archaeological School had the roof made of a supporting structure of laminated wood and plexiglass. As a whole, the protection of the remains of the ancient palace is ensured, but not the relationship with the surrounding landscape, even if the materials used an approach, without a strong contrast, with the materials of the structures highlighted, which should always remain protagonists (Fig. 8).

The Bronze Age City of Akrotiri, near Santorini, (3100–2200 BC), in Greece, was destroyed by the eruption of the Thera volcano, also of 1628 BC in 1860, the ruins of the city of Akrotiri were discovered, but only in 1967, systematic excavations began, under the direction of the Greek archaeologist Spiridion Marinatos (1901–1974). The excavation work resumed in 1978, under the direction of the archaeologist Christos Georgio Dumas, who created a first cover to protect the remains, consisting of shapeless calcarenite stones, raw earth mortar (for the walls) and wood, for pillars and lintels. At the end of the twentieth century, the construction of a new roof began, but in 2005, due to problems in the structures, the site was closed. In 2012, after the replacement of the protective structure, the site was reopened. The island of Santorini is a highly seismic Island and therefore the Akrotiri site was covered with a steel lattice structure supported by 94 columns (with seismic sinks) of steel with a hollow circular section, according to the project of the architect Nikos Fintikakis, with consultants the two engineers Panayotis Carydis and Nikos Antoniou. The covered surface of Akrotiri is 11,800.0 m^2 and, when completed, will be the largest cover of a prehistoric site in the world (Fig. 9).

In Greece, in the Peloponnese, near the city of Figalia, there is the archaeological site of Bassae, famous for the temple dedicated to Apollo. The ruins of the ancient city of Bassae were noticed by French and German travelers, like the architect Joachim Bocher, in 1765, while the English architect Charles Robert Cockerell, in 1811, explored the Temple of Apollo and discovered its frieze. At the time Greece belonged to Turkey, and therefore the Pasha of Tripoli, in 1812, authorized the sale and the British government bought the frieze in order to exhibit it in the British Museum. Excavations were being conducted at the site by Russian archaeologists under the leadership of Karl Brjullov (1799–1852) since 1836. And, in fact, part of the finds are kept at the Pushkin Museum in Moscow. Finally, in 1902, systematic excavations were undertaken by the Greek Archaeological Society of Athens. Further excavations were carried out in 1959, 1970, and between 1975 and 79. In 1986, the Temple of Apollo was included in the World Heritage List. In 1987, a temporary cover was made consisting of a metal structure and synthetic fabric sheets to protect the temple from degradation due to atmospheric phenomena (m. $54.0 \times 54.4 \times 18.50$). The temporary structure protects the temple consisting of local gray limestone and marble from the quarries of Capo Tenaro. The sheets that were used have suitable inclinations to avoid the accumulation of snow in winter. The thermal variations were reduced with the protection as well as the subsidence of the laying plan of the foundations of the temple. In the early years of the twenty-first century, the restoration of the monument conducted by the architect Sotiris A. Papadopoulos. In particular, in the northern part of the temple, it is planned the disassembly of the architraves, columns, stylobate and the base and their temporary arrangement in the same site. After the consolidate of the foundations, reassembly is planned (Papadopulos, 1995). In the Temple of Apollo in Figalia, the roof reveals the initial phase of the restoration work and does not represent the final solution (Fig. 10).

In 1787, the architect J. L. Houel (1735–1813) published the *Voyage pittoresque sur l'île de Sicile, Lipari et Malte…* in Paris and he made known to the world, with the beauty of his gouache, the Antiquities of Sicily, and the Megalithic Temples of Hagr Qim e Mnajdra on the island

Fig. 10 Greece, Bassae, Temple of Apollo with the temporary cover, from Tinkstock (2018)

Fig. 12 Malta, Tarxien, temples protected by a tensile structure, Schillaci (2018)

Fig. 11 Malta, Mnajdra, temples protected by a tensile structure, Schillaci (2018)

of Malta (Fig. 11). The Maltese temples were built between 2200 and 1800 BC, using sedimentary stones: limestone called "Coral" and limestone "globigerina". In the middle of the nineteenth century, the interest in these monuments began, most of which were brought to light, while the first systematic excavations and complete studies were carried out between the end of the nineteenth century and the first decades of the twentieth century (Ugolini, 1934). A tensile roof was built in 2009 to overcome the degradation of disintegration and alveolarization of the very porous sedimentary materials of the temples, a work designed by the Swiss architect Walter Kiefer with the collaboration of the engineer Walter Hunziker, with the Curator of the World Heritage Sites of Malta the archaeologist Reuben Grima. Since 2009, also the temples of Hagr Qim and Mnajdra are on the list of the World's Human Heritage.

Also in Malta, a few kilometers from Valletta are located the megalithic temples of Tarxien, built in 3150 BC. The site was systematically excavated between 1915 and 19 and excavations continued until 1997. In the temples of Tarxien,

in 2012 an elevated catwalk was completed for the enlarged use, while in 2015 a protection of the imposing remains of limestone was completed, with a tensile structure. Also, this site has been included, since 2009, in the list of World Heritage Sites. In general, in the sites of the Megalithic Temples of Malta where tensile structures have been built to protect them, there is an absolute denial of the relationship with the surrounding landscape together with a striking contrast (Fig. 12).

In southern Anatolia of Turkey, the Megalithic Temples of Göbekli Tepe are located, built between 11,500 and 8000 BC, even before, for example, the construction of the pyramids of Egypt (3000–2550 BC). The complex of buildings, presumably intended for worship, of Göbekli Tepe that was discovered in 1958, excavated, between 1963 and 1995, by a joint archaeological mission of Turkey and the United States of America. Instead, since 2006, the direction and excavation have passed to two German universities. The constituent material of these temples is calcarenite, a notoriously porous stone that degrades easily. Also, in this case, in 2019, it was decided to protect the site with a tensile roof (including a system to promote accessibility). It is believed that in this way, to better preserve, with the mentioned protection, the archaeological site considered the oldest in the world so far found. For its longevity, rarity, and representativeness, the Megalithic Temples of Göbekli Tepe, they have been part of the list of the World's Human Heritage since 2018 (Fig. 13). Also, in Turkey, recently, near the city of Antiochia, today Antakya, on the coast of Anatolia, almost on the border with Syria, was discovered, while a hotel was being built, a complex of Roman villas of the period between the third and sixth centuries AD, belonging to the ancient city of Antioch. They are characterized by rich mosaics, among which emerges one of the size of square meters 1,050.0, which was the floor of the Greek
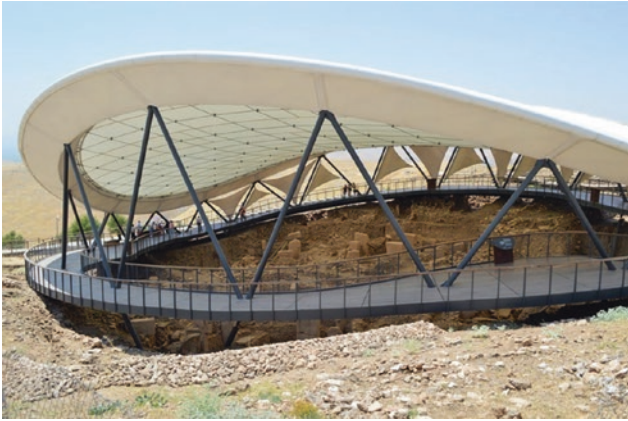
Fig. 13 Turkey, Göbekli Tepe, the temples protected by tensile structure, from turismodelgusto.com (2020)

agora and then, after the third century AD, the Roman forum. Since 2011, the private owners of the archaeological area, with its imposing mosaic surface (which today has a wavy surface due to earthquakes), have borne the expenses for the studies and restoration of this heritage. Always for private owners, the well-known architect Emre Arolat designed as a protection-cover (the entire intervention cost 120 million dollars), of the archaeological remains, an imminent building intended for luxury hotels. According to the intentions of the architect Arolat, the discovery of the site and the construction of the hotel represents a strategy to protect and make use of the archaeological remains with the extraordinary large mosaic, together with the other Roman villas, and the National Museum also housed inside, where thousands of artifacts, recovered during the excavation, are exhibited and which shows the different civilizations that have been in the area (Penna, 2020). On the ground floor, since 2019, it is possible to enjoy, also as hotel guests, the site and the museum, while the hotel is placed above the other four floors. The project of Arolat aims mainly to protect the archaeological remains, through transparent architecture, such as that of the hotel, but it is not for this that it is not incisive, but as far as it regards the relationship with the surrounding environment (Fig. 14).

6   Final Thoughts

In general, today much attention is paid to the issue of the protection of archaeological evidence, and there is no excavation that does not provide for the arrangement and protection of the remains found (Romeo et al., 2014; Varagnoli, 2005). In the past, for example, the interventions carried out in Crete, at the beginning of the twentieth century, by the Italians, are interventions characterized by the culture, as we can define it, of the architectural project. In Gortina,

at the end of the century. To protect the Large Inscription, a simple volume was rebuilt with terra cotta bricks, which are distinguished from the originals in size and color, while the space that was created evokes the arched environment no longer existing. Instead, at the beginning of the twentieth century, in Festos and Haghia Triada, the unconditional trust in reinforced concrete is evident to establish permanent protections, well-inserted in the surrounding landscape. In the middle of the twentieth century, the remains of the Roman Villa del Casale in Piazza Armerina in Sicily have been protected by an exemplary intervention by the architect Franco Minissi and Cesare Brandi. In 2007–12, the lack of maintenance and improvements, but possible and desired, at the Minissi solution, condemned the Villa del Casale to a de restoration, and to a non-innovative solution, expression of an immature Conservative Action. At Akrotiri, in Greece, the de-restoration with the elimination of a previous roof, and the realization of an anti-seismic reticular structure, covered in the internal surfaces of wooden lamellas, leads to an innovative solution, improving and agreeable for the purposes that originated it.

Still in general, instead today the restoration intervention must always aim at the maximum possibility of better preserving, and better-making use of the archaeological sites, through the use of new opportunities deriving from modern research, with new materials, techniques, and tools of control, for example of the micro-climatic conditions and conservation of the constituent materials (Biscontin & Driussi, 1999). In de restorations, it is necessary to talk about conservative interventions that are added, improving the performance of previous restorations, thanks to new materials and techniques. However, the need to protect and make the most of the archaeological sites, even providing, exceptionally, the de-restoration, must in any case be an opportunity to approach with "discretion" the new solutions to the ancient material in fact the new restauration intervention must not erase the old, but must add to and improve the state of conservation and enjoyment for everyone, even with continuous and scheduled maintenance (Della Torre, 1999, 2014), it and therefore only highlight it. However, every restoration must also tend to maintain, as far as possible (Marino, 2016), the previous restoration, because this is today embodied in the archaeological monument and constitutes a page of its long history. The restoration work, in fact, is to be considered an integral part of the life of the monument itself.

Since 1987, the Temple of Apollo, in the archaeological site of Bassae, is protected by a temporary structure, functional only to the execution of structural consolidation of the land where the monument rests, and restoration. At the end of the works, the temple will be returned to the initial relation with the natural site. In the most recent realizations of protection of archaeological rests, in the island of

Fig. 14 Turkey, Antakia, the mosaics "protected" by the Hilton hotel, from themuseumhotelantakya.com (2020)

Malta, in the temples of Hagr Qim e Mnajdra and in Turkey, in the site of Göbekli Tepe, the preeminent address is the use of exasperatedly technological tensile structures, where the fundamental relationship with the landscape is totally denied. In particular, in Malta, the permanence of the material consistency of the millennial archaeological remains takes a back seat, leaving, in fact, the preservation to technological protection alone. Also, in Turkey, in Antakya, the realization of the Hilton hotel, after the discovery, arrangement, and preservation of the archaeological site, has become the opportunity to protect and show it properly. This recent intervention, rare as far as the Mediterranean area is concerned, is not however unique, if only for example one thinks, in Italy, of the Crypta Baldi, with the archaeological remains and the relative museum located on the floors below the old palace in Rome, or the remains of the Stadium of Domitian, located at less than 4.5 m from the floor of Piazza Navona, also in Rome (Ruggeri Tricoli & Germanà, 2013).

In general, in contemporary restorations in the archaeological field, and not only, the "prudential guiding criteria" should be: "the 'minimum intervention' (…) the 'reversibility' or even the 'distinguishability' or the chemical-physical compatibility" (Gizzi, 2015). With regard to distinguishability, recalls Giovanni Carbonara, in many interventions, there is the desire to accentuate the differences between pre-existence and addition, while it would be enough just to "whisper" the information you want to offer. In order to stimulate a personal and direct observation and internalization of the monument, you can be helped by simple and effective information. Ultimately, it is necessary "to always do as little as possible, including reintegration and operating when the need really arises". Because "our task (…) can only be that, very humble, slowing down this degradation, not much more" (Gizzi, 2015). Therefore, I believe that, in general, in the archaeological field, interventions must necessarily be more prudent and respectful of the testimonies received, and regarding this Italian archaeologists and architects have contributed significantly in order to spread the values of attention to the authenticity and respect of the monument in its environment, and especially when the latter is in a landscape context. This attention to the archaeological site, in the choice of interventions aimed at maximum conservation for the maximum understanding of the monuments of antiquity, allows us to imagine a more serene future for the cultural testimonies and of course for the very life of the communities.

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The Accessibility of Archaeological Areas in Urban Contexts: The Valorisation of the Archaeological Areas of San Giorgio and Castello San Pietro in the Wake of the I-Access Project

Clelia La Mantia

Abstract

The I-Access project, developed for the historic centres of Palermo and Valletta (Malta), has made it possible to verify a method for the regeneration of the two historic centres, with the aim of improving both physical and cultural accessibility of the heritage. It is now necessary to enlarge the range of action of the project, also including another type of heritage, that of archaeological areas in an urban setting. In particular, the reference is to the case of the archaeological areas of San Giorgio and Castello San Pietro, located in an extended archaeological area in the historic centre of Palermo. These areas today are abandoned, fenced and inaccessible, despite being fundamental elements for the knowledge and understanding of the evolutionary history of the city. It is possible to carry out a valorisation project, with the aim of full accessibility, by implementing the methodology already tested and by using a more structured and adaptable approach to an extended and complex heritage, as already done in other experiences taken as a reference and cited in this paper, which also helps in the objectification of the results. An approach borrowed in part from the technological area and in part from the valuation disciplines. In particular, reference is made to the application of precise multi-criteria analysis, therefore to the systematic collection of data on the basis of objective criteria, which in the design phase allow us to understand at the same time the criticalities and strengths in support of the valorisation project, in subsequently, they allow the quality control of the project itself (both on a territorial and architectural scale) and, finally, they allow a continuous monitoring of the conditions of usability of the site, according to principles that respond to the so-called "planned conservation".

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1   Introduction

If many archaeological emergencies characterise the extra-urban contexts in the Mediterranean area and, in particular, in Sicily (Valley of the Temples, Villa del Casale in Piazza Armerina, Archaeological area of Segesta, Selinunte, etc.), just as many are found in urban contexts and, more precisely, in the historic centres of cities.

Renowned cases are the Temple of Apollo in Syracuse and the Roman Amphitheatre in Catania, but also in Palermo, there are notable situations, such as the archaeological park of Castello a Mare and the neighbouring archaeological areas of San Giorgio and Castello San Pietro (Fig. 1).

How to make these areas accessible and usable, reintegrating them in a multi-layered urban context? The experience of the "I-Access" Interreg VA Italy-Malta project has shown how it was possible to develop a method to make accessible (both physically and culturally) the historic centre of Palermo and, specifically the Vucciria. This took place by proposing architectural projects to overcome architectural barriers in two churches of Vucciria (two of which have been built to date), but also by designing devices and tools for the dissemination of contents, in order to allow everyone, according to the principles of *design for all*, to enjoy not of single buildings, but of an entire portion of the city. As scope of the I-Access project, an itinerary has been devised among some of the most important monuments of the district, selecting some for the pilot application phase for which content dissemination devices (totems and tactile maps) have been designed and also built.

Archaeological Areas
A - S. Giorgio　　　　　B - Castello - S. Pietro　　　　C - Castello a Mare　　　　- - - - - - - - Historic centre boundary

Fig. 1 Aerial photo of the Cala area, with identification of the archaeological areas

It is desirable that, starting from the method just described, the Municipality can replicate the guidelines for the entire historic centre.

The aforementioned archaeological areas were not taken into consideration due to the limits imposed by the project itself, but the need to include them was made evident also thanks to the didactic work carried out in parallel in the Monuments Restoration Laboratories (Prof. Prescia and Scaduto), at the University of Palermo.

In fact, it is important to include archaeological areas, both urban and extra-urban, among the sites to be enhanced and made fully accessible, overcoming Giovannoni's conception of "dead monuments", only to be contemplated (Giovannoni, 1925, pp. 127–131). This takes on an additional meaning if we are dealing with urban sites and, in particular in the context of the regeneration and valorisation of historic centres, since archaeological remains are important instruments in order to understand the historical scenario of a city. Besides, they are also pieces of a history that, especially in the case of a city like Palermo, it is a rather complex and stratified reality and still to be investigated.

2　The Current Inaccessibility of the Archaeological Areas of San Giorgio and Castello San Pietro

The problem of enhancing archaeological remains in urban contexts lies in their fragmentation in the complex architectural and stratified structure of a historic centre. The archaeological areas in these contexts are left as "islands of ruins", often fenced and inaccessible.

But today the conception of archaeological remains as a heritage intended just to be contemplated is outdated, in favour of a more modern vision for which, taking up the words of Bellini (1998) "pure contemplation does not belong to architecture" (p. 3). This gives rise to the opportunity for a more complex process of enhancing an archaeological site.

When we talk about valorisation, we do not mean a mere preparation of the ruins, which are made visible and accompanied by descriptive and didactic panels, but a more complex challenge that concerns the cities, especially those of the Mediterranean area, rich in this heritage.

Unlike archaeological sites in extra-urban areas, in an urban context and even more so in the historic centre, we

must take into account the comparison and the relationship with the built and stratified heritage. In this environment, a valorisation project must first of all be a project for the re-contextualisation of the remains, which entrusts the archaeological area with a role in relation to the new meanings of the city. In this case, it is necessary to overcome the condition of an 'island' enclosed by a fence, considering that the fence can also consist of the presence of misalignments between the current urban plan and the excavation plan, which is usually located at a lower altitude.

A new dialectic will then have to be established between the different stratigraphic heights and the footfall level, applying the tools of the architectural project, even contemporary ones, which approach the pre-existing structures, establishing a relationship between the "new" which will have the role of exaltation of the ancient; that is a role that will consist above all in allowing accessibility to the remains (and therefore the physical use of the area), but also in facilitating the visitor in the process of understanding the remains, giving him a frame of reference to understand their meaning in the urban dimension.

This was confirmed with the I-Access project in the cases of the churches of Santa Maria in Valverde and Santa Maria la Nova in which we tried to demonstrate how an architectural project, with absolutely contemporary language and materials, avoiding the use of technological systems difficult to maintain, can approach historical architecture with traditional characters, denouncing itself as a further stratification that is "added" to the pre-existence, without altering its understanding.

The same principles can be declined in architectural projects for archaeological remains, which need to be equipped, for example, with raised walkways, or covering systems for the remains, which take into account the fragility of the material and respect it. This is also the case of the archaeological areas of San Giorgio dei Genovesi and Castello-San Pietro, in the Castellammare district, in the historic centre of the city of Palermo.

They are located within the defined perimeter of the ancient fortification walls of the city, in the area formerly known as "Seralcadi" and here are kept the remains of the presence of Byzantine, Arab settlements, etc., on which the subsequent historical building was destroyed by bombing in the Second World War, allowing subsequent excavations by the Superintendency of the BB. CC. AA. of Palermo, which, however, has never developed a project for their accommodation and use.

The area of San Giorgio dei Genovesi, neighbouring to the square where the church of the same name stands, is located at the corner between Piazza XIII Victims, Via
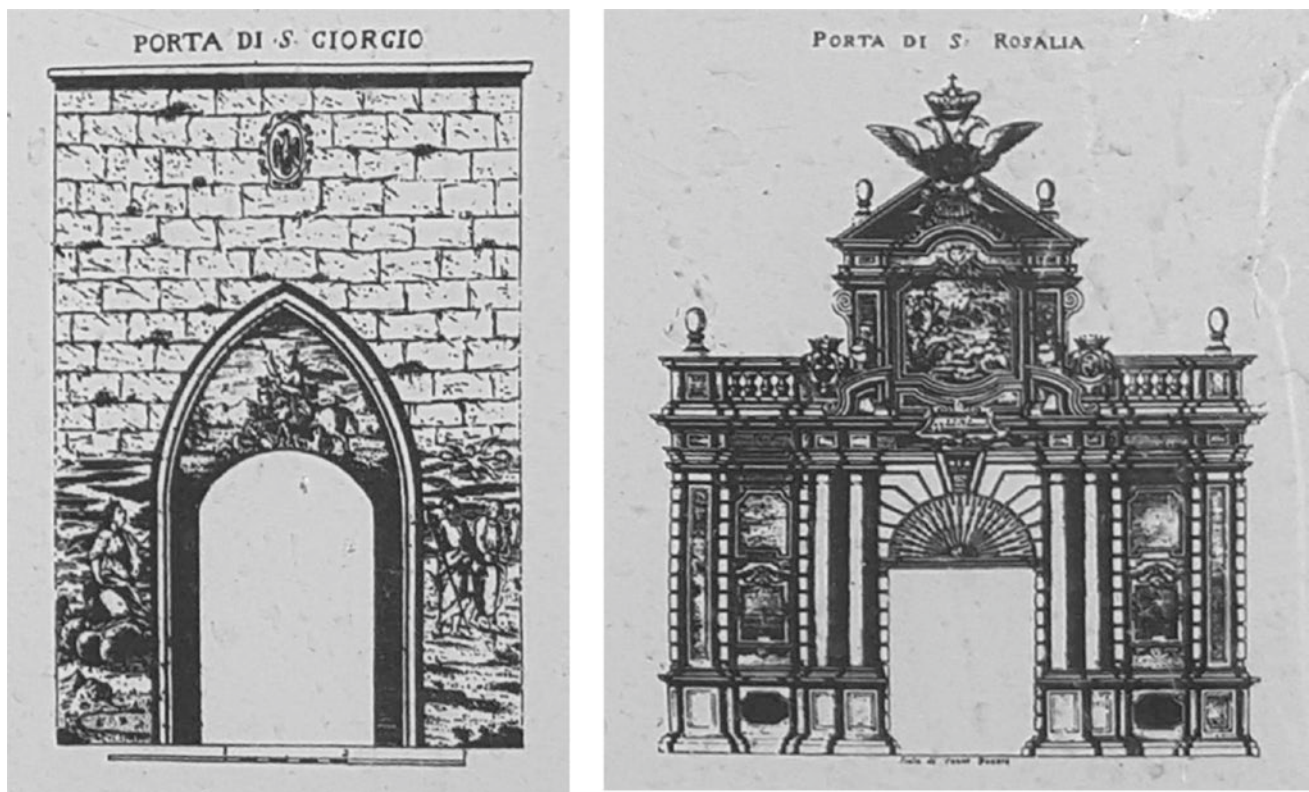
Fig. 2 **a** Drawing of San Giorgio's Gate. **b** Drawing of Santa Rosalia's Gate

Cavour, to the north and Via Francesco Crispi, to the east; access to the area, on the other hand, should take place through a gate (the so-called San Giorgio's gate) located on via Squarcialupo, on the west side (Fig. 2a). The area has a surface of approximately 3600 m² in which, among the spontaneous vegetation, the excavations of 1986 and 1988–1992 can be identified.

The perimeter of the archaeological area of Castello—San Pietro is bordered to the north by Via Castello, to the east by Via Francesco Crispi, to the south by Via Fratelli Cianciolo and to the west by Via Fratelli Orlando. The surface of the area is approximately 4000 m², characterised by a fenced space in which some remains of masonry dating back to the sixteenth to nineteenth century can be identified.

During the thirteenth century, this portion of fortifications built in the period of Arab domination (tenth century AD) of Sicily, underwent several renovations, both to remedy the damage caused by the Angevin-Aragonese conflict, and to improve the defensive structure, which involved a general review of the fortified system of the entire city.

The San Giorgio's gate was demolished in 1724, to make way for the more impressive and modern gate of Santa Rosalia (Fig. 2b), built by the Senate architect Andrea Palma, in turn demolished about a hundred years after its construction.

In 1943, the bombings of the Second World War damaged the entire area due to its proximity to the port and the archaeological pre-existing structures were buried.

The first excavation in 1986, carried out by the Superintendency of Palermo, made it possible to find in the western portion of the San Giorgio dei Genovesi archaeological area, about 30 m of wall, part of the reinforcement works of the city walls put in place in the sixteenth century, according to the project by Antonio Ferramolino. In addition, the structures of the Islamic age and the stone ammunition for the trebuchet were recovered (Fig. 3). A second excavation was started in 1989, during which the easternmost part was analysed. Here, further sections of the wall were recovered whose construction phases could be identified and which can be placed in a period between the Islamic age and the first half of the 1500s.

Thanks also to these excavations, it was possible to reconstruct the history of the city. In fact, it has been confirmed that during the period of Arab domination, the site now called Castello San Pietro was used as a necropolis, thanks to the discovery of ceramics dating back to the tenth century. A.D. (Arcifa, 1989). Subsequently, the area was urbanised and was built between 1001 and 1100 AD. The medieval wall was built to protect the city from enemy invasions. Near the archaeological area of San Giorgio

Fig. 3 Trebuchet stone bullets found during the excavations in 1982 and 1986 (Di Stefano, 1991)

was the gate of San Giorgio, at the entrance to the current via Squarcialupo. Following excavations and restoration work in 2009, Castello a Mare became the nucleus of the 'Castellammare archaeological park', but the intervention did not concern either of the two archaeological areas.

At the archaeological site of San Giorgio dei Genovesi in 2019 the ephemeral setting up of two works was allowed: the "Latente" obelisk and the "Euruin 100 Eur" gate. The obelisk symbolises the hymn to the lost history of the area and the gate is a reinterpretation of previously existing city gates. Both have already been dismantled.

These areas, as already mentioned, are now inaccessible, enclosed by fences and left to neglect and to the growth of spontaneous vegetation. But these are important pieces to understand and transmit the evolutionary history of the city, in particular the expansion and construction of the new fortifications between the Arab period and the sixteenth century, which must be integrated with the archaeological park of Castello a Mare and other features of the Arab fortifications still visible in the historic centre.

3   Related Experiences

The issue of the accessibility of archaeological areas in urban contexts has been addressed in many places, such as Catania (Sanfilippo et al., 2021) and Lucentum, in Spain (Faraci, 2013).

In the first example, as a preliminary operation, a census of the archaeological areas present in the historic centre was carried out, developing personal data sheets to carry out a cataloguing, inserting the data into a GIS platform being tested with the "Catania OPENCiTy" project (Caravale, 2016) and comparing them with the VIR system.[1]

In this way, it was possible to evaluate the conditions of Catania archaeological heritage, referring in particular to the Roman era, the state of conservation and the relationships with the urban context and between the sites themselves. On the basis of this, projects on an urban scale have been developed to improve accessibility to some areas, in particular those falling within the quadrilateral between the Theater, the Odeon, the Terme della Rotonda and the Balneum of Piazza Dante, but also projects on an architectural scale, always trying to integrate the new systems with

the physical and cultural context, but also by creating networks between the various sites.

Another example is the Roman archaeological site of Lucentum, in Alicante, Spain. Here a valorisation project was realised between 1992 and 1996 which consisted in the consolidation and protection of the architectural surfaces, in the construction of a drainage system in the ground for the disposal of water, in the arrangement of the paths inside the area also with insertion of walkways, etc. Furthermore, a few years after the end of the works, it was decided to draw up a scheduled maintenance plan, indicating the maintenance operations to be carried out and their frequency.

This program proved to be so inadequate that it was replaced, starting from 2000, by another monitoring system which provided for the compilation of forms for each building to be updated every year. The data collected in the cards were then uploaded to a GIS database. This type of monitoring allows continuous control and prevention of damage, which consequently determine very low maintenance costs.

These experiences can be considered as good starting points for certain aspects, which however need to be further developed and implemented. It is necessary not to standardise the methodology of intervention too much, but to make it as versatile as possible because especially in the case of archaeological areas, we are dealing with a fragile cultural heritage from the conservation point of view, so it is good to be aware that each site will have, on the one hand, its own critical issues to solve and, on the other hand, strengths to leverage for a valorisation project.

4   A Possible Approach for the Objectification of the Results

It is not easy to propose a unique method for the valorisation of archaeological areas in urban contexts, but it is possible to adopt an analytical approach both in the preliminary phase and in the control phase of the results of a project, which lends objectivity to the data and results, but which at the same time can be adaptable to sites where different issues have to be approached.

Replicating the methodology used in I-Access, for the archaeological areas of San Giorgio and Castello San Pietro, I would propose to evaluate, through certain criteria, different aspects related to accessibility, use, knowledge, maintenance, and restoration project.

In particular, reference is made to the so-called *multicriteria* analysis already applied to extra-urban archaeological sites in other research experiences (Nicolini, 2021), which take into consideration a series of requirements to be evaluated in relation to a theme and at different scalar and dimensional magnitudes.

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[1] The "Vincoli in rete" (Network restrictions) information system, created by the Higher Institute for Conservation and Restoration, is a project for the development of services dedicated to internal and external users of the Ministry of Cultural Heritage and Activities and Tourism (MIBAC) and allows access in consultation to information on Architectural and Archaeological cultural heritage (http://vincoliinrete. beniculturali.it/VincoliInRete/vir/utente/login).

Since the objective of this study is accessibility, the specific criteria to be analysed will first be chosen to evaluate the conditions of the site from this point of view. It is not a question of analysing not only the reachability, or the possibility of accessing buildings or not, but also the quality of the surfaces on which to walk and the accessibility from a visual, auditory and content point of view, for example relating to the presence of tools to support the visit and to customise the experience (brochures, guides, illustrative and explanatory panels, etc.).

It would be necessary to start from a broad scale, thus assessing factors related to the reference territory. For example, criteria related to the site's accessibility should be analysed, which in the case of urban areas—in some cases even historic centres—means reasoning about road infrastructure, public mobility inside and outside the city, parking facilities and so on.

Subsequently, services related to the management and use of the site can be evaluated, if any, i.e. whether there are management bodies, which may also be associations, cooperatives, or others, and how they act to enhance and maintain the site (site publicity or other strategies).

Once these criteria have been established, an analysis of the state of conservation of a site can be carried out, highlighting its strengths and weaknesses to be taken into account in a restoration project, as a combination of conservation and valorisation actions.

Since a proper conservation and valorisation project for an archaeological site must also take into account the user needs derived from the users, it may be useful to involve the users themselves and the local communities by submitting questionnaires to them. This will provide further feedback on the perception of the community and its needs. This type of approach focuses on the users, which is the real users, who express the actual needs of use.

The same approach can be used in the control phase of projects once they have been realised, through the use of the same analysis to verify whether or not the set objectives have been achieved, for the purpose of full physical and content accessibility.

This can be fundamental in the case of architectural projects, such as roofing systems, walkways, ramps, which always generate extensive debates following their construction, or for the relationship they establish with the ruins, or for technological and construction problems if not compatible materials are used. The quality of a project, in fact, which in this case should be based on criteria such as not preventing or disturbing the reading of the ruins, can be objectively assessed if we resort to multi-criteria analysis, which also in this phase can offer ideas for a further

improvement of conditions and to further confirm that the requirements of the preservation of an asset of historical and cultural interest have been met.

Another moment of application can be the monitoring of the conditions of a site. Once the projects have been implemented and evaluated, the most appropriate way to preserve an archaeological site is certainly continuous maintenance, or rather the so-called "planned conservation" (Della Torre, 2014). It would be possible, in fact, to also analyse through the use of questionnaires or sheets, on the model of Lucentum as explained in the previous paragraph, based on the same criteria considered in the preliminary phase, mentioned above, adding others such as conservation conditions, internal walkability, acoustic-visual comfort, but also thermo-hygrometric and respiratory comfort, access costs and so on. For adequate monitoring, it would also be useful to evaluate factors such as the type of attendance at the site.

By applying the analysis periodically, it is possible to carry out a careful monitoring of the conservation status of an archaeological site, directing intervention actions towards a constant improvement of the condition of the site, both from the conservation point of view and in terms of accessibility and use by the community.

5   Interventions for the Valorisation

The valorisation of urban archaeological areas must be faced on the level of analysis, applying for example the methods described above, but also on the operational level.

Furthermore, such a complex issue must be faced by applying a multi-scalar approach, thus considering the problems both at the territorial scale and at the same time also at a lower scale, such as that of the conservation of ruins.

The territorial scale poses the problem of reintegrating archaeological areas into the urban context, or rather of how to reconstruct a relationship with the city itself. Once this has been done from the historical point of view and after having deepened the knowledge of the property and having clarified its role in the course of urban history, the question arises of giving it a new role, to be assumed in the dynamics of the contemporary and future city.

This must be done similarly to the scale of the immediate context, which in the present case takes into consideration two archaeological areas, San Giorgio and Castello San Pietro, completely disconnected from each other although very close and without a relationship even with the nearby Castello a Mare (Fig. 4).

Fig. 4 Bird's eye photograph of the archaeological area of San Giorgio dei Genovesi

To face the isolation of the sites, one possible way is to build itineraries and networks of relationships with other archaeological sites, both to reconstruct an overall picture that helps in understanding the history of a city, and to improve the experience of visitors, who walk the streets of historic centres.

They can only start from the archaeological museum "A. Salinas", which also has the managerial competence of the two archaeological areas. The role of the museum is important, even more so because of its real proximity to the two areas, as it would be difficult to set up a museum in situ, a recurring problem for archaeological sites as well. The connection with the Salinas museum would make it possible to create a tour that completes the understanding of the archaeological excavation, for which, moreover, to make use of the most advanced technological tools, when it is no longer possible to tell what is no longer visible or to perceive intangible heritage is an absolutely valid choice, if based on a scientific method.

Reference is made to technological tools, such as WebGIS platforms and virtual tools, such as augmented reality.

In the first case, the WebGIS platforms, as already happened for other experiences which will be discussed in the next paragraph, allow the construction of virtual itineraries, which can be consulted by users through the now most common devices (smartphones and tablets), giving the possibility to simultaneously query the platform and get in-depth information on what they are visiting. In the case of augmented reality, this would allow those who have the skills (in this case archaeologists and architects together) to develop the basic scientific content, which can and must certainly be enriched by other skills, adopting an interdisciplinary approach and taking always present the goal of not trivialising the content that is represented.

The value of these tools, in addition to allowing full access to information and therefore making knowledge open to all, both to the simple visitor and to those who do

research, consists in making this information updatable over time. Furthermore, building a consistent database could be a stimulus to continue investigating these places, where the latest essays were performed in the 1980s.

The scale of the ruins, on the other hand, poses problems of conservation of the remains and use of the area. Here the themes of the architectural project come into play.

Another action that can be done, more specifically in the San Pietro area, is to create, through participatory practices, connections with the resident community to contribute to their social improvement through the growth of awareness.

For this reason, we have joined, and are working together, in creating relationships with schools, groups and associations, already met during the I-Access project, to the initiative of the Association "Tu Sei La Città" which more or less since July 2021 began a process of redevelopment, initially cleaning it and building a fence to delimit a portion that will be destined for public use for the district in order to give the area, as previously mentioned, a role in the contemporary city, to be lived in an active way.[2]

6   Conclusions and Future Perspectives

This contribution was prepared to emphasise that there is still a little known and almost forgotten heritage, which however is an important presence in many cities of the Mediterranean area and therefore needs attention. Starting from an experience that has already begun, it was decided to implement it, also taking into consideration the heritage of archaeological areas in the urban area, although there has not yet been a chance to apply it in reality.

Adequate valorisation projects must be developed, which take into account many aspects and to which architects must dedicate themselves, due to their competence and ability to have an overall vision at a multiscale level and to draw up subsequent implementation and management processes, evaluated from multi-criteria analysis and, therefore, sustainable.

The desirable and possible future developments of this process concern the possibility of extending the range of action of the limited urban context so far considered, for example by local authorities, such as the Municipality or the Superintendency, and to create databases that can be updated and used on large scale for the benefit of all.

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[2] The story of this experience will be narrated in the degree thesis in History of Art by Emanuela Carullo (University of Palermo, thesis supervisor Prof. R. Prescia).

Multidimensional Approach to Evaluation of Weathering Degree of Lower Plant on Stone Cultural Heritage in Cambodia

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Abstract

The West Gate of Nokorbachey Temple, built by King Jayavarman VII in the Angkor period (12–13 c), is decorated with bas-relief on medium-grained sandstone. It is being damaged by lower plants such as algae and lichens, which inhabit the surface of the stone and produce organic acids, releasing minerals into the soil and causing physical damage when removed. The high temperature, humid climate and spore reproduction of lower plants make it impossible to completely solve the biological damage of stone cultural properties in Cambodia. Thus, it is necessary to collect data on biological distribution and activity through monitoring and establish scientific conservation measures based on the analysis. In particular, because damage by lower plants is a three-dimensional damage type that accompanies the corrosion of stone through biochemical action rather than simple biofilm formation, quantitative and qualitative evaluations were carried out in parallel. In this West Gate, the incidence rate of photosynthetic algae and lichens is close to 80%; however, the bas-relief showed relatively little coverage and vitality due to the role of roof shading. As a result, partial cleaning and consolidation of the two passage gates and the right area of the external side are required due to the high level of biological weathering.

1 Introduction

The stone cultural heritage of Cambodia in the Angkor period is subjected to weathering effects due to exposure to high temperatures and humidity. In the case of large-scale cultural properties exposed to the outdoors, the climate and the conservation environment related to the growth of vegetation are challenging to improve, and consequently, many variables arise in terms of control. Therefore, it is essential to periodically check the status of the growing organisms that threaten cultural properties so that conservation or restoration work can be done appropriately.

The collapse and structural problems of Angkorian stone heritages caused by trees that grow abundantly throughout Cambodia are already well known from the conservation science perspective (Mishra et al., 1995; UNESCO Office Phnom Penh, 2009). Cambodian trees grow in the vicinity of the gallery, which are built with block-shaped sandstones and decorated with bas-relief during the Angkor period. Their roots invade the platen soil layer and have caused structural imbalance and collapse.

However, the trees primarily cause the collapse of old stone structures and do not destroy the unique decorations or the iconography of Apsara. Among the elements of stone cultural properties in the Angkor period, bas-relief performs not only decorative functions but also demonstrates the period, background, purpose and record of the history of the cultural properties. Bas-relief with various values cannot be restored by simple work when damaged, and accordingly, their uniqueness must be preserved by continuous monitoring.

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In contrast, the lichen grows on the pattern fragments engraved on the surface of stone cultural properties, and destroys the icons, making restoration challenging. The damage observed in bas-relief from the Angkor period is mainly due to the erosion of the stone surface by organic acids emitted by the growth of the lower plant (Mottershead & Lucas, 2000; Piervittori et al., 2004; Salvadori & Municchia, 2020). The lower plant, which mainly propagates by air, is easy to grow on the surface of the bas-relief, where micropores and irregularities are prominent, and it is impossible to remove completely. Residual organisms reproduce when growth conditions are met; thus, effective control is difficult with only one-time management.

In addition, the lower plant is epiphytic between the micro-crack of minerals on the surface of the rock. It has a hard bonding force and physical removal causes damage to the bas-relief when cleaned. Therefore, appropriate cleaning times and methods should be considered after comprehensively judging the distribution and growth status of organisms that have grown on the surface causing damage to stone cultural properties. Accordingly, various biological monitoring methods used in the Republic of Korea were applied to Cambodian stone cultural properties. The appropriateness of conservation treatment was evaluated according to the state of the stone materials.

In this study, the damage patterns of lower plants that are faced by sandstone masonry cultural properties exposed to high temperature and humidity for a long period were investigated, and various approaches for analysing them were applied. For the purpose of this study, the target of damage assessment was the Nokorbachey Temple, a Buddhist temple built in Kampong Cham the last years of King Jayavarman VII during the heyday of the Khmer Empire in the Angkor period (Fig. 1a).

This temple was built by King Jayavarman VII of the Angkor Empire while expanding his power to the south. It is a fortress surrounded by a total of four enclosures (Angkor Conservation Office, 2016). The object of this study, which is the back door of this temple, is in the third enclosure. The inside of the door is filled with laterite, and the exterior is decorated with light green sandstone. There is an entrance in the centre, and it is characterized by the decoration of Absara surrounding the windows symmetrically to the left and right of the door (Fig. 1b). This temple was

Fig. 1 Study object and biological weathering situation. **a** Main gate of the Nokorbachey Temple in the Angkor period. **b** Biological diversity on the sandstone gate. **c**, **d** Lichen on the stone block and lost part of bas-relief

structurally reinforced three times during the French occupation period to 2013. Lichens of crustose and foliose types mainly inhabit the surface of the bas-relief (Fig. 1c, d).

2   Research Methodology

It is fairly typical for stone architecture to undergo biodeterioration in Cambodia as well as worldwide. In this regard, to determine the effects of organisms on stone heritage, a Scanning Electron Microscope (SEM) is commonly used (Caneva et al., 1991; Mihajlovski et al., 2015) with which deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are analysed (Li et al., 2021; Portillo & Gonzalez, 2011; Rölleke et al., 1996). Furthermore, various methods such as environmental impact analysis (Tiano, 2016) have been continuously proposed. However, there is not enough discussion on the distribution and vitality of monitoring techniques of lower plants inhabiting the surface of stone cultural properties.

The Normal Distribution Vegetation Index (NDVI), which is the new method for quantification of biodeterioration, detects the vitality of chlorophyll within the research area, and it can determine the distribution area of the organism that engages in photosynthetic activity (Gamon et al., 1995; McGwire et al., 2000; Thenkabail et al., 2000). The NDVI uses the third and fourth bands of Landsat TM/ETM+ in the near-infrared region from spectroscopy as an index indicating the distribution and activity of plants within the range −1 to +1. Therefore, the criteria for calculating the biodeterioration area are objective, and as results are worked out through scanning and arithmetic (Chun et al., 2015), it is non-destructive and effective.

This study investigated how the lower plant epiphytic affected the cultural properties of sandstone and how diagnosis could be carried out by taking the west stone gate of Nokorbachey Temple as the study object. Scanning Electron Microscope (SEM) analysis was performed with the JSM-IT300 model of JEOL to observe the epiphytic state of organisms and the biochemical weathering of minerals that occur on the stone surface. The weathering grade according to the coverage was calculated using the checklist used by the National Research Institute of Cultural Heritage (2017) based on visual observation. Image analysis with a hyperspectral camera of PS-FW-11-V10E model of Specim was carried out to calculate the NDVI.

Based on the research results, damage assessment techniques suitable for on-site investigations were presented. The evaluation result of biodeterioration condition was provided as primary data for conservation treatment and restoration work. Analysis methods and conditions suitable for the local investigation environment were provided to suggest establishing a long-term monitoring plan for stone cultural properties.

3   Results

In the lower plant species, which mainly reproduce by spores, the spores are suspended in the air. When the conditions are suitable for growth, the mycelium germinates from the spores, absorbs nutrients from the stone surface and reproduces. After the algae layer is formed, the fungus develops, forming a symbiote and a lichen biofilm. No epiphytic vegetation was observed in the West Gate fresh sandstone sample under macroscopic examination. However, as a result of SEM analysis, mycelial epiphytic was sporadically observed, suggesting that even the fresh stone surface observed in the study had entered the early stage of biological weathering (Fig. 2a–c).

In addition, as a result of collecting a sample from the area where the lower plant propagated, and observing the surface attached to the stone, mineral particles formed by the decomposing rock grains between the mycelium (Fig. 2d), spore formation (Fig. 2e), and the vigorous growth of lichens and lower cortex (Fig. 2f) were observed. Algae or spores spread into the air without being adjacent to the surface of the stone cultural property. However, the mycelium forms rhizines and lower cortex that adhere closely to absorb nutrients from the stone material of the West Gate and turn the stone into soil.

The checklist can be used to monitor the change in the lower plant covering the West Gate surface. The organism divides the weathering grade from 1 to 5 according to the coverage area. The checklist was prepared for those members or stones decorated with bas-relief (Table 1). This method is much simpler than estimating the weathering rate based on the weathering map, and accordingly, it is a suitable method for inspecting the damaged state of stone cultural properties in Cambodia with many members.

To monitor the change in the covering condition of the lower plant inhabiting the West Gate surface of the temple, a checklist was prepared by dividing it into 10 areas and legends (Alga, Lichen, Moss, Plant). Those that may occur in Cambodian stone cultural properties were selected from among the types of bioinvasion indicated by ICOMOS that was collected (Vergès-Belmin, 2008), and the weathering grade was calculated according to the number of occurrences and coverage.

Overall, the results showed that the frequency of occurrence of algae and lichen was overwhelmingly dominant, and the external side had a higher degree of cover than the internal side. In particular, for the West Gate entrance (C, H), a high weathering grade was calculated regardless of
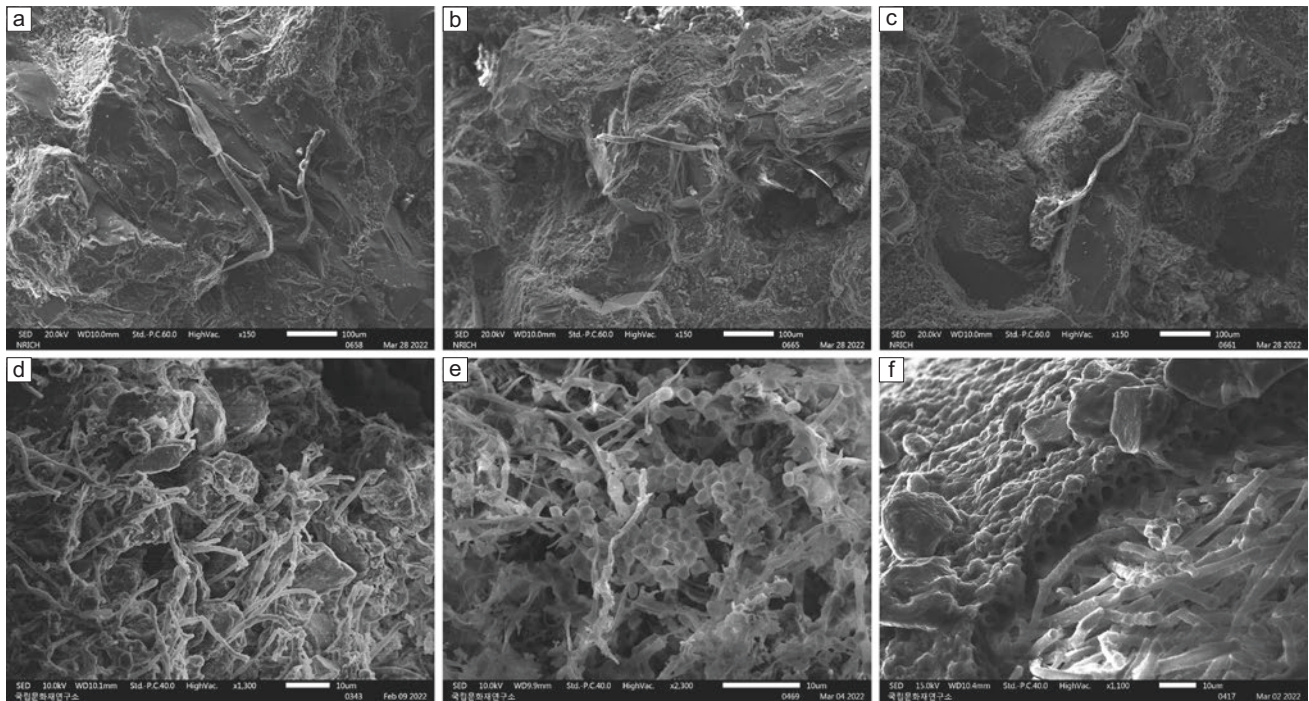
Fig. 2 Inhabitation status of lichens growing on the surface of stone from Nokorbachey Temple. **a–c** Germination of hypha from the surface of minerals constituting the stone of the West Gate. **d** Minerals fall off by granular decomposition by the hyphae of lichens. **e** Spore production inside lichens. **f** A lower cortex adheres closely to the adjacent surface of the stone and removes minerals

Table 1 Biological weathering grade using the checklist in the Nokorbachey Temple

Nokorbachey Temple data sheet
12–15 July 2017
Stone Team, Conservation Science Division, NRICH

Location	Group	Rock type	Unit	Occurrence				Weathering grade[a]
				Alga	Lichen	Moss	Plant	
External side	A	Sandstone	39	38	30	0	2	3.6
	B	Sandstone	70	70	70	0	6	4.5
	C	Sandstone	54	54	52	0	0	4.6
	D	Sandstone	68	54	58	0	1	3.5
	E	Sandstone	39	36	31	0	0	3.4
External side subtotal			253	252 (93.3%)	249 (92.2%)	0 (0.0%)	9 (3.3%)	4.0
Internal side	F	Sandstone	54	20	21	0	5	1.8
	G	Sandstone	50	33	36	0	1	1.0
	H	Sandstone	46	36	36	0	4	4.5
	I	Sandstone	56	35	34	0	0	1.9
	J	Sandstone	38	14	17	0	0	2.0
Internal side subtotal			244	138 (56.8%)	144 (59.3%)	0 (0.0%)	10 (4.1%)	2.5
Total			497	390 (78.5%)	393 (79.1%)	0 (0.0%)	19 (3.8%)	3.3

[a] Biological weathering grade was determined by the organism coverage rate in the study area. Grade 1; coverage rate 0–20%, Grade 2; coverage rate 20–40%, Grade 3; coverage rate 40–60%, Grade 4; coverage rate 60–80%, Grade 5; coverage rate 80–100%

the direction. The external side of the bas-relief surface area (A, B, D, E) showed higher incidence and coverage than the internal side (F, G, I, J).

Plants (3.8%) growing on the surface of stone cultural properties engage in activities to transform their habitat into the soil to absorb nutrients. Lichens (79.1%) and algae (78.5%), which showed the highest incidence at this entrance of the temple, are the most representative organisms that corrode the stone surface by releasing organic acids. Therefore, the greater the vitality of plants, the higher the risk of erosion by exposure to organic acids.

The NDVI was calculated by scanning the living organisms on the surface of this stone gate with a hyperspectral camera, and a comparative analysis was performed between the external and internal sides to check the distribution status and vitality of the plant's epiphytic state on the temple stone gate (Fig. 3). Among the vegetation legends presented in this study, 0–0.6 was observed for algae and lichens, 0.6–0.8 was observed for herbaceous plants, and non-weathered parts where no epiphytic state was observed visually were distributed within the range of −0.2 to 0.2.

$$NDVI = \frac{(band4 - band3)}{(band4 + band3)}$$

The spectral information obtained from the West Gate was 755,440 on the external side and 648,584 on the internal side (Table 2). The NDVI was distributed between −0.2 and 0.8 on all of the parts. The NDVI grade 1 (−0.2 to 0.0), which indicates the freshness of the stone surface, was less than 1%, and grade 3 (0.2–0.4), where vegetation was active, was 30%, which was similar to the external and internal side conditions.

However, in the distribution trend of grade 2 (NDVI 0.0–0.2), which indicates the unweathered state of stone and the early stage of epiphytic, the internal side (33.01%) showed a difference of more than twice the time of the external side (14.92%). Grade 4 (NDVI 0.4–0.6), which indicates the vigorous growth of algae and lichens, accounted for 42.29% on the external side and 33.38% on the internal side, indicating high overall biological vitality of the external side.

The biological distribution and vitality in the area of the West Gate of Nokorbachey Temple were analysed through a checklist and the NDVI, and the degree of biological damage was comprehensively identified by confirming the distribution of weathering grades (Fig. 4). The results indicated that biological damage occurred more frequently on the external side than on the internal side. In addition, slightly more lichens than algae were observed, and therefore the progress of the symbiotic relationship between algae and fungi was significantly higher. In the case of bryophytes, which are next to algae and lichens, succession was not observed, and herbaceous plants mainly grow between the soil and stone material, suggesting that the biological weathering stage of stone material is early.

As a result of comparing the vegetation coverage rate through the checklist of the lower plants and the vitality

Table 2 Results of the Normal Distribution Vegetation Index calculation of external and internal sides of the West Gate

Grade	NDVI	External side		Internal side	
		Pixel	%	Pixel	%
1	−0.2 to 0.0	474	0.06	1,542	0.24
2	0.0–0.2	112,070	14.92	214,073	33.01
3	0.2–0.4	252,758	33.46	195,047	30.07
4	0.5–0.6	319,513	42.29	216,497	33.38
5	0.6–0.8	70.038	9.27	21,425	3.30
Total		755,440	100.00	648,584	100.00
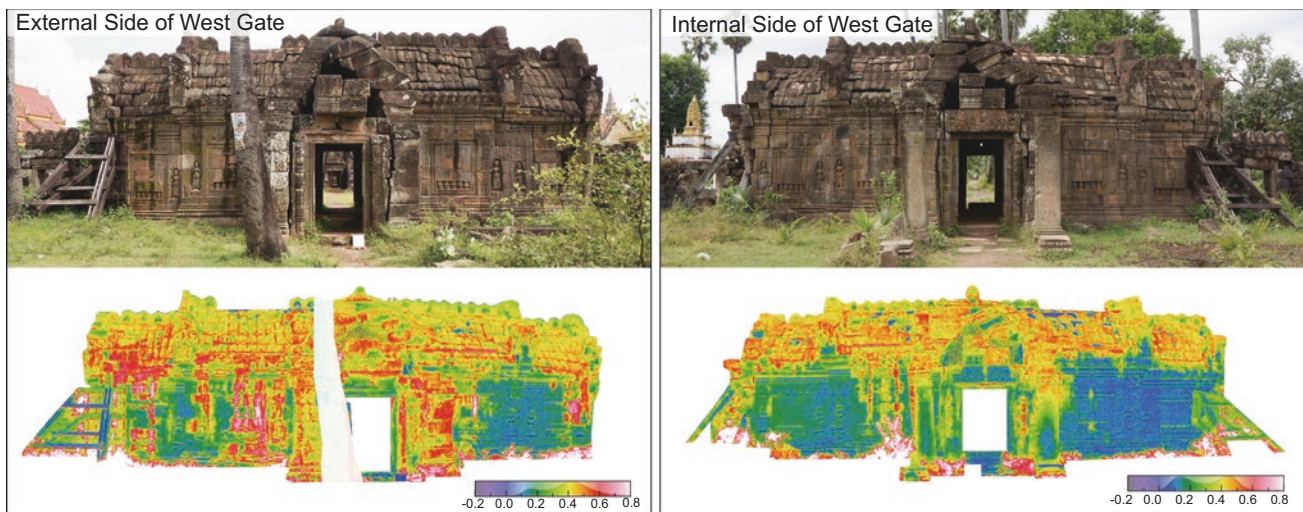
Fig. 3 Normal Distribution Vegetation Index using the hyperspectral scanning method in the West Gate of Nokorbachey Temple
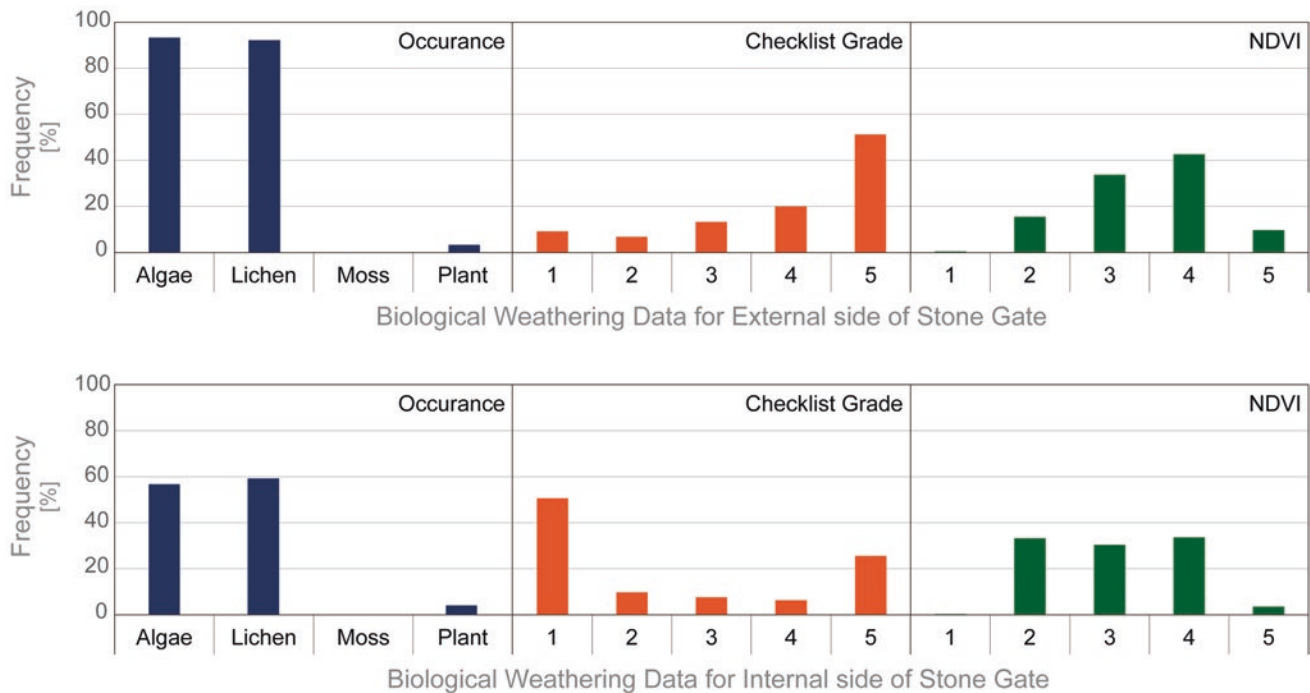
Fig. 4 Checklist and the Normal Distribution Vegetation Index analysis results of the West Gate of Nokorbachey Temple

through NDVI, the incidence rate, coverage, and NDVI all tended to be high on the external side. The walls with bas-relief were generally calculated in grades 1–3, implying little biological damage; thus, maintenance and monitoring are required. However, some of the right-side walls of the external side (group B) showed severe biological damage of grades 3–5, indicating that surface cleaning and reinforcement treatment were necessary.

4 Conclusion

Biological weathering is not a type of damage caused by the condition, such as simple contaminant cover or physical loss. Lichens are a symbiote of algae and fungi, and through organic interaction, they release lichen acid, causing chemical damage that breaks down the stone surface and physical loss due to mycelium adhering to the stone during the epiphytic process.

Plants that grow in close contact with the stone surface, such as algae and lichens, increase the extent of damage through reproduction and the depth of damage through growth activities. Furthermore, the trend of damage changes depending on their surroundings. Damage caused by living organisms has a three-dimensional damage area and variable nature and it is difficult to represent the damage rate with a quantitative scale simply. Therefore, biological weathering is a type that requires continuous monitoring.

The bas-relief, a characteristic sculpture of the Angkor period engraved on the front door of Nokorbachey Temple, not only includes various epiphytic plants of the lower level, spoiling the aesthetics, but it also accelerates the formation of soil by the stone. This is in the case of a biofilm formed by a lower plant that occurs continuously in a high-temperature and high-humidity environment. Thus, there is a risk of losing the original shape of the piece if excessive and frequent washing is repeated due to continuous soiling caused by organic acids and hyphae.

We used the Normal Distribution Vegetation Index (NDVI) to calculate biological vitality through the photosynthesis of algae and lichen of lower plants that produce organic acids that convert stone into soil. Moreover, according to the results of the spectral image analysis of the temple surface, the external side showed a higher NDVI distribution than the internal side. Since the West Gate roof acts as a shallow awning to block direct sunlight and rain, the NDVI of bas-relief had less distribution and less occupancy than the roof.

As observed in the case of the West Gate of temple, the lower plant plays the role of a precursor plant in the area without vegetation; during the succession process, the stone becomes soil, and the growth environment is created so that moss and higher plants can grow gradually. Therefore, from

a long-term perspective, the biological damage of algae and lichens occurring on the surface of stone cultural properties is not a simple phenomenon such as a covering formed of inorganic contaminants, but a complex phenomenon that causes the physical and chemical soilization of stones.

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Activating and Institutionalising Heritage Regulations in Sacred Historic Cities: The Case of Vrindavan, India

Charlie Gupta and Ridhu Dhan Gahalot

Abstract

India is a country with a rich and diverse heritage due to the numerous ethnicities and religions that have settled in the region over thousands of years. The country has many historic cities with unique and complex architectural heritage, which attract millions of tourists worldwide. However, due to rapid urbanisation and intensive development, these heritage assets are often neglected and at risk of being lost. This paper aims to address this issue by integrating planning and urban conservation paradigms to ensure heritage regulations and awareness towards sensitive development in historic cities. The case of Vrindavan, a prominent heritage city in northern India, is examined as an example. With its unique cultural identity under threat from rapid expansion, this study proposes a methodological approach to preserve and conserve the heritage fabric of the city and generate awareness among locals and tourists. This study could be used as a basis for future research and to suggest strategies and recommendations for conserving and revitalising other historic cities worldwide.

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1 Introduction to Heritage and Sacredscape

ICOMOS defined "Heritage" as a broad concept that includes tangible assets such natural and cultural environment, encompassing landscape, historic places, and built environment as well as intangible assets such as the past and continuing cultural practices, knowledge and living experiences (Rossler, 2010). The tangible asset mainly comprises of the architecture or the built heritage of any place. The architecture heritage of any region is among the priceless and irreplaceable possessions. Under the influence of a given culture, itself changing through time, the architecture heritage of a region undergoes development, passing through phases, and probably reaching ultimately the end of its cycle of development. Historically, architectural heritage has been a part of many of the greatest civilisations in this world and, thus, has been one very influential way of learning about history. In the form of buildings, towers, statues, and monuments, architecture has delivered historical information from one generation to another. The UNESCO Recommendation on the Historic Urban Landscape reports states that "The heritage shall be taken to mean any groups of buildings, structures and open spaces including archaeological and paleontological sites, constituting human settlements in an urban or rural environment, the cohesion and value of which, from the archaeological, architectural, prehistoric, historic, heritage, aesthetic or socio-cultural point of view are recognized" (Taylor & Amiel, 2014; UNESCO, 2019).

Accordingly, the sacred cities are not only significant historically or archaeologically for national identity but also for defining our own identities today (Serageldin et al., 2001). The scaredscape combines the absoluteness of space, relativeness of place, and comprehensiveness of landscape, thus altogether results in a 'wholeness' carrying the inherent and imposed spirit of 'holiness', which is to be called 'scaredscape' (Singh, 2017). Typically, a scaredscape will

have a deity whose main temple or group of temples is believed to have the power to connect to the sacred territory as defined by any religion. The focus of this study will be on scaredscape that are in city centres and have historical significance in terms of their built heritage. Additionally, it is very important to consider the relationship between heritage and Sacredscape. The Sacredscape may not only have heritage value but it also reflects the spiritual qualities of a religion, or a community, posing additional challenges to its protection (Alexopoulos, 2014; Hammer, 2018).

2   Urban Heritage and Sacred Cities

The term 'urban heritage' has two interpretations. Firstly, archaeological artefacts, historical structures, vernacular architecture, historical gardens, social activities, rituals, and celebratory events are all examples of urban heritage. Second, urban heritage can relate to the city as heritage, which is a specific sort of cultural property linked with neighbourhoods, urban centres, and historic cities (María García-Hernández, 2019). Most urban planners and managers associate urban heritage with monuments when thinking about urban heritage, while this understanding often omits heritage areas which equally represent the urban heritage (Steinberg, 1996). Urban Heritage is a manifestation of history that people interpret through their everyday lives, making it distinct from other forms of heritage, rather than being a collection of historic building details and spatial attributes of a townscape (Orbasli, 2002). Historical urban settlements have only recently been recognised and understood as heritage, and their conservation has gained momentum in recent decades. Through the contributions of international organisations like UNESCO, ICOMOS (International Council on Monuments and Sites) and the Council of Europe, cultural heritage is becoming recognised as a significant link in urban life and the development process (Orbasli, 2002). The Organization of World Heritage Cities (OWHC) under UNESCO had listed 250 cities under the category of world heritage cities that includes cities of Agadez (Niger), Ahmedabad and Gwalior (India), Asmara (Eritrea), Evora (Portugal), Cusco (Peru), Oaxaca (Mexico) and many more. Numerous historic cities on the List possess elements of religious significance and are considered sacred by many communities around the world such as Varanasi for Hinduism, Jerusalem for Christianity, Islam and Judaism, Mecca for Islam etc. According to the UNESCO MAB (Man and the Biosphere) Programme, sacred sites are the oldest protected areas on earth and have a vital importance for safeguarding cultural and biological diversity for present and future generations and can singularly demonstrate the spirit of a particular place. However, rapid urbanisation around the world is changing their culture, customs, and history. This quick change in socio-spatial structure has led to the loss of cultural identity, posing a serious threat to these cities. In the recent years, UNESCO had played a very important role in carrying out the development and heritage conservation initiatives in these cities. The recent transformations observed due to religious tourism, however, have opened the door to an ever-increasing number of visitors to many cities globally. Therefore, there is a need for effective solutions and strategies to alleviate these problems.

3   An Overview of Tourism in Sacred Heritage Cities

Tourism has become an ever-growing industry that transcends global boundaries and binds nations together. Historic monuments, endowed with a message from the intervening decades, have helped to establish cultural and heritage tourism and have become a key source of revenue for many regions globally (Alnafeesi, 2013). As per the ICOMOS International Cultural Tourism Charter, Domestic and international tourism continues to be among the foremost vehicles for cultural exchange, providing a personal experience, not only of that which has survived from the past but also of the contemporary life and society of others. It is increasingly appreciated as a positive force for natural and cultural conservation (ICOMOS, 2002). In the recent decades, however, religious tourism had also gained momentum where people travel to different places that hold spiritual importance. This travel for religious purpose is also defined as pilgrimage or sacred journeys. As per the recent statistics published by UNWTO, in 2018, around 3.93 million tourists visited Jerusalem, 2.5 million visited Holy Mecca, 1.3 million visited Vatican city and 8 million tourists visited Vaishno Devi shrine (UNWTO, 2018). Tourism in many of these cities is increasing, and as a result, many historic structures are being demolished to make way for new ones, or they are being converted into commercial space. It is disturbing to see that many historic towns around the world are grappling with the same kind of problem where the fabric of their heritage is being destroyed because of urbanisation and growing tourism. Tourism has made history and cultural identity a commodity that is advertised, sold, and recreated. Preservation and conservation of these sites are, therefore, necessary to ensure the continuity of cultures and to safeguard them for future generations.

4 Need for Preservation and Conservation of Sacred Heritage Cities

Any religious building or sacred site can be considered both tangible and intangible since both concepts are interconnected. Usually, these buildings or sites should be very well preserved due to a large number of people visiting them, which form an important fact in the approaches of the conservation process (Soubeh & Khaled Al-Omari, 2014). However, the global phenomenon of tourism has significantly impacted the sacred heritage cities across the world. The growing and sophisticated desire for a modernised spiritual traveller has led to substantial spatial cultural commodification in many of these cities. To accommodate a large number of pilgrims at once, the infrastructure of these cities had transformed and gradually expanded in a range of different ways to give a broader range of accommodation, food, and transportation options. Although, it had greatly benefited the global tourism providers due to the increased revenues through religious tourism. In the course of urbanisation and development, when cities expand, the core areas are usually left in a degraded state and the majority of heritage structures are being demolished due to the lack of regulations and guidelines. This phenomenon has been studied, with scholars observing a significant shift from the prospect of going to the gods' abode to a place of vacation that is more focused toward pleasure and recreation (Kaelber, 2006), thus contributing to globalisation and commodification of sacred cities. Conserving the sacred heritage is often a challenging task. Even though various approaches are used today for the conservation and preservation of these sites, a lack of awareness among the locals and the authorities obstructs the overall process.

5 Sacred Heritage Cities and Tourism in the Context of India

As one of the oldest civilisations, India has a diverse range of heritage due to the large number of ethnicities and religions that have settled in this region throughout human history. It has a diverse spectrum of historical cities that span millennia and symbolise its rich architectural heritage, which is unparalleled in both complexity and richness. Indian cities are the nuclei of the cultural legacy that ranges over millennia and exhibits a richness and diversity that is nearly unparalleled. Anywhere one goes to India, one will visit a living landscape where mountains, rivers, woods and villages are interconnected with mythical stories (Eck, 1998). As the second most populous nation on earth, India has a diverse culture, as shown in the many different architectural styles and cultural aesthetics found in its various states (Chalana & Krishna, 2020). In the lands that are part of India today, there are many histories of multiple kingdoms that flourished together, which has left India dotted with several heritage sites. India's rich heritage makes it a unique destination and most tourists who come to India are intrigued by the diversity of its culture.

According to the World Heritage Report published by UNESCO, India has 40 world heritage sites, including cities like Ahmedabad and Jaipur that are on UNESCO's list of world heritage cities (UNESCO, 2003). The Archaeological Survey of India (ASI) had also demarcated 3650 ancient monuments, archaeological sites, and remains of national importance. Apart from it, there are more than 3000 historic towns in India. The rich tangible and intangible assets of India's heritage attract millions of tourists, making these areas prominent tourist destinations. Its vast territory is characterised by unity in diversity that includes beautiful beaches, the ever-inviting mountains, the dazzling deserts, the flora, and the fauna and to add to its beauty-the rich cultural heritage. A visit to India, without a doubt, involves visiting towns such as Jaipur, Delhi, Agra, Mathura-Vrindavan, Madurai, or Kancheepuram, all of which possess extensive collections of India's architectural heritage (Bhardwaj, 2015). These cities are characterised by core areas that are characterised by distinctive architectural styles or urban characteristics that embody the way of life of the inhabitants. These areas have been places of life, values, culture and many social components, which are missing in new towns of today which almost look very similar to one another.

However, today cities in India are growing exponentially, putting tremendous pressure on the historic core as they need to build more homes, infrastructure and industries. As land use changes and urban development continues, these historic districts are undergoing a transformation. Most of the historic structures are viewed as liabilities and not assets. Even though India has made many steps towards an improved system of city planning and urban conservation by implementing various schemes like JnNRUM (Jawaharlal Nehru National Urban Renewal Mission), HRIDAY (Heritage City Development and Augmentation Yojana), PRASAD (Pilgrimage Rejuvenation and Spiritual Augmentation Drive), etc. Despite all the policies and schemes, the heritage conservation values were not adequately integrated into the principles of urban planning, despite the policies and schemes.

6   Current Paradigm of Urban Development of Sacred Historic Cities in India

In the context of India, there has always been a lack of attention that needs to be paid towards the historic core of most towns and cities, as urban development in India primarily involves adding infrastructure (NIUA, 2015). The government itself has, for the past few decades, been more concerned with the problems of newer developments than those of the ancient historic cores, as urbanization has increased exponentially over time (Steinberg, 1996). This has led many of India's historic cities to go under constant pressure of this development surge, creating inexplicable tensions and disparity between the old and the new city fabric. The urge for 'modernisation' by the government and top decision-makers is one of the other factors that has given rise to the constant disregard for the preservation and maintenance of historic city centres, which initially used to be the epitome of vibrant life in Indian cities.

The ideology towards modernism and intensive physical transformations induced by rapid urbanisation in Indian historic cities has subsequently altered the spatial pattern of land uses, and the identity of these cities has now begun to change. Although, it is true that most of the urban heritage in the India has been conserved because of tourism interest but it won't be wrong to say that a considerable amount has been extensively destroyed because of it as well. As the inside–outside tension increases because of the newer developments and illusive decision-making takes hold of these cities, the future of historic towns in India hangs by a thread and sensible urban conservation and preservation seems to be the only option.

7   An Assessment of the Institutional Infrastructure for Urban Conservation in India

Most of the urban conservation work in India is being undertaken in walled cities including Ahmedabad, Jaipur, and Delhi, and it also includes some of the famous tourist destinations such as Udaipur, Jaisalmer, Agra, Kanchipuram, Mathura, Vrindavan, etc., most of these cities are also the destination for religious tourism. Based on preliminary estimates, India's built heritage and archaeological remains might amount to approximately 4 lakhs heritage structures across the country including the centrally protected monuments, state-protected monuments, heritage buildings under various religious trusts, historic cities and archaeological sites (NITI Aayog, 2019). Among the many government and non-government organisations that

are working in the field of urban conservation and protection of cultural heritage, the main regulatory body is the Archaeological Survey of India (ASI) formulated in the year 1861, under the Department of Culture, Ministry of Tourism and Culture. Besides maintenance of ancient monuments and archaeological sites, it also regulates all archaeological activities in the country as per the provisions of the Ancient Monuments and Archaeological Sites and Remains Act, 1958. It also regulates Antiquities and Art Treasure Act, 1972 (Archaeological Survey of India, 2014). Other than this, there are several NGOs such as the Indian National Trust for Art and Cultural Heritage (INTACH), which was formulated in the year 1984 with the vision to spearhead heritage awareness and conservation. It has revolutionised the conservation and preservation of intangible and tangible heritage in India. With new doctrines of heritage conservation, evolved in Europe, the Venice Charter, 1964, the ICOMOS Charter, 2003, etc., are also playing a major role for the conservation and heritage preservation in India. For the protection of sacred or religious heritage, there are schemes such as Pilgrimage Rejuvenation and Spiritual Augmentation Drive (PRASAD), which focuses on developing and identifying pilgrimage sites across India for enriching the religious tourism experience, and National Heritage City Development and Augmentation Yojana (HRIDAY), which offers tremendous opportunity towards an integrated, inclusive and sustainable development of identified heritage cities in India (Martorell Carreño, 2018; Ministry of Tourism, 2015). Even many of the religious tourism destinations have their own governing bodies that looks after its welfare and protection.

Since the last few decades, heritage conservation has become increasingly important. However, the uncontrolled development of encroachments overshadowing around the historical monuments continues to thrive. Even though there are many regulatory bodies to oversee the matter, no substantial steps have been taken. Most cities in India are caught up in between promoting tourism and preserving cultural heritage assets, while seeking smart city development by setting up new development projects, again contributing towards the deterioration of cultural identity of these cities. There is a lack of common vision for the conservation and preservation of these cities. Heritage structures are under jeopardy in the quest to become a Smart City. As a result, the community has become less concerned about preserving their own cultural heritage. Governments should take a more active role in educating the locals to the need of preserving our cultural legacy. Therefore, it is imperative to quantify the current state of historic conservation in India, highlighting the obstacles and investigating new paradigms for a more comprehensive approach to cultural conservation and preservation in India.

8 Research Methodology

The research methodology adopted for the study is based on mapping and conditional survey analysis of the heritage core of Vrindavan, followed by the review of existing government policies and initiatives. The objective of the research is to propose a methodological approach to carry out sensitive conservation in historic sacred cores. A similar approach can also be used to conserve and revitalise the existing historic core in urban areas. The paper can be broken down into three main sections, as illustrated in section 1 of Fig. 1, which spatially narrates the evolution of Vrindavan in terms of its built form and the way its cultural landscape has transformed over the years. Section two is based on the identification and analysis of the present condition of the heritage core through observational and visual study. The last section focuses on analysing the initiatives, policies and conservation guidelines implemented in Vrindavan's heritage core. Based on these three sections,

the paper eventually proposes tentative strategies and recommendations for enhancing integrity and regulations in the heritage core.

9 Context of Vrindavan

Vrindavan grew as a sacred city located on the banks of river Yamuna, in the Braj region of Northern India, 150 kms south of Delhi and about 50 kms north-west of Agra. As per 2011 Census of India, the population of the town was 63,000 (Census UP, 2011). It is a Nagar Palika Parishad city in the district of Mathura, Uttar Pradesh. It is an important pilgrimage attraction and a part of the famous 'Golden Triangle for Tourism', including Delhi, Jaipur, and Agra as shown in Fig. 1. Being a prominent Hindu pilgrimage centre with over 5,000 temples devoted to Krishna or Bihari ji, it invites around 13 million tourists annually (Udyoh Bandhu, n.d.). Figure 2 shows the location of the city of
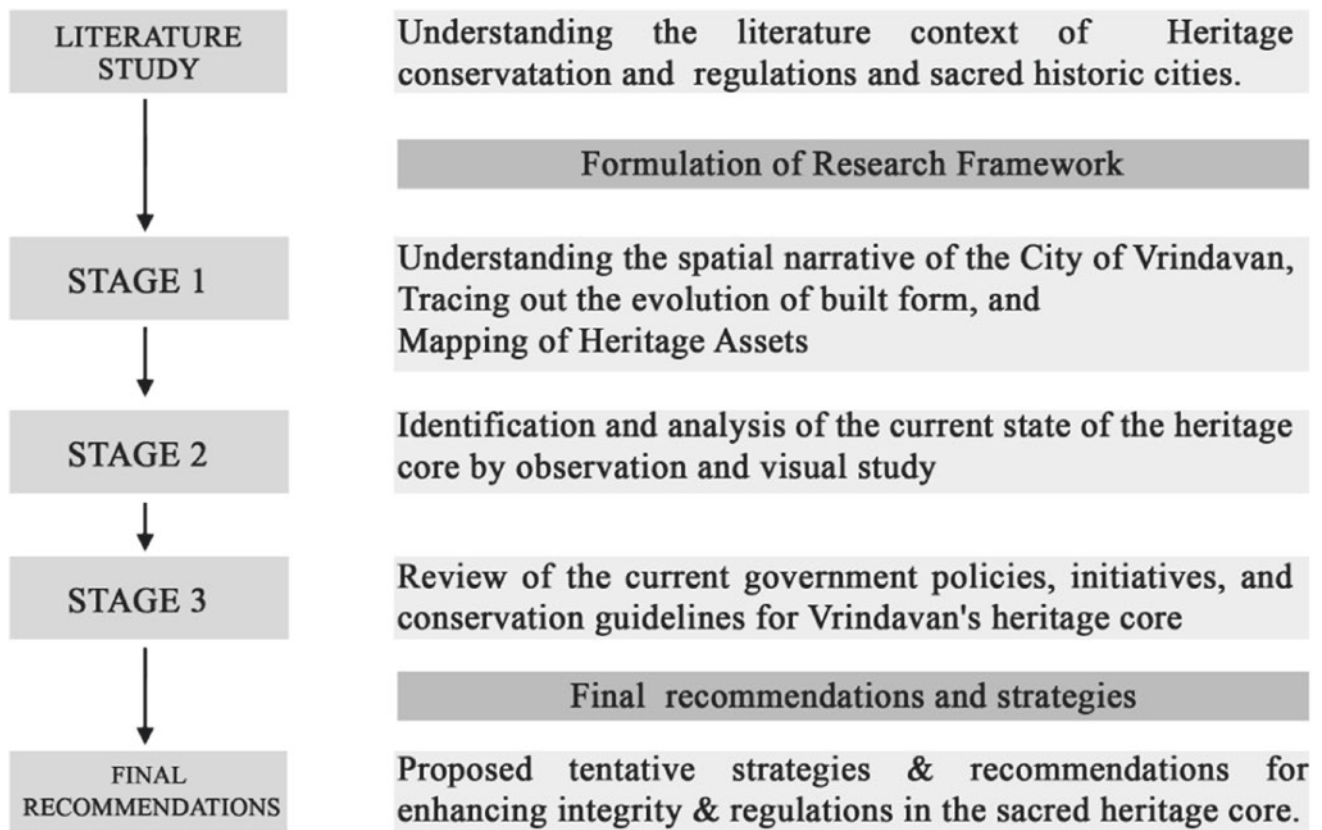
Fig. 1 Methodological framework. *Source* Author
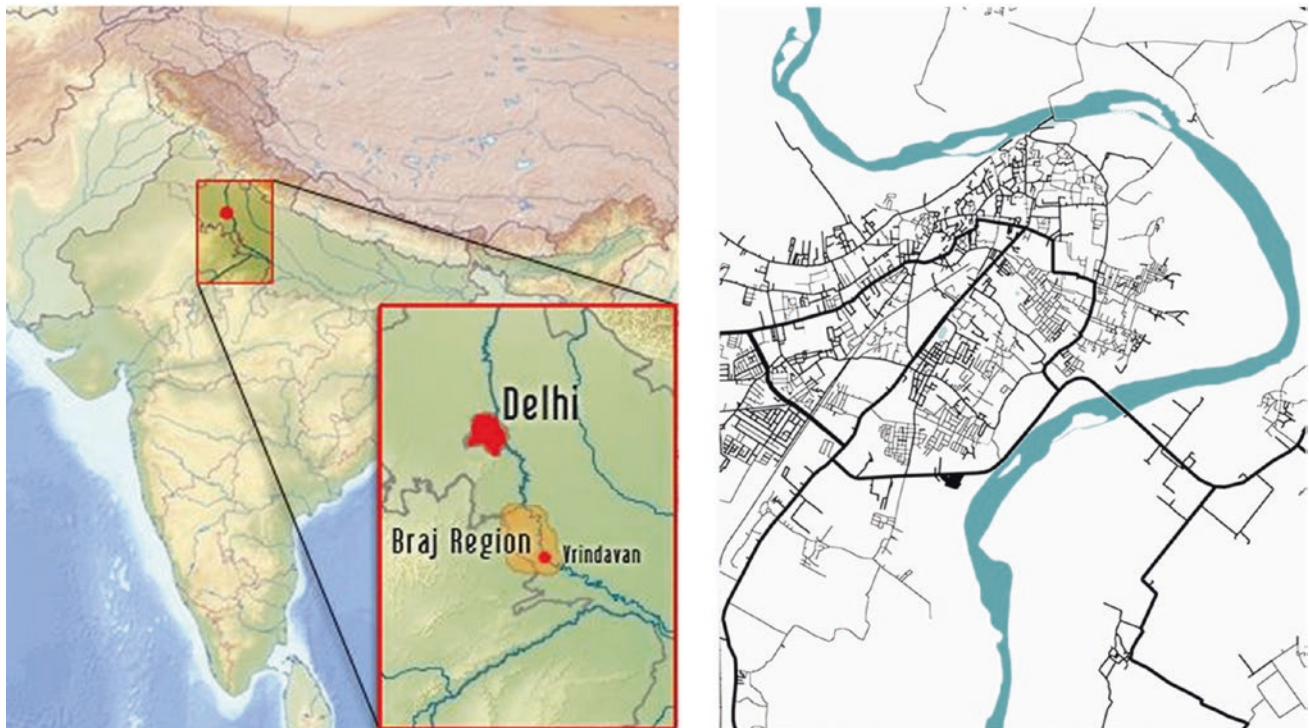
Fig. 2 Location map of Vrindavan. *Source* Author

Vrindavan in the physical map of India on the left and the figure and ground map of the city with respect to the location of the river Yamuna.

10 Evolution of Built Environment of Vrindavan's Heritage Core

With a landscape untainted by history, Vrindavan is the cradle of heritage sites. Different theological texts like Bhāgavata Purān described Vrindavan as the grove of goddess Brinda (Tulsi plant)—as a region where Krishna, an incarnation of Vishnu, defeated the evil Kaliya serpent, slaughtered the demon Keshi and danced with his devotees, but archaeological remains suggest that Vrindavan was by the Second Century an important Buddhist centre as well.

With movements led by saints like Chaitanya Mahaprabhu, Vrindavan began to reclaim its importance as a centre of Krishna devotion during the Bhakti Movement. Gaudiya religious scholars recalled a narrative from the Skanda Puran that said that Vajranabha, Krishna's great-grandson, reclaimed the sacred spaces of Mathura and Vrindavan by building temples, establishing wells and tanks, and inviting Krishna's adoptive clan to reclaim the sacred spaces of Mathura and Vrindavan. Only with the construction of four red sandstone temples in Vrindavan in the late sixteenth and early seventeenth centuries did

the area develop an extant cultural heritage, a pilgrimage tradition regarded as the vanayatra, a walk through Braj forests, a circumambulation or Parikrama of the places where Krishna is said to have spent his childhood (Ray & IN, 2012). Figure 6 shows all the heritage assets spatially mapped across the city, which includes Ghats, sacred grooves, water bodies, temples and Parikrama path. Broadly classifying, Vrindavan's evolution can be divided into five phases which are explained below.

(a) Ist Phase—Before Fifteenth Century

Vrindavan was the forest land of the basil plant and Kabamba tree all around. It was an imaginary landscape where Krishna is believed to spend his childhood days while performing many divine actions. It was established as a Krishna pilgrimage centre by six Vrindavan Goswami's. During the late fifteenth and early sixteenth centuries, the Six Goswami were a community of ascetic and scholarly Krishna devotees who resided and wrote in India. They were devout Chaitanya Mahaprabhu devotees. During the Bhakti movement (Fourteenth century), migration of people from the Eastern and Southern part of India started and many huge temples were constructed during this time. It was the time that led to the formation of four Hindu sects and the first pilgrimage in Braj was established.

(b) IInd Phase—Between Fifteenth and Eighteenth Century

Religious tourism in Vrindavan began to take shape during this period. Many spiritual locations were discovered and added to the Braj Mandala pilgrimage circuit, making it even more profound. Due to the arrival of people from across India. Various buildings of varying architecture style were constructed including the Mughal style of architecture, Rajputana style of architecture, Bengal style of architecture, etc. as shown in Fig. 3. Even the influence of westernised architecture could be seen in some of the temples, for example, a palace-style structure with exquisite designs and carvings, the Shahji Temple is located in the sacred core near Nidhi Van, and dates back to the nineteenth century. Its design was inspired from Rajasthani, Italian and Belgian art. However, the city's social structure overall had a strong Mughal impact in terms of its built form.

(c) IIIrd Phase—Between Eighteenth and Nineteenth Century

During this time, the Jats of Bharatpur occupied the territory of Vrindavan. The pilgrim circuit was extended by wealthy traders and seths from all over India. New types of built form started developing in the city such as riverside Ghats, palatial Havelis and many Akharas. Some of these structures are the Keshi Ghat, Sooraj Ghat, Bansi Vat, Madan Mohan Temple, Shri Jugal Kishore Ji Temple, etc.

(d) IVth Phase—Between Nineteenth and Twentieth Century

During the nineteenth century, Vrindavan's Municipality was established by the Britishers. The establishment of ISKON and the rise of Neo Vrindavan all around the globe started taking place, and Vrindavan gained worldwide popularity. Krishna Bhakts from all over the world started coming to Vrindavan. This was the major stage of the transformation for the sacred city of Vrindavan. The formation of MVDA (Mathura Vrindavan Development Authority) and subsequent institutional control started formulating the regulations for the development of pilgrimage activity.

(e) Vth Phase—Twenty-First Century

As a result of the increase in international and national visitors, the city's real estate market began to expand, resulting in the construction of high-rise mega-projects. The city's sacred space got commercialised because of the development of numerous massive temple complexes. A new culture of selling and consuming started to evolve in the city. Government schemes such as PRASAD, HRIDAY, and the Smart City Mission had a negative impact on the city,

Fig. 3 Image representing the mixed architecture style of the temples in Vrindavan. *Source* Author

culminating in the formation of many underdeveloped areas. All this led to threaten its cultural and sacred identity. Vrindavan's imagined landscape started to be replaced by concrete jungle. Figure 2 explains the spatial context of the city where the sacred core is now shrinking to limited territorial space. There are only a few sacred waterbodies left in the city, and among all the sacred grooves, only Nidhi Van and Sewa kunj remains.

11   Present Condition of Heritage Core of Vrindavan

Every object of cultural heritage stands amid a terrifying present and the same stands true with the case of Vrindavan where majority of the historic structures are in a state of dilapidation. The rapid expansion of urban periphery, and the evolution of Vrindavan's build form have resulted in several issues that are threatening heritage sites throughout the city. Due to the construction of high-rise commodified temple on the Chhatikala Road which connects the city of

Vrindavan to Delhi NCR, the tourism in the sacred core had declined drastically. Most of the temples and sacred sites remain beyond the reach of the visitors and the tourism is now concentrated to the Bankey Bihari temple in the old core. Because of increased urbanisation, social reforms, and widespread commercialisation, the central region of Vrindavan has been subjected to pollution and various forms of issues as listed down below.

(a) Negligence of Heritage Sites

Figure 4 shows the mapping of all historic temple and other structures of cultural importance. The Parikrama Marg or the circumambulation path encircles the sacred core. One of the importance parts of Vrindavan pilgrimage is doing the Parikrama by walking, but now the entire path had been converted to tar road, chocked with traffic throughout the day. Many of the sacred sites in the old city remain beyond the reach of the visitors as shown in Fig. 5. Due to the lack of legibility within the sacred core, one cannot find these temples in the narrow alleys. Also, due to the decline
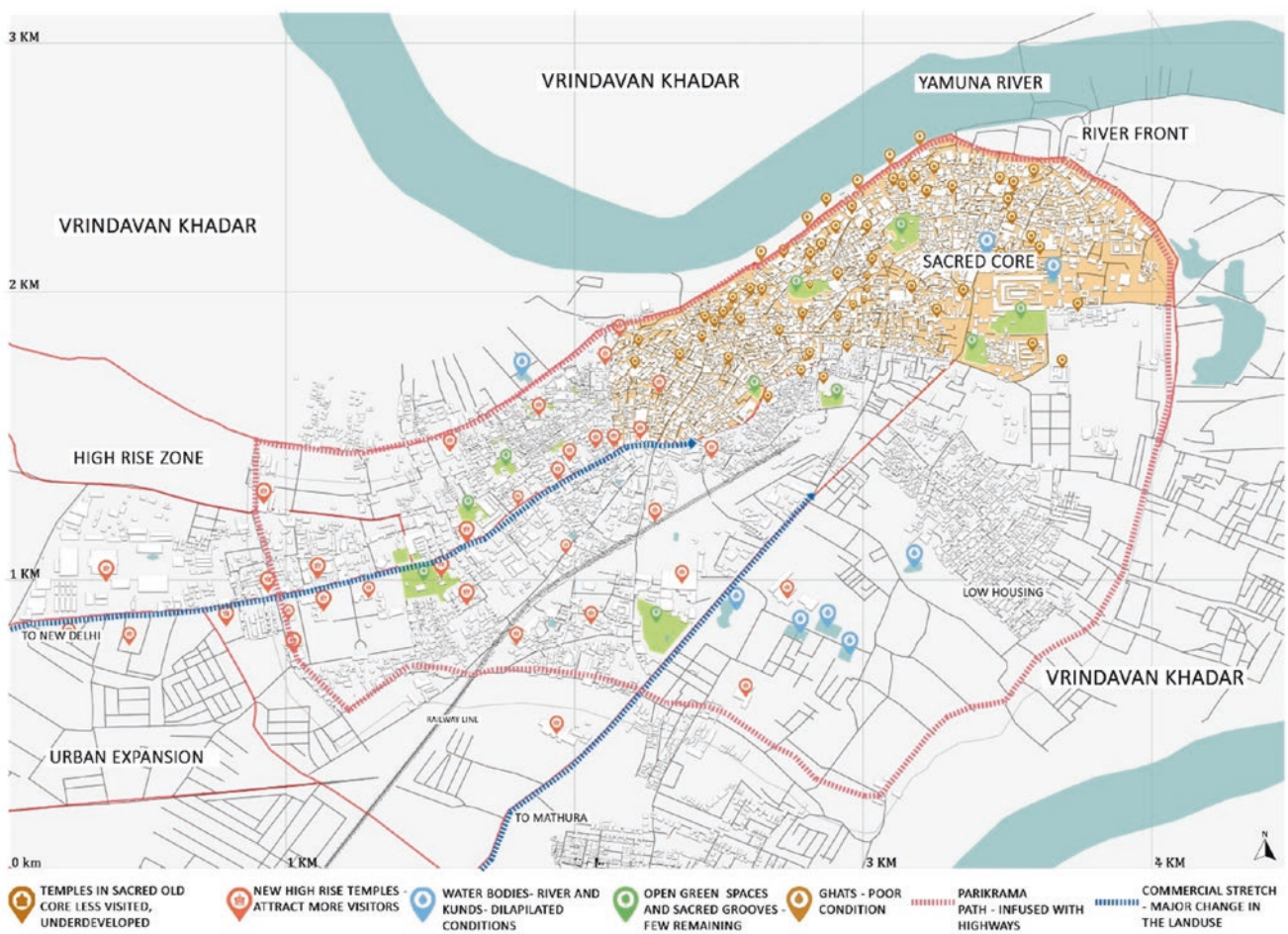
Fig. 4 Spatial mapping of Vrindavan. *Source* Author

Fig. 5 Madan Mohan Temple is considered to be the first temple of Vrindavan now hidden in the Narrow alleys. *Source* Author

of tourist footfall in the sacred core, many heritage temples have lost their significance and presently they are in a very bad condition as shown in the figure. The region around the Bankey Bihari temple faces severe problems due to traffic at peak hours as majority of the tourist footfall is just limited to one temple. The narrow alleys that reach to the temple are always chocked with auto rickshaws and hand driven carts, which makes it extreme difficult for the pedestrians (Fig. 6).

(b) Loss of Sacred and Cultural Essence

Many festivals are celebrated in Vrindavan, including Akshaya Tritiya, Ekadashi, Kartik Poornima, Tulsi Pooja and Janmashtami, among others, however, the celebrations have become limited to a certain group of people due to the changing character of these public spaces. Given the poor conditions and encroachment, there is no more adequate space to perform religious ceremonies. As a result, many religious practices are being faded out. Even the Parikrama path, which once used to have a vibrant public realm, is now a part of state highway and often encroached upon

with illegal parking of vehicles. Figure 7 shows the dilapidated condition of Keshi Ghat and the adjoining structures.

(c) Transformation of the Architecture Character

Vrindavan's prevailing architectural style is Rajputana, but commercialisation has resulted in the development of modern buildings with no heritage management guidelines, causing conflict and competition in urban spaces. Many of the structures are in various states of disrepair, causing the historical fabric to deteriorate and, as a result, heritage to be lost. Vrindavan's ghats, too, are in precarious need of heritage conservation guidelines as shown in Fig. 8.

(d) Loss of the Ecological Heritage

Present-day Due to the rapidly increasing pilgrim footfall and local population, Vrindavan is besieged with several environmental issues. The city is overcrowded, and the land area under urban settlements is growing, which is the root cause of environmental problems. Because of the city's rapid development, most of the buildings with larger

Fig. 6 Heritage mapping of Vrindavan

Fig. 7 Keshi Ghat of Vrindavan is in dilapidated condition, and there is no space left to perform any rituals. *Source* Author

footprints are blocking drainage channels, drying up the scared waterbodies, grooves, and even the river Yamuna, which is slowly shifting away from its original channel. There is no proper treatment for the river's edge, and the entire river plain is used for dumping concrete waste and other types of city waste. Most of the area is used for parking, and on weekends, the entire town is transmogrified into a parking lot. The view of the Yamuna is completely

Fig. 8 Mushrooming of contrasting architecture elements at the historic Sooraj Ghat on the Parikrama Marg. *Source* Author

Fig. 9 The floodplains of river Yamuna are encroached upon and now used as dumping ground for the entire city. *Source* Author

obstructed by the presence of many informal structures on the river plains, and one cannot feel the presence of the river while walking on the Parikrama path as shown in Fig. 9.

12 Existing Government Initiatives in Vrindavan

Different tiers of government agencies operate with regards to pilgrimage, tourism and heritage-related issues in Vrindavan. At the district level, the Administration of Mathura and Mathura–Vrindavan Development Authority (MVDA) are the relevant government agencies for the Braj region. MVDA is mandated with the urban planning development guidelines through land use zoning. At the town level, Vrindavan Municipality is the local self-government agency responsible for provision and maintenance of services, including water supply, drainage, and solid waste management (Shinde, 2012). Vrindavan is also listed under the National Heritage City Development and Augmentation Yojana (HRIDAY), which seeks to conserve and develop core heritage assets of the city, and PRASAD Scheme, 'Pilgrimage Rejuvenation and Spiritual Augmentation Drive', which aims for developing and identifying pilgrimage sites for enriching the religious tourism experience. Apart from these, several other organisations such as Uttar Pradesh State Tourism Department, The World Bank, ISKON (The International Society for Krishna Consciousness), INTACH (Indian National Trust for Art and Cultural Heritage) and ASI (Archaeological Survey of India), etc. are also working on different schemes in the

city, but there is lack of common vision and more attention is given to the commercial aspects, thus resulting in the decline the heritage and cultural aspects of the city.

13 Identification of Current Paradigm of Urban Conservation Approach in Vrindavan

The current paradigm of the urban conservation approach in Vrindavan is just limited to only a certain number of sites. Few of the initiatives have been done on the Vrindavan Parikrama Marg, which includes installation of wall murals at Suraj Ghat, provision of seating space, development of the entire Parikrama Marg with Coal Tar making it extremely difficult for the pilgrims to walk upon. There are several heritage structures on the Parikrama Marg, which are although listed by the ASI, but they are in dilapidated condition. Mathura Tourism Department has selected 11 kunds for renovation under the pro-poor tourism project of World Bank. Out of these 11, 4 kunds have been selected to start the project (Krishna Bhoomi, 2016). Residents were outraged by the recent construction of a bridge over the Yamuna River, and it was eventually dismantled thanks to the efforts of numerous local groups. Hence, there is a need to integrate the paradigm of planning and urban conservation approach that ensures heritage regulations and awareness towards sensitive development within the heritage core of Vrindavan.

14 Proposing the Strategies to Activate Awareness and Enforce Heritage Regulations

On the basis of the mapping and conditional survey analysis of the heritage core of Vrindavan, followed by the review of existing government policies and initiatives, few of the recommendations and strategies have been discussed down below.

(a) Culture-Based Urban Regeneration Strategies

The first strategy uses culture-led urban regeneration as a tool for conserving the identity of heritage core. Through cultural events and flagship projects, culture-led regeneration has bolstered the rationale for cultural investment and included arts-based projects, which increase social exclusion, the well-being of urban dwellers and participation in community life (Evans, 2015). There are many events that are associated with Vrindavan such as the celebration Holi and Janmashtami. Even, there are many forms of traditional art and craft such as sanjhi art, folk paintings, raasleela,

poshak making, tulsi mala making, etc. that are unique to the city but most of them are endangered now. By organising cultural festivals, these art forms could be revived back. This strategy along with the improvement of decrepit built environments would also create several employment opportunities, which will help in the upliftment of traditional communities (Kyu Hong Hwang, 2014).

(b) Heritage Education and Awareness

The strategy will be focused on raising awareness of the heritage and cultural worth of the area among locals and visitors. Residents should be deeply involved in any city planning policy or regulation. It will also make them aware of Vrindavan's tradition and cultural legacy, which has been eroding. In the inner-city area, a heritage walk might be proposed, which would connect all the heritage monuments like as temples, palaces, and havelis with an interconnected network. It will assist visitors in learning more about Vrindavan's forgotten heritage.

(c) Community Collaboration

The strategy would be focused on raising knowledge of existing development programmes among the villagers and encouraging them to engage in them. The initiative would also encourage residents to learn about and appreciate their city's rich history and traditions. In every institutional decision-making system, the role of the local community should be expanded.

(d) Incorporating Heritage Regulations in Masterplan and Policies

The preservation and restoration of heritage structures in Vrindavan's historic city would be the emphasis of this strategy. Façade development guidelines would also be included, which would be based on the city's current heritage character. It will also seek to resurrect the glorious experience of ghats. Colours, textures, spires, fenestration, steps, platforms, plants and vessels, among other characteristics, should be duplicated at random intervals in a visually complex structure to function as a coherent component. Encroachments and advertisements that endanger the iconic image of the ghats and result in a loss of architectural significance should be eliminated altogether.

15 Conclusion

India is on the threshold of establishing a modern identity, and it is growing at a dizzying pace that may be challenging to handle. The idea of a new India is appealing

undoubtedly, however, the top-down infrastructure development model is threatening millennia of Indian culture and heritage. Hence, it is important to find ways to preserve and enhance the regions where history can be lived out but also to meet the real need for effective infrastructure in this area. The historical significance of several of these locations is largely unknown, even though they are popular tourist and pilgrimage destinations. A lack of understanding is impeding and preventing the expansion of public, political, and government funding and support for heritage preservation and restoration.

It is observed in the conditional survey of Vrindavan that the city is experiencing a wide range of problems, including the loss of spiritual and cultural essence, the transformation of architectural character and a loss of ecological legacy and Negligence of Heritage sites. Due to the insatiable needs of speculative development, Vrindavan is losing much of its traditional and vernacular architectural style. There is a need to develop a new regulatory framework for historic and traditional neighbourhoods, and it should be rigorously adopted to preserve its cultural identity. The proposed strategies, which are culture-based urban regeneration strategies, educating and raising awareness about heritage, community collaboration, and the inclusion of heritage regulations into master plans and policies, may necessitate a series of systemic changes that gradually bring about the necessary fiscal, social, and regional changes. This approach can also be used to conserve and revitalise existing historic cities, as well as to develop new urban centres in the already existing historic cores.

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Development and Application of an Intelligent Modeling Process for Heritage Masonry Structures in BIM Applications: Literature Review

Sara Ben Lashihar

Abstract

The **Heritage Building Information Modelling (HBIM)** technology for historic and heritage masonry buildings has recently expanded in response to urgent conservation and structural analysis needs. The masonry structures of ancient architectural construction have a unique cultural, spiritual, and historical significance. However, there is a lack of research concerning the reliability of the recent HBIM modeling process of these structures. This process confronts major challenges due to the inherent complexity and uniqueness of the heritage masonry structures. It is primarily based on tracing the point clouds and infrequently adheres to documents, archival records, or direct observation. This method produces highly abstract models with an accuracy that doesn't go beyond LOD 200. Masonry assemblies, particularly curved elements such as arches, vaults, and domes, are typically modeled with standard BIM components or in-place models, and brick textures are input graphically. Hence, future investigation is necessary to establish a methodology to automatically generate parametric masonry components for these structures. These components should be developed algorithmically in accordance with the mathematical and geometrical accuracy and validity of the survey data. The main goal of this paper is to provide a comprehensive review of the state of the art of literature that has been conducted on the HBIM modeling of the heritage masonry structural elements. It investigates the latest approaches that have been applied to obtain parametric models that have both high visual fidelity and high geometrical accuracy. The paper examined over 700 articles, with proceedings papers from 2017 to 2021 focusing on the keywords "*HBIM and Masonry*." The co-occurrence bibliometric method was used to analyze these publications after they were downloaded from reputable, well-known bibliographic databases. The analysis was performed using VOSviewer software, which extracts the main keywords from these publications to retrieve the relevant works. Subsequently, the literature, most closely related to the subject and the highest frequency of occurrence was assessed through the qualitative review. In the qualitative review phase, the latest approaches and the future suggestions proposed in these publications were collected, which can be a valuable reference for researchers and BIM specialists who are interested in developing the modeling process of historic masonry structures.

Keywords

HBIM · Masonry · Modeling · Approach · Parametric · Algorithm · Automatic

1 Introduction

The Building Information Modeling (BIM) industry has become a dominant force within the **Architecture Engineering and Construction Management (AECM)**. It was first established in 1974 by the "*father of BIM*," Charles Eastman, and the concept was developed in the mid-nineties. It took twenty years for BIM to be adopted throughout the world. The term **HBIM** was first presented in 2009 by Maurice Murphy, who defined it as the following "*Historic Building Information Modelling (HBIM) is a novel solution whereby interactive parametric objects representing architectural elements are constructed*

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from historic data, these elements (including detail behind the scan surface) are accurately mapped onto a point cloud or image-based survey…." (Murphy et al., 2009) This definition was more technical than implicit. In contrast, HBIM is an approach that improves the process of knowing, analyzing, designing, conserving, and managing heritage and historical structures (Adami et al., 2018). The oldest of these structures are the masonry buildings scattered around the world, which date back to the Egyptian civilization (Graciela Maldonado et al., 2019). Therefore, they have been studied the most, and most research has now focused on their varied construction techniques. In order to study these constructs, it is necessary to be adequately documented in a digital format. As a result, HBIM has been incorporated into this documentation process since 2019. Despite the increase in research on this topic, there is still no definite approach to achieving accurate documentation. In addition, there is no formal standard to measure the reliability and accuracy of the resulting models. The accuracy of these models does not exceed LOD 200, including geometrical misalignment with the point clouds.

Thus, it is essential to find an automated approach for intelligent modeling of the masonry element in HBIM that is characterized by practicality, accuracy, and speed. The approach must be implemented within the context of BIM without the need for additional technology. Thereupon, this paper presents a comprehensive review of the potential approaches to this typical process within the latest research and publications between 2017 and 2021. These publications were analyzed through three phases, starting with the Bibliometric Analysis phase, where VOSviewer software was employed. This was followed by screening and categorizing the publications for deeper analysis during the Qualitative Review process.

2 Methodology

Initially, the research method was based on **Bibliometric Analysis**. It is a widespread research method that detects the latest findings in a specific field. The application relies on quantitative and static analysis to locate relevant publications within a given period (Dereli et al., 2011). The resulting publications of this analysis were reviewed and filtered according to their degree of relation to the topic. In the final phase, the Qualitative Review, the publications with the strongest relevance were read thoroughly, and the suggested approaches were extracted for further investigation. An illustration of the phases of the research methodology can be found in Fig. 1.

2.1 Bibliometric Analysis

For the bibliometric analysis, the **VOSviewer** software was chosen over existing applications because: first, it is free and easy to access; second, it is compatible with well-known bibliographic databases; third, the ease of use and flexibility of its integration with these databases; and fourth, it provides excellent visualization of its diagrams (Moral-muñoz et al., 2020). Four bibliographic databases were chosen for this phase that VOSviewer supports, including **Scopus, Web of Science (WoS), Lens**, and **Dimensions** (Van Eck & Waltman, 2013). The PubMed files were excluded because they are concerned with medical research (Fig. 2).

The analysis was started in August 2021, searching the Scopus database. The search depended on the keywords "**HBIM**" and "**Masonry**." It is limited to these two keywords because four large databases should be analyzed in a short time. The following sections provide an overview of the analysis process.

Fig. 1 The three main phases of the methodology

Bibliometric Analysis

VOSviewer application was used for the bibliomertric analysis to reach the publications related to the use of HBIM technology in the intelligent modulation of hestoric masonry structures.

Reviewing and Filtring

Reviewing and checking the lists of the publications; filtering and classifying them according to the degree of their reletion to the research topic.

Qualitattive Review

Deep reading of publications that have a strong relationship with the topic and elicit the suggested approches that have been proposed for the intelligent modulation of masonry structures by using HBIM technology.

Fig. 2 The VOSviewer's wizard for the possible databases that can be imported

2.1.1 Scopus Database

The search of the Scoup database revealed 16 publications, as seen in Fig. 3. These publications were downloaded as .csv* files since the VOSviewer only accepts these formats or .txt* files. Among the information in the Excel file was the name of the author, the title, the abstract, the date of publication, the source title, the author's keywords, and the DOI number.

Based on a full count of keyword occurrences in the publications, the analysis process within the VOSviewer was conducted. Using the **Create Map wizard**, as shown in Fig. 2, the lowest possible occurrence of the keywords was set to 1. As per the software criteria, 195 keywords were found in the publications. The software provided the option to choose the most appropriate keyword for the research objective at the end of the wizard. After filtering the keywords, the **Network Visualization (NV)** emerged, as illustrated in Fig. 4.

According to the emerging NV, the most frequent keywords are HBIM, Surveys, and Historic Preservation, while the strongest links to HBIM are Surveys, Masonry Materials, and Historic Preservation. Thus, the keywords "masonry materials" and "surveys" are more strongly associated with HBIM, as shown in Fig. 5. Considering the chronology, the **Overlay Visualization (OV),** shown in Fig. 6, illustrates that the research on HBIM has resumed in 2019 and has gradually accelerated throughout 2020, especially in the field of masonry materials.

2.1.2 Web of Science (WoS) Database

In the same context, the WoS database's bibliometric analysis produced 50 publications. The exported data file was in *.txt format, the only file type to export to the VOSviewer software. As with Scopus, the same procedures were followed in this software. As seen in Fig. 7, the Create Map wizard generated an NV of 36 items, 5 clusters, 455 links, and 3591 links in total.

Based on Fig. 7, it can be seen that the most frequently occurring keywords in the WoS are, in descending order: Analysis, Data, BIM, HBIM, and Accuracy. In this database, the keyword "Analysis" was the most commonly occurring and strongest, but it was the least closely related to "HBIM." The keyword "Data" was most strongly related to both "HBIM" and "BIM," which explains the focus of most BIM publications on Data collection, conservation, and surveying. In chronological order, publications pertaining to BIM and HBIM have been introduced in 2019, focusing primarily on IFC technology and conservation (Fig. 8).

2.1.3 Lens Database

A total of 36 publications were extracted from the Lens database, with the majority being published by Politecnico di Torino and Politecnico di Milano. Figure 9 shows the generated VOSviewer's NV, which includes 34 items, 4 clusters, 471 links, and 5547 total link strengths (Fig. 10).

As reported by the NV, "Structure" and "Data" are the keywords most strongly associated with "HBIM." The keywords "Geometry," "Accuracy," and "Vault," which are related to the topic, are also very strongly associated with "HBIM." These strong associations indicate a growing tendency toward research regarding masonry structures in relation to HBIM technology. Furthermore, the resulting OV indicates that 2019 has seen a significant rise in publications that discuss HBIM. Among the topics covered in these publications were modeling and surveying related to the evaluation of masonry structures, specifically vaults.
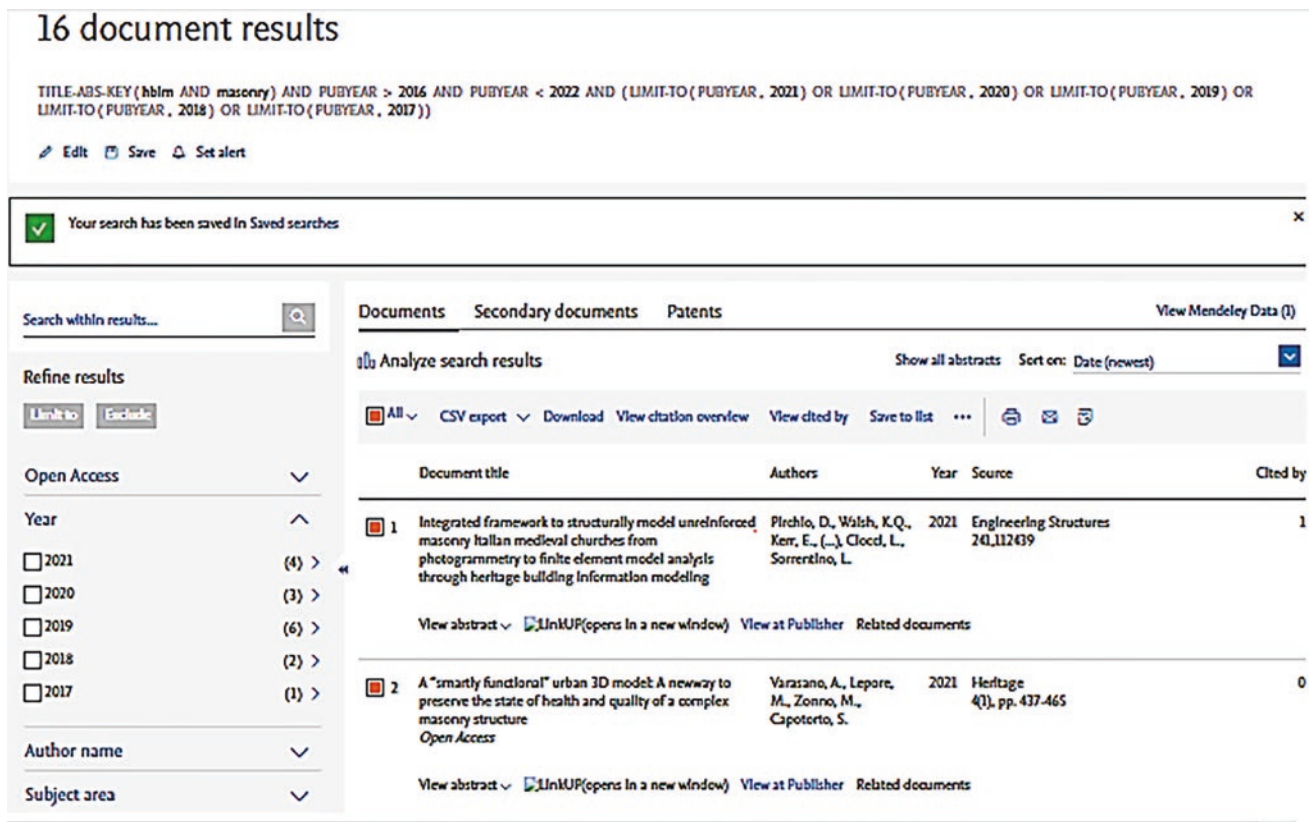
Fig. 3 The search results in the Scopus database

Fig. 4 The visualization of the Scopus database

Fig. 5 The analysis of the strongest keywords linked to HBIM in the Scopus

2.1.4 Dimensions Database

Approximately 600 documents were derived from the Dimensions database, which was primarily published between 2019 and 2020 within the field of Geometric Engineering. The VOSviewer has extracted about 700 keywords from these publications, resulting in the following NV: 270 items, 9 clusters, 13,858 links, and 77,035 total link strength (Figs. 11 and 12).

In a careful analysis of the emerging NV's keywords, it was found that the keywords Analysis, Data, Structure, Accuracy, Vault, and Geometry were primarily associated with the HBIM, while the keywords Masonry and Dome were primarily associated with the keyword "Data." This indicates the recent interest in the HBIM and the masonry vaults, especially cloister vaults. Clearly, this interest is reflected in the vital connection between "HBIM," "Geometry," and "Vault," which reveals a focus on
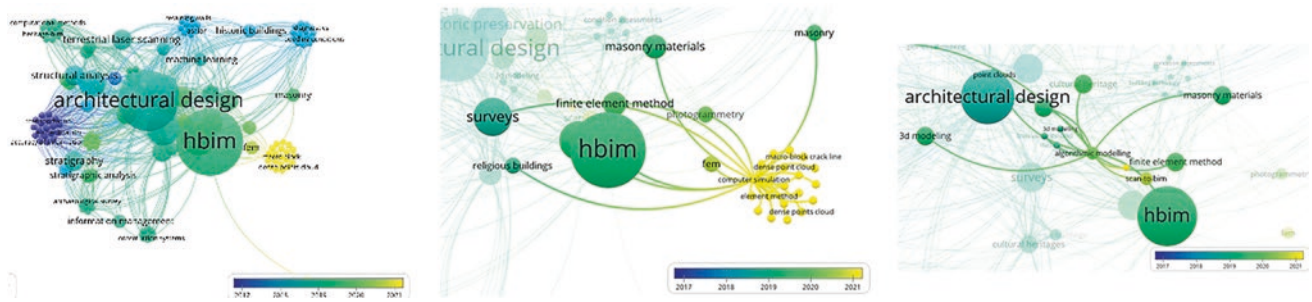
Fig. 6 The Overlay Visualization (OV) of the Scopus database
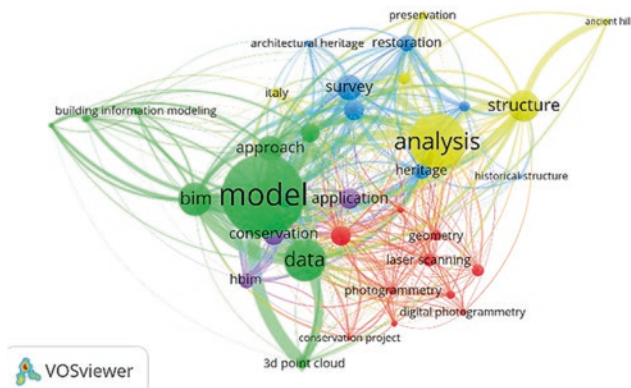
Fig. 7 The NV of the WoS database
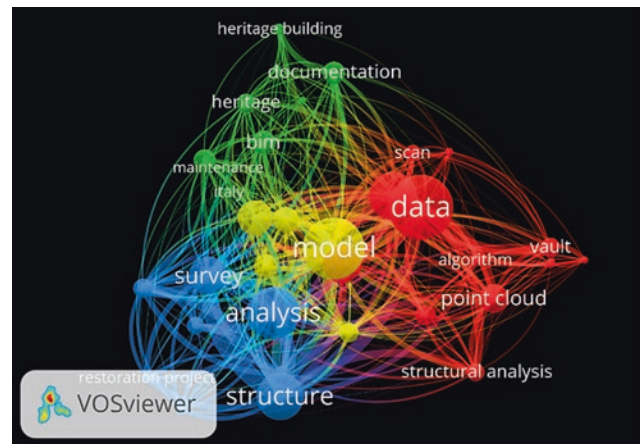
Fig. 8 The NV of the Lens database
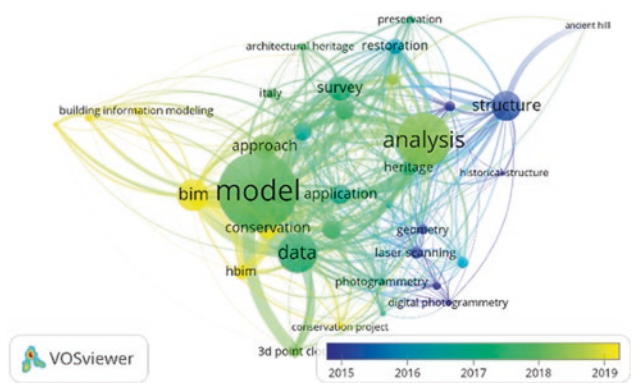
Fig. 8 The OV of the WoS database

geometric engineering. From a chronological perspective, the HBIM topic exhibited a significant amount of activity at the beginning of 2019 and has tended to shift towards masonry vaults in 2020, as shown in Fig. 13.

2.2 Reviewing and Filtering

This phase involved a comparison between the Excel lists generated from the four databases and the results of the bibliometric analysis. Each list was initially classified according to the availability of keywords relating to the purpose of
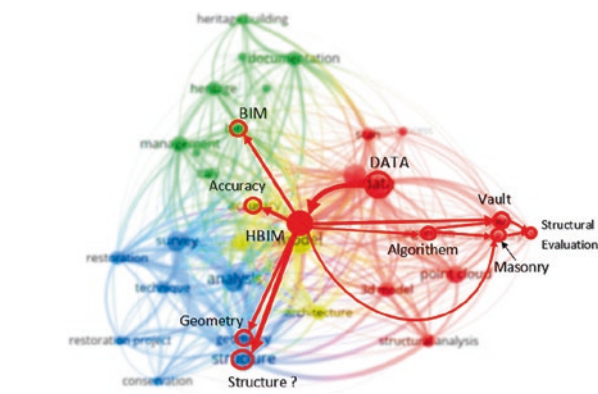
Fig. 9 The strong link of HBIM with the keywords; "Geometry," "Accuracy," and "Vault."

this paper. The final category was determined after reading the abstracts and conclusions of the most relevant publications following the initial classification.

Detailed descriptions of the phase are provided in the following criteria:

1. In each Excel spreadsheet, the list is filtered by the following keywords; BIM, HBIM, Vault, Masonry,
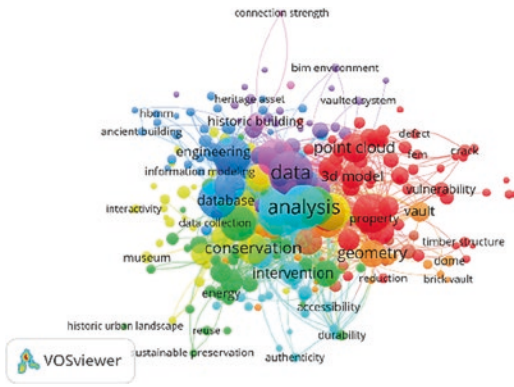
Fig. 11 The NV of the Dimensions database
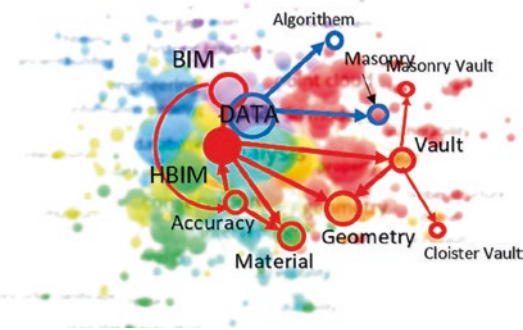
Fig. 12 The strongest linked keywords to HBIM

Accuracy, Geometry, Database, Dome, Structure, Heritage, Cloister, Material, Algorithm, Parameter, Wall, and Automation. The keywords were selected based on their occurrence in the VOSviewer results.

2. Each list of publications was classified and colored following the color scheme presented in Table 1. For each keyword in this table, a specific color was assigned,

along with a group of the strongest keywords. Figure 14 shows examples of filtered Excel lists.

3. As per predefined criteria, the publications were sorted into three folders: ***Important Related Publications, Referenced Publications***, and ***Useful References***.

2.3   Qualitative Review

During this phase, the most relevant publications from all four databases were reviewed comprehensively. The purpose of the qualitative review is to identify more efficient approaches that employ radical solutions to automate the modeling of masonry structures in BIM. The following sections present examples of these approaches in three categories for better understanding.

2.3.1 Machine Learning Approaches

Three publications have proposed distinct approaches based on machine learning algorithms. Machine learning is a branch of ***Artificial Intelligence (AI)*** that utilizes computer systems to develop algorithms that execute programmed instructions without the need for human intervention (Learning, 2017). The paper "***High Level-of-Detail BIM and Machine Learning for Automated Masonry Wall Defect Surveying***" (Valero et al., 2018) discusses two approaches within this framework. A major objective of the research is to conduct an evaluation and management of the ashlar columns and walls of the Chapel Royal of Stirling Castle in Scotland for future replacement. The paper pointed out the low accuracy of BIM models for such evaluations and the need for a Scan-to-BIM technique that can generate rich 3D BIM models of these ashlar walls with a high level of detail. Due to this, the paper presented two approaches, as illustrated in Fig. 17. As part of the first approach, a new Scan-to-BIM method is introduced that automatically
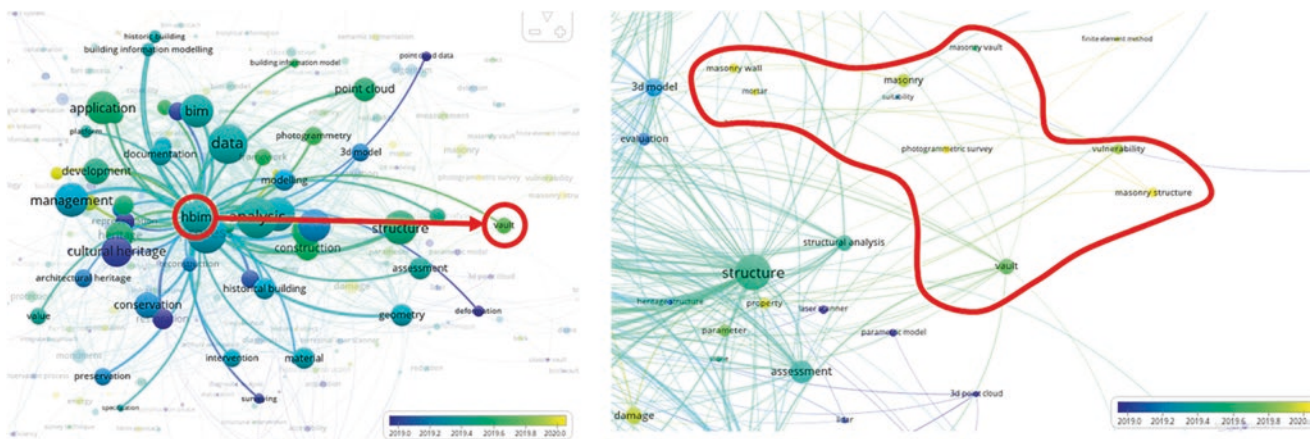
Fig. 13 The chronological relationship between HBIM and the keywords; Vault and Masonry

Table 1 The color scheme of the keywords

Keywords		Colors
BIM		
HBIM		
HBIM + Vault		
HBIM + Vault + Masonry		
HBIM + Vault + Masonry + Accuracy		
HBIM + Vault + Masonry + Accuracy + Geometry + Database+ Dome + Structure		
Vault / Masonry		
Vault + Masonry + Heritage/Acccuracy		
Vault + Masonry + Heritage + Acccuracy + Structure + Geomtry + Database + Dome		
BIM + Vault / Masonry	Dome	
BIM + Vault + Masonry	Cloister	
Heritage	Material	
Accuracy	Algorithm	
Geometry	Parameter	
Structure	Wall	
Database	Automation	

Authors	Author(s) ID	Title	Abstract
Pirchio D., Walsh K.Q., Kerr E.,	57223225585;2664	Integrated framework to structurally model unreinforced masonry Italian medieval churches from photogrammetry to finite element model analysis through	A novel, integrated framework i
Varasano A., Iepore M., Zonno	57191924192;5720	A "smartly functional" urban 3D model: A newway to preserve the state of health and quality of a complex masonry structure	The 3D model is the primary inf
Brumana R., Stanga C., Banfi F.	6507761201;57194	Models and scales for quality control: toward the definition of specifications (GOA-LOG) for the generation and re-use of HBIM object libraries in a Common D	The paper focuses on new oppo
Bagnolo V., Argiolas R.	57208645496;5721	Scan-to-BIM Process Versus 3D Procedural Modelling of Gothic Masonry Vaults	The so-called "Scan to BIM" pro
Diara F., Rinaudo F.	57202444524;6505	BUILDING ARCHAEOLOGY DOCUMENTATION and ANALYSIS through OPEN SOURCE HBIM SOLUTIONS VIA NURBS MODELLING	The implementation of historica
Pepe M., Costantino D., Garofa	56465493000;3665	An efficient pipeline to obtain 3D model for HBIM and structural analysis purposes from 3D point clouds	The aim of this work is to identi
Bruno S., Musicco A., Galantuc	57198898259;5721	Rule-based inferencing diagnosis in hbim	The aim of this paper is the imp
Borin P., Cavazzini F.	57195303996;5721	CONDITION ASSESSMENT OF RC BRIDGES. INTEGRATING MACHINE LEARNING, PHOTOGRAMMETRY and BIM	The survey of building patholog
Argiolas R., Cazzani A., Reccia	57210872505;6603	FROM LIDAR DATA TOWARDS HBIM for STRUCTURAL EVALUATION	In HBIM processes, the extracti
Rolin R., Antaluca E., Batoz J.-L.	57211691941;8571	From point cloud data to structural analysis through a geometrical hBIM-oriented model	The assessment of the structura
Brumana R., Ioannides M., Pre	6507761201;36650	Holistic heritage building information modelling (hhbim): From nodes to hub networking, vocabularies and repositories	HBIM (Heritage Building Inform
Trizio I., Savini F., Giannangeli	57194378461;5525	THE ARCHAEOLOGICAL ANALYSIS of MASONRY for the RESTORATION PROJECT in HBIM	The experience described in this
Cerisano Kovačević V., Conti A	57214759418;5621	An integrated computational approach for heritage monumental museums	This paper discusses and prese
Valero E., Forster A., Bosché F.	36761645100;1640	High level-of-detail BIM and machine learning for automated masonry wall defect surveying	Despite the rapid development o
Bruno S., Fatiguso F.	57198898259;5555	Building conditions assessment of built heritage in historic building information modeling	The article concerns the implen
Oreni D., Brumana R., Torre S.[	55315403900;6507	Survey, HBIM and conservation plan of a monumental building damaged by earthquake	Surveying a monumental buildi

| Authors	Author(s) ID	Title	Abstract	Year	Source ti
Pirchio D	57223225585;26642263100;5	Integrated framework to structurally model unreinforced masonry Italian medieval churches from photogrammetry to finite element model analysis thro	A novel, integrated framework is proposed 1	2021	Enginee
Varasano A	57191924192;57208652683;3	A "smartly functional" urban 3D model: A newway to preserve the state of health and quality of a complex masonry structure	The 3D model is the primary information of	2021	Heritage
Brumana	6507761201;57194550787;5	Models and scales for quality control: toward the definition of specifications (GOA-LOG) for the generation and re-use of HBIM object libraries in a Comm	The paper focuses on new opportunities of	2021	Applied
Bagnolo	57208645496;57210872505;	Scan-to-BIM Process Versus 3D Procedural Modelling of Gothic Masonry Vaults	The so-called "Scan to BIM" process has be	2021	Springer
Diara F.,	57202444524,6505516700;	BUILDING ARCHAEOLOGY DOCUMENTATION and ANALYSIS through OPEN SOURCE HBIM SOLUTIONS VIA NURBS MODELLING	The implementation of historical informatic	2020	Internat
Pepe M.,	56465493000;36650325800;5	An efficient pipeline to obtain 3D model for HBIM and structural analysis purposes from 3D point clouds	The aim of this work is to identify an efficie	2020	Applied
Bruno S.,	57198898259;57211439398;5	Rule-based inferencing diagnosis in hbim	The aim of this paper is the implementatio	2020	Archeolc
Borin P.,	57195303996;57211006140;	CONDITION ASSESSMENT OF RC BRIDGES. INTEGRATING MACHINE LEARNING, PHOTOGRAMMETRY and BIM	The survey of building pathologies is focuse	2019	Internati
Argiolas	57210872505;6603056311;5	FROM LIDAR DATA TOWARDS HBIM for STRUCTURAL EVALUATION	In HBIM processes, the extraction of geome	2019	Internati
Rolin R.,	57211691941;8571963100,7	From point cloud data to structural analysis through a geometrical hBIM-oriented model	The assessment of the structural behavior c	2019	Journal
Brumana	6507761201;36650699200;54	Holistic heritage building information modelling (hhbim): From nodes to hub networking, vocabularies and repositories	HBIM (Heritage Building Information Model	2019	ISPRS Ar
Trizio I.,	57194378461;55258119500;5	THE ARCHAEOLOGICAL ANALYSIS of MASONRY for the RESTORATION PROJECT in HBIM	The experience described in this paper conc	2019	ISPRS An
Cerisano	57214759418,56216759600;7	An integrated computational approach for heritage monumental museums	This paper discusses and presents a worktl	2019	COMPDY
Valero E.	36761645100;16401284600;2	High level-of-detail BIM and machine learning for automated masonry wall defect surveying	Despite the rapid development of reality ca	2018	ISARC 20
Bruno S.,	57198898259;55550584100;	Building conditions assessment of built heritage in historic building information modeling	The article concerns the implementation of	2018	Internati
Oreni D.,	55315403900;6507761201,65	Survey, HBIM and conservation plan of a monumental building damaged by earthquake	Surveying a monumental building damaged	2017	Internati

Fig. 14 The Excel list from the Scopus database before and after the filtering and classification process

subdivides the point clouds of the ashlar walls into their component units, including the stone and mortar regions (Fig. 15). A specialized surveying team performed the scanning process, which used the frequency "Two-dimensional continuous wavelet (CWT)" to determine the primary units of the structural element. As a second approach, point clouds are used to identify the defective parts of the walls using geometry and color information (Fig. 16).

During the analysis of the units, the assumption parameters were set. Following the evaluation of the samples, a logistic regression algorithm was adopted to identify masonry units that were degraded with an overall accuracy

of 93.3%. It was estimated that there were approximately 230 areas of deficient stone, and all results were exported to HBIM as colored maps.

Similarly, another interesting article, entitled "*Rule-Based Inferencing Diagnosis in HBIM*" (Bruno et al., 2020), discusses two approaches to HBIM implementation: manual and semi-automated. In manual mode, segmented point clouds are exported to Autodesk Revit in PTS format. To create the architectural elements, Boolean operations have been used, and primitive lines have been traced across the point clouds. With a semi-automated approach, the modeling process relies on the use of BIM libraries and custom
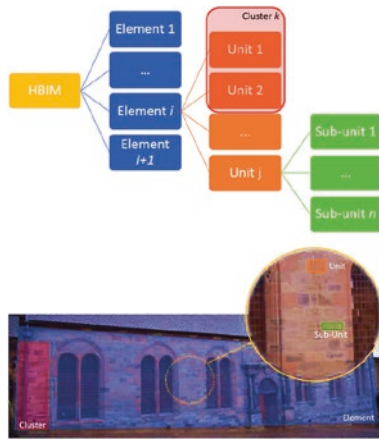
Fig. 15 The new Scan-to-BIM method automatically subdivides the point clouds of the ashlar walls into their constituent units (Valero et al., 2018)
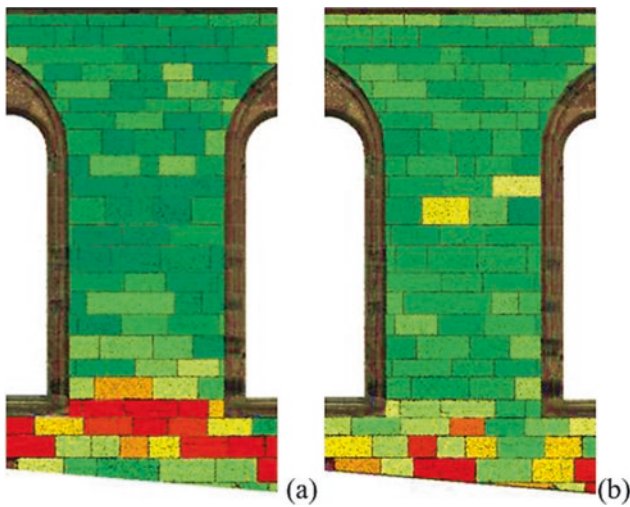
Fig. 16 The approach considers the geometry and the color information from the point clouds (Valero et al., 2018)

commands within Revit. Subsequently, the resulting model accuracy was evaluated by the Revit FARO As-Built module, which was compared to the original point cloud. These approaches were applied to the farmhouse, Masseria Don Cataldo, in Bari, Southern Italy. The Photogrammetry process commenced in September 2016 and covered the exterior of the building. Dense point clouds were created and transformed into polygonal meshes. The BIM model was

developed using the aforementioned manual and semi-automated methods, using the Revit Salone Ottagonale module. This plugin tests walls and openings to compute the most primitive objects that correspond to the point cloud. The process was predominantly manual and very imprecise.

To detect the defect, an inference logic was engaged in a pre-diagnosis step. It included a series of surveys and preliminary tests to identify the damage patterns and diagnose the potential causes. The entire process was implemented in BIM with the aid of Dynamo Studio, an Autodesk script based on the visual programming language (VPL). Figure 18 illustrates the followed approach.

The article "*From Point Cloud Data to Building Information Modelling: An Automatic Parametric Workflow for Heritage*" (Andriasyan et al., 2020), presents the third distinct approach composed by Rhinoceros, Grasshopper, and ArchiCAD. The survey data were obtained from Terrestrial Laser Scanning (TLS) and Structure From Motion (SfM). These data have been converted to 3D meshes and later modeled as BIM objects. This approach enables heritage conservation professionals who have no experience in digital digitization or 3D modeling to work smoothly in a flexible workflow. This workflow is formalized through three scripts generated by Grasshopper and Volvox for creating surfaces from the point cloud. These surfaces are subsequently exported to ArchiCAD by means of the ArchiCAD + Grasshopper live connection (Fig. 19).

The algorithm generates an artificial point cloud with adjustable parameters that provides flexibility to the user to select the desired shape from this point cloud. Consequently, subsampling operations are followed to decrease the number of points in the cloud, and the algorithm implements the mesh object through the Delaunay method. The whole process, as exhibited in Fig. 20, is facilitated by an interface where users can enter a set of values necessary to start the process. This article introduced an integrated approach that employs algorithms that work directly on the point clouds, saving time. However, the process is slow and frequently crashes due to heavy operations.

2.3.2 Grades of Generation (GoG) Approaches

Recent literature has highlighted the **Grade of Generation (GoG)** classification system. This system, established by Banfi in 2017 (Banfi, 2017), is a reference scale that
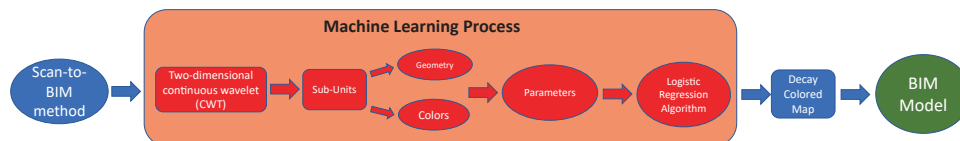
Fig. 17 The proposed approach in the paper "*High Level-of-Detail BIM and Machine Learning for Automated Masonry Wall Defect Surveying*"
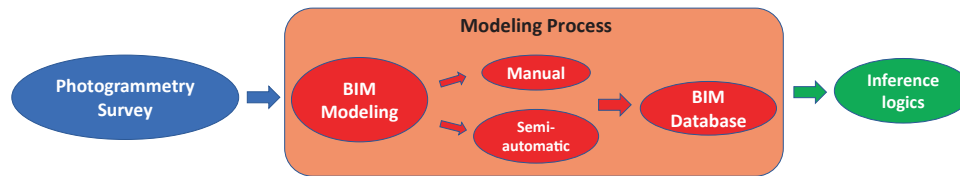
Fig. 18 The proposed approaches in the paper "*Rule-Based Inferencing Diagnosis In HBIM* (Bruno et al., 2020)
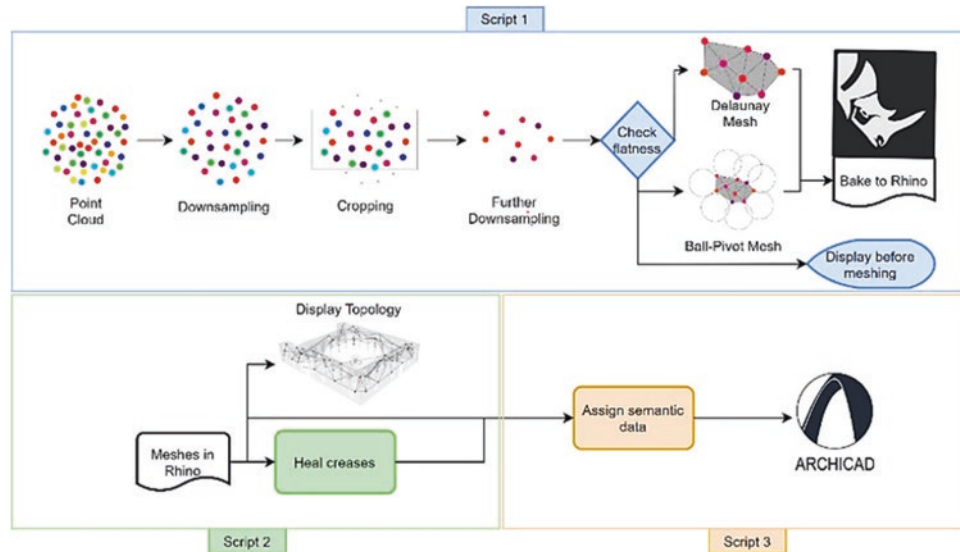
Fig. 19 The automatic parametric workflow from point cloud to BIM (Andriasyan et al., 2020)
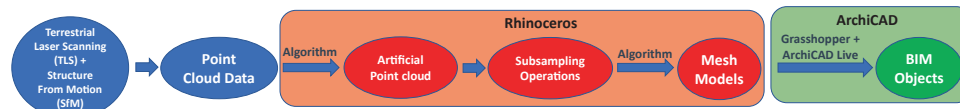
Fig. 20 The proposed approaches in the article "*From Point Cloud Data to Building Information Modelling: An Automatic Parametric Workflow for Heritage*"

classifies the model's accuracy into ten grades (Fig. 21). The lowest grade is GoG1 when the model is simple and wired, while in GoG10, the irregular shapes are generated directly from the point clouds. The main issue is that the BIM applications have not yet reached the grades; GoG 9 and 10; this issue has been further explored in the following three papers.

The research "*Building Archaeology Documentation and Analysis Through Open Source HBIM Solutions via Nurbs Modelling*" (Diara & Rinaudo, 2020) is one of those publications that involved this system along with machine learning algorithms. The purpose of the research was to create a customized HBIM modeling process for archaeological buildings. The process included an approach that developed a special Scan-to-BIM methodology known as Scan-to-Open BIM via NURBS. This process is strictly dependent on an open-source solution termed FreeCAD, which has

contributed to the BIM modeling and the documentation of a refectory inside the Staffarda Abbey in Italy (Fig. 22).

Stratigraphic analysis of the refectory's walls and the vault was conducted because the stratigraphic data is essential historical information for studying the archaeological buildings. Two surveys made up the analysis: the metric survey and the stratigraphic survey, both of which used the LiDAR metric to produce precise stratified data.

By utilizing NURBS curves and surfaces, the Rhinoceros software has been used to model the intricate geometries in 3D. Consequently, the whole refectory was modeled completely and the GoG system classified it. The GoG8 was taken into consideration for the use of loft and sweep tools, while the GoG9 was considered for its high level of detail. The model's final components are not parametric despite having a high LOD. As a result, FreeCAD parametrized them before exporting them to BIM platforms.

Fig. 21 Grades of Generation (GoG) for existing and HBIMs (Banfi, 2017)
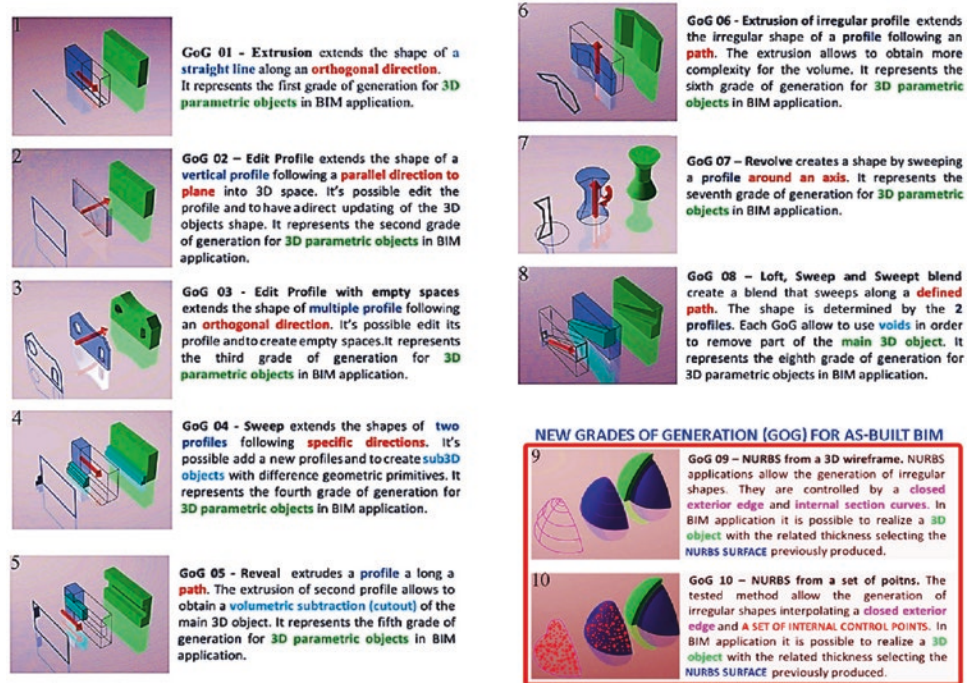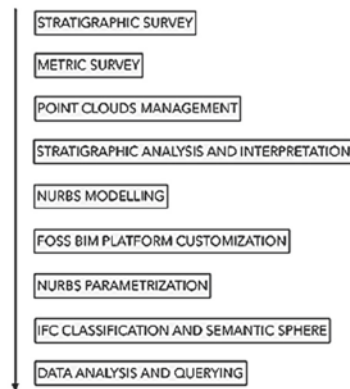
Fig. 22 The main workflow of Scan-to-Open BIM via NURBS (Diara & Rinaudo, 2020)

FreeCAD is an open-source solution for dynamic parametric modeling. It was created in Python and C++ as Foss CAD and BIM software (Fig. 23).

Banfi also published an article that provided further details on the GoG, entitled "*HBIM, 3D drawing, and virtual reality for archaeological sites and ancient ruins*" (Banfi, 2020). In this paper, the GoG system was used in the modeling process of the ancient church of San Nicolò and the ancient palace in Western Liguria. While in another research by Banfi, "*The Integration Of A-Scan-To-HBIM Process In BIM Application: The Development Of An Add-In To Guide Users In Autodesk Revit.*" (Banfi, 2019), the process of developing a new Revit "Scan-to-BIM" add-in has been dealt with in detail. The research was beyond the scope of the literature reviewed in this document. It was part of the HOM & BIM live APP project, which was funded by the Regione Lombardia, in cooperation with the Politecnico di Milano's Architecture Department and the consulting firm Mainlab (Mainlab srl, 2022). The research demonstrates how the add-in has been applied in the modeling process of the vaulted system of the Basilica of Collemaggio (L'Aquila, Italy) and the Arch of Peace (Milan, Italy). The add-in makes it possible for BIM users to model complex geometric shapes directly from point clouds. This process minimizes the time and effort devoted to the generative process in Autodesk Revit. The add-in was developed employing the application programming interface (API). It consists of four sections: Scan Management for cloud points' importing process; Modeling (GoGs) that facilitate the creation of complex geometries; Database Generation (GOIs) for the automatic production of databases and parameters; and Interoperability Levels for the exporting process (Figs. 24 amd 25).

In the case of the ancient church of San Nicolò and the old palace in Western Liguria, the Scan-to-BIM add-in was not employed. Instead, a five-step method was applied, as seen in Fig. 26. In Step 1, the survey data was handled by Autodesk Recap, while in Step 2, the NURBS profiles were generated in AutoCAD, Rhinoceros, and FreeCAD. In Step 3, the NURBS surfaces were modeled in Rhinoceros and Grasshopper, and in Step 4, the GoGs measured accuracy to compare the point cloud and the NURBS surfaces as in the earlier research by Politecnico di Torino (Diara & Rinaudo, 2020). The surfaces were then exported to the
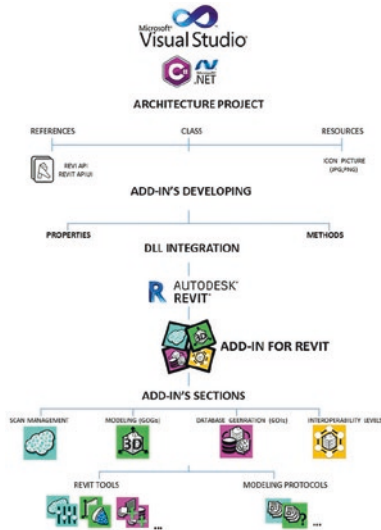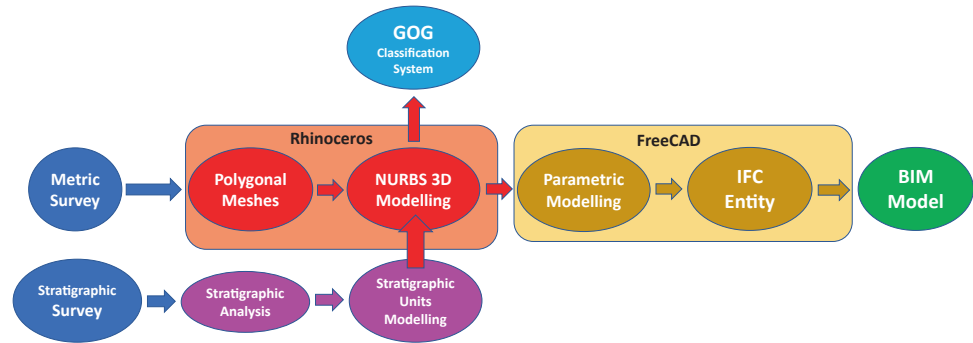
Fig. 24 Revit add-in's development workflow (Mainlab srl, 2022)

Fig. 25 Modeling (GoGs) panel supports users in the generative process (Mainlab srl, 2022)

BIM application so that they could be given texture and thickness. The sub-elements "***Granular HBIM Objects***" have been modeled by the naked eye through careful examination of point clouds and historical references of buildings.

Based on the final BIM model, it can be concluded that this approach did not reach a high LOD for the sub-elements. The sub-elements, such as stone units, were not modeled individually; they were part of a geometry that represents the structural element. This geometry was then parameterized and mapped in BIM with just one material (Fig. 27).

2.3.3 Grasshopper and Rhino Plug-ins Approaches

The article "***An Efficient Pipeline to Obtain 3D Model for HBIM and Structural Analysis Purposes from 3D Point Clouds***" (Pepe et al., 2020) investigates an approach to the structural analysis of the HBIM models (Fig. 28). The Scan-to-BIM method, which generates dense point clouds, serves as the foundation of the approach. These point clouds were exported to Rhinoceros through the plug-in Arena4D. This plug-in has a powerful function in filtering the point

cloud through the tool "Elimination of Outlines". The tool also creates detailed profiles of complicated geometries and easily converts them into NURBS surfaces. In order to reconstruct the surfaces, Rhinoceros used the tessellation technique, but the resulting meshes had a poor edge accuracy. They required substantial computational operations due to their density and a large number of triangles.

The benefits of Rhinoceros have been the primary focus of this article. It mentioned a number of modeling-enhancing plug-ins, including the EvoluteTools PRO, which facilitates the creation of extremely complex NURBS surfaces. Additionally, the Boolean tools and Grasshopper plug-ins for Rhinoceros are useful add-ons for modeling and parameterizing the emerging surfaces. However, the method examined in this paper required several steps and softwares. It

Fig. 26 From point clouds to HBIM models: the application of GoG 10 for the parametric object of the vault (Banfi, 2020)
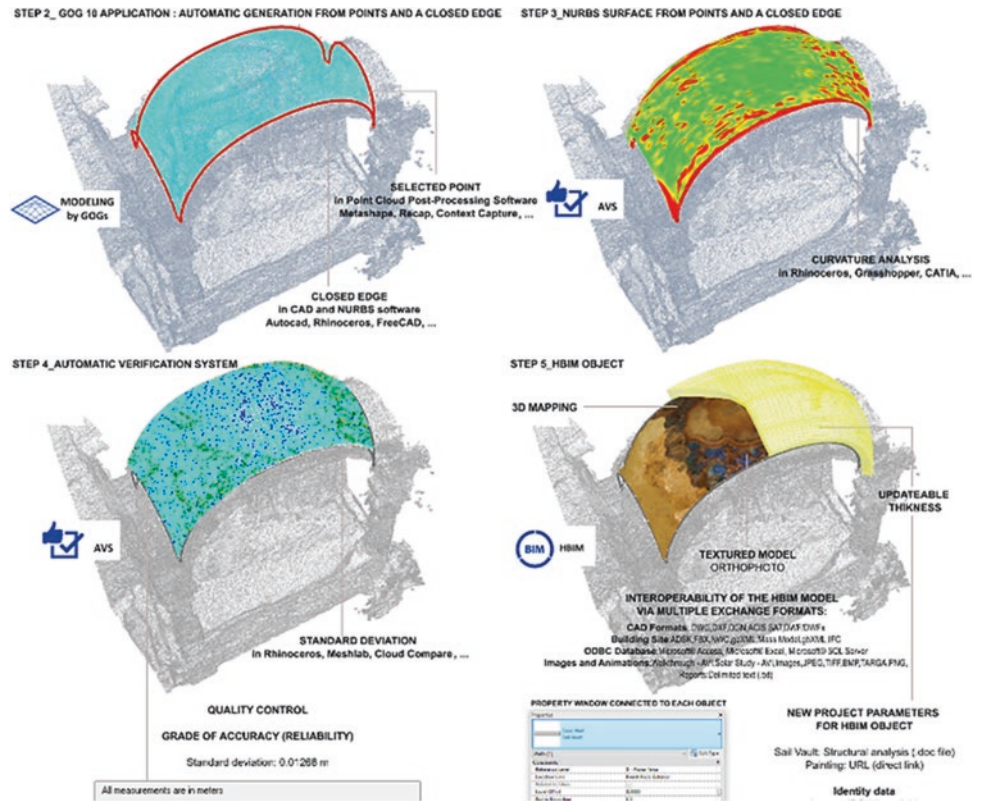
Fig. 27 The proposed approach in the paper "*HBIM, 3d Drawing and Virtual Reality for Archaeological Sites and Ancient Ruins*"
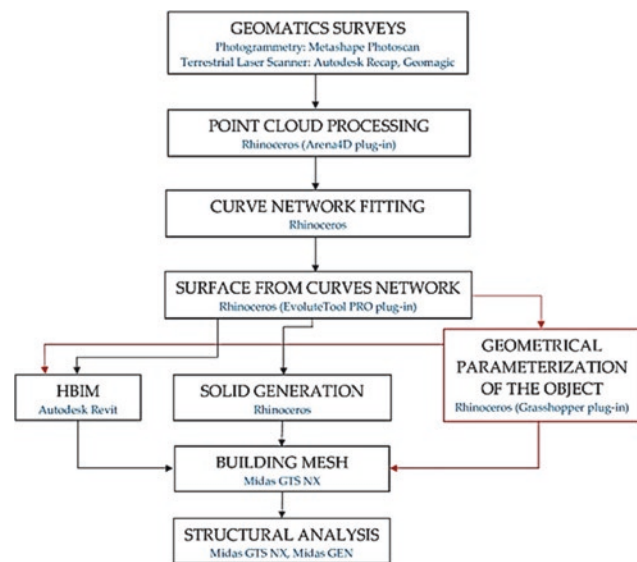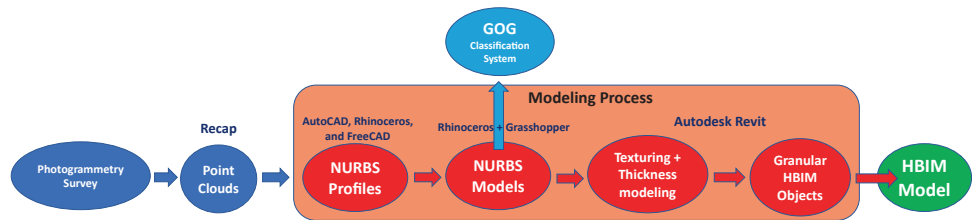
Fig. 28 Pipeline of the developed method (Pepe et al., 2020)

was a long and complex approach, which raises the question of why long-term approaches are still recommended. They are still featured in articles despite the possibility of developing algorithms and add-ins to promote the modeling process inside BIM. Figure 29 illustrates the approach's steps.

A lengthy method was also introduced in the following conference paper: "*From TSL Survey to HBIM, Issues on Survey and Information Modeling Implementation for the Built Heritage-The Case Study of the Temple di Bacco Ravello*." (D'Amico & Currà, 2017). The proposed approach seeks to solve the problem of scanning sites with complex topography. This issue was featured in the modeling case study of the Temple di Bacco in the gardens of Villa Cimbrone in Ravello. The temple is located on a site with a particular configuration of very steep topography and narrow space. The surveying team faced the problem of scanning the circular elements as shown in Fig. 30; therefore, they used the 3D laser scanner Faro Focus3D X 330,

Fig. 29 The proposed approach in the article "*An Efficient Pipeline to Obtain 3D Model for HBIM and Structural Analysis Purposes from 3D Point Clouds*"
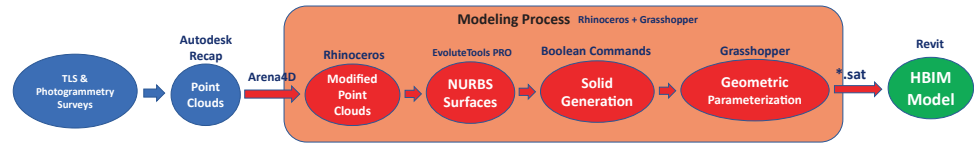
which is placed in seven positions to obtain the whole geometric data. The resulting point clouds have been processed with FaroSCENE and exported to Autodesk Recap, which can be easily manipulated and exported to Revit.

3 Results and Discussion

The bibliometric analysis reviewed about 700 publications between chapters, articles, conference papers, and proceedings. The choosing process of these publications was based on the keywords "HBIM" and "Masonry" in four bibliographic databases: Scopus, WoS, Dimensions, and Lens. VOSviewer software was used to analyze the

publications because it is free, simple to use, compatible with most databases, and has excellent visualization. The number of publications derived from each database varied; for instance, Dimensions resulted in 631 documents, while Scopus only had 16. The Dimensions database covers more documents than Scopus, but it lacks affiliation information in half of its publications. This flaw affected the reliability of the database, with incomplete and inaccurate citation links (Guerrero-Bote et al., 2021). This significant difference in the results is caused by the implicit variation in the algorithms of each database. In Table 2, each database's outcome is summarized, and we can notice the significant number of documents that Dimensions generated, while
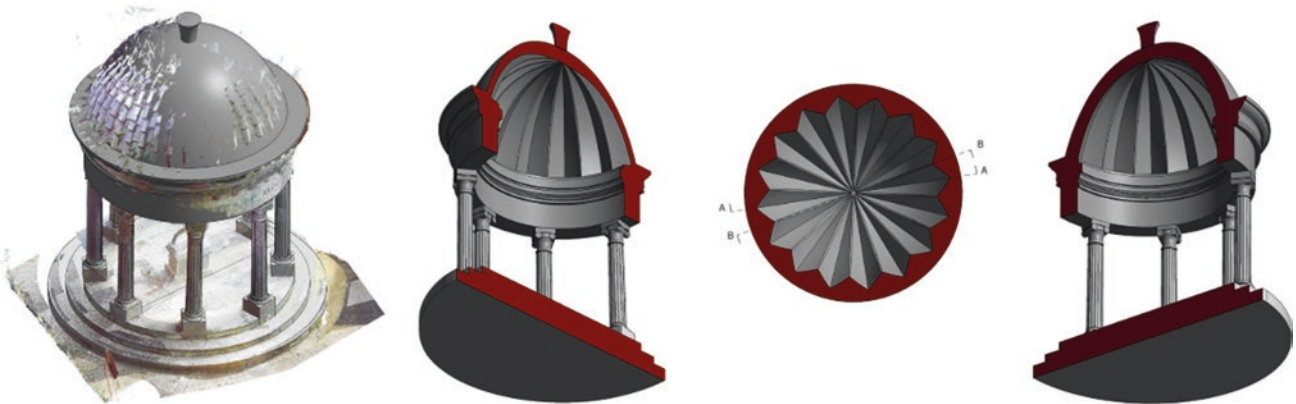
Fig. 30 The digital transformation from the point clouds to the BIM model.Error! Bookmark not defined (D'Amico & Currà, 2017)

Table 2 The results of VOSviewer analysis

Database	Scopus	WoS	Lens	Dimensions
Number of Publications	16	50	36	**631**
Total Keywords	195	75	82	**705**
Visualization's Result	160 items, 10 Clusters, 2080 Links, 2195 Total Link Strength	36 items, 5 Clusters, 455 Links, 3591 Total Link Strength	34 items, 4 Clusters, 471 Links, 5547 Total Link Strength	**270 items, 9 Clusters, 13858 Links, 77035 Total Link Strength**
Strongest Keywords	**Architectural Design, HBIM, Survey, and Geometry.**	**Analysis, Data, Accuracy, BIM, and HBIM.**	Data, Model, Analysis, Survey, Structure.	Analysis, Data, Conservation, Geometry, Point Cloud, Intervention, and Vault.
Keywords Most Linked To HBIM	**Structure, Masonry Materials, and Historic Preservation**	Data, Model, Survey, and Analysis.	Structure, Data, Geometry, Accuracy, and Vault.	Analysis, Data, Structure, Accuracy, Vault, and Geometry.
The Start of HBIM Research	2019	2019	2019	2019
Keywords Focused On	**Masonry Materials**	Conservation and IFC	Modeling, Surveying, Structure Evaluation, Vault, and Algorithm.	**Masonry Structures, Walls, Vault, Mortar, Damage, and Database.**
Number of the Most Related Publications	**9**	1	7	14

the databases Scopus and WoS contained the most related research about HBIM and masonry structures.

In the Reviewing and Filtering phase, an initial review of the Excel files for these publications was done. The evaluation was dependent on the accessibility of the pertinent keywords, particularly "HBIM" and "Masonry." As a result, each file was initially categorized by the color scheme displayed in Table 1. As illustrated in Fig. 31, all four classified files were then combined into one Excel file for comparison. According to the comparison table, the Scopus database has nine research papers with a strong connection to HBIM and masonry, despite the fact that there are only a few publications as a result. The Lens database comes next, followed by Dimensions.

Following the preliminary review, color-coded publications ranging from red to yellow were scanned by reading their summaries and conclusions. Subsequently, as Fig. 32 shows, the documents were organized into various sub-folders, each of which corresponded to its classification for the Qualitative Review phase.

In the phase of the qualitative review, the publications with the greatest relevance to the topic have been carefully read and then categorized according to their approach orientation. The most attention-grabbing research was oriented toward machine learning. These publications include approaches with algorithms developed to increase the reliability of the HBIM models. Some of these approaches can accurately extract the sub-elements of the structural components from the point clouds by their properties such as color and texture, whereas some other approaches localize the decay areas for restoration studies. In addition, some publications propose semi-automatic approaches to derive the primitive geometries from the point clouds. Likewise, the research related to the GoG classification system is riveting and encourages more rigorous analyses to be gradually matured in the future. According to Fig. 21, the GoG system assesses the HBIM models' accuracy across ten

Fig. 31 The preliminary analysis of the keywords in the four databases according to the Color Scheme

Fig. 32 The folders specified for the Dimensions database

Vos	Approach	Year	Country
BIM for heritage science: a review	Review	2018	UK
Comparison and analysis of results of 3D modelling of complex cultural and historical objects using different types of terrestrial laser scanner	Laser Scanner Review	2018	Bosnia and Herzegovina · Croatia
CRACK DETECTION LIMITS IN UNIT BASED MASONRY WITH TERRESTRIAL	Laser Scanning TLS	2014	Ireland · UK
From Point Cloud Data to Building Information Modelling: An Automatic Parametric Workflow for Heritage	Rhino · Grasshopper · ArchiCAD · Algorithm	2020	Italy · UK · Spain
From TSL survey to HBIM, issues on survey and information modeling implementation for the built heritage	TSL · Recap · Revit (Manual)	2017	Italy
BIM related workflow for image based deformation monitoring of bridges	Unmanned Aircraft Systems (UAS) · BIM (Manual)	2018	Germany
Implementing BIM on conservation heritage projects: Lessons from renovation case studies	BIM for Conservation; Review	2019	UK
INTEGRATION OF JEDDAH HISTORICAL BIM AND 3D GIS FOR DOCUMENTATION AND RESTORATION OF HISTORICAL MONUMENT	BIM Libraries (LiDAR · BIM · GIS) Manual	2015	UK · Saudi Arabia
MODELING ROMAN PAVEMENTS USING HERITAGE-BIM: A CASE STUDY IN POMPEII	Civil 3D · BIM (Manual)	2020	Italy · Lithuania
On the generation of numerical models from point clouds for the analysis of damaged Cultural Heritage	Survey · CLOUD2FEM · FE model (Semi-automatic workflow) it says BIM but it is not clear	2018	Italy
The use of 3D-laser scanning in assessing the safety of masonry vaults—A case study on the church of Saint-Jacobs	Survey · AutoCAD · ObjectARX (Autodesk) application · MATLAB · Calipous ((semi-) manual work)	2009	Belgium
Scopus			
BUILDING CONDITIONS ASSESSMENT OF BUILT HERITAGE IN HISTORIC BUILDING INFORMATION MODELING	BIM and Databases	2018	Italy
CONDITION ASSESSMENT OF RC BRIDGES, INTEGRATING MACHINE LEARNING, PHOTOGRAMMETRY AND BIM	Machine Learning: (Neural network and photogrammetry) · Point clouds · BIM (Manually) · Dynamo (Scripts to insert photos)	2019	Italy
High Level-of-Detail BIM and Machine Learning for Automated Masonry Wall Defect Surveying	Machine Learning: Survey (Special Waves) · Sub-elements · Algorithms · BIM	2018	UK
Integrated framework to structurally model unreinforced masonry Italian medieval churches from photogrammetry to finite element model analysis through heritage building information modeling	Photogrammetry · Point Clouds · BIM · FEM (Manually)	2021	USA · Italy
RULE-BASED INFERENCING DIAGNOSIS IN HBIM	Machine Learning: Photogrammetry · Point Clouds · BIM · Inference Logic (Manually ·	2020	Italy

Publications with Manual BIM approaches

Publications with Rhinoceros and Grasshopper BIM Approaches

Publications with Machine Learning approaches

Publications for Structural Analysis approaches.

Fig. 33 The results of the Qualitative Review

generational grades. This categorization system is useful for figuring out the required LOD for HBIM projects based on their goals. Politecnico di Milano published the majority of the material about this system, and it was used in numerous case studies in Italy. A Revit add-in called "Scan-to-BIM" was also created by this university as part of the HOM & BIM live APP project, which was funded by the Regione Lombardia. The GoG9 and GoG10 classifications are directly applied by this add-in inside the Revit application.

From Fig. 33, we can observe the availability of some interesting papers that highlight the advantages of Rhinoceros software in their approaches. As mentioned in the "*Grasshopper and Rhino Plug-ins Approaches*" section, Rhinoceros eases the modeling of complex geometries because it has a variety of tools and plug-ins that make the modeling process more straightforward. For instance, the Grasshopper plug-in boosts the software's potent capabilities and enables the user to use advanced programming scripts to perform special operations. Numerous researchers, therefore, use this software to model NURBS models before transforming them into BIM applications.

For the remainder of the approaches in the literature reviewed, they typically performed traditional multiphase software methodologies that did not develop the process of modeling the masonry structures in BIM. They focused mainly on the structural analysis of HBIM models using CLOUD to FEM. The models analyzed were inaccurate and most were abstract geometry. In conclusion, the review produced valuable and fruitful findings that can benefit any researcher interested in developing an automated modeling approach for BIM masonry structures.

4 Conclusion

This paper is part of the doctoral research "*Development and Application of an Intelligent Modeling Process for Heritage Masonry Structures in BIM Applications*." It is intended to develop an automated modeling approach for heritage masonry elements in HBIM. This approach is characterized by precise details, rapid actions, short lead times, and minimal software usage. To achieve this objective, extensive research into the latest techniques in this field should be conducted. Therefore, this paper outlines a methodology for an in-depth review of the most recent publications that address the relationship between HBIM and masonry structures. Accordingly, over 700 publications released between 2017 and 2021 underwent review. These publications were found after a thorough deep search in four bibliographic databases that were chosen for compatibility with VOSviewer software.

The review process was conducted in three phases, the first being bibliometric analysis, where VOSviewer analyzed the Excel lists of search results from the four databases. During the second phase, these files were filtered, and the publications were sorted into folders depending on the strength of their relationship to the subject. The final phase, qualitative review, was the pivotal stage in which the most pertinent approaches were gleaned from these publications.

It is worth noting that during the qualitative review phase, it was discovered that less than 10% of the publications generated during the search process used advanced and non-conventional approaches. As previously stated, the main emphasis of these novel approaches is on machine learning and algorithm use. Simultaneously, some of these approaches

have incorporated the GoG system, which has been applied to various case studies of heritage structures in Italy. Moreover, Rhinoceros software, specifically Grasshopper, has been the savior in many cases. The plug-in has been commonly employed to develop custom scripts to automate tasks such as reducing the density of the point clouds, handling meshes and NURBS surfaces, and parameterizing geometries.

However, Grasshopper's widespread use in the processing of complex geometries has raised questions about the status of the Dynamo add-in in this process. Dynamo's capabilities are quite similar to those of Grasshopper, with very little difference, but as can be observed, Dynamo is rarely found in the resulting publications. The following are possible explanations: First, Dynamo is more recent than Grasshopper, and the latter has been released for CAD (Rhino) operations, whereas Dynamo was developed for BIM (Revit). Due to the fact that CAD users are more than BIM, Grasshopper would be more popular and widely used. A further factor reflecting this is that most European universities and training institutions have recently integrated BIM into their curriculum. This had an impact on the technical background of the researchers.

Future research should focus on the development of the advanced approaches mentioned in this paper, particularly those concentrated on machine learning and GoG techniques. Further examination of what researchers have found in these methodologies will help build more practical approaches that enhance and facilitate the modeling process of masonry structures in BIM. The algorithms that have been scripted in Grasshopper can be developed and generated directly by the Dynamo add-in in Revit without the use of different software. Additionally, operations that should be prioritized in future research include the management of point clouds and the automated assembly of primitive geometries within BIM applications. The future targeted approach is expected to be practical, feasible, accessible, and forceful within the BIM environment.

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Integrated Urban Conservation Management Framework for M&E-Systems Applying PDCA Method and Logic Model Approach

Leila Mueller-Shahbazi

Abstract

The need for improving the performance of Integrated Urban Conservation Interventions in terms of outputs, outcomes, and overall achievement of urban conservation goals by using monitoring and evaluation systems (M&E-systems) becomes more and more important and has been stressed and considered by many researchers and organizations recently. Although some attempts have been undertaken in Urban Planning, there is still a lack of an underlying conceptual framework for Key Performance Indicator (KPI) based M&E-systems that draws a holistic picture from an Integrated Urban Conservation point of view on the whole landscape. This paper proposes an analytically derived Integrated Urban Conservation Management Framework (IUCMF), including its functions, structure, and scope. The framework is based on ISO 9001 (Quality Management Systems), DIN 69909–2 (Multi-Project Management), and the Burra Charter Process and allows a high level of application flexibility for M&E-systems developer for a geographically defined area, according to cultural specifics, local features, and available regional data. The framework consists of a strategic and an operational level. The strategic level contains Integrated Urban Conservation policies, charters, and objectives, the objective breakdown according to regional specifics, and evaluation and impact of outcomes. The operational level considers the implementation of Integrated Urban Conservation targets and requirements via interventions at a place of cultural significance and contains program management, project management, and project phases. Inherent to this framework on both levels is the application of Plan-Do-Check-Act method (PDCA) and the Logic Model approach. The PDCA method foresees feedback loops within the IUCMF on a strategic level, but also within the programs and projects on an operational level. The logic model approach is inherent to the operational level, which allows monitoring of project performance. Objective determination and outcome evaluation are linked to the "Plan" and "Check" step on strategic level. Finally, the framework indicates the underlying activities (i.e., purpose factors) of each framework element as a precondition to derive Key Performance Indicators (KPI) for M&E-Systems. The IUCMF shall help researchers in developing appropriate M&E-systems but also policymakers, program managers, and local authorities to receive inputs for informed decisions regarding policy amendments, goal continuation, or project performance.

1   Introduction

The importance of Integrated Urban Conservation gained widespread attention over the last decades. Integrated Urban Conservation encompasses the comprehensive local tangible and intangible cultural values of the place and embraces the dynamic characteristics and complexity of the city (UNESCO, 2020). It is considering the values and interests of the existing historic fabric as equal in status to other factors in the urban development process, (Jokilehto, 1999) meaning that urban conservation integrates the goals of urban heritage conservation and those of socio-cultural and economic development (Boccardi, 2007; UNESCO, 2011).

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The Burra Charter recognizes the conservation as a dynamic process of change management (ICOMOS, 1999). Burra Charter declares that conservation has three phases in its management process: understanding significance, developing policies, and the management of conserved places.

According to the Burra Charter, conservation must be an integral part of good management. Burra is the only document to explicitly define the process in a schematic way by considering monitoring and reviewing as parts of urban conservation management (ICOMOS, 1999, 2013). Figure 1 shows the Burra Charter Process.

One important recommendation in the field of Integrated Urban Conservation is the Historic Urban Landscape (HUL) which was adopted by the General Conference of UNESCO at its 36th session in 2011 (UNESCO, 2011). The HUL recommendation was reaffirmed by UNESCO in the context of Agenda 2030 for sustainable development in 2016, showing that the significance of Integrated Urban Conservation targets is of high importance, especially in light of sustainability to meet the current and future needs of inhabitants (Veldpaus, 2015).

The central Historic Urban Landscape (HUL) recommendation aims at:

- Preserving the quality of human environment;
- Enhancing the productive and sustainable use of urban spaces; and
- Promoting social and functional diversity (UNESCO, 2011 Art. 11).

In sum, Integrated Urban Conservation aims at considering many different aspects, such as community life, quality of life, significance, integrity and authenticity of the place, identity, diversity and vitality, community action and
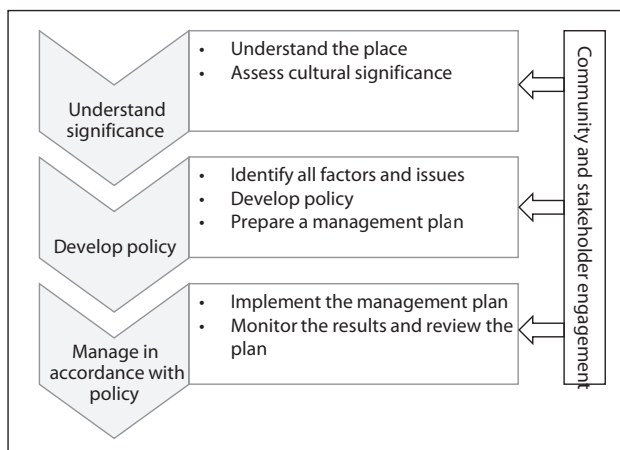
responsibility through stakeholder involvement, and suitable policy framework driving sustainable development (Bandarin, 2020; Jokilehto, 2006, 2017; UNESCO, 2013).

The consequence of these developments toward integration of social and sustainability aspects, paired with economic pressure and accountability of conservators and heritage professionals, lead to the realization that adequate M&E-systems are needed to improve project quality regarding monitoring of project performance, measurement of long-term effects, and evaluation of target achievements (Avrami et al., 2000; Bandarin, 2019; Alonso & Moers, 2012; Ragheb et al., 2012; UNESCO, 2011). Furthermore, M&E-systems are considered to increase decision-making quality by providing relevant stakeholders with the information and capabilities needed (UN Habitat, 2007; Kusek & Rist, 2004).

This topic has thus become an important concern for conservation scholars and practitioners over the past 20 years. The need for M&E-systems is unquestionable as the successful achievement of Integrated Urban Conservation aiming to be "an integral part of civil society" (Avrami et al., 2000, p. 3) clearly depends on well-designed Monitoring and Evaluation systems (Quyen et al., 2018).

Although several work and approaches to develop KPI-based M&E-Systems have been done so far, e.g., Avrami, 2011; Bandarin, 2015; Bandarin, 2019; Gravagnuolo & Girard, 2017; Guzman et al., 2018; Labadi & Logan, 2015; Ripp & Hauer, 2017; Rodwell & Turner, 2018; Zancheti & Hidaka, 2012, there is still lack of adequate conceptualization of a management framework as a basis for KPI-based M&E-systems.

As monitoring and evaluation systems in the field of Integrated Urban Conservation are still at the beginning, (Zancheti & Similä, 2012) this paper proposes an analytically derived Integrated Urban Conservation Management Framework (IUCMF) as conceptual basis for future KPI-based M&E-systems. To achieve the aim of this research, the relevant terminology is introduced and clarified in chapter two. Chapter three is dedicated to the introduction of PDCA method, Logic Model approach, and KPI usage. In chapter four, the IUCMF is developed by determining the function, structure, and scope. Chapter five provides implications for future M&E-systems followed by a conclusion.

Fig. 1 Burra charter process (ICOMOS, 2013)

2 Essential Definitions for M&E-Systems in Integrated Urban Planning

This chapter clarifies the terminology currently applied in the context of M&E-Systems.

2.1 Monitoring

OECD defines *monitoring* as "[…] a continuous function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indicators of the extent of progress and achievement of objectives and progress in the use of allocated funds." (OECD, 2002).

The notion of "continuous function" implies that data collection and data aggregation into indicators is permanent in its character and a fundamental task to be performed. Whereas this definition leaves open what an intervention exactly is, when the start of an intervention occurs and when to start data collection respectively, UN Habitat clearly relates the notion of intervention to the singular project context, as *monitoring* is "an internal project activity designed to provide constant feedback on the progress of a project, the problems it is facing, and the efficiency with which it is being implemented" (UN Habitat, 2007, p. 29, referring to Bamberger and Hewitt, 1986). It can therefore be stated, that monitoring is an exclusive project task that must be performed within or across the distinct phases of a singular urban conservation project. This does not apply to the *evaluation* aspect.

2.2 Evaluation

OECD defines *evaluation* as "[…] the systematic and objective assessment of an ongoing or completed project, program, or policy, including its design, implementation, and results." (OECD, 2002) Thus, the definitional scope is much broader for the term *evaluation* as it is for the term *monitoring*, which leads to the conclusion that, irrespective of the fact that evaluation could be part of a project, these activities can be performed on different conceptional levels (e.g., project, program, policy—as stated in the definition). Also, other conceptual levels might be thinkable whereas the wording and levels of detail with its functions may vary depending on the systematics applied for model construction and the view taken by the model maker:

- Micro level (Project), meso level (Program), and macro level (Project Portfolio as an indirect expression of policies);
- Operational level (Project and Program with focus on implementation) and strategic level (Policy, with focus on prescribing and updating standards and systems);
- Process level (project, incl. project phases with respective processes and programs as sum of projects within a certain period of time) and systems level.

Regardless of the considerations just made, the definition of *evaluation* given by UN Habitat (2007) severely narrows the approach and points back on singular projects, as *evaluation* "[…] assesses the outcome of a project or a distinct segment of a project, with the aim of influencing the design of future projects." (UN Habitat, 2007, p. 34). Furthermore, the notion of "outcome" implies, that evaluation activities can be performed during the project phases and after a project, which is in line with the OECD approach.

2.3 System

A thorough analysis of urban conservation literature revealed that the *system* term is not explicitly specified for the purpose of Monitoring and Evaluation in Integrated Urban Conservation. Therefore, an own and appropriate understanding of the *system* term must be elaborated and applied for this research aim. Systems theory and quality management norms (ISO 9000 et seq.) are a sound basis for this task. According to systems theory, the term *system* contains *elements* and the *wholeness*. Furthermore, a system is constituted by an order characteristic, meaning that there is an arrangement pattern between the elements. The wholeness is structured and organized. Thus, the elements of a system are related to each other, and interaction occurs among them. All parts, which are not part of the system are part of the environment (Ulrich, 1970).

According to ISO 9000, a system is a "set of interrelated or interacting elements" (ISO, 2015a, p. 36). As Burra Charter (ICOMOS, 2013) explicitly points out the aspect of *managing* places, this notion can be used to expand the *system* understanding by adding the management component. A (Quality) *Management System* is characterized as "[…] a dynamic system that evolves over time through periods of improvement." (ISO, 2015a, p. 23). The driver for change is improvement and as the notion of improving a system is inherent to the idea of Burra Charter as well, taking a particular focus on a *system* from a (Quality) *Management* point of view appears to be useful.

The *management system* definition of ISO understands a system to be a "set of interrelated or interacting elements of an organization […] to establish policies […] and objectives […], and processes […] to achieve those objectives" (ISO, 2015a, p. 36). Nevertheless, this understanding is clearly related to a single organization. However, the *management system* definition could be adopted to the context of Integrated Urban Conservation in so far as the scope of the management system could be approached according to territorial clusters (i.e., local, regional, national, or global). It is to consider, that a territorial cluster (e.g., a country)

may cover different places with cultural significance, whereas the term *place* is used according to the definition within Burra Charter (ICOMOS, 2013).

The definition of an Integrated Urban Conservation Management Framework for the purpose of this study is thus laid down as follows:

Definition An *Integrated Urban Conservation Management Framework (IUCMF)* is a system consisting of a set of interrelated or interacting elements within a geographically limited area, that consist of at least one place with cultural significance, to establish policies, objectives, and processes, to achieve those objectives.

2.4 Process

No explicit definition of *process* has been found in Integrated Urban Conservation literature. As the Burra Charter contains a process dimension in that it recognized conservation to be a dynamic process of change management which contains Monitoring and Reviewing activities as parts of urban conservation management (ICOMOS, 1999), an understanding of what a *process* is and what the constituting elements are, must be elaborated. Some practitioners derive their process understanding already from ISO 9000 which sounds promising, due to the universal application possibilities.

According to ISO 9000, a process is a "set of interrelated or interacting activities that use inputs to deliver an intended result [output]" (ISO, 2015a, p. 33). "The inputs to a process are generally the outputs of other processes and process outputs are generally the inputs for other processes." (ISO, 2015a, p. 33) Central to the process is the activity performed based on inputs to generate outputs. An activity is defined as the "smallest identified object of a work […]" (ISO, 2015a, p. 32). Figure 2 shows the constituting elements of a process according to ISO 9001 (ISO, 2015b, p. 12). Due to its wide scope of applicability, the process definition of ISO 9000 will be applied in this paper.

2.5 Project

The *project* term itself has not been addressed by researchers in Integrated Urban Conservation yet. According to ISO, a project is a "unique process […] consisting of a set

of coordinated and controlled activities with start and finish dates, undertaken to achieve an objective […] conforming to specific requirements […], including the constraints of time, cost and resources." (ISO, 2015a, p. 34) It is further noted, that a singular project could be a "[….] part of a larger project structure […]" (ISO, 2015a, p. 34) which means that a project could be a part of a bigger project as sub-project or be a part of a program. The project definition sounds suitable for the research aim. Therefore, this definition is followed. As the *project* is a unique process, the term is similarly understood as the term *intervention* which is used by OECD and UN Habitat.

2.6 Program

A program comprises a certain number of related projects (interventions). The projects pursue an overriding goal and can be combined to a program. As soon as the program achieves its targets, the program with its projects is closed. The difference to project portfolio management lies in the fact that projects or programs could follow different aims, meaning that there could be several programs constituting a project portfolio, whereas a project could be a part of a program, or directly a part of a project portfolio (DIN, 2013, p. 6). Adopting this notion to the context of Integrated Urban Conservation with the systems understanding already elaborated above, allows to conclude that the achievement of Integrated Urban Conservation objectives in a certain system boundary will be achieved by integrating the needed activities (i.e., transformed aims) into the projects that are either a part of a wider program or direct part of project portfolio for a certain period of time. Figure 3 shows the relationship between system boundary, project portfolio, programs, and projects.

2.7 Policy

The last term to be discussed is *policy*. According to ISO (ISO, 2015a, p. 38) the policy consists of "[…] intentions and direction of an organization […] as formally expressed by its top management". Transferring the notion from the organizational context to that of Integrated Urban Conservation leads to the realization that the inherent conservation aims and objectives (e.g., Burra Charter, UN Habitat) can be considered as policy.

Fig. 2 Elements of a process according to ISO 9001 (ISO, 2015b, p.12)
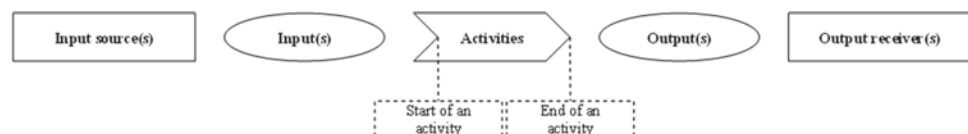
Fig. 3 Relationship between systems boundary, portfolio, program and project
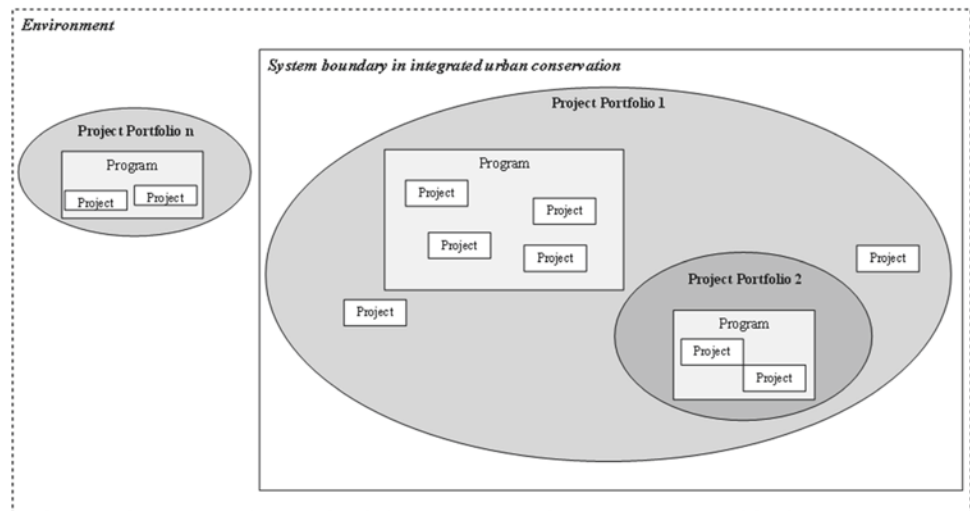
After all relevant terms have been discussed, the next chapter focuses on the applied methods of PDCA and Logic Model as they have been approached manifold in the context of M&E-systems development.

3 PDCA Method, Logic Model, and KPI Usage in Urban Conservation

Considering the growing demand for efficiency and performance improvement within (and across) urban conservation projects, PDCA, Logic Model, and Key Performance Indicator (KPI) have gained increasing popularity in conservation literature.

3.1 PDCA

The *Plan-Do-Check-Act Cycle* (PDCA) is aimed at improving the performance of processes within organizations in a structured way (see Fig. 4) and can be considered as a comprehensive approach including management, conservation process, and implementation (Alegre & Covas, 2015; Candiello & Cortesi, 2011).

According to Stem et al. (2005), the main advantage of PDCA for conservation managers lies in the learning aspects which helps to improve interventions. The learning character has also been pointed out by Cowley and Domb (1997). Originally, PDCA was developed in the field of quality control to improve process performance (Maruta, 2012). Here, the fundamental requirements for using PDCA are the measurability of critical process properties and required data (e.g., in R&D, Production) (Walton, 1986). Furthermore, all relevant actors in target-related processes have the task to contribute to improvement (Imai, 1986). In quality management, the PDCA cycle can be applied to

processes itself but also to the quality management system level (ISO, 2015b). Transferring this notion of PDCA to the context of Integrated Urban Conservation M&E-systems modeling in line with the system definition applied in this paper, this results in the realization to clearly distinguish between system and process (project) level—or strategic and operational level respectively. The evaluation of available research papers dealing with M&E-systems development in urban conservation and urban planning revealed a shortcoming in this regard.

3.2 Logic Model

The description of *logic models* has started already many decades ago by Wholey (1983) and has been strongly promoted by Kellogg Foundation as an approach to program evaluation. Logic model is used as a tool for program planning, management, and evaluation (Chen, 1990). It gives a broad picture of how an organization does "[…] its works […]", its underlying theory and assumptions (Kellogg, 2004, p. III). Logic models have also been called *chains of reasoning*, *theory of action*, *performance framework*, and *logical framework* (McLaughlin & Jordan, 1999). According to Kellogg (Kellogg, 2004, p. III) it facilitates "thinking, planning, and communications about program objectives and actual accomplishments." In their regard, the development and use of logic models is "[…] an important step in building community capacity and strengthening community voice." (Kellogg, 2004, p. III) The logic model can be used to tell the performance story of a program, as it is an appropriate method to describe the link between program resources, activities, outputs, customers reached, and short, intermediate, and longer-term outcomes (McLaughlin & Jordan, 1999). Today, logic models are also found in proposals and project reports for government agencies and

Fig. 4 PDCA cycle for continuous improvement of a singular process
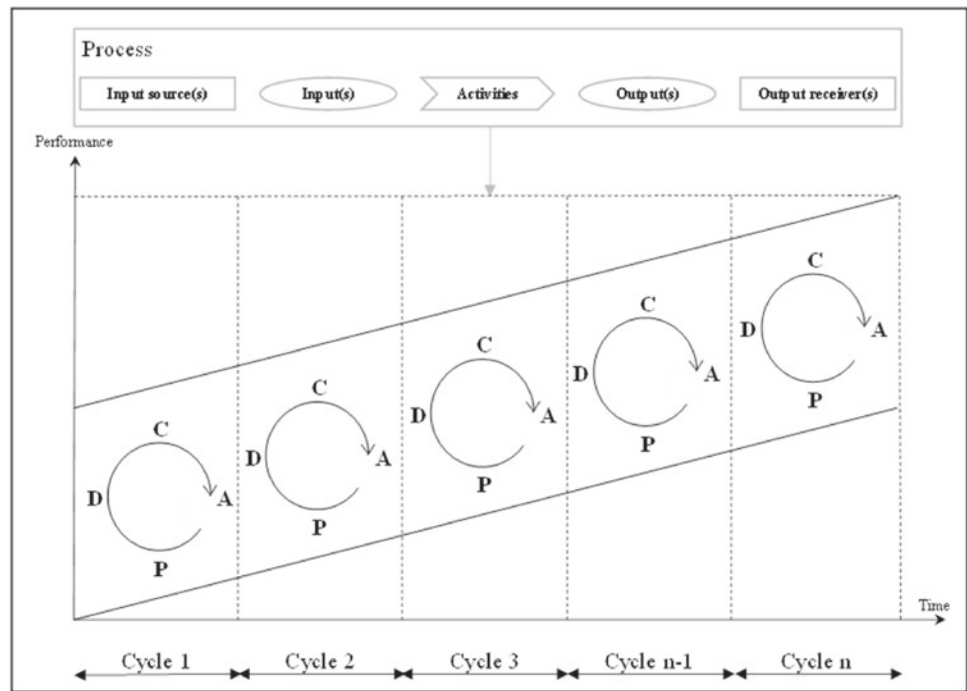
have also been applied in urban planning in the context of management systems (HerO, 2010; Quyen, 2017; Quyen et al., 2018). In Integrated Urban Conservation, where communities are placed at the core, the logic model can achieve consensus among diverse stakeholders, by allowing them to focus on objectives that are concrete, measurable, and mutually acceptable (Helitzer et al., 2010). Some approaches have been undertaken to link the logic model approach to monitoring and evaluation measurement (e.g., UNDRR, 2015). Output measurement is thereby linked to the realization of activities whereas outcome measurement shows to what degree direct objectives and anticipated results are realized. The impact assessment shows the degree of overall objective or goal realization. According to UNDRR (2015), the prerequisite is the definition of clear and measurable goals, as well as the definition of objectives and activities in the design stage. Figure 5 shows the structure of the logic model.

A closer look to the structure of the logic model in comparison with the structure of a singular process reveals that the input, activity, and output elements are similar. This means in turn, that building M&E systems based on a logic model would fall short, because the implicit process logic inherent to the logic model approach just allows monitoring and evaluation on a singular process level. The structure of the logic model does not allow for monitoring and evaluation of an Integrated Urban Conservation Management *System* without adaptation, as processes form "just" a part of the system. Nevertheless, the logic model approach is an important part of modeling M&E-systems.

3.3   KPI

In Integrated Urban Conservation, the need to evaluate the success and performance of interventions with the help of

Fig. 5 Structure of logic model
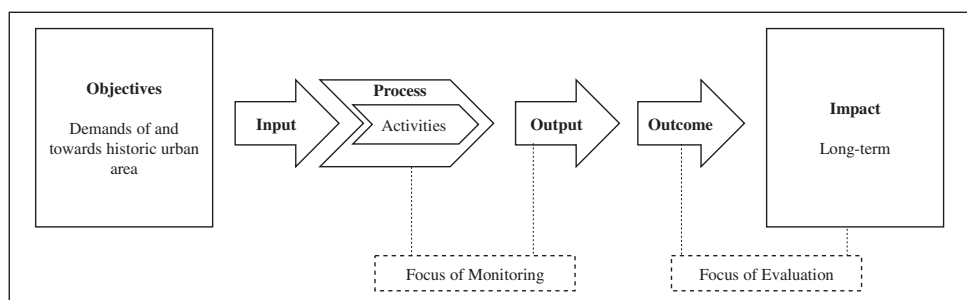
Key Performance Indicators (KPIs) has become increasingly important. The main functions of KPI usage are to provide relevant data to:

- Support informed decision-making and policy-making (Local/Government/Project Management);
- Improve project systematics and performance;
- Monitor the status of an intervention/project in the implementation phase;
- Benchmark project/program performance or achievement against peers; and
- Evaluate the target (objective) achievements of interventions (projects) against policies, e.g., significance, value, integrity, authenticity, threats, management, and public use (Mega and Pedersen, 1998; OECD, 2002; UNESCO, 2007, 2009; Zancheti and Hidaka, 2011; Alonso and Meurs, 2012; Kusek and Rist, 2004).

It is important to note that the term KPI solely refers to the achievement of critical *key* targets or *key* success factors of any activity or process and should not be mixed-up with indicators or metrics (Lorenz, 2015). This means on one hand, that the *key* objectives must be clear, the measure points must be clear, the underlying activities that contribute to the achievement of *key* targets must be clear, and the relation between the activities must be clear. In turn, a pure listing of indicators without clear targets, activities, descriptions of their relation to each other, or their order, would not be purposeful. It would lead to confusion and non-transparency (Lorenz, 2015). On the other hand, this emphasizes the need in the field of Integrated Urban Conservation for a conceptualized framework describing the interrelation of elements, processes, activities, and objectives in its wholeness.

As can be seen from the above considerations, PDCA, Logic Model, and KPI have their own benefits and are important aspects to consider in the development of an M&E system.

4　Development of Integrated Urban Conservation Management Framework (IUCMF) as the Basis for Future M&E-Systems

The proposed management framework (system) will be built on the terminology and concepts introduced in chapters two and three. In the first step, the requirements for the framework will be determined. This includes requirements for the indicator system and for the framework as such. In the second step, the function and elements of the framework will be clarified and structured on a strategic and operational level according to the control- and optimization function of the Quality Management System Norm ISO 9001.

Inherent to this function is the PDCA method. Further structural considerations regarding processes, projects, and programs will be done using project management literature and the process model approach, which is described in DIN 69909–2 (DIN, 2013). Afterward, the scope of the framework will be determined and the "purpose factors" that constitute the Integrated Urban Conservation view will be assigned to the structure. This includes aspects like outcome and impact which are taken from the logic model approach. Finally, the IUCMF is developed. The proposed IUCMF Framework is intended to provide the conceptual basis for future KPI-based M&E-systems.

4.1　Requirements for an Indicator System

As already elaborated above, KPIs are necessary to monitor and evaluate the outcome of interventions. The preconditions are key targets, key objectives, available data, and streamlined indicator systems. In literature, several requirements for indicator systems can be found (Lorenz, 2015). The KPI requirements with the most relevance for the purpose of this paper, are listed below and need to be further considered for the framework development:

- The system shall be clear (i.e., contain not too many indicators).
- The critical success factors shall be connected.
- The cause-effect relationship shall exist and KPI shall be verified regarding their appropriateness.
- The process (within projects) shall be standardized, meaning that it should be adoptable to other projects.
- The result of measurement is reliable, meaning that they are reproducible under similar conditions.
- Each KPI provides information about a process, meaning that all KPI-relevant processes are identified.

4.2　Requirements for an Integrated Urban Conservation Framework (IUCMF)

Besides the requirements for Indicator Systems, the requirements for the management framework are derived from the purpose of this research and are listed hereinafter:

- The management framework shall sufficiently visualize the constituting elements, their interrelation, processes/projects/programs, and policy in Integrated Urban Conservation.
- The management framework shall include PDCA and Logic Model.
- The management framework shall include a benchmarking function.

- The management framework shall allow a clear amount of KPIs to be integrated; and
- The management framework shall be applicable to different regions, according to cultural specifics, and give the freedom to develop individual KPIs.

4.3 Function, Structure, and Scope of the Proposed Integrated Urban Conservation Management Framework (IUCMF)

A management system comprises several *functions*, e.g., communication, allocation of responsibilities and resources, and control- and optimization function. These functions are assigned on strategic and on operational level within organizations as they are the foundation of the system as a whole and its processes (ISO, 2015b). For the purpose of this paper, the relevant function is the control- and optimization function (of processes) as Monitoring and Evaluation aims at improving the performance and target achievements of Integrated Urban Conservation interventions.

The inherent *structure* of the systems level follows its function. Thus, the structure consists of a strategic and operational level and includes mechanism for continuous improvement (ISO, 2015b). On a strategic level, there is a "Plan", a "Do", a "Check" and an "Act" element. The "Do" however, is located on the operational level as doing is always related to the implementation of targets or activities within processes. In Integrated Urban Conservation, the implementation is done via projects (or programs). Thus, projects (or programs) constitute the operational level and have their own inherent PDCA logic. The inputs and outputs of the operational level are thereby linked to the plan and check element on a strategic level. Figure 6 shows the control- and optimization function of the Integrated Urban Conservation Management Framework (IUCMF).

- *Plan:* According to ISO (2015b), the planning step must contain the determination of context, relevant issues, measurable targets, and the needs and expectations of interested parties (stakeholders) on systems level. This also includes statutory and regulatory requirements. The targets and their evaluation procedure must be defined. Furthermore, the risks and opportunities need to be determined, and measures to be defined to prevent undesired effects and to achieve improvement.
- *Do:* This step contains the implementation of the planned activities in the system. This includes the detailed determination and provision of targets, resources, external support, the necessary people, infrastructure and environment, competence, internal and external communication, documentation and planning, and implementation and control of the processes needed to meet the requirements. Furthermore, within these processes, the specific requirements must be defined, and the degree of fulfillment has to be reviewed (ISO, 2015b).
- *Check:* This step contains the monitoring, measurement, analysis, and evaluation of the management system as such (ISO, 2015b). It includes the determination of what to be monitored and measured, the methods applied, and the time for measuring and evaluation. It should be clearly distinguished from monitoring of programs/or projects on an operational level in the context of Urban Conservation Interventions, because, firstly, the terminology of monitoring differs. Secondly, the interventions in Integrated Urban Conservation are done in projects (or programs) and not on systems level. According to project management literature, the project output monitoring is completely done within the project phases. In contrast, the outcome and impact evaluation—which measures fulfillment degree after a certain time of a project (or program) is part of the check phase on a strategic level and is based on the objectives defined in

Fig. 6 System level structure of control- and optimization function in IUCMF
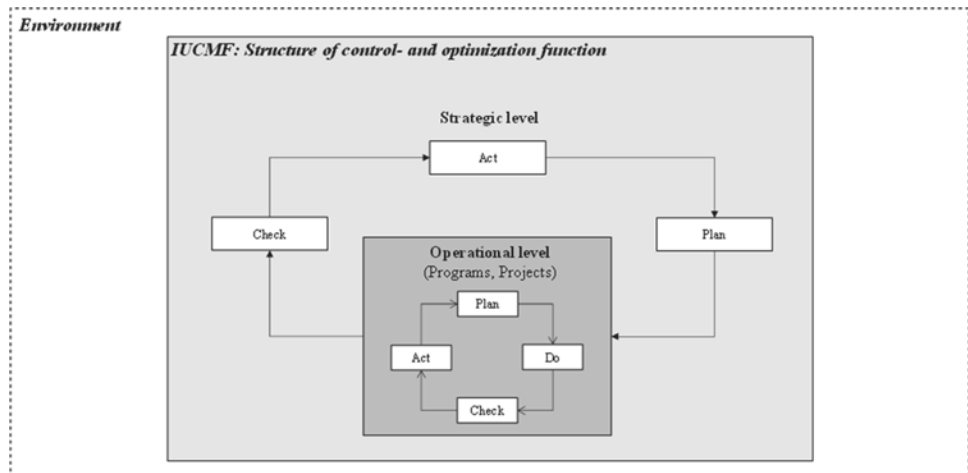
the plan phase. A very important part in this step is the management review. The system as such is evaluated regarding performance, satisfaction, and decisions are made regarding the need for changes and improvement opportunities.

- *Act:* This step deals with the improvement of the system as such. This means that the opportunities for improvement shall be determined and implemented. This includes corrective measures to prevent undesired results, improving performance, and updating of documents (e.g., policy, strategy, objectives).

The *structure* of the operational level is determined by the projects or programs. As described in chapter two, a program comprises a certain number of related projects. A typical project consists of several project phases. In literature, many different approaches exist. For the purpose of this study, a 5-Phase structure will be applied.

- *Phase 1* is the initialization phase. In this phase, the requirements are determined, the scope of the project is drafted, and a rough estimation is done. Furthermore, the risks are identified, success factors determined, and milestones planned. Typical methods are brainstorming, SWOT-Analysis, top-down approach, and risk analysis.
- *Phase 2* is the pre-study phase. In this phase, a general planning is drafted. The project scope is verified, and a situation analysis is performed. The project targets are structured, and solutions are drafted. Furthermore, the feasibility is tested, the profitability is checked, and the risks are assessed. Methods and tools used are Kick-off meetings, problem-solving techniques, work-breakdown structure, risk analysis, and project portfolio management (or program management).
- *Phase 3* is the concept phase. In this phase the detailed planning is done, the budget is created, the costs and resources are planned. Furthermore, the solution options and a detailed concept are elaborated. Popular methods applied are for instance brainstorming and planning instruments like GANTT.
- *Phase 4* is the realization (or implementation) phase. In this phase, the project is realized according to the plan. Deviations will be communicated, and all activities related to the hand-over phase will be prepared.
- *Phase 5* is the introduction (or closing) phase. The hand-over will be organized, the relevant documentation will be created, and lessons learned will be processed and documented. Methods and tools used are usually project assessment, closing meeting, and certain controlling instruments (Kuster et al., 2011).

Inherent to the project phases are processes. As already elaborated above, PDCA targets at improving processes. Thus, projects as such and its project phases have PDCA inherent. The same applies to the program level, as the lessons learned from one project can be transferred and applied to other projects or project phases. Thus, in the case of existing programs, a link between programs and projects regarding monitoring of project performance, improvement, and performance comparability (benchmarking) exists. It can be concluded that the structural elements of the IUCMF are the PDCA steps on a strategic level, and the program(s) and the project(s) with its project phases on an operational level.

Figure 7 shows the amended functional structure of IUCMF by integrating the project structure and its link to the program on an operational level.

The *scope* of the Integrated Urban Conservation Management Framework is based on the system understanding elaborated in chapter two. According to ISO (ISO, 2015b, p. 18) it is important to understand the system boundary of the management framework and its context (ISO, 2015b, p. 18). As already pointed out, the scope of the proposed management framework is geographically limited and clearly relates to the context of Integrated Urban Conservation interventions. Additionally, the internal and external factors "[…] relevant to its purpose […]" shall be determined (ISO, 2015b, p. 18). Furthermore, the needs and expectations of interested parties as well as external requirements must be considered (ISO, 2015b, p. 18).

To determine the *purpose factors* that "fill" the model structure with the content relevant to Integrated Urban Conservation, the implications from ISO 9001 regarding control- and optimization function in the Plan, Do, Check and Act phase will be applied. Furthermore, the Burra Charter Process will be used exemplary to specify the scope according to the context of Integrated Urban Conservation. The basis for assigning the factors to the functional structure on strategic and operational level in the framework model is the logic taken from DIN 69909–2, which describes the process model in multi-Project management. According to the norm, the purpose factors can be assigned on strategic and operational level, whereby the strategic level represents the first layer, and the operational level contains the second (program) and third layer (project). Regarding the Integrated Urban Conservation Framework definition above, it is important to note that the framework relates to a geographically defined area (e.g., a country). The area can consist of several places with cultural significance. Therefore, the single project is always related to a certain place of cultural significance. This is not necessarily

Fig. 7 Functional structure and interaction of strategic and operational level within IUCMF
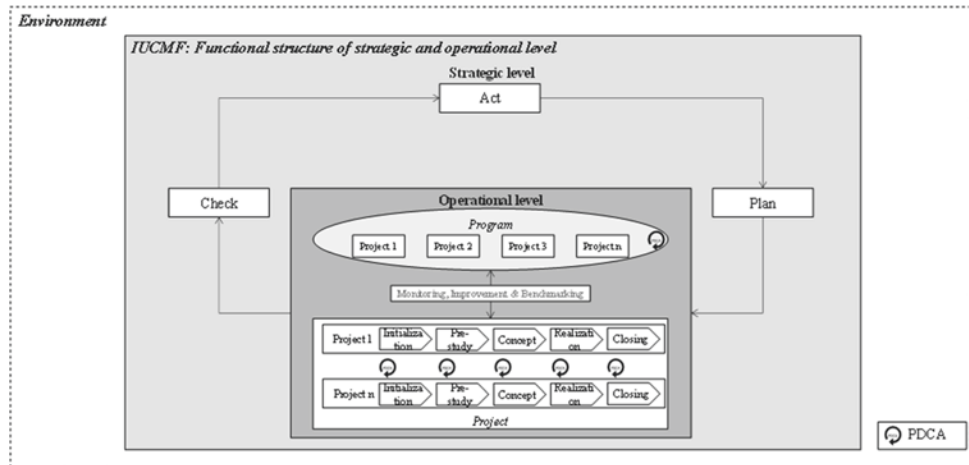
the case for the program as such, as a program can be performed within a geographically defined area consisting of projects at different places.

- *Plan* (strategic level): As elaborated above, the planning step contains—among others—the following purpose factors:
  - Determination of context;
  - Measurable targets derived from (international) state-of-art policy objectives and their breakdown (e.g., from Burra Charter or HUL);
  - General needs and expectations of interested parties (internal/external stakeholders);
  - Monitoring statutory and regulatory requirements (e.g., local laws);
  - Evaluation procedure (of programs/projects) for outcome and impact;
  - Determination of overall risks and opportunities;
  - Measures to prevent undesired effects and to achieve improvement; and
  - Management of stakeholder expectations.
- *Do* (operational level): This step represents the implementation phase and relates to projects at a specific place with cultural significance and/or programs and contains—among others—the following purpose factors:
  - Determination of program(s)/project(s);
  - Detailed determination and provision of program/project targets;
  - Determining cultural significance;
  - Monitoring and assessment of requirements/obligations through engagement (e.g., detailed expectations of internal/external stakeholders like community, municipality, or project team);
  - Develop policy/statement of significance/management plan;

- Resource planning and competence (e.g., financial, staffing, knowledge, skills);
- Project/program management tools and methods (e.g., SWOT, lessons learned);
- External support needed for the program(s)/project(s) (e.g., services);
- Infrastructure and environment (e.g., external constraints);
- Internal and external communication (e.g., to external stakeholders);
- Planning, documentation, implementation, and control of the projects/programs needed to meet the requirements; and
- Reporting of project/program phase outputs (results)—this includes reviewing fulfillment degree and continuous improvement within project phases or across projects/programs regarding target achievement (e.g., project monitoring; benchmarking).

- *Check* (strategic level): This step contains the purpose factors monitoring, measurement, analysis, and evaluation of the management system as such, for instance
  - Determination of what is to be evaluated and measured, whereas the "what" refers to the objectives defined in the plan phase;
  - Evaluation method and timeline;
  - Outcome/impact evaluation of programs(s)/projects achievements against the targets and expectations determined in plan phase; stakeholder satisfaction; and
  - Management system review (i.e., performance evaluation of the whole system regarding performance; satisfaction; decisions to change local policies, recommendations, objectives, or laws).
  - *Act* (strategic level): This step contains the improvement of the system as such, and contains the following purpose factors:

- Corrective measures to prevent undesired results like conflict between Integrated Urban Heritage Objectives and local laws; and
- Creation/refinement/revision of strategic documents and objectives relevant to Integrated Urban Conservation (e.g., charters, principles, procedures, objectives).

Table 1 shows a summary of relevant purpose factors for the aim of this research and their allocation within IUCMF.

After determining the requirements, the function, the structure, and the scope via assignment of purpose factors, the consolidated framework is shown in Fig. 8. Please note, that the purpose factors do not claim to be complete

Table 1 Selected purpose factors and their allocation within the IUCMF

Purpose factors	Level	Layer	Structural element phase
Context	Strategic (system) and operational (project, program)	1, 2, 3	All
Objective breakdown into targets for geographically defined area (e.g., country/state)	Strategic (system)	1	Plan
Monitoring and evaluation of statutory and legal requirements for geographically defined area (e.g., country/state)	Strategic (system)	1	Plan
Needs & expectations of interested stakeholders for geographically defined area	Strategic (system)	1	Plan
Evaluation procedure for output/outcome of projects	Strategic (system)	1	Plan
Risks and opportunities for geographically defined area	Strategic (system)	1	Plan
Measurable targets for a program, and/or project at a place of cultural significance	Operational (project, program)	2, 3	Do
Monitoring and evaluation of statutory and legal requirements for place of cultural significance	Operational (project, program)	2, 3	Do
Needs and expectations of interested stakeholders for place of cultural significance	Operational (project, program)	2, 3	Do
Risks and opportunities for place of cultural significance	Operational (project, program)	2, 3	Do
Program	Operational (program)	2	Do
Project	Operational (project)	3	Do
Cultural significance of place	Operational (project, program)	2, 3	Do
Project policy, management plan for the place of cultural significance	Operational (project, program)	2, 3	Do
Output reporting, monitoring, and benchmarking of project (phases)	Operational (project, program)	2, 3	Do
Determination of evaluation objects, method, and timeline	Strategic (system)	1	Check
Outcome/impact evaluation of programs and projects against the targets and expectations determined in the plan phase; stakeholder satisfaction	Strategic (system)	1	Check
IUCMF review (performance evaluation, decisions regarding the whole system, e.g., charter amendment)	Strategic (system)	1	Check
International policies/charters/recommendations and objectives (e.g., Burra, HUL, cultural significance, community engagement)	Strategic (system)	1	Act
Creation and revision/amendment of procedures, approaches, international policies, charters	Strategic (system)	1	Act

Fig. 8 The complete IUCMF as basis for M&E-systems
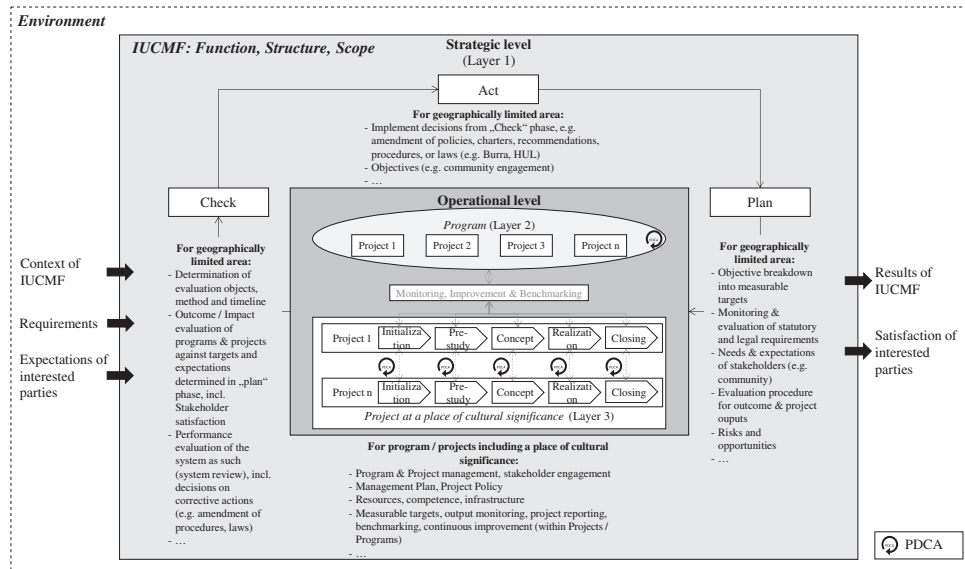
and might be subject to change. Depending on the context, additional or differing purpose factors could be assigned whereas the framework structure remains untouched.

5   Implications for Future M&E-Systems

This section describes the implications for researchers that aim at developing KPI-based M&E-systems on the base of the proposed Integrated Urban Conservation Management Framework (IUCMF). The IUCMF consists of three layers. Layer 1 describes the strategic level, layers 2 and 3 describe the operational level. A consistent KPI system needs to consider all three layers and the relationship between the relevant elements. As already mentioned in Sect. 4, several requirements for KPI systems have been considered in the IUCMF and will be discussed now.

Firstly, it is necessary to emphasize the difference between Monitoring and Evaluation as such. It has been elaborated, that *monitoring* is solely related to programs and projects. It shall not be mixed-up with monitoring of requirements in the "plan" phase on a strategic level, as the purpose of this paper is to improve the performance of Integrated Urban Conservation interventions. This means, that any metrics, data, or indicator used, must refer to the structural elements of programs and projects on the operational level of the IUCMF. Thus, assigning monitoring KPIs in the "Plan" phase on a strategic level would lead to failure. Due to the applied program and project systematic in the model, the indicators could rather be assigned to a program, to a project, to distinct project phases, or to underlying activities in the process phases. Activities can be described as processes—as they require inputs and generate

outputs. Measuring points to monitor performance can be assigned to each process element: source of inputs, input, activity, output, and receiver of output. Applying this systematic would in turn allow comparability and performance benchmarking of a complete set of activities in a project or activities in a single project phase against various other projects or project phases of similar structure. Using KPI for monitoring further requires measurable project targets which are usually defined in the initialization phase of a project. *Evaluation*, on the other hand, may cover certain structural elements on the operational level but mainly comprises the plan and check elements with its underlying activities on a strategic level. In the IUCMF, the objective breakdown is foreseen in the "Plan" phase on a strategic level. Comparability is reached if the target breakdown follows a standardized process across different projects or programs. The same applies to the definition of evaluation methods and evaluation timelines for checking the objective achievement in the "Check" phase on a strategic level. In combination with possible evaluation points on the operational level (within projects), the evaluation results would be an input for management review, e.g., regarding decisions on policy amendment.

Secondly, a KPI system for Monitoring & Evaluation shall have just a limited set of indicators. Whereas the IUCMF makes no proposals regarding the amount of KPI used, the IUCMF allows KPI to be integrated in each structural element on a strategic and operational level, i.e., the "Plan", "Check", and "Act" phases on a strategic level, and the Program, Project, and Project Phases on operational level (i.e., "Do" phase).

Thirdly, a KPI system shall connect the critical success factors. In the IUCMF, the identification of critical success

factors is directly assigned to the "Plan" phase on a strategic level and to the initialization phase of a project on an operative level. Furthermore, the critical success factors are indirectly assigned to the program management layer. However, as no specific structural element is foreseen for the program, the IUCMF implies to assign KPI to the distinct phases of a single project or the project itself, and to the "Plan" phase on a strategic level. The evaluation is performed in the "Check" phase. This connection means, that critical success factors will be mitigated via the activities within a project.

Fourthly, the processes for monitoring and evaluating aspects in the IUCMF shall be standardized, meaning that it should be adoptable to other projects. The model provides a uniform structure, which could be transferred from one geographically defined region to another. As KPIs can be assigned to each element of the framework, the standardization is given. However, building a "universal" M&E system would require prescribing the complete range of activities that need to be performed in each element on strategic and operational level in standardized processes. This would then also allow for reliable measurement in order to achieve reproducible results under similar conditions.

Finally, each KPI provides information about a process, meaning that all KPI-relevant processes are identified. The purpose factors (activities) for improving the performance of Integrated Urban Conservation have been assigned to the structural elements. This assignment would be the starting point for process modeling by transforming the purpose factors into activities and to add input sources, inputs, outputs, and output receivers. Definition of standard processes within the IUCMF would ease the identification and adoption of relevant KPI.

6 Conclusion

The need for appropriate M&E-systems in Integrated Urban Conservation to improve the performance of interventions has been stressed by many researchers. However, there is still a gap in underlying concept to build effective M&E-systems upon. To contribute to the discussion, an Integrated Urban Conservation Management Framework (IUCMF) as conceptual basis for KPI-based M&E-systems has been developed. It could be shown that the proposed framework contains relevant structural elements, purpose factors, and improvement systematics which are needed to develop consistent monitoring and evaluation systems in the future. The framework can principally be used in different countries or regions. It allows adaptation of purpose factors according to the local situation by the model user. Due to its simple construction logic, the applicability is given and improvement within the systems boundary is considered. However, the

wish to compare projects or programs across different geographically defined areas, to exchange best-practices, and to improve decision-making has not been considered in the model. These aspects must be reflected in M&E-systems. In order to develop robust M&E-systems in the future, the next important research step toward KPI-based M&E-systems would be to validate the purpose factors in order to standardize the underlying activities and model the processes for each activity within the IUCMF as this is a precondition for KPI selection.

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Carlo Scarpa in Palermo: Vladimir Zoric and the Restoration Experiences at Palazzo Abatellis and the Transformations of the Steri

Cinzia Accetta

Abstract

Scarpa's architecture in Palermo has undergone several maintenance or restoration interventions over time. Scarpa works with great attention to the existing structures and the museum installations are real stage machines, complex gears to be deciphered in order to be adequately preserved. In Vladimir Zoric's interventions there is this great attention to the study of the complexity of the materials used, in relation to the local components but also to what we now recognize as a clear and unmistakable formal language. The paper studies the works of Carlo Scarpa in Palermo in two important sites: the museum organization of Palazzo Abatellis and the collaboration in the adaptation to the seat of the Rectorate of Palazzo Steri. The restoration work on these buildings became necessary just thirty years after their construction. This is due to the materials used and the unscrupulous construction techniques often pushed to the extreme limits of strength and durability. The intervention required for the adaptation of the systems and safety equipment was different. Both at Palazzo Abatellis and at the Steri there has been a change in the intended use of some rooms which entailed adaptations and modifications that are not always in line with the aims of the project, generating a real anthropic degradation. Zoric's program for Palazzo Abatelis starts from Scarpa's techniques. In fact, he knew Scarpa's language well, having often collaborated with the master and having designed together with him some permanent installations of the museum. In the paper I wanted to remember how Vladimir Zoric, with extreme sensitivity, solves the problem of lighting adaptation by opting for light sources hidden from view. He wisely uses inexpensive elements, such as fluorescent neon tubes, which are placed on the roof, in positions hidden from the view of museum users and able to give diffused and non-punctual lighting, as in the frames of the dome-skylight of the ancient Chapel of the Palace. The comparison with the latest extension works of the National Gallery is an opportunity to reflect on the methods of intervention in historic buildings. Scarpa's lesson at the Steri is declined between agreements and contrasts, modern materials used in an ancient way and ancient techniques that give a new shape to iron and concrete. The analysis of the cases addressed in the paper shows many ideas to reflect on. There is a close relationship between conservation, restoration and maintenance. Years later we are witnessing the need for "restoration of the restoration" but it can be said that both at Steri and Abatellis it is the so-called anthropic degradation that causes the greatest damage and causes heavy transformations in the work of Carlo Scarpa.

Carlo Scarpa's museum installations and architecture in Italy have undergone maintenance or restoration over time with considerable differences from place to place. The quality of the intervention reflects the different sensitivity and technical and critical preparation of the operators. The conservation of Scarpa involves great attention to the relief of the structures, real scenic machines to be deciphered. Fundamental is the study of the materials used, partly local but mostly linked to Scarpa's formal language. Just think of the use of "clauzetto" marble or the stuccoes of Eugenio De Luigi. Scarpa's language is made up of spatial relationships between the elements that make up the architecture. The use of light in museum installations is unique, as is the combination of materials with programmed aging to

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Fig. 1 View of the courtyard of Palazzo Abatellis with the closing of some windows with the fixing of a plywood panel

obtain particular colors. Scarpa was able to read ancient architecture and relate it to modern language, establishing a dialectical relationship with the pre-existing ones. In the maintenance or restoration interventions already carried out, the collaboration of a varied group of workers (often part of Scarpa's team) is highlighted, called to disassemble, recreate recipes, decipher often experimental techniques. This process unites almost all of the interventions already carried out in Italy. The "almost" refers to those few examples in which the master's work was not understood (Manzelle, 2002) and was labeled as the creation of "a certain Mr. Scarpa" and as such expendable in the name of change. In Sicily, opposite attitudes coexist and overlap. There are different readings of the same work, based on the fluctuations of taste over time. Carlo Scarpa's experience in Palermo is linked to two important executions: the museum organization of Palazzo Abatellis and the collaboration in the adaptation to the seat of the Rectorate of Palazzo Steri. The conservation of the works is an operation made necessary after just thirty years from its realization for various reasons. First of all, for the often-unscrupulous construction techniques often pushed to the extreme limits of strength and durability. Other times it was necessary to intervene to adapt the systems and safety equipment that characterize places open to the public such as museums. Finally, there was a general process of modernization and modification of the intended use of some environments, which involved adaptations and modifications not always in line with the aims of the project, consequently generating a real anthropic degradation.

Abatellis, a portolan master of the Kingdom of Sicily under King Ferdinand II. After the death of Abatellis, it was inherited by a congregation of Dominican nuns who transformed it into a monastery and resided there for four centuries. The eighteenth-century wing was built in this period. It became the seat of the Regional Gallery of Palermo, initially the National Gallery, on 23 June 1954. In 1943 the palace had suffered the terrible bombings that affected a large part of the historic center of Palermo. Structural consolidation interventions and a heavy stylistic restoration were carried out, in line with the cultural climate of the time. Since 1945, the superintendents Mario Guiotto, Armando Dillon, and Giuseppe Giaccone have followed one another in the direction of the restoration, aimed at recovering the aesthetic and formal values. From 1953 to 1954 Carlo Scarpa, on behalf of the superintendent of the Sicilian Galleries Giorgio Vigni, oversaw the museum layout of the building, creating a masterpiece of perfect figurative fusion, the exact calibration between container and content (Marcianò, 1984). In 1962 Scarpa was awarded the IN/ARCH prize for the conservation and enhancement of the national architectural heritage, arousing the ire of the Superintendency[1] for what is seen as an unjust attribution that did not take into account the alternating figures. Thanks to Scarpa, the restoration carried out by the Superintendency had turned into a box of wonders, a *wunderkammer* where the works are enhanced by the container and vice versa. Vigni affirms that at the Abatellis there was a complete adaptation of the premises to the exhibition needs. The gates needed to visit the rooms were opened and a certain empiricism of

1 Palazzo Abatellis

Abatellis palace is a splendid example of Gothic-Catalan architecture (Fig. 1). The building is characterized by a complicated construction event and by various changes of intended use. The palace was built in the fifteenth century by Matteo Carnilivari as the residence of Francesco

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[1] On 29 March 1963 the superintendent Giuseppe Giaccone wrote to Comm. Girolamo Ardizzone, director of the Giornale di Sicilia: "I would be grateful if you would like to inform the readers of your newspaper that the Prize for the restoration of Palazzo Abatellis in Palermo awarded to Prof. Scarpa will concern other merits but not that of "restoration"», Historical Archive of the Superintendence of Cultural and Environmental Heritage of Palermo, fasc. Mon. 297.

monumental restoration was remedied with various expedients, ensuring that the architecture could live in harmony with what would have been the atmosphere of the museum (Polano, 1996). The architecture itself was to be exhibited. Scarpa also takes care of the routes between the exhibition rooms and of the connections from the ground floor to the main floor. Pay particular attention to the location of the fifteenth-century fresco of the Triumph of Death, originally painted in the internal courtyard of Palazzo Scaflani, detached after the Second World War. By treating natural light as if it were a solid, Scarpa (Morello, 2018) prepares all the panels, the glossy and opaque backgrounds on which to highlight the works. In his notes he questions the lighting conditions of the various works, choosing diffused natural lights or from above (Polano , 1996). He takes care of every detail by designing the supports, openings, and curtains, wooden and glass fixtures. He studies the textural effects of flooring and vertical surfaces, varying the grain size of the plaster in the courtyard and the rooms on the main floor. Finally, he realizes the internal staircase that leads from the ground floor to the first floor, entirely cantilevered in Carini stone, with hexagonal section steps and completely without handrails. Scarpa's project at Palazzo Abatellis has the merit of making the architecture expressive just as the museum layout makes the works eloquent and intriguing. This result is achieved through real display machines studied by Scarpa and his workers in the smallest details. Exemplary is the one created for the collation of the marble bust of Eleonora d'Aragona by Francesco Laurana (Fig. 2).

The bust is brought back, via a pedestal, to the right visual height, but the support itself integrates and accompanies the work through the curved shape of the ebony. The materials are in a general good state of conservation, both the woods and the lead support, on which the bust rests, and the brass plate that connects to the structure, with negligible oxidation layers that can be remedied with simple cleaning operations. Different was the fate of the colored stucco

Fig. 3 New setting up of the room IV after the last intervention, 2022

panels that Scarpa inserts on the back and next to the bust to bring out the pale profile of the work with a clear chromatic contrast. Today completely destroyed by the last intervention del 2007 (Fig. 3). The solutions tested by Scarpa at Abatellis soon revealed an intrinsic fragility, especially as regards the plaster of the courtyard and the plaster finishes. Other adjustments were necessary to extend the museum's visiting hours. Initially, the attendance of the exhibition areas was exclusively during the day, such as to justify the lighting of the rooms mainly with sunlight. Subsequently, the opening extends to the afternoon and evening hours, involving many problems in relation to the diffused and punctual lighting of the works on display (Fig. 4). The uniqueness of Scarpa's language is based precisely on the relationships existing between the environments, the light variations at different times of the day and the museum itineraries. It immediately becomes clear that the problem of integrating light sources was not an easy solution. In 1984 the architect Vladimir Zoric[2] was entrusted with the drafting of the gallery's modernization project. This is not a simple maintenance operation but rather a real restoration project. In 1979 Zoric had already worked at the Regional Gallery, planning and directing the works for the museum insertion of the Gaginesque bases and capitals in the large room on the ground floor. From 1984 to 1988 he was responsible for the project and construction management of the restoration of the roofs, the waterproofing of the terraces, and the restoration of plasters and paintings, both internal and external, of the museum. From 1991 to 1993,

Fig. 2 Scarpa's setting up of the room IV after Zoric's intervention (Polano, 1996)

[2] Vladimir Zoric was born in Sibenik (Croatia) on August 13, 1934. From 1962 to 1970 he attended the Faculty of Architecture of the University of Palermo. Since 1970 he has collaborated assiduously with figures of the stature of Vittorio Gregotti, Roberto Calandra and Leonardo Benevolo. From 1985 to 1988 he was an adjunct professor at the Faculty of Architecture of Palermo, where he taught History of Technologies, Techniques and Building Systems in Architecture for Restoration. He worked diligently until 2005.

Fig. 4 Room VI, new lighting added with the last intervention, 2022
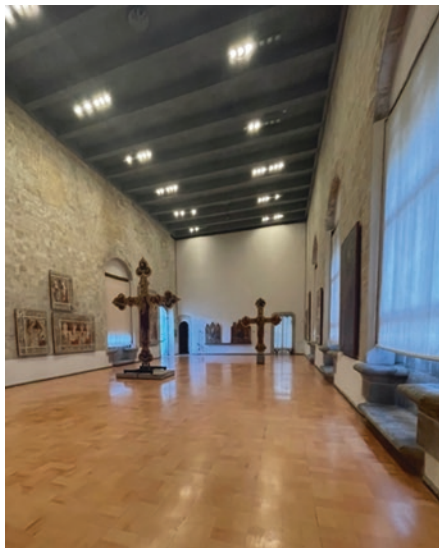
Fig. 5 Room IX, 2022, note the new lighting creates remarkable reflections on the floor, 2022

on behalf of the Gallery and with funds from the Sicilian Region, he designs and directs the static consolidation and general restoration works of the N–O Tower. Even if not expressly indicated in the assignment, in this phase he takes care of the lighting engineering adaptation of all the exhibition rooms. In fact, Scarpa, as already mentioned, had not set up artificial lighting in the Gallery (Fig. 5). The exhibition rooms differed both in the dimensions and finishes of the ceilings and in the chromatic and material treatments, so

much so that a different study was required for each environment. Obviously, Zoric, applying Scarpa's lesson excluded serial or generalized solutions (Fig. 6). It was evident how the inclusion of even slight changes risked compromising the relationship of the parts and the dialog of the elements. With extreme sensitivity, he solves the problem by opting for fluorescent neon tubes placed on the roof, in positions hidden from the view of museum users and capable of providing diffused lighting. This is the case, for example, in the dome-skylight of the ancient Chapel of the Palace, where the new lighting is hidden in the cornices of the roof. It should be noted that Scarpa himself had used a similar solution in Verona, in the Castelvecchio Museum, resorting to the use of fluorescent tubes between the wooden beams of the ceiling, and specifically designed aluminum ceiling lights (Manzelle, 2002). From the technical report attached to the report for the restoration work, it is immediately clear that the aim of the designer is that of a real mimetic restoration aimed at reconciling the reasons for the need for the new systems with the original aesthetics of the surfaces. Zoric himself affirms that the quality and fame of this work of high museography required that the new interventions follow the language of the master as much as possible (Zoric, 1985a, 1985b). This approach is a forerunner of what then happened for the restoration of the access bridge of the Querini Stampalia Foundation, dominated by the criterion of minimum impact. In Venice, while opting for the replacement of the deteriorated elements that had to guarantee the stability of the bridge, a mimetic intervention was carried out, as far as possible aesthetically invisible. The new surfaces were abraded with a metal brush to make the color similar to that of the existing steps, then they were darkened with a water-based dye to

Fig. 6 Room IX (Polano S. 1989)

"accompany" them with the black-gray tone of the bridge (Manzelle, 2002). Zoric was well acquainted with Scarpa's language, having designed with him some permanent installations of the museum. The phases of the restoration start from the study of the Gallery project and from the survey of Scarpa's often experimental techniques. For example, the use of different shades of color in the same environments, in order to regulate the perception of light, was deduced from the analysis of the finishing samples taken in the shadiest spaces and less subject to degradation. The plasters of the three facades of the courtyard were characterized by different shades, each time matched with the shades of the stone and with the intensity of the sunlight, to avoid the chromatic uniformity of the surfaces. Scarpa's technique consisted in darkening the hue in the presence of particularly bright environments, in order to dose the sunlight. The first cleaning tests reveal the presence of colored bands placed under the embossing surface of the wooden ceilings, made completely illegible by superficial deposits and found with simple cleaning operations. In the chapel Scarpa had created a rough finish altered by time on the walls, obtained by working the plaster with bristly rags. The possibility of a brush or spray painting is immediately discarded due to the uniformity that these treatments would have given to the surfaces. Zoric, discarding the hypothesis of a total reconstruction of the plaster, opts for the reintegration of the gaps with a mixture of quarry sand, colored earth, fixative, with the addition of glue, applied in imitation of the original technique, trying to reproduce the size and direction of the existing grooves. As for the paintings and stuccos, laboratory analyses reveal the use of artisan tempera, made up of colored earths and organic glues. The finding of the same workers employed in the original project for the realization of the paintings further clarifies the use of particular techniques, dictated on site by Scarpa himself, to obtain unique veins and textures. For example, the luster of Eugenio De Luigi's Venetian plaster is more the result of a manual execution technique than the use of oils or waxes. This technique is based on the subsequent application of several coats that give the surface a transparent and glossy effect. Zoric writes that the only variant introduced with respect to the original composition was the replacement of casein and isinglass, both in the preparation of the support and in the mixing of the tempera with the acrylic fixative. Material not in use at the beginning of the 1950s but which subsequently confers greater reliability in duration (Zoric, 1985a, 1985b). Durability soon contradicted by the test of time, so much so as to require continuous repainting. De Luigi was in fact called more than once by the Director Vincenzo Abbate to intervene on the exhibition panels of the Gallery. The interventions continued until 2007, with the intervention of the Regional Restoration Center of Palermo, which involved the painting of the interiors and a further enhancement of
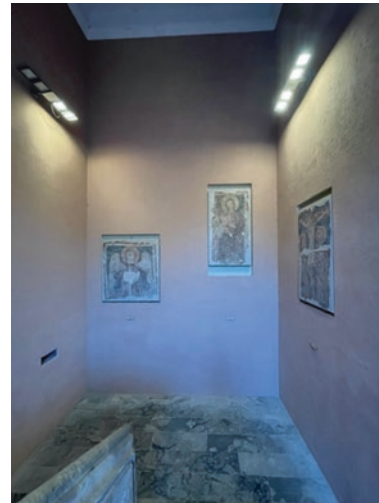
Fig. 7 Connecting staircase between the ground floor and the first floor. Detail of the new lighting, 2022

the lighting of the fifteenth-century wing, by the Castiglioni company. This construction site involved the total removal of the lighting commissioned by Vladimir Zoric and the installation of new lighting fixtures, as well as the expansion of the exhibition area with the unification of the so-called eighteenth-century wing of the building. The Regional Gallery of Sicily reopens in 2009, after the restoration and adaptation of one of the parts of the ancient cloistered convent. The ancient parlor of the Monastery of Portolano, already used as a deposit, was reintroduced into the museum itinerary with the exhibition of works by Vincenzo da Pavia. In the new part of the museum the works involved all the masonry works, the systems, including those for safety and air conditioning. A staircase and a lift have also been added to connect the various levels of the complex, allowing the use of the Museum also to the handicapped. The external plastered surfaces have been entirely redone without taking into account the color differences prescribed by Scarpa. The most disturbing element of the intervention both in the fifteenth century and in the new part is the alteration of the light. The new lamps project annoying beams of light on the floors, generating shadows and reflections that prevent the correct vision of the works (Fig. 7). It seems paradoxical that the same problem arises in the extension of the museum which should have had a good lighting system, specially designed for large-format works. If Scarpa's scenic machines are born from the dialog with the object to be exhibited, the same cannot be said for the new staging. Scarpa creates a dialog between time and history, in the new intervention only the reasons for the specifications and the "practical" choice of prefabricated elements can be read. Certainly, it was not easy to compare with the work of a master like Carlo Scarpa. But the lack of attention to detail, from the explanatory plaques of the

works to the steel benches positioned along the route, suggests more of a subway stop than of a museum of such importance. Some methodological choices, such as the removal of the stuccoes wanted by Scarpa and their replacement with acrylic paint on wooden panels, passed in absolute silence. The public visiting the museum today cannot discern between what remains of Scarpa's installation and what belongs to the new project. One can only rely on one's knowledge and sensitivity. Scarpa work constitutes a work among the works and as such it had to be protected and protected from tampering and arbitrary destruction. The occasion of the extension of the museum itinerary could build new dialogs from past and present. On the other hand, there remains a missed opportunity for a more active participation of the cultural world.

1.1 The Exhibition Itinerary

The collections of the Regional Gallery originate from the heritage collected in the National Museum especially during the direction of Antonio Salinas (1873–1913). Other collections were added later by purchase or donation: that of the French Bressac, acquired by the bourbon kingdom due to lack of heirs. the picture gallery of Carlo Cottone Prince of Castelnuovo (1828); the collection of the Marquis G.G.Haus, tutor of Ferdinand II of Bourbon; the remarkable group of paintings on wood and canvas datable between the sixteenth and eighteenth centuries, sent from Naples by the donation of Francesco I (1828) and Ferdinand II of Bourbon (1838). After the fall of the bourbons, a new increase in the collections of the National Museum followed with the curatorship of the Commission for Antiquities and Fine Arts of Sicily (1860). This is followed by the acquisition of the so-called "Salnitrian Museum", founded in 1730 in the Collegio Massimo of Palermo by the Jesuit Ignazio Salnitro, and the entire Museum of the Benedictine Abbey of S. Martino delle Scale, rich in a precious picture gallery, archaeological collections and numismatics (acquired under a special law of 21 June 1869). Following the suppression of the religious corporations in 1866, countless works of art were removed from the conventual churches of the city and the territory, and placed in the Pinacoteca thus formed, which could boast an important testimony of the history of local painting from the fifteenth to the eighteenth century. Not indifferent was the contribution of the private patron, culminating in the legacy of the Triptych of Mabuse by the Prince of Malvagna (1866) and in the legacy of the Duchess of Serradifalco (1888). Today, the increases in collections are guaranteed by the purchases of works of art financed by the Regional Department of Cultural Heritage. The portal on Alloro street gives access to the large atrium of the Abatellis palace and subsequently to the courtyard and portico, where
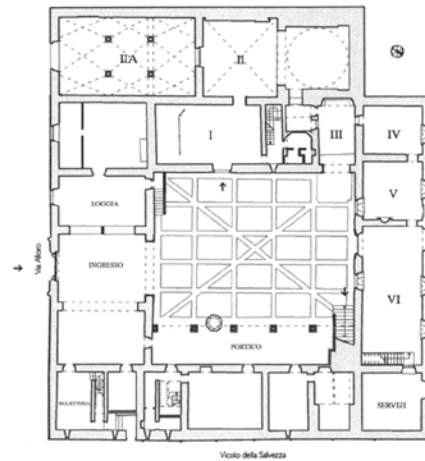
Fig. 8 Distribution of the ground floor

some sculptural fragments dating from the twentieth to the sixteenth century are placed. Going up a small stone staircase, located in the courtyard to the left of the path, you enter the loggia floor, where columns, steles, and marble fragments are exposed. The rooms on the ground floor (room I) host works that are heterogeneous in character and style (Fig. 8). The continuity is given by the sculptures that well document the path of this art in Sicily from the twelfth to the sixteenth century. Room II is the presbytery space with the last span of the ancient church of the Dominican convent. On the walls there are some sculptures between the first half of the fourteenth century and the end of the following century. Scarpa collects here the extraordinary fresco of the Triumph of Death (mid-fifteenth century), already in the atrium of Palazzo Sclafani in Palermo (Fig. 9). In rooms III, IV e V begins the exhibition of some cornerstones of sculpture in Sicily between the fifteenth and sixteenth centuries. Here is the famous installation by Scarpa for the beautiful profile of the bust of a noblewoman, a masterpiece by Francesco Laurana, identified with the portrait of Eleonora d 'Aragona wife of Guglielmo Peralta, lord of Sciacca, who died in 1405. And the famous head in polychrome marble sculpted at the end of the fifteenth century by Antonello Gagini, known as Portrait of a young man (formerly as Saint Vitus). In the last room on the ground floor (rooms V-VI), other sculptures from the Gagini school and some painted panels of the destroyed ceiling of the Church of S. Agostino in Trapani are exhibited, with the typical medieval "dròleries" decoration, and a fragment of the ceiling of the great hall of Palazzo Chiaramonte in Palermo. While the Gaginian capitals on display come from the Annunziata church in Palermo, which was destroyed in 1943. On the main floor (rooms VII-XVIII) there is the art gallery with works from the Sicilian sixteenth century, most of which come from the churches and convents of Palermo (Fig. 11). In the

Fig. 9 Room XI, detail of the view on the fresco "Trionfo della Morte", 2022. Note the presence of the new lights, compared to the intervention of Zoric (Polano, 1989)

large hall (rooms IX), noteworthy is Scarpa's extraordinary museography set-up, for two Crosses, painted on both sides, and for this reason placed in the center of the room. On the wall in front of the entrance stands the so-called Corleone Polyptych, formerly in the Monastery of the Holy Savior of that city, majestic in the rich wooden decoction typical of the flowery Gothic. In room X there is one of the most extraordinary pictorial works in the world: the small panel depicting the Annunziata by Antonello da Messina, datable to around 1474 and donated to the Museum in 1906 (Fig. 10).

In Scarpa's masterful museography conception, the ambient light is diffused and filtered through an invisible window that withstands the optimal conditions of use to the work, without the artificial shadows caused by punctual lighting that unfortunately we can find in the whole new setting that it tends to illuminate the rooms more than the works. The fulcrum of the new image of the Regional Gallery of Sicily revolves around the "Annunziata",

Fig. 11 Distribution of the main floor

constituting its logo and acting as a symbol of the entire structure. In room XI Scarpa realizes his masterpiece giving visitors an admirable view from above of the Triumph of Death, which is accompanied by the vision of some works by Riccardo Quartararo: the Coronation of the Virgin and Saints Peter and Paul, which document the orientations of painting in Palermo between the end of the fifteenth and the beginning of the sixteenth century. The path of the picture gallery (rooms XII-XV) hosts a series of Flemish paintings, dating from the fifteenth to the sixteenth century, which tell of the spread of this painting thanks to the commercial exchanges of the time. The pearl of the collection is the Malvagna Triptych, the work of Jean Gossaert known as Mabuse, datable after 1511. This is followed by works of Tuscan-Roman Mannerist ancestry. Here ends the museum exhibition curated by Carlo Scarpa. In room XVI we find two paintings by Giorgio Vasari, one by Girolamo Muziano, one by Marco Pino. While the room XVII acts as a junction and connection to the new part of the gallery. The presence of a late Baroque wooden ceiling, painted with stories of biblical heroines, is badly accompanied by the choice of lighting bodies that make observation difficult

Fig. 10 Room X, Annunziata by Antonello da Messina, 2022

due to the direction of the light beams pointing downwards. Unfortunately, the lighting design choices made in the last refurbishment of the Museum do not follow Scarpa's lesson, writing a bad page of museography design. Zoric had tried to solve the complex issue of plant engineering and lighting engineering adaptation, drawing inspiration from the choices made by Scarpa himself in Castelvecchio and mainly using the criterion of diffused light that is added to daylight. The new prefabricated lighting bodies project light beams on the floor and on the paintings, disturbing the vision of the paintings.

The new spaces of the museum are accessible from the last room of the fourteenth-century building, maintaining the continuity of the visit itinerary (Fig. 12). The new rooms can also be reached independently by reaching the second courtyard, via a staircase and an elevator. The Regional Art Gallery has thus doubled the original exhibition space and was able to present the collections in chronological order. These changes have significantly increased the number of visitors. The strength of the project was the unification of the fifteenth and eighteenth-century sections, once separate. Now all the exhibits in the museum are connected. This connection allows to overcome architectural barriers thanks to the new steel and glass elevator. The new two-storey exhibition spaces present a collection of seventeenth-century Sicilian paintings. The green room illustrates the works of late Mannerism with a Counter-Reformation imprint. The red room houses the Caravaggesque-inspired section. Remarkable are the works of Pietro Novelli, large altarpieces, and paintings of mythological subjects.

Following, the developments of figurative culture during the seventeenth century. The most markedly Baroque line of the exhibition closes the itinerary, through the paintings of Luca Giordano and Mattia Preti. Palazzo Abatellis survived the transformation into a monastery, the bombings of the Second World War, and its transformation into an art museum. Scarpa had managed to add beauty to a place already of great value, establishing a dialog with the past. The very high value of Scarpa's project lies precisely in having been able to intervene with skill while using modern materials. Some choices, such as that of having used glossy stucco instead of a simple acrylic paint, are the result of a long reasoning aimed at regaining the thread with tradition. In the restorations carried out from 2007 to today, this sensitivity and attention to detail is lacking (Fig. 13). If Scarpa's project had sought a different path to the simple superimposition of visual languages, through the attention to every detail of the set-up designed piece by piece and through the care of light, the new intervention does not stand up to comparison. Vladimir Zoric's intervention had sought a compromise between the needs of the lighting engineering adaptation and the pre-existence, resulting in almost invisible. The maintenance of the surfaces, from

Fig. 12 Distribution of the new section of the museum, 2008
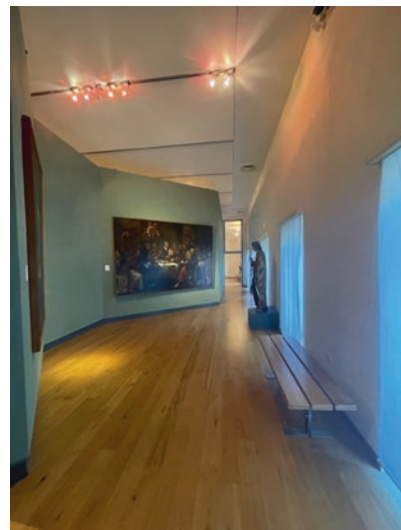
Fig. 13 Green room and red room, detail of the lighting, 2022
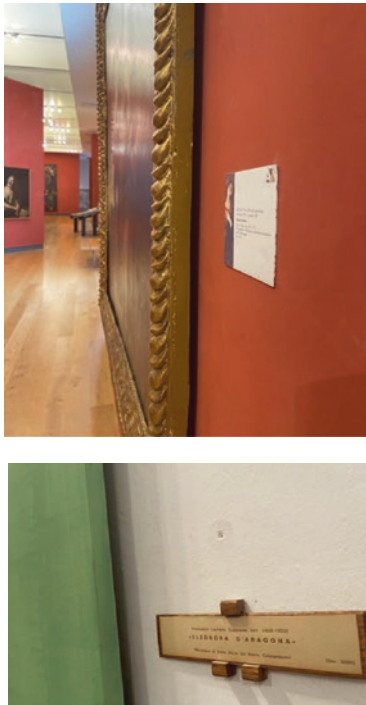
Fig. 14 Particles of the plaques of the paintings in Scarpa's intervention and in 2008

the stuccos to the plasters to the coloring, is carried out respecting the indications of Scarpa (Zoric, 1985a, 1985b), in absolute continuity with the principles of the 1954 museum arrangement. In conclusion, we can say that all the stage machines that have not been overhauled have withstood the test of time well. Not requiring any restoration, the iron and wooden pedestals, doors, and window frames have been preserved intact. Scarpa's language remains the choice of never letting the different surfaces touch each other, detaching the new materials from the walls of the building. Of the colored stucco panels slightly protruding from the walls, only the wooden support remains, which for convenience or for difficulty of restoration has simply been repainted keeping the original colors. The series of maintenance and new interventions that have followed one another until today have lost their artisanal character to increasingly take the commercial and industrial route, with the inclusion of banal and unoriginal objects, from lights to benches, from handles to plates of paintings (Fig. 14). If the restoration of the Scarpa exhibition has caused destruction and misunderstanding, the fate of the new rooms in the eighteenth-century part of the picture gallery does not seem better. The incomprehensible choice of the type of lights and their positioning only benefited the installation company. Some large-format works are exhibited in narrow corridors that prevent their correct view. An overall vision is lacking,

inspired by a higher level of dialog with the old and the exaltation of the beauty of the new. It is not modernity itself that clashes in the comparison but the cheap use that has been made of it.

2 Scarpa's Contribution to Palazzo Steri

The residence of the Chiaramonte, built at the beginning of the century. XIV, constitutes a program so stratified and controversial, as to represent a real test bed for the modern conception of restoration, today as in Scarpa's time. The history of the building is marked by a series of changes in intended use. The Steri was transformed from a noble palace into a royal and viceregal residence, seat of the offices of the Magna Curia, for two centuries the Sacred Office and its prisons, and finally the seat of the Judicial Offices until 1957. Numerous restoration interventions, not exactly conservative, have made selections and implemented value judgments, with demolitions and reconstructions in style. From 1970 the building underwent the adaptation to seat of the Rectorate of the University of Palermo, made by the Superintendency of Monuments until 1972, and then from 1972 to 1986 by the architect Roberto Calandra, with the advice of Carlo Scarpa, who died prematurely in 1978, leaving however a vast number of sketches, drawings and design indications. The first restorations were carried out in the early 1900s for 30 years by the Superintendents Patricolo and Valenti. In 1967 the Rector Michele Gerbasi received the Steri from the Ministry of Finance, and organized the adaptation work to the Rectorate headquarters (Lima, 2006). Much has been written about Steri (Lima, 2006), the contribution focuses on Scarpa's contribution and its conservation. The Superintendence of Palermo had carried out numerous demolitions, such as that of the cells of the Holy Office. It also replaced the wooden floors with reinforced concrete floors and rebuilt the roofs, in compliance with anti-seismic regulations. New volumes were reconstructed with the criterion of mimetic imitation (Vicari, 1988). The general conservation work of surfaces and stratifications is due to the sensitivity and theoretical-critical preparation of Roberto Calandra (Campo, 2006), holder of the Chair of Restoration of the Faculty of Architecture, with the obvious exception of those lost forever, following the previous demolitions. Carlo Scarpa, Camillo Filangeri (architecture historian), and Nino Vicari (technologist) are part of the Calandra team, called to draw up the project for the interior arrangement and furnishing of the Steri as Rectorate (Fig. 15). Thanks to the discussions with prof. Vicari, construction manager together with Calandra allo Steri, it was possible to clarify the doubts
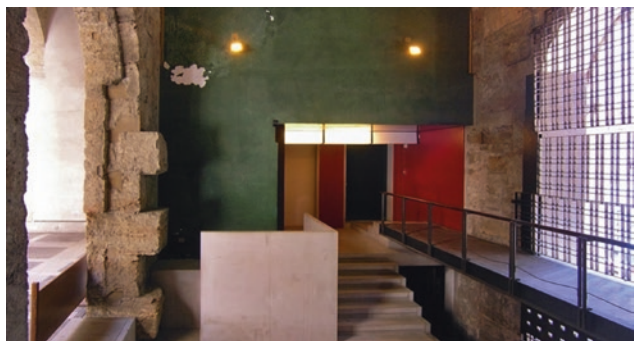
Fig. 15 Entrance from piazza Marina

Fig. 16 Lighting of the Hall of the Barons

about Scarpa's actual participation in the design choices. Scarpa's lesson at Steri unfolds through agreements and contrasts. His language is articulated between ogival windows, slender columns, walls, and stairs in exposed concrete, modern materials used in an ancient way, and vice versa. Ancient techniques give new shape to modern materials, mentioning the wooden floors, pre-existing and demolished, in the play of the levels of the mezzanine floors. The basis of the intervention was the balance of needs related to the dual use, that of public and cultural use of the building, intended for exhibitions and conferences, and the strictly administrative one linked to the destination of the Rectorate. Scarpa identifies alternative routes that simultaneously guarantee the usability of the rooms and offices and the reading of history. Particular attention is paid to the design of the paving of the central courtyard in concrete and stone, the gates and grates in seamless iron, as well as the Venetian marble inserts around the doors. Characteristic of Scarpa's language is the use of glossy and opaque colored stuccos, which in Palazzo Steri we find in the various rooms of the building, also here implemented by Eugenio De Luigi. The analysis of Scarpa's work lies in the investigation and research of compositional rules, tracing the subtle balances that govern the relationship between the parts and the juxtaposition of materials. Only by understanding the project can we know the rules that must guide the conservation plan of Scarpa's works. The materials and surfaces are made, here in Palermo as in the rest of Italy, to slowly adapt to the passage of time. This serene aging is clearly visible on the surfaces of the Steri. The patina of time caresses the rough concrete surfaces, they play an active role, planned by the Author, without falling into decay. The aging of the characteristic elements of the Scarpiano language is not worrying. The iroko wood frames are perfectly functional as well as the iron closing elements, from the grates of the seamless Scottish mesh gates on the ground floor to the panels of the entrance hall on Piazza Marina. The major damage suffered by the building is mainly attributable to

the superficiality of its maintenance. Without a just law of protection of the modern we are getting used to the systematic destruction of the twentieth century. Among the most serious transformations carried out on Scarpa's project, for example, the closure of the tunnel that connected the ground floor of the Steri with the adjacent Palazzo Abatellis, (not to be confused with the Regional Gallery in via Alloro) and its transformation in storage. This resulted in the loss of functionality of the entrance hall on Piazza Marina, which from the nerve center of the project has become an environment excluded from visits and use. This transformation was justified by the lack of railings and parapets, due to the alleged difficulty of regulatory compliance. Up to now, the University's technical office has directed the modernization work of the Rectorate offices, carrying out many other transformations. In the Sala dei Baroni the addition of lighting (Fig. 16) was obtained with a heavy work of channeling and consequent loss of the original finishes. Similarly, the council room was equipped with a lighting system on steel wires that limits the view of the wooden ceiling. The lighting of the weapons room is more successful, created with the addition of modern elements which, following Scarpa's lesson, don't touch the vertical surfaces but overlap the walls, giving a diffused light (Fig. 17). Many rooms have been divided by dividing elements that have caused the deterioration of the original finishes, due to the hooks on the stucco walls. The original furnishings have been removed or relocated in a completely arbitrary way. Think of the three Doge tables (1969) in steel and glass, originally planned for the Rector's rooms, now scattered around the offices as needed, or even in storage. In the Magna room the Frau leather armchairs that gave the room a particular solemnity has been removed and replaced with removable seats in fabric and metal structure, for reasons related to the maintenance of the ceiling. Even the stuccoes by Eugenio De Luigi that adorned the Rector's waiting

Fig. 17 Weapon room lighting, detail of the lights made by Adragna Illuminazione

room have been replaced during the recent restoration and modernization works with industrial stuccos, due to their deterioration caused by changes in use. The room, from a place of representation, has become an office, with new furniture set against the walls. Outside, the sixteenth-century staircase, designed by Calandra (Ianello 2009), originally equipped with a light iron handrail that followed the purity of the lines, has been modified with the addition of glass parapets, with the multiplication of supports and anchors, and by the affixing of painted wooden boards on the steps of the sixteenth-century part. The elevations of the building which, despite the numerous restorations that have taken place over time, still retained the signs of history, (the affixing of the clock, the aedicule of the Holy Office) have been completely canceled by a general work of integration and replacement of the elements deteriorated.

3 Conclusions

The analysis of the cases addressed shows many points to reflect on. There is a close relationship between conservation, restoration, and maintenance. Years later we are witnessing the need for "restoration of restoration". The need for constant and continuous intervention is often not only linked to the degradation of the materials used but to incorrect use and incorrect maintenance. It can be said that both at Steri and Abatellis it is the so-called anthropic degradation that causes the greatest damage and causes heavy

transformations in the work of Carlo Scarpa. The reasons for its use in the restoration project must always be balanced with the needs of the building, which is not a mere container. The dichotomy between the need to preserve the physical consistency of the constituent matter and restore the original function of an element or environment is well known. This is all the more valid for the restoration of the contemporary. To this contrast is added in Scarpa the possibility of allowing, despite the necessary restoration, the permanence of that very fragile system of relationships that make his architectural poetics a visual experience. Losing this precious legacy entails a non-compensable cultural loss. The almost total lack of maintenance in the last twenty years has made the results of the absence of actions resulting from a culpable cultural and design void clearly visible. The urgent obligation is to provide for the resolution of this specific maintenance problem, within a broader program of cognoscitive in-depth studies that can form the basis of a subsequent restoration intervention or, more correctly, of a complete and responsible project for all the maintenance interventions. As for the many wrong choices that debase the comparison with Scarpa's work, a general rethinking in the design of light inside a museum would be appropriate, regardless of Scarpa's poetics (Miotto, 2004). The new area of the museum represents a missed opportunity for an addition of good contemporary architecture in such precious contexts. An action of direct protection cannot be aimed exclusively at preserving the value of memory, but must also address the definition of a quality project. In the case of the contemporary this sees the collaboration of interdisciplinary figures, considering the programmatic values that this can assume for the restoration of contemporary architecture. The need for a contemporary archive allows for example to analyze a large number of materials that are not similar to ancient ones and, above all, to verify the main characteristics (duration, effectiveness, compatibility, etc.) of the possible treatments envisaged to guarantee their conservation, selected among those available on the market.

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Seismic Reinforcement of Brickwork Shear Walls Using Titanium Rods

Fitsum Haile, Marco Corradi and Jill Adkins

Abstract

Titanium alloys (TA) exhibit high mechanical properties, great durability, and high deformation capacity. These characteristics make TAs of interest also in Conservation Engineering. This paper presents the results of an experimental campaign on the use of titanium threaded bars for reinforcement of masonry shear walls. TA rods have been used to reinforce 8 full-scale brickwork walls (dimensions $1230 \times 1230 \times 215$ mm) against in-plane loading. The investigated retrofitting method consisted in the application of TA rods fully embedded into the horizontal mortar bed joints, known as Bed Joint Reinforcement (BJR). Different layouts have been considered and tested, with TA rods installed on a single side of the walls (single-sided reinforcement) or on both sides (double-sided reinforcement). The structural performance of the brickwork walls under lateral loading is also discussed showing the wall response after TA reinforcement in terms of energy dissipation, shear stiffness, deformation capacity, and in-plane shear strength provided by the various types of BJR. This study has a significance because it uses a new material, TA, in Conservation Engineering along with a new method of BJR.

1 Introduction

TAs are rarely used in civil engineering, and their applications are limited to medical and dental implants or aerospace engineering. TAs have excellent specific strength, high yield strength (1000–2000 MPa), and low weight density (4000 kg/m^3), which makes them an ideal solution in earthquake engineering, where flexibility and lightness are important characteristics. In addition, titanium can withstand harsh environmental conditions, including saltwater and road salt, without exhibiting the common problems of traditional metals like carbon steel (Titanium Expo, 2018), (ASTM B348). The TA structural sections available on the market (Fig. 1) are actually limited to simple shapes (circular, tubes, square, and rectangular), but treaded rods are making their appearance.

Titanium is available in commercially pure grades and titanium alloy grades. TAs can be divided into three main categories: α alloys, α+β alloys, and β alloys. These categories depend on the material microstructure. Alloying elements can generally be classified as α or β, changing the microstructure and mechanical properties. The most common titanium grade is Ti-6Al-4 V (α+β alloy, grade 5), which is used in civil and other engineering applications. By comparing the Ti-6Al-4 V mechanical characteristics with structural carbon steel S275JR widely used in construction, it can be noted that TA may exhibit higher elastic deformation (Young's modulus, typically 50% smaller compared to S275JR) and yield strength (+200/300%, compared to steel). The weight density of steel (7850 kg/m^3) is much

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Fig. 1 **a**, **b**, **c** Examples of different titanium profiles on the market

higher compared to TA (4500 kg/m^3), with a TA-specific strength about 4/6 times higher than S275JR.

Old masonry constructions often need repair or reinforcement, especially in areas under seismic and flooding hazards. Shear reinforcement of masonry walls is very frequently necessary, and several solutions have been proposed by many researchers. A well-known traditional method to reinforce masonry walls is to apply a Reinforced Concrete (RC) coating on the wall sides (Binda et al., 1997) (Manzouri et al., 1996).

In the late 1990s, the use of composite materials (FRP, Fiber Reinforced Polymers) was proposed as a viable retrofitting method for heritage masonry structures. A large amount of research has been made to assess the structural response of masonry structures reinforced with epoxy-bonded FRPs. Santa-Maria and Alcaino (2011) tested full-scale brickwork walls, at first tested in shear, after having repaired according to two layouts of carbon FRP sheets, and subsequently re-tested in shear to study the effect of composite reinforcement. It was found that repaired panels exhibited a similar structural response in terms of lateral load capacity and shear strains as undamaged strengthened walls. Valluzzi et al. (2002) tested 9 unreinforced and 24 reinforced wall specimens in shear. Several FRP layouts were used for reinforcement, and test results demonstrated that the single-side FRP reinforcement did not considerably reduce the strengthening effect and the walls` structural behavior. ElGawady et al. (2006) proposed a method to reinforce concrete walls using FRP strips and sheets, and a significant increase in lateral load capacity was recorded in this experiment. Borri et al. (2011) studied the shear behavior of stone and brick masonry panels subjected to shear loading before and after reinforcement using traditional (injections, RC coatings) and innovative solutions (FRP, steel fibers). In Marcari et al. (2007), tufa masonry panels were tested, and experimental data provided information on the in-plane behavior of unreinforced and FRP-reinforced walls. Experimental results pointed out that the FRP reinforcement did not significantly affect the walls` lateral stiffness, while significant lateral strength gains were achieved.

While it has been demonstrated that FRPs can increase the seismic capacity of masonry shear walls, recent research has also highlighted the poor durability of these retrofits. Phenomena of mechanical degradation, debonding from masonry, cracking, and deterioration were observed on FRP-reinforced masonry only a few years after application (Karbhari, 2003) (Heshmati et al., 2015).

The use of an isotropic material, like a metal, can solve these problems. TAs not only are isotropic, but also extremely durable. The shear strength of these metals is surely higher than any other composite material, and this can simplify the design. In addition, in conservation engineering, it is often required to use "reversible" retrofits. Reversibility is a common condition required by conservation bodies: reinforcement should be removable without damaging the old masonry material in case new solutions and knowledge are acquired (ICOMOS, 2003): TAs and metals in general are typically coupled with mortars (instead of epoxies used for FRP applications) providing a superior degree of reversibility of these retrofits (Corradi and Atkins, 2022). Applications of TA have recently been made in several heritage buildings and monuments (Fiove Fantozzi & Angeletti, 2005) (Ioannidou, 2007) (Hadingham, 2008) (Trevi Company) (Resin Proget Company).

BJR is a relatively new method to reinforce masonry walls: it consists in removing the old (often degraded) mortar from the wall`s bed joints, renewing the outer portion of the mortar joint that connects the bricks with new mortar, and "reinforcing" it with a metal or composite rod.

2   Material and Methods

Material-level tests were at first carried out to characterize the properties of bricks, mortar, and TA reinforcements used in this experimental investigation.

2.1   Masonry Material

Very common in historical constructions, a lime mortar was used for wall construction and BJR. The mix design of the mortar was the following: sand-to-lime volume ratio of 6:1,

resulting in an M4 (according to specifications in EN1996-1–1) natural mortar. To characterize the mortar, bending and compression tests were carried out. Mortar prisms with dimensions $160 \times 40 \times 40$ mm were first tested in flexure and after in compression on the resulting halves. Weight density of the cured lime mortar was 1.51 g/m^3.

For the bending tests, an average strength of 1.544 MPa was measured with a Coefficient of Variation (CoV) of 19.3%. Compressive strength was 3.414 MPa (CoV = 23.2%). These mechanical characteristics are similar to the ones of a historic lime mortar.

The brickwork walls were assembled at the laboratory using solid bricks (nominal dimensions of the bricks $215 \times 102 \times 65$ mm). ASTM C67 (2007) standard was used as a reference for bricks compression tests. In total, eight bricks have been tested in compression at the Structures Laboratory at Northumbria University. Average compressive brick strength was 28.44 MPa (CoV 14.9%).

The thickness of the mortar bed (horizontal) joints was 10 mm thick as per construction practice in the UK with the support of an experienced local mason. English bond with alternate headers and stretchers was used for the construction of the wall panels (Figs. 2 and 3).

2.2 Titanium Rods

TA threaded rods have been embedded in the walls` bed joints as reinforcement. TA rods have a diameter of 6.35 mm, length of 1150 mm, and have been provided by Perryman Company (Fig. 4a). The bar was also turned down in diameter from 6.35 mm to 5 mm in order to remove the ribbing from the exterior of the bar, the ribbing was left as is for the ends of the bar where the clamps connect to the sample in the testing machine. Six rods have been tested in tension: tensile strength resulted in 1012.6 MPa, yielding strength 923 MPa and Young's modulus (0.2% offset) 111.7 GPa. The linear weight density of the titanium rod was 144.35 g/m. Figure 4b shows the titanium rods used for the reinforcement, while Fig. 4c details the rod ready for tensile testing.

3 Wall Reinforcement

The basic idea is to use titanium threaded rods embedded in the bed joints on one or two-panel sides as a method to increase the masonry shear strength. TA rods can be installed

Fig. 2 **a** Brick dimensions, all used bricks were solid **b** and **c** Wall on construction

(a)　　　　(b)　　　　(c)
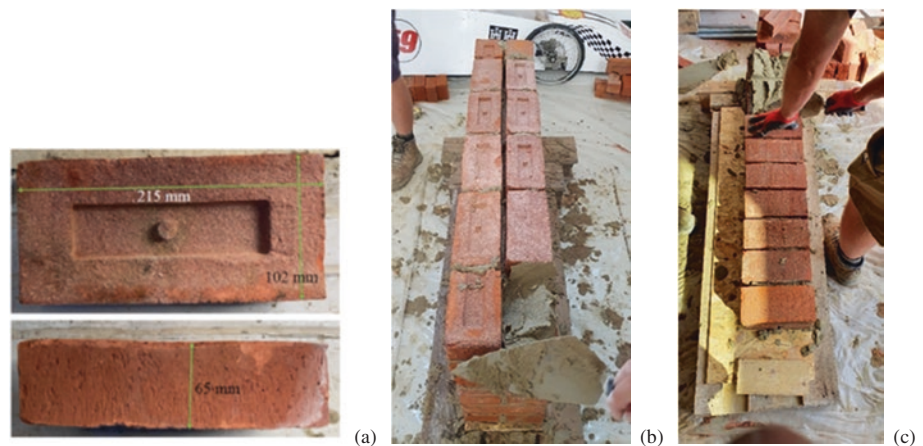
Fig. 3 **a** Walls on construction, **b** wall after construction (English bonding pattern wall)

(a)　　　　(b)
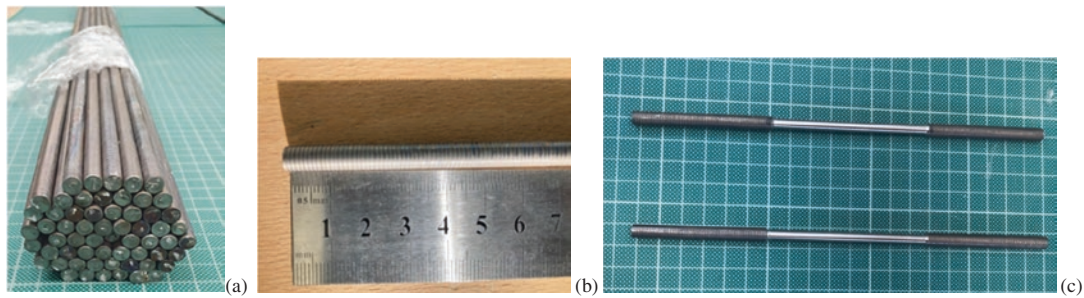
Fig. 4 Used titanium rods: **a** The titanium threaded, **b** Detail of the titanium threaded rod, **c** After removal of ribbing
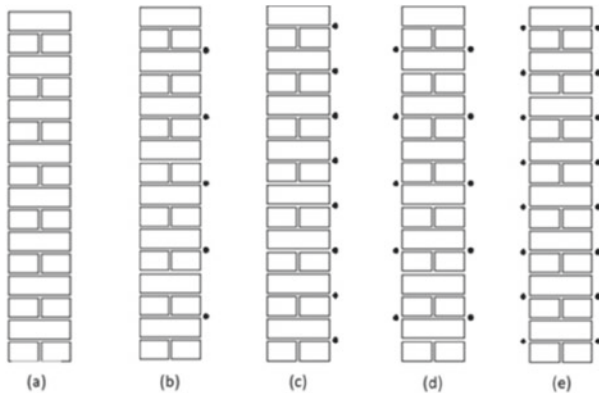
Fig. 5 Types of walls: **a** Unreinforced, **b** Single-sided (5 rods), **c** Single-sided (8 rods), **d** Double-sided (10 rods), **e** Double-sided (16 rods)

and, if needed, removed, with a high degree of reversibility; titanium ensures exceptional durability for outdoor and unprotected uses. The use of a lime mortar to apply the rods provides material compatibility between old masonry and retrofits. TA rods are "invisible" and this permits preservation of the masonry fair-face aspect. Figure 5 shows the different reinforcement schemes used in this experiment.

Figure 6 shows the application procedures of the proposed reinforcement method. In general, this reinforcement technique also confines the masonry material, positively impacting the wall's compressive resistance, but, more importantly, this method provides tensile strength to the masonry making it able to better resist shear forces and

lateral loading. Using the proposed method, the original masonry is still visible and intact, and its transpiration capacity is also not affected, reducing the risk of masonry degradation due to weathering. Figure 7 shows a detail of bed joint reinforcement: existing mortar was mechanically removed from the bed joint up to a deep of approx. 15–25 mm, this was accurately cleaned by air-compressed, and a new 5 mm-thick layer of lime mortar was subsequently applied before rod installation. Finally, a second layer of lime mortar was used to fill the gap between the TA rod and the bed joint. Two-rod quantities have been adopted for reinforcement: a higher density (every other bed joint was reinforced) and a low density (one bed joint reinforced every three). To take into account that in many existing buildings the indoor wall surface is not often accessible, the retrofit was applied only on one wall side (single-sided reinforcement) or on both sides (double-sided reinforcement).

4   Test Method

The diagonal compression load was applied in loading and unloading cycles, by increasing each cycle by 10 kN (1 ton) with a load gradient of approximately 0.5 kN/s. The load was applied using a hand pump, connected to a 50 ton hydraulic cylinder installed into a steel frame (Fig. 8). For each cycle, the maximum load level was maintained for approximately 30 s and then completely removed. Then, the wall was left unloaded for another 30 s before applying the next load cycle.

Fig. 6 Detail of the reinforcement method: **a** Method used to remove the mortar before rod application, **b** TA threaded rod reinforcement
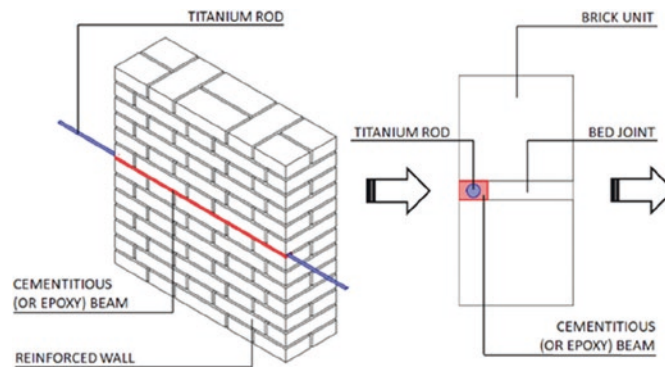
Fig. 7 Layout of the reinforcement method
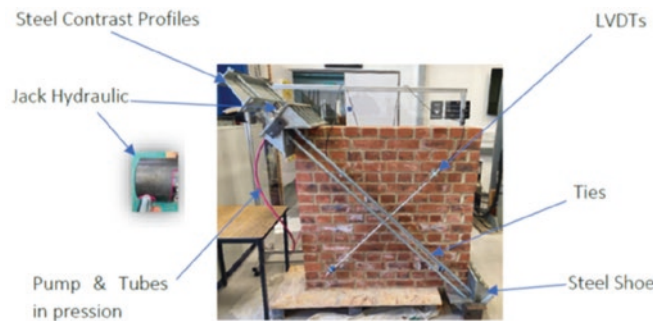
Fig. 8 Test layout

The geometric properties of the eight walls are reported in Table 1. The shear stress τ and strength S_S were calculated using the following:

$$\tau = \frac{0.707 \times P}{b \times t} \tag{1}$$

$$S_S = \frac{0.707 \times P_{max}}{b \times t} \tag{2}$$

where P is the shear load, b and t the wall width and thickness, respectively. The angular (shear) strain γ is given by

$$\gamma = |\varepsilon_t| + \varepsilon_c \tag{3}$$

where ε_t and ε_t are the axial strains along the stretched and compressed wall diagonals, measured using contact instrumentation (LVDTs, Linear Variable Differential Transformers).

In addition, the stiffness characteristics of each wall panel have been calculated using two methods (Fig. 9): $G_{1/3}$ is the slope of the secant line passing through the origin of the shear stress versus shear strain plot and 1/3 of maximum shear stress (shear strength). The second stiffness value, G_u, is given by the slope of the secant line at maximum shear stress. Shear failure causes a rapid loss of lateral stiffness (shear modulus G), which can be noticed by comparing the results of $G_{1/3}$ and G_u.

Table 1 Test matrix

Test	Wall height/width (mm)	TA rod diameter (mm)	Wall thickness (mm)	No. of titanium rods used	Single/ Double sided reinforcement
I-02–00-U I-06–00-U	1230/1230	–	215	0	Unreinforced
I-04–08-S I-05–08-S	1230/1230	6.35	215	8 8	Single
I-08–05-S I-01–05-S	1230/1230	6.35	215	5 5	Single
I-03–10-D	1230/1230	6.35	215	10	Double
I-07–16-D	1230/1230	6.35	215	16	Double
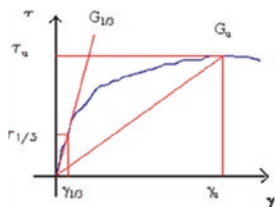
Fig. 9 Method of calculation of lateral stiffness $G_{1/3}$ and G_u

Each test is identified using an alpha-numeric index: the letter designation I was used to identify the type of test (I = in-plane shear test), the second number characterizes the wall panel (from 1 to 8), the third number provides the total number of TA rods used for reinforcement (ranging from 0 (Unreinforced) to 16), and finally the last letter designates the type of reinforcement (U = unreinforced, S = single-sided, D = double-sided).

5 Test Results

5.1 Unreinforced Walls

Two wall panels (I-02–00-U and I-06–00-U) were tested without any reinforcement (control specimens) as a method to assess the effectiveness of the reinforcement by comparison with reinforced walls. All test results are summarized in Table 2. Figure 10 shows a typical load history of a shear test: unreinforced panel I-02–00-U failed in shear after 18 loading and unloading cycles. Figure 11 shows the shear stress versus shear strain plot for this panel: the wall exhibited a lateral capacity of 111.5 kN, corresponding to the shear strength S_S of 0.2983 MPa. The other unreinforced wall I-06–00-U failed for a diagonal load of 121 kN corresponding to the shear strength S_S of 0.3234 MPa (Fig. 12). Scattering of shear results was relatively low and

Table 2 Test results

Wall	Shear Stiffness G_u (MPa)	Shear Stiffness $G_{1/3}$ (MPa)	Max Compression train ε_c (10^{-3})	Max Tensile strain ε_t (10^{-3})	Maximum Diagonal Load P_{max} (kN)	Shear Strength S_s (MPa)	$S_{s, reinforced}/S_{s, URM}$ (-)
I-01–05-S	384.0	838	1.201	−1.687	136.0	0.3636	1.17
I-02–00-U	472.8	1183	0.364	−25.676	111.6	0.2983	–
I-03–10-D	457.6	1174	0.002	−0.059	163.8	0.4379	1.41
I-04–08-S	410.4	670	2.898	−2.664	138.3	0.3698	1.19
I-05–08-S	377.6	996	1.716	−1.847	125.8	0.3365	1.08
I-06–00-U	794.7	963	5.015	−7.893	121.0	0.3234	–
I-07–16-D	382.8	683	–	−0.017	149.9	0.4008	1.29
I-08–05-S	207.4	767	1.716	−1.847	139.9	0.3739	1.20

Fig. 10 Load history (I -02–00-U)
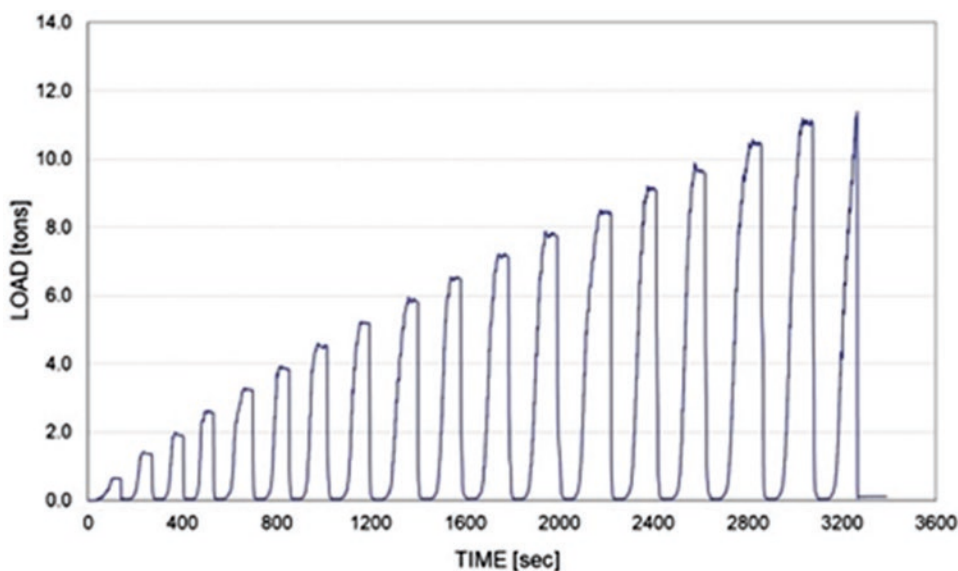
Fig. 11 Shear Stress versus
Shear strain (I-02–00-U)
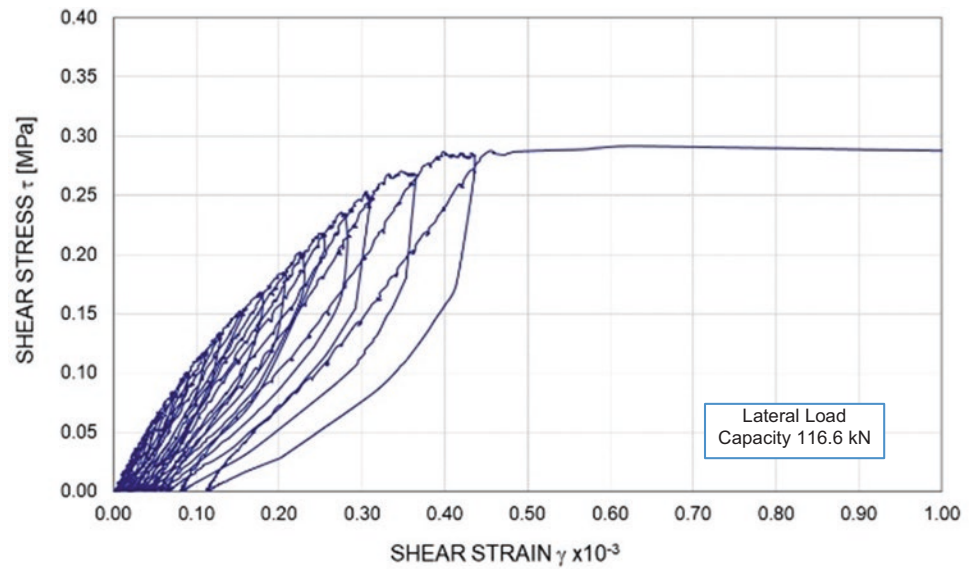
Fig. 12 Shear Stress versus
Shear Strain I-06–00-U
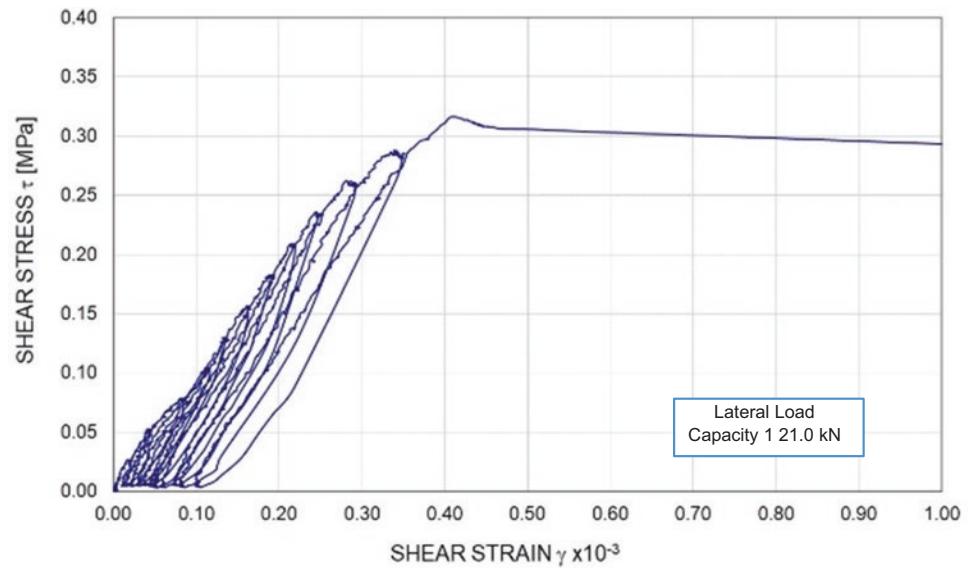
the average shear strength of unreinforced masonry S_S was 0.3180 MPa.

With regard to the mode of failure, a diagonal crack, along the compressed diagonal, passing through the wall thickness, developed at the mortar joints (Fig. 13) following a zig-zag pattern. This crack developed suddenly near maximum diagonal load and produced an abrupt loss of stiffness. In general, failure did not cause cracking/crushing of the solid bricks, with only the mortar typically cracking and debonding from the bricks.

For the shear stiffness, test I-02–00-U exhibited stiffness of 1183 and 472.8 MPa calculated at 1/3 maximum

Fig. 13 Failure mode of an unreinforced brick wall

load ($G_{1/3}$) and at ultimate load (G_u), respectively. For Test I-06–00-U these stiffness values were 963 and 794.7 MPa. The stress–strain plot of both unreinforced panels is almost linear up to 80% of the wall capacity. After failure, the curve becomes almost flat, and the structural response turns highly inelastic. The nonlinear plastic behaviors are basically caused by the progressive diagonal cracking of the masonry material along with the compressed diagonal.

5.2 Single-Sided Reinforcement

Four single-sided reinforced wall panels have been tested: two of them with eight titanium threaded rods (every other bed joint reinforced), and two more with five rods (one every third bed joint). Figures 14 and 15 show the shear stress versus shear strain diagram, and shear stress versus compression and tension strains (ε_c and ε_t), respectively for the I-01–05-S (low-density TA reinforcement): the average lateral load-carrying capacity of this wall is 137.95 kN, which corresponds to a shear strength of 0.3686 MPa. The scattering in terms of lateral load capacity of the two wall panels was again relatively low (<5%). In terms of enhancement of lateral load capacity compared to unreinforced panels, it can be noted that the TA rod reinforcement has increased the wall lateral capacity by 18.9%.

For the shear stiffness, test I-01–05-S: shows stiffnesses of 838 and 384 MPa, calculated as 1/3 of the maximum

Fig. 14 Shear Stress versus Shear strain (I-01–05-S)
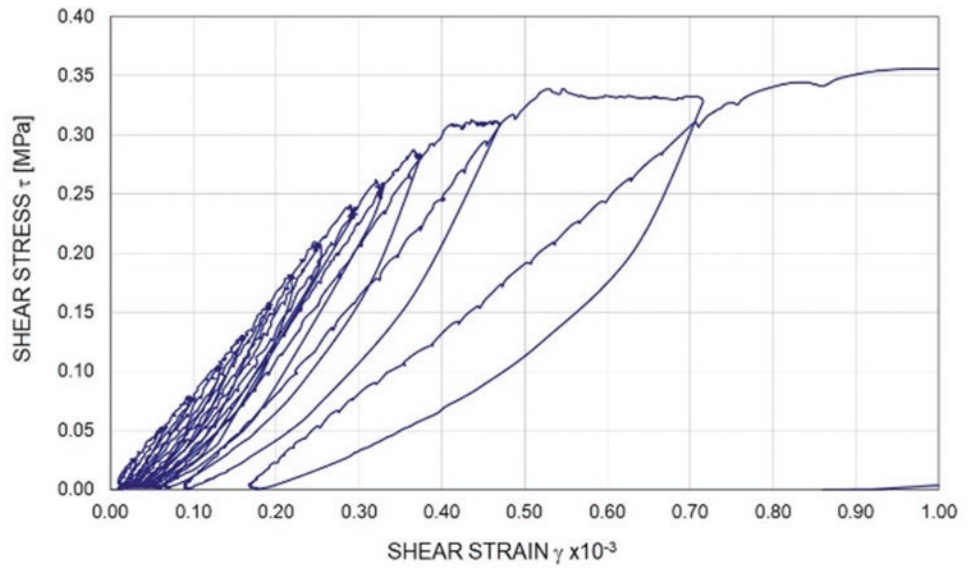
Fig. 15 Axial strains along stretched and compressed diagonals (I-01–05-S)
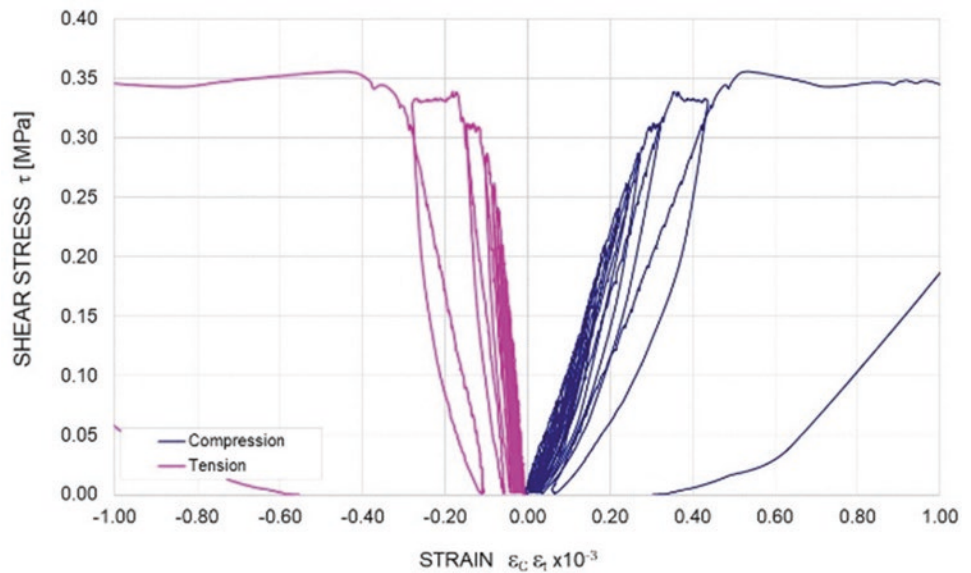
load and breaking load, respectively. For Test I-08–05-S: Demonstrated stiffness of 767 and 207.41 MPa, calculated as 1/3 of the maximum and breaking loads, respectively.

Regarding the type of failure, the compressive diagonal cracks developed in a zig-zag pattern along with the inner wall thickness at the mortar joints (Fig. 16). Generally, solid bricks will not crack, and the mortar will usually separate from the bricks. The thickness of the crack at failure is 10–20 mm, and it develops slowly up to the maximum load.

For the panels reinforced with eight rods (high density of TA reinforcement), Figs. 17 and 18 shows the shear stress versus shear strain plots for tests I-04–08-S and I-05–08-S,

Fig. 16 Failure mode of a reinforced brick wall

Fig. 17 Shear Stress versus Shear strain (I-04–08-S)
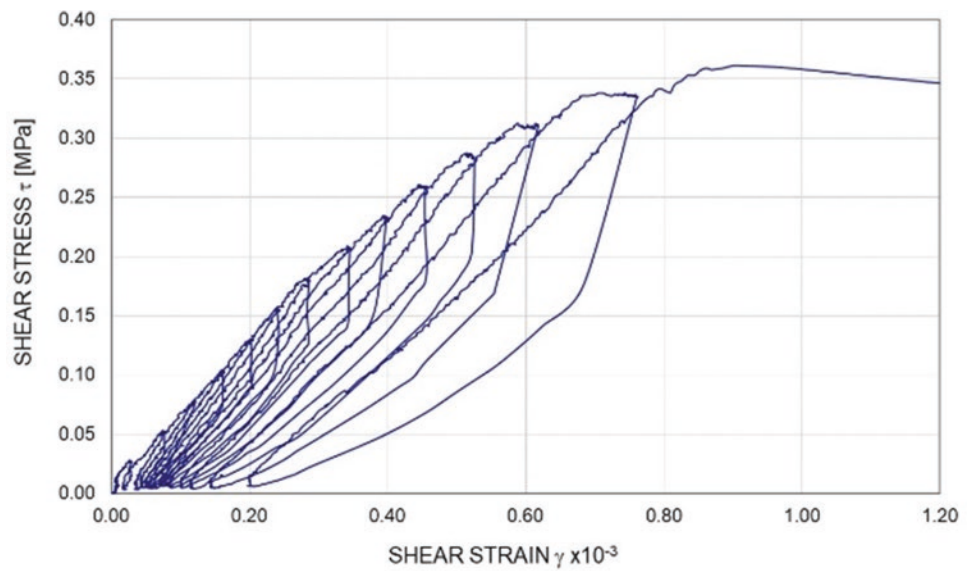
Fig. 18 Shear Stress versus Shear strain (I-05–08-S)
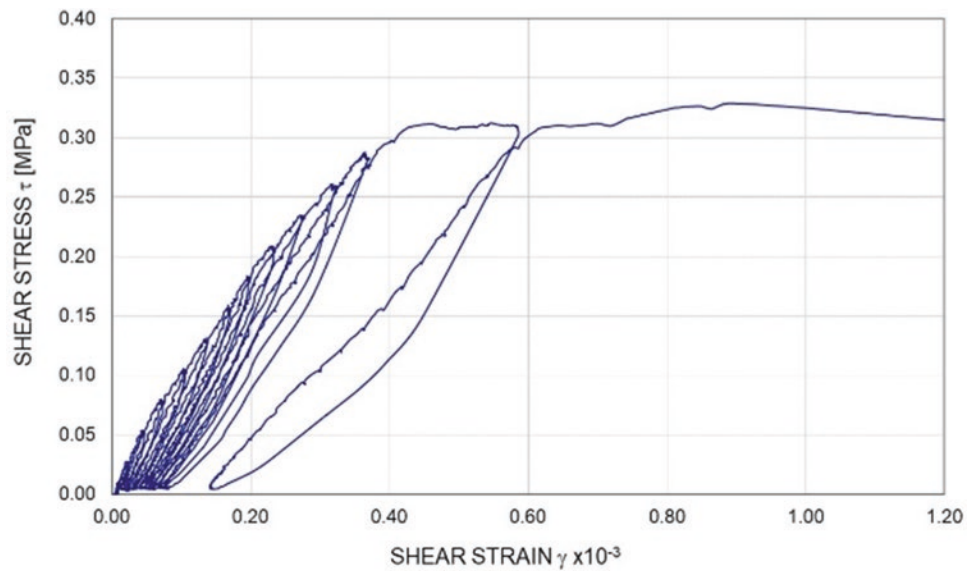
respectively: the wall has an average lateral load capacity of 132.05 kN, corresponding to the average shear strength of 0.3531 MPa. Scatterreing of test results is again very small (<9%). In terms of increasing sidewall resistance, it can be said that the titanium rod reinforcement increases sidewall resistance by 13.8% compared to the unreinforced plate.

For the shear stiffness $G_{1/3}$ and G_u, Test I-04–08-S shows a stiffness values of 670 and 410.4 MPa, respectively. For Test I-05–08-S: Demonstrated stiffness of 767 and 207.41 MPa, calculated as 1/3 of the maximum load and breaking load, respectively.

5.3   Double-Sided Reinforcement

Two double-sided reinforced wall panels were tested, one with 10 TA threaded rods (5 on each wall side) and the other with 16 rods (8 on each wall side). Panel I-03–10-D (Fig. 19) exhibited a lateral load capacity of 163.8 kN, corresponding to shear strength of 0.4379 MPa. The other double-sided wall I-07–16-D failed for a load of 149.9 kN (shear strength $S_S = 0.5952$ MPa) (Fig. 20). The failure mode of reinforced wall panels was similar to the one recorded for unreinforced ones: a diagonal crack developed

Fig. 19 Shear Stress versus Shear strain (I-03–10-D)
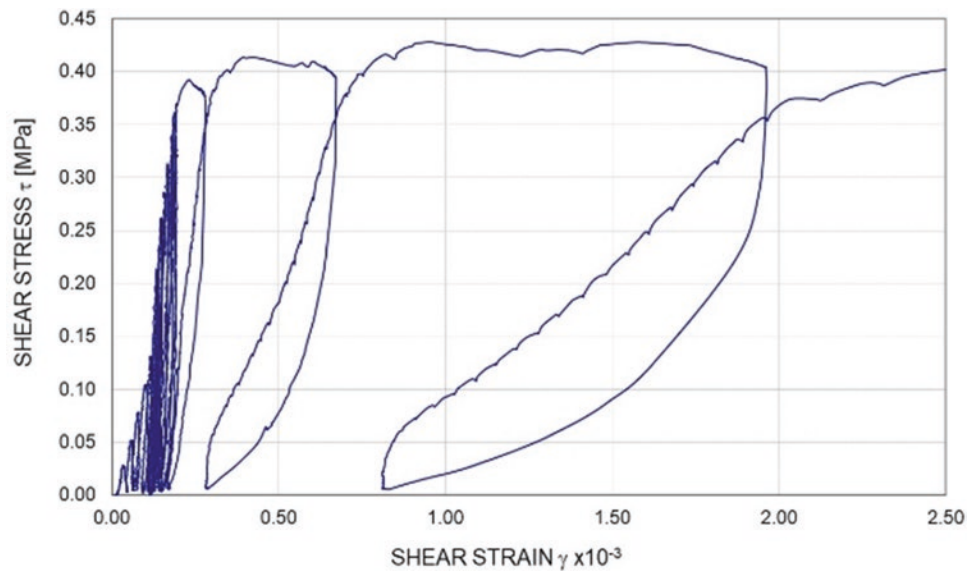
Fig. 20 Shear Stress versus Shear strain (I-07–16-D)
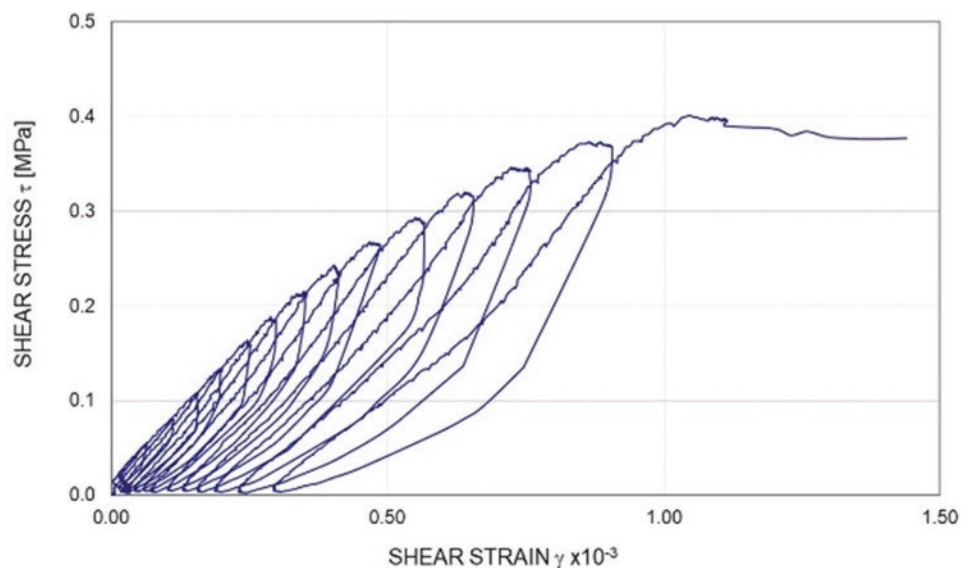
at the mortar joints while loading the wall in shear. For the shear stiffness, test I-03–10-D showed: stiffnesses of $G_{1/3} = 1174$ MPa and $G_u = 457.6$ MPa, while this was 683 and 382.8 MPa for I-07–16-D. Table 2 presents the main test results, this table also indicates the increase in the cracking load P_{max} and shear strength for all of the strengthened specimens, compared to control specimens. The highest increase in maximum shear load was obtained in test I-03–10-D which exhibited a 41% increase over the control specimens. Despite being reinforced with a larger number of TA rod, specimen I-07–16-D obtained a smaller increase in the failure load of 29%.

The low-density and high-density TA rod applications behaved similarly throughout the cycling experimental program, with limited differences in terms of lateral load capacity. A difference was recorded in single and double-sided applications: the effectiveness of the TA reinforcement was generally higher when rods were installed on both wall sides. More tests will be necessary to study the effect of the TA reinforcement amount and layout configurations.

For reinforced wall panels, the development of a diagonal shear crack implies the phenomena of debonding at interface rod-to-mortar or mortar-to-brick in the bed joints. Post-test observations of the region of BJR indicated locally cracked mortar surrounding the rods. The thread of the TA rod clearly improved bonding; however, the use of a stronger repointing mortar could increase the efficiency of the TA reinforcement.

The increase in shear stiffness was again limited or negligible, compared to control specimens. This is likely because a small amount of relative slippage is necessary between the TA rods and the mortar in order to successfully activate the shear transfer action. The main conclusion is that TA rod reinforcement is able to significantly increase the lateral load capacity of the walls while leaving unaffected the stiffness characteristics.

6   Conclusions

This paper reports the results of an experimental campaign of the structural behavior of masonry panels reinforced with TA threaded rods embedded in the mortar joints and loaded in shear. This retrofitting method is of interest because it combines a high degree of reversibility and durability, with the possibility to preserve the fair-face aspect of the masonry. Brickwork panels have been reinforced on a single side or on both sides. Based on the current research, the following conclusions can be drawn:

1. The unreinforced brickwork control specimens resulted particularly strong, and this likely reduced the retrofit

effect of TA rods. It is expected that TA rod reinforcement could be more effective using low-quality masonry.
2. The installation of the TA rods into the horizontal mortar joints did not weaken the walls` integrity and did not weaken the wall panels by inducing a splitting plane at the level of the reinforcing TA rods.
3. For both TA reinforced and unreinforced specimens, shear failure was noted: it consisted of a diagonal crack along the compressed wall diagonal. Crack had a zig-zag pattern and shaped and only formed horizontally and vertical mortar joints.
4. Both TA reinforcement layouts produced significant shear strength increases over the control specimens. Ultimate lateral load increased by 16% and 35% for the wall specimens reinforced with the single-side and double-sided methods, respectively.
5. Accumulation of (residual) shear strains with cycling indicates that TA retrofit method considered exhibited progressive masonry damage and some degrading bond characteristics with cycling.
6. Negligible increments in the shear stiffness of TA reinforced walls were also noted. This is particularly interesting for seismic reinforcement applications: rod reinforcement produces an increase of the lateral load capacity of shear walls, while leaving unchanged the stiffness characteristics and the overall deformation capacity of a building when struck by an earthquake.

Test results are encouraging and seem to demonstrate that TA rod reinforcement could represent an interesting alternative to FRP and traditional retrofits. More tests will be conducted to study its effectiveness for low-quality masonry. Efforts will be also dedicated to design and calculation procedures.

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Conservation of Wooden Built Heritage in Poland—The Current State and Future Challenges

Tomasz Tomaszek

Abstract

Poland is a country with an extremely rich tradition of wooden building. Due to its location in the heart of Europe, Poland has for centuries combined the influences of the frame construction popular in the west of the continent and log construction widespread in the east. Thanks to this, the wooden structures with unique architectural solutions and aesthetic values have developed here. These include the oldest and largest historic Roman Catholic and Greek Catholic wooden churches in the world, currently inscribed on the UNESCO list.

The protection and conservation of wooden architectural heritage in Poland has a long and rich tradition. This can be demonstrated, above all, in the number of preserved historical wooden structures, both in situ and open-air museums created especially for the purpose of saving vernacular heritage. This paper is a concise review of the development of the idea of an open-air museum in Poland and at the same time discusses the conservation and technical solutions for the protection of wooden heritage that have been implemented in recent decades in Poland. Additionally, the paper deals with the issue of maintaining the authenticity of historic wooden structures in the context of the dynamically changing cultural landscape of Poland. Finally, it critically discusses the problems and the challenges that currently face the protection of wooden built heritage in Poland.

1 Introduction

Wooden architecture is a key part of the richness of Poland`s cultural heritage. Being an inseparable element of the cultural landscape of the country, wooden buildings delight the subsequent generations with their charm and at the same time with varieties of sophisticated shapes and construction solutions. It can be undoubtedly postulated that the wooden architecture heritage of Poland is a phenomenon not only on a European but also on a global scale. In fact, this is Poland's most important contribution to the global history of architecture (Szałygin, 2013).

The fascinating tradition of this type of construction and thus the prevalence of wooden buildings in these lands were determined by natural conditions—the inexhaustible resources of this natural building material, the ease in obtaining it, as well as the skills of its processing acquired over generations, and at the same time the shortage of stone in the vast areas of the Polish lowlands. Consequently, it influenced the formation and development of regional and supra-regional features in architecture that were important for the entire European material culture. For centuries log construction was dominant in Poland, occurring mainly in southern and eastern parts of the country. In parallel, other construction methods, which were adapted mainly from Western Europe, were also present. Among them, the palisade post-frame should be mentioned first, the frame and the half-timbered construction methods, which historically predominated in the western and northern areas of Poland

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(Szałygin, 2013). All of this led to the development of an extremely rich material culture and wooden building heritage. Forming construction solutions that were seen as unique compared with world-wide solutions. Creating a new architectural quality, the wooden structures of Polish lands have become a hallmark inspiring the development of European building tradition.

2 Historical Types of Wooden Buildings in Poland

Temples occupy a special place in the tradition of Polish wooden architecture, which are not only cultural landscape but also ideological dominants, being testimony to denominations once present in these lands. It is worth mentioning that historically, Poland was a common homeland for followers of many religions, ranging from Catholics, through Orthodox Christians, Evangelicals, and Muslims, to such small religious communities as Mariavites and Mennonites. The oldest preserved wooden churches date back to the fourteenth and fifteenth centuries (Ważny, 2000). These are Roman Catholic temples that represent a type of Gothic churches, so rare and important that they have been inscribed on the UNESCO World Heritage List.

A peculiar phenomenon of Polish sacred architecture are also churches built in the Baroque period being an implementation of monumental brick buildings in wood, of which a similar tendency cannot be found in any other European country. On the other hand, an extremely fascinating part of wooden temples, being some kind of mosaic of a variety of types and shapes, are Eastern rite churches, located mainly in the east of the country. The oldest of them are preserved to this day. For instance take the dedicated to the Nativity of the Blessed Virgin Mary church in Gorajec

and the dedicated to St. Paraskevi church in Radruż (Fig. 1). These are dated to the sixteenth century (Mazur, 2005).

The third most significant group of wooden temples are Evangelical churches usually built in a half-timbered construction, most often very modest, excluding so-called "Churches of Peace" in Świdnica and Jawor built as structures with a huge cubature (Szałygin, 2013). Interestingly, the temple in Jawor is the largest wooden building with religious functions anywhere in the world and in 2001 it was inscribed on the UNESCO World Heritage List.

Apart from the aforementioned churches, wooden manors are extremely important for the cultural landscape of Poland. They are usually one-story buildings, with a functional and artistic program reminiscent of baroque and classicist palaces (Kornecki, 1998). Unfortunately, the vast majority of manors have not survived to this day. In the past, they were located in practically every village, together with the accompanying wooden farm outbuildings, in the number and size appropriate to the character of the household, often reflecting the reduced programs and types of brick architecture (Szałygin, 2013).

Public buildings were also made of wood. Especially taverns and country inns often erected in interregional shapes and types. In addition, villages were abounded with a variety of architectural structures representing rural industry and crafts: water mills with overshot and undershot wheels, and near large rivers water mills with stream wheels, as well as windmills—so-called "koźlak", "paltrak", and "Dutch" types. These facilities were, of course, accompanied by livestock buildings and other outbuildings, also made of wood, complementing the entire industrial complexes.

The full picture of wooden architecture is completed by small-town complexes of buildings, typologically corresponding to the requirements of the historical limitation

Fig. 1 St. Paraskevi Greek-Orthodox Church in Radruż

of plots (Kornecki, 1998). Most often it was represented by houses with their gables facing the street, often arcaded, often inhabited by Jewish communities. The peculiarity of agricultural towns was the separation of barn or granary districts outside the central part, spatially connecting the "urban" and "rural" areas of the settlement (Szałygin, 2013).

3　The Beginnings of Wooden Building Protection in Poland

The nineteenth century, and especially its second half, is the period when the value of wooden building of individual nations was recognized and appreciated on the international arena. This type of heritage has since been recognized as reflecting local building traditions and the material culture of individual ethnic groups. The attribution of value to wooden construction coincides with the time of growing interest in ethnography and folk culture. At the same time, it is a direct result of the increasingly rapid decline of this construction tradition and the observable successive destruction of historical buildings. Global trends in the appreciation of wooden construction are also visible in the Polish arena. Around the turn of the nineteenth and twentieth centuries, more and more frequent initiatives of inventorying wooden objects and the dissemination of knowledge about their importance for Polish heritage spread. The Society for the Preservation of Monuments of the Past stood out in this field, by carrying out an extensive inventory and popularization activities (Jamski and Manikowska, 2010).

Traditionally, the most numerous wooden buildings were, of course, in the countryside. Until the end of the 1950s, this type of construction was dominant there. The 1960s brought rapid changes, when the popularity of more and more easily available materials, such as brick, grew. Wooden construction, treated as obsolete, was liquidated and slowly began to be replaced by brick construction. As a result, this led to the disappearance of traditional construction methods in many regions of the country. This was also caused by a deficit of wood as a building material, which, apart from being more and more expensive, began to deteriorate in quality. Restrictions resulting from changes in Construction Law, fire, insurance, and other regulations also played a role (Szałygin, 2013). Not without significance, was the predominantly poor technical condition of wooden buildings, their evidently lower standard of use, and in particular, giving the wooden material the designation of backwardness. The re-building and modernization of villages, which has taken place since the 1970s, and the widespread use of brick and siporex as the main building material,

quickly began to eliminate wooden structures from landscape of Poland (Dragan, 2018).

Essentially, until the present day, it was believed that the resources of wooden architecture and wooden construction in Poland were inexhaustible, and that the cultural landscape of this land will never run out. Therefore, it would not be necessary to urgently protect the objects found in plenty at every turn until recently. Thanks to sporadic initiatives, some wooden structures were nevertheless listed into the national register of monuments. It is difficult to understand today what really triggered this decision at the time, the more so as the mentioned listed inscription often contributed to the acceleration of the destruction of the object (e.g., through the lack of interest of the owners in repairs of a building subject to conservation restrictions). The early protective measures on wooden construction can not therefore be described as fully thought through. The resources of this construction, its state of preservation and, above all, its value and significance for Polish cultural heritage has never been recognized (Kornecki, 2001). Also, an inventory of the remaining wooden structures has never been carried out in a consistent and comprehensive manner, which means that even today we do not have a figure on how many valuable wooden objects are in Poland (Szałygin, 2003). In the second half of the 1990s, an attempt was made to identify and describe the resources of wooden sacred architecture in Poland by the Center for the Protection of Public Collections, but the record-keeping work was interrupted due mainly to insufficient funding (Szałygin, 1997).

The tendencies prevailing since the 1960s, in resigning from the protection of individual wooden monuments, to the direction of extending that protection to entire architectural complexes together with their surroundings. Thereafter moving to the protection of spatial complexes and the cultural landscape in recent decades. This was the reason as to why the conservation authorities and the conservation professionals have unfortunately not always succeeded in their attempts to save these objects. Due to numerous cases of neglect, lack of funds, and insufficient social awareness, wooden manors taken away from their owners suffered particularly badly, as they were usually completely run down by temporary users and often ruined. Neither, did time spare the majority of rural industrial structures—like mills, fulling mills or windmills, or the most valuable rural cottages. This happened despite the fact of many initiatives taken to protect rural wooden structures and their complexes in situ, and on the other hand the creation of numerous open-air museums after World War II and the intensification of the inventory and documentation campaign. Unfortunately, all these initiatives were often met with a lack of social support, usually resulting from the low general awareness of the high values of this type of building, and above all due to

Fig. 2 Typical cultural landscape of Rzeszowiacy ethnographic group preserved in the Ethnographic Park of The Folk Museum in Kolbuszowa

poor or underdeveloped mechanisms for financing renovation and conservation supervision (Szałygin, 2013).

Despite all these shortcomings, the lack of adequate funding and insufficient measures to protect the remaining heritage of wooden architecture. A mention should also be made of the significant successes in this field in Poland in recent decades. Among the most important, the above-mentioned creation of a large number of open-air museums (Fig. 2) and the development of appropriate conservation methods, successfully implemented on leading wooden monuments.

4   Open-Air Museums in Poland—A Short Description

The idea of establishing museums, presenting wooden buildings in an open space, came as a consequence of rapid changes across Europe during the second half of the nineteenth century. Particularly social and cultural metamorphosis leading to significant modification of lifestyle as well as conciseness of societies. An especially important role was played at that time by progressive industrialization, resulting in an increased interest in the past and the national identity of individual ethnic groups (Spiss, 1985). Thus, it was followed by the recognition of folk culture as an essential conveyor of tradition, and the need for the museum exhibiting this part of heritage became urgent. The first ethnographic park was established soon after in Stockholm in 1891 by

Artur Hazelius (Rentzhog, 2008), while the first institution of this type in what is now Poland was established in 1906 in Wdzydze Kiszewskie by the Gulgowski family (Spiss, 1985).

The open-air museums created in the first decades of the twentieth century in Poland were designed primarily by the implementation of a so-called "park layout". Therefore, only the buildings considered as the most representative for particular region or ethnographic group were collected and exhibited in a kind of free compositional layout and often also framed by loosely arranged greenery (Prarat, 2013). The next step in the development of the idea of open-air museums was to include entire settlement layouts with farm buildings exhibited in the arranged complexes (Spiss, 1985). This tendency slowly began to change in the interwar period. At this time the "average" buildings were recognized as requiring relocation and exhibition in the open-air museums, these structures became to be recognized as typical for a given ethnographic group within a given timeframe (Spiss, 1985). The most advanced and visible development of open-air museum institutions in Poland took place in the second half of the twentieth century, when typical country life started to change from day to day. The open-air museums established during this period typically were divided into particular—each presented chosen ethnographic groups, usually from a given region of the country. Particular care was not only taken to reconstruct the spatial structure, but also the terrain constructed to be as similar to the natural and cultural

Fig. 3 St. Nicholas` Gothic church from Bączal Dolny in Poland, now in the open-air museum in Sanok

environment of the exhibited ethnographic group (Fig. 3). Strict planning of the composition of the relevant buildings and their relation between each other (Ginalski and Ossadnik, 2008).

This type of exhibition can still be found in Poland and observed currently by most open-air museums that now exist in this country (Święch and Tubaja, 2006). The design concept of open-air museums was also influenced by general changes in the approach to conservation that happened at the end of the 1960s. The cultural landscape since came to be understood as the human environment, and thus this idea had a huge impact on the protection of wooden heritage (Szmygin, 2000). Since that moment, significant new spatial layouts that wholly presented the "real" historical space of rural settlements have been introduced into open-air museums in Poland.

5 Methods of Conservation Currently Used in Poland

The current methods of conservation of wooden architecture used in Poland can be divided into two main approaches (Larsen, 1994).

The repair of wooden buildings by disassembling them into separate members.

(a) Replacement of degraded wooden elements (or degraded parts of elements) with new elements repeating the original techniques applying:
  - Connection methods that are traditional

  - Joining methods that are secondary (for example with steel plates or belts or with epoxy resins)
(b) Consolidation of damaged parts of members (for example by filling with synthetic resins)
(c) Reinforcement of damaged parts or whole structure (for example by use of fiberglass rods or metal plates)

Structural repair carried out in situ (without disassembly into separate elements).

This approach can be applied by lifting the whole building or part thereof by the means of pneumatic jacks. In this case access is possible via the lifted section and it allows the replacement or removal of degraded members or degraded parts.

The method of repairing in situ without disassembly is carried out using the same processes as above (1a-c).

Bearing in mind contemporary conservation ideas, promoting the mineralizing of the interference, the stabilization, replacement, or reinforcement of degraded members without dismantling, is considered as the most justified. However, the decision about the usage of any particular method is always based on a 'case by case' analysis of the conservational issues for each building.

It is also worth mentioning, that due to a long tradition of wooden building, the practice of dismantling a structure for conservation is widely practiced in Poland, if it is thought to be the necessary method. This is in line with the overall tradition in Europe, where the process of disassembling and reassembling wooden structures is widespread, as this method was used historically to relocate farm buildings (Haslestad, 1992).

However, according to studies by various authors, in general, usually the lowest (ground-level) part of the structure needs to be replaced more frequently, thus its replacement is almost always performed by slightly lifting the building.

6 The Methods of Vulnerability Assessment of Wooden Buildings Currently Practiced in Poland

The methods used in Poland for diagnosing condition status and conducting vulnerability assessments of wooden structures in general are divided into carried out in situ and carried out ex situ (Shabani et al., 2020).

The first group, the in situ methods, is used for the purpose of gathering systematic information on the current condition of the structure, including information about defects and voids in elements, as well as an assessment of the mechanical properties of individual members (Cruz et al., 2015). In situ methods are usually applied as the first step in a vulnerability assessment, and they include an expert visual inspection and documentation. They could also involve non-destructive tests (NDTs) or semi-destructive tests (SDTs) (Riggio et al., 2018).

The second group, the ex situ methods, is used for advanced vulnerability assessments. These methods help to analyze the detailed behavior of the whole building, as well as all of its components (Riggio et al., 2018). The undertaking of ex situ experimental tests also allows the investigation into the behavior of the structure when subjected to various types of loads and stresses. As such, these methods are used for developing numerical models, in different risk scenarios. An example of an ex situ analysis can provide a wind and snow vulnerability assessment (Shabani et al., 2020), which is particularly applicable to wooden structures in Poland due to heavy snowfall during the winters.

7 Typical In Situ Methods of Vulnerability Assessment Used in Poland

In many cases, the in situ analyses for the vulnerability assessment of historic wooden structures are adequate to provide enough data to determine the methodology to be used for their conservation. They are often used without implementing more advanced ex situ analyses. In general, in situ methods are helpful for the evaluation of the mechanical properties and thus the condition status of individual members. Regarding the characteristics of these analyses, these methods fit into two groups: a preliminary survey and a detailed survey (Riggio et al., 2018; Shabani et al., 2020).

A preliminary survey is the most basic methods of the assessment. Usually, it includes a visual inspection with the recorded data being later provided in elemental documentation. It also includes geometric surveys and any essential analyses (Riggio et al., 2018). The preliminary survey is conducted in order to gain access to all the possible data on the history of the building, as well as any past restorations and eventual changes. It also helps to identify various damage (for example, biological damage) and their causes (possibly the identification of biological species), but also different risks and exposures to these risks (Cruz et al., 2015). Finally, these analyses also bring identification of wood species and are a contribution to the identification of other materials used for construction (Riggio et al., 2018).

A detailed survey helps to locate any defects together with their advancement in cross section of all analyzed members. Due to contemporary requirements for minimizing the usage of destructive tests in heritage conservation, non-destructive tests (NDT) or at times semi-destructive tests (SDT) are applied (Shabani et al., 2020). These allow for the collection of data to identify the mechanical properties and thus are very helpful for choosing the correct conservation methodology. In some cases, various NDT or SDT tests are conducted simultaneously to provide a more accurate diagnosis. The data collected provides information on the soundness of individual wooden members (Cruz et al., 2015).

One of the most common NDT methods in Poland is the Resistance Drill Method (RDM) (Tomaszek, 2015). This technique helps to identify and quantify decay and any voids in sections of wooden members (Ross, 2015). The method is based on the measurement of cutting resistance during drilling, and thus it reveals variations in density caused by deterioration. Resistance drill equipment measures the resistance of wood with around a 1.5 mm diameter drill (Cestari et al., 2002). The RDM identifies areas with the low density, indicative of decay or deterioration. The degree of resistance indicates the level of decay and identifies areas of low, mild, and high levels of decay (Rinn et al., 1996). The data from drilling is collected electronically producing a chart showing degree of resistance over the drill path (i.e., the test shows if the analyzed wood has increased, medium, or reduced strength parameters) (Tomaszek, 2015). The RDM method is considered as highly effective for identifying the deterioration of wooden structures (Ceraldi et al., 2001).

The data collected from the preliminary and detailed surveys together can feed into recording templates for the assessment of heritage timber buildings, which were elaborated in 2020 by the group 1-TG1, COST Action FP1101-WG (D'Ayala et al., 2014).

8   The Future of Wooden Building Heritage in Poland—Threats Perspectives and Challenges

Taking into account contemporary conservation thought, it can be rightly postulated that one of the fundamental aims of monument protection is to preserve the broadly understood cultural landscape in all its material, spiritual, and social manifestations. Thus, it is extremely important to maintain its identity and completeness. In the case of Poland, wooden architecture is certainly an especially integrated and inseparable element of the cultural landscape, which has been co-created since the dawn of the history of these lands (Szałygin, 2013).

The drastic decline of wooden architecture in recent decades, has already happened in many areas in Poland, has many different causes. One of them is natural disasters and the detrimental effect of atmospheric and biological factors, to which wooden structures are extremely sensitive. Another, unfortunately quite often encountered reason, is the lack of constant, proper, and professional care on the part of the current owner or user. This is compounded by conservation authorities failing to systematically supervise the building's preservation state. Resulting in a lack of control in the accuracy of the carried out repairs. It is vitally important to constantly monitor historic wooden buildings, especially as many repairs and renovation work are carried out by owners or users without professional conservation techniques.

Finally, fire rates as one of the greatest threats to wooden buildings. Unfortunately, these are often the result of a deliberate act, frequently to cover up traces of break-ins and thefts. According to statistical data, 3–5 churches have been destroyed every year since the end of World War II, this gives a total of more than 250 lost temples (Szałygin, 2013).

All the above allows us to conclude, that caring for wooden structures due to their exceptional value and significance for the history of world architecture, should be associated with raising the general state of social awareness in this matter. Unfortunately, after World War II, Poland's aversion and even hostility toward everything that was old or rural, thus usually equating to anything that was wooden, was noticeable in every aspect of life. In the case of the remaining wooden buildings, it was and still is common place, to find improper "modernization", including wooden churches, manors, forester`s lodges, or plain cottages. Decades of deterioration to most wooden buildings has also been caused by the legal and ownership status of the monuments. Some, to this day, still remain un-rectified. Unfortunately, despite defining conservation recommendations, they are often not respected, and as a consequence the objects are not properly maintained. According to applicable regulations, in order for a wooden monument to be protected by law, it must be covered by certain, strictly defined forms of protection—first of all, it must be listed on the register of monuments. In the register, wooden buildings and structures partially made of wood only constitute about 11% (according to the data from the National Institute of Cultural Heritage of Poland) (Szałygin, 2013). It seems unbelievable, but the need to identify and inventory wooden structures still appears to be foremost and very urgent.

Studies carried out at the beginning of the twenty-first century, showed that over 70% of the remaining objects of wooden architecture in Polish villages are in a poor condition. This also applies to sacred buildings, over 40% of which have been described as very poorly preserved (Mielczarek, 2001). The main causes for the destruction of historic wooden buildings are specified as follows (excluding biotic and abiotic factors):

- Fires and thefts,
- Insufficient care of the owners to the technical condition of the structures,
- High costs of the conservation works necessary, often resulting in repairs being carried out with the use of inappropriate materials and techniques.

In order to protect not only individual objects but entire rural complexes or larger parts of the historic cultural landscape in Poland, conservation awareness should be increased. It is essential therefore, for the practical implementation of the postulates raised in the Charter "Principles for the Preservation of Historic Timber Structures", issued by the International Wood Committee (established within ICOMOS), and adopted in 1999 as a result of the Mexico meeting (Stępień, 1998). It is also worth adding that a significant number of historical wooden structures in Poland are the material remains of national or ethnic minorities that lived in Poland until World War II. The forced displacement of these minorities after 1945 interrupted their cultural continuity. Thus, the buildings left unattended deteriorated at an accelerated pace and what survives to this day is usually in advanced ruin. The protection and conservation of these monuments should be a priority. It applies both to individual structures as well as the historically shaped cultural landscape, but also the intangible assets beyond the material substance frozen in architectural shapes. The most desirable—both from the point of view of conservation values and social impact—would be to preserve in situ. This could take place in the form of a protected area with an authentic fragment of the former village of a displaced ethnic minority. Such solutions, however, are burdened with many difficulties, including financial or ownership issues.

9 Conclusions and Directions for Future Action

Undoubtedly, the primary task is to recognize and describe, as well as to properly conserve, the resource of historic wooden architecture in Poland as an element of the broadly understood cultural landscape. This requires further intensive research, interdisciplinary studies, and the implementation of advanced up-to-date documentation. Consequently, it is necessary to develop and implement a rational conservation policy, aimed at preserving the most valuable, but also the most representative examples of wooden architecture and wooden construction in their natural settings for future generations.

Future actions should be based on the preservation of as many objects as possible in situ, and as much of the original building substance as possible, as well as keeping alive the disappearing local crafts and building traditions. These activities should therefore be aimed at maintaining the possible aspects of the authenticity of the value of the wooden structures in question. Due to recent negative changes in attitude toward wooden buildings. There is an urgent need to protect traditional carpentry and wooden construction skills, re-building a local carpentry culture, before it is lost completely.

In further activities aimed at the protection and care of wooden structures in Poland, over the past twenty years, there has been an increasing trend in wooden buildings returning to fashion. Thanks to this, the heritage of wooden architecture in Poland will have a continuation with a new dimension and a new space, showing us both the beauty of this material, as well as its technical qualities that are not yet fully appreciated by everyone (Szałygin, 2013).

Finally, it needs to be remembered that the critically endangered objects, which for various reasons cannot be left in situ, should be translocated to the open-air museums. However, this should not be reserved to only the most valuable or typical buildings. As far as possible, the surviving pearls of wooden architecture in Poland should be left in situ. In the places where they were erected, and where they affect the surrounding environment, constituting an element of the authentic cultural landscape that affirms the identity of the Polish nation.

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Turning to History and Science in Order to Preserve Wooden Shingles in Sweden

Maria Mellgren

Abstract

The use of wooden shingles as a building material has a long tradition in Scandinavia, going back to medieval times. Unfortunately, knowledge regarding manufacturing, quality, and maintenance of shingles has been partly lost and without it we cannot properly preserve the precious historic values of shingles. A recent project on wooden shingles on churches in the dioceses of Strängnäs and Västerås in Sweden investigates why, in too many cases, relatively new shingles have proven to be less durable than old ones and demanding more maintenance in comparison to older ones. 300–400 year-old wooden shingles in the study demonstrate outstanding sustainability, hold unique values, and have to be handled with great caution. The main purpose of the project has been to increase knowledge on shingles as a façade and roof covering throughout history in order to obtain a deeper understanding of the material. In an attempt to find out about traditional manufacturing methods, surface treatment and maintenance of shingles as well as how conservation principles have varied over time, we turned to the archives. In order to find out more about the quality of the wood and the surface protection of the shingles, tar in most cases, different methods of scientific analysis have been carried out. Through X-ray of shingles, chemical analysis, and analysis of mold and rot, we have been able to thoroughly investigate the properties of the wood and different surface treatments as well as the decay of the wood. The different types of analyses and approaches stated above give a comprehensive picture of which factors that work in the long-term perspective. The results will be an important tool for authorities in approving interventions and of use for property caretakers. It is hoped that the results—in the long run—will lead to reduced maintenance costs for the parishes, paired with greater caution during renovation.

1 Introduction to Wooden Shingles

The tradition of using wooden shingles to cover roofs and façades is old in Scandinavia. The use of wooden shingles in Sweden is probably as old as the oldest churches from the medieval period (Utas, 2009). Shingle coverings of medieval origin are still to be found on churches in parts of Sweden. As examples of the oldest façades and roofs still existing, they represent high historic values. In Europe, the use of wooden shingles in building construction can even be traced back to Roman antiquity, as Pliny the Elder in *Naturalis Historia* mentions that the best shingles were made of oak (Plin. *NH* 16.15).

There are churches with wooden shingle roofs and façades from all centuries existant in present-day Sweden. The shingles date from the medieval period to the present, with a majority deriving from the twentieth century. The shape and surface of the shingles have varied over time and reflects technical development as well as changes in architecture and society. Shingles are wedge-shaped and in Sweden mostly made of Scots pine (*Pinus sylvestris*), but oak and other types of wood have also been used, depending on availability.

Wooden shingles are important in the built religious heritage in Sweden. A lot can be learned from this material and it forms an important part of the architectural and aesthetic

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values of a church building and church environment. We have to safeguard and find the best way of managing the shingle coverings, for the continuity of this building tradition and in order to safeguard important values. These are some of the reasons why Stiftelsen Kulturmiljövård has managed a project aimed at investigating as much as possible about shingles on churches in two dioceses in central Sweden.

1.1 The Project Stavspån I Strängnäs Och Västerås Stift (Wooden Shingles in the Dioceses of Strängnäs and Västerås)

The project *Stavspån i Strängnäs och Västerås stift* (Wooden shingles in the dioceses of Strängnäs and Västerås) has been carried out in two phases during 2018–2022. It is managed by Stiftelsen Kulturmiljövård on behalf of the Church of Sweden in the Dioceses of Strängnäs and Västerås. During the first phase 2018–2020, a survey was made of all the roofs and façades made of wooden shingles in the two dioceses. This resulted in the recording of 155 parish churches where shingle coverings were found. Out of these, 31 single shingle coverings, in both dioceses combined, were selected for further in-depth studies in the second phase of the project, which has been undertaken in 2020–2022.

The main purpose of the project is to identify where wooden shingles are to be found in the dioceses, to increase knowledge of wooden shingles, and to obtain a deeper understanding of this building material. The second phase of the project also seeks to develop a working method for management and measures of shingle coverings.

2 Problem Statements

Wooden shingles are still among the most commonly used roofing materials on church buildings in Sweden. But in the course of time, many wooden shingle roofs have been lost due to material replacements, such as copper plate and slate. The reasons for this can be found in high maintenance costs, wage increases, and expensive fire insurance. Although many shingle roofs are now lost, several well-preserved 300- and 200-year-old coverings have been recorded in the project. However, many wooden shingles of relatively recent date, by which we mean the twentieth century, have proven to be less durable and demanding more maintenance than shingles that are several hundred years old. Why is that? And what can be done about it? How can we improve the quality and durability of newer shingle coverings? A central issue is: what works in the long-term perspective? Another important question is: how can we reduce

the maintenance costs connected with shingle coverings in the long run?

An important issue to address has been to look at the quality of wood in relation to damages. What does the quality of wood mean for the life span of a wooden shingle? Is it the choice of wood, the shape of the shingle, the mounting of the shingles, the substrate, or the maintenance that have played a crucial part regarding a shingle covering which has stood the test of time? Perhaps several combined factors have been important for the final result? Another key question in the project is to find out how often, and with what kind of treatment, wooden shingles have been protected and maintained throughout the years. Which factors have proven to be successful for old and still healthy shingle coverings? (Figs. 1, 2).

3 Methods of Investigation

Many different methods of investigation have been applied in this project in an attempt to gain a comprehensive understanding of wooden shingles. The objective is to gather all available information on wooden shingles to get an overall picture. Equally important is to evaluate the different kinds of information emanating from the different methods and analyses.

3.1 Archival Studies

Parish protocols from the seventeenth and eighteenth centuries allow us to follow a shingle covering from decision-making to finished result. It is also possible to follow decisions regarding the maintenance of shingle coverings over the centuries. Parish records have been studied at Landsarkivet i Uppsala (Swedish National Archives in

Fig. 1 Särna old church. *Photo* Lisa Skanser

Uppsala) for all 31 shingle coverings that have been more thoroughly investigated in the second phase of the project.

3.2 Field Work and Workshop Examination

People with several different professional skills collaborate in the field surveys: conservation officers, carpenters, a blacksmith, and an architect. A small amount of shingles are disassembled and then examined in the carpentry workshop, in search of traces of tools and damages. Nails of special interest from eleven shingle coverings have been examined by a blacksmith. An architect has made scalable drawings of a section of each shingle covering, in order to enhance and unveil every detail of the shingles. Permission to disassemble and reassemble shingles have been obtained

by the county administrations in each of the five counties included in the survey (Dalarna, Stockholm, Södermanland, Västmanland, Örebro).

3.3 Scientific Examinations in Laboratories

Specialists from the Division of Wood Science and Engineering at Luleå University of Technology have been consulted for the examination of wood, and for carrying out chemical and biological analyses. Old shingles from two churches and one belfry were sent to the Laboratory for Wood Anatomy and Dendrochronology at Lund University for age determination. Tar samples from twelve shingle coverings were selected for different examinations, chemical analysis, and thin section analysis (Figs. 3, 4).

4 Results So Far

The project is now nearly finished but not entirely summarized. Studies of several parameters have been carried out on the 31 coverings in the second phase of the project. It is clear that the survey does not give distinct answers to all our questions, but certain conclusions can be drawn. Below follows a selection of what has emerged so far.

4.1 From the Archives

Through archival studies we have not only learnt how many shingles that were produced for a church roof, and how

Fig. 2 Wedge-shaped shingles. *Photo* Daniel Eriksson

Fig. 3 Examination by skylift. *Photo* Jennie Björklund

Fig. 4 Shingles in workshop. *Photo* Daniel Eriksson

much tar was bought and applied. We also understand more about the organization of work in a pre-industrial society, the quality of wood required, traditional manufacturing techniques of shingles, and how conservation principles have varied over time. In addition, archival sources are necessary in the assessment of the historic value of wooden shingles.

Shingles and tar were produced locally in each parish. Often shingles were made from trees in forests owned by the church. According to law, parishioners were obliged to contribute to construction work and maintenance of church buildings. This was done by delivering raw material and day labor, until the mid-nineteenth century (Gustafsson, 2002). Shingles are both labor and material intense and quite easy to produce. Therefore, inhabitants of a parish had to contribute to the manufacturing of shingles.

In the County of Dalarna it was common for the parishioners that contributed with shingles to set their property marks on every shingle. This practice was a control measure for the church to ensure that everyone contributed with an exact amount of shingles (Bannbers, 1957). Nails especially adapted for wooden shingles were produced and bought by the church at nearby mill towns. Manufacturing procedures and purchase of shingles, tar, and nails were meticulously recorded in the parish protocols. Thanks to this, it is possible to get a comprehensive picture,"a shingle history", of a specific church, which has proven very useful for the project.

4.2 Using Dendrochronology for Dating

Shingle samples from three of the oldest shingle coverings in the survey (Sala parish church, Svedvi belfry, and Tångeråsa church) were sent to Lund University for age determination by dendrochronology. The basis of dendrochronology is the age determination of wooden material by examining the annual ring pattern, which reflects the growing conditions of the tree. In addition to the age determination it is thus possible to obtain information on the growing place of the examined tree and by that, information on old landscapes and how they were used (Andersson & Sjömar, 2002).

The results proved to be interesting. Shingles from Tångeråsa church and Svedvi belfry came from trees felled in the 1420 s and 1430 s, which means they are the oldest shingles in the survey. Furthermore, the results suggest that these shingles also have the same provenance, coming from trees which originate in the same forested area. Svedvi and Tångeråsa are situated some 100 km from each other, which is quite a distance. This raises questions on how shingles were produced in fifteenth century Sweden (Linderson, 2021a, 2021b).

4.3 Field Work Observations

During field work many observations were made and many parameters were taken into consideration. Observations regarding a few of them follow below.

4.3.1 Location and Roof Inclination

The location of a church can be of crucial importance to the aging of a shingle covering and for the risk of different damages. The latitude also has an effect on wooden shingles. A clear difference in moisture levels and damages can be seen between north- and south-facing sides of a roof. The slow drying rate of moisture to the north can cause biodeterioration and rot, while UV radiation and sun exposure lead to cracks and leach of the shingles. Also the microclimate can vary within the same shingle covering, causing damage in one spot but not a few meters away (Mattson, 2017). A tree can give shade to one part of the roof, but not the other. However, this factor has not been studied in-depth in the project. Despite this, we have noted that most south-facing shingle roofs are in good condition. But at the same time, it is also worth noting that the two oldest shingle coverings in the survey are north-facing.

Shingles on façades are less exposed to weather than roof shingles. A steep inclination makes water run away faster. Most of the roofs have an inclination of 50 degrees or more. Half of the coverings in bad condition have an inclination of less than 40 degrees. It is less likely that a steeper roof inclination leads to damages, even if we have seen the opposite.

4.3.2 Substrate

The construction and condition of the substrate of a shingle roof are of great importance for the life span of the whole roof. Traditionally the shingles have been mounted on an airy substrate, which has been positive for both the shingles and the climate in the attic of the church. During the twentieth century, it has become more common to mount the shingles on roofing-felt, which gives a more dense construction that leads to difficulties for the roof to dry out. It is important to examine both the shingles and the substrate at the same time, to get a comprehensive picture of any damages. It is of great interest to note that some of the churches in the investigated area still hold medieval roof trusses and substrates. These medieval boards are vulnerable and will not survive substantial changes, such as the laying of new shingle roofs, fastened with nails over and over again.

4.3.3 Quality of Wood and Knowledge of the Craft

In the project we have been able to compare several hundred-year-old shingles that mainly consists of heartwood with younger shingles with a large proportion of sapwood. In Sweden today there is very limited access to the same high-quality wood as used in pre-industrial times. The quality of wood is of great importance for the shingle´s resistance to mold and rot. During field work it was possible to detect moisture in the sapwood of a shingle, while the heartwood part of the same shingle was dry. In some cases the sapwood in particular was contaminated with rot (Figs. 5, 6).

Archival studies have shown that in pre-industrial time, shingles were generally produced by the parishioners. This means that the knowledge of craft and woodwork was very good among the population. Even if almost everyone who could handle an axe was able to produce shingles, there were also people who became specialized in making them. They could then either produce a lot of shingles themselves or give instructions or templates of shingles to others. However, the parish protocols rarely mention craftsmen's

Fig. 6 Old shingles from Orsa church. *Photo* D. Eriksson

titles linked to shingle production. In contrast, blacksmiths and mill towns are often mentioned by name in connection with producing and buying nails for shingles. When looking at the oldest coverings still in good condition, it seems that accuracy and attention to detail have not always been of great importance for the preservation of the shingles. Several shingles seem to have been altered right before the laying of the roof, but this has not affected the durability of the shingles.

4.3.4 Surface Treatment

Surface treatment is presumably one of the key factors related to the aging of wooden shingles and the prevention of damages. Throughout history, man has always tried to protect wood from decaying. Shingles have usually been treated with tar as protection against weather and wind. During the twentieth century we have seen a period of experimenting with different surface treatments, including pressure impregnation with creosote oil or CCA (Copper, Chromium, and Arsenic), used in the modern wood industry. This was also a way to compensate for the use of poor-quality wood. Other compensatory measures included treatment with coal tar or oil containing asbestos.

The oldest shingle coverings in the survey (dating from the fifteenth to the eighteenth century) have, or have had, thick layers of tar applied on the surface of the wood. These thick layers have functioned as protection of the wood for a long time and contributed to the long life span of the shingles. It is worth noting that three out of four of the oldest coverings with a thick tar layer were façades. This has probably contributed to the preservation of the thickness of the layer.

About half of the coverings in the survey had thin layers of tar. Nearly all of them date to the second half of the twentieth century. Six of the investigated shingle coverings had no tar left at all but were fairly undamaged. Shingle

Fig. 5 Shingles damaged by rot. *Photo* Jennie Björklund

coverings treated with pressure impregnation and/or creosote all date between 1940 and 1980 and are still in good condition. This treatment is probably the reason why shingle coverings from this period in time are still well functioning, despite poor-quality of wood.

During the twentieth century a new routine for tar treatment developed, in which the shingles were entirely dipped in tar before the laying. Previously, tar was only applied to the surface after the laying. In the survey, shingles dipped in tar show less damage by rot, than shingles where tar had been applied in a traditional way. Still, it is hard to draw conclusions since older shingles treated with tar in a traditional way, are much older and have been exposed to different factors of risk for a long period of time (Figs. 7, 8).

4.3.5 Secrets Behind Shingles Produced Before 1850

In an attempt to try to answer the question of what works in the long-term perspective, we have taken a closer look at shingles produced before the year 1850. Out of the oldest coverings, most of them are placed on façades. The roof coverings all have a pretty steep inclination of 50–65 degrees and are nailed to an airy substrate. All different shapes of shingles are represented. Most of the shingles are hewn. Twigs are present but they are few. Almost all of these old shingles have, or have had, a thick layer of tar on the surface. Damages occur but are fairly limited.

To summarize the success factors found in older shingles:

– Placement as façade shingles
– A steep roof inclination
– An airy substrate
– Two-and-a-half to three-layer mounting of shingles
– Good quality of wood (heartwood)
– Hewn shingles with almost no twigs
– A thick layer of tar
– A limited amount of damages

As has been demonstrated above, there are many parameters to take into consideration when drawing conclusions from the fieldwork and analyses undertaken. When this project is finished we will hopefully have many more clues as to what makes a shingle covering last longer, as well as more tools for the preservation of this precious built heritage.

Fig. 7 Thick layer of tar at Sala church. *Photo* Lisa Skanser

Fig. 8 Curved roof of Kvistbro church. *Photo* Lisa Skanser

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Questioning the Rural Architectural Typology and Its Transmission Due to Reuse: The Cases of Guest Houses in Bağlıköy/Ampelikou

Makbule Oktay

Abstract

Rural architecture is the built reflection of the lifestyle, economy, and culture of a rural society and it is also shaped by the environmental characteristics of the region in which it evolved. Therefore, it is considered to be cultural heritage and should be valued, protected, and handed down to future generations. However, abandonment has become the destiny of rural settlements in general and vernacular houses in particular, as a result of lifestyle changes and technological developments. There are opportunities for abandoned vernacular houses to be reused for other functions. The reuse of vernacular houses provides various benefits to the owners and community such as a positive contribution to the economy of the household and/or the economy of the rural settlement. Moreover, reuse contributes to the preservation of the rural architectural typology and rural architectural heritage, and enables the transmission of this rural heritage to future generations. Bağlıköy/Ampelikou in Cyprus is a rural settlement that experienced abandonment and is therefore comprised of many uninhabited vernacular buildings. This rural settlement attempted to become an eco-village in the last decade and consequently underwent some changes. The introduction of the guest house concept to the village and the opening of two guest houses through the reuse of vernacular houses are two of these changes. Although at the first glance these changes can be evaluated as a positive endeavour, further exploration is still needed to understand their impact on the typology of rural architecture in the village. To sum up, this study explores two guest houses in Bağlıköy/Ampelikou which have been converted from houses, in order to interrogate the impact of reuse on the vernacular architectural typology. First, the original typology of these two houses is explained, and then alterations to and adaptations of the houses are identified. The study is expected to draw lessons for possible future efforts to reuse vernacular houses.

1 Introduction

Vernacular rural settlements or 'historic villages' are regarded as physical proof of the traditional culture of the past (Eres, 2016). Their vernacular architectural heritage is significant since they reflect the culture of the community, representing the cultural diversity of the world (ICOMOS, 1999). Therefore, it is important to value, protect, and hand down them to future generations.

Abandonment, as a consequence of technological and physical insufficiency and migration from rural to urban settlements, is one of the primary barriers to the retention of vernacular architecture. A vacant house, a house without people in it cannot live; conservation is possible only by keeping the building alive (Bektaş, 2001). Therefore, the reuse of abandoned vernacular houses emerges as an opportunity to keep buildings alive and to sustain vernacular typologies.

Bağlıköy/Ampelikou in Cyprus is a rural settlement which experienced abandonment and is therefore comprised of many uninhabited vernacular buildings. The settlement used to be one of the mixed villages of Cyprus that were inhabited by both Greek Cypriots and Turkish

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Cypriots before the inter-communal conflict and division of the island (1958–1974). Displacement from the village resulted from tensions between the two communities, changing needs and requirements of the villagers, a lack of job and educational opportunities, and the search for more facilities than a village can provide. These issues resulted in the decline in the village population and led to many vacant houses. Over time some of the abandoned houses were demolished, while others survived. The latter ones stand as opportunities to be evaluated for the benefit of the village.

Beginning in 2011, this rural settlement attempted to become an eco-village and consequently underwent some changes. In this year, the guest house concept was decided by the government as a way of developing the village's economy. The decision suggested the renovation and reuse of vernacular houses as guest houses and/or as cultural and entertainment spaces particularly for tourism related uses. The opening of two guest houses through the reuse of vernacular houses is an example of the changes caused by the eco-village journey of the village. Although these changes can be evaluated as positive endeavours at the first glance, further exploration is needed to understand their impact on the typology of rural architecture of the village.

Consequently, the aim of the study is to explore two guest houses in Bağlıköy/Ampelikou which have been converted from houses, to examine the impact of their reuse on the vernacular architectural typology. The study is a case study, thus includes fieldwork, non-participant observation, and interviews as methods of data collection. The original typologies of the two houses are described and alterations to and adaptations of the houses are identified. Owners of the guest houses are interviewed in relation to the process of conversion.

2   The Reuse of Vernacular Houses

Vernacular architecture includes buildings, which are usually built by their owner or community with regarded to their environmental context, using existing resources and traditional technologies. They are built to meet particular needs and include the values, economies, and ways of living of the cultures that they evolved in (Oliver, 1997). Over the past several decades, vernacular architecture has been evaluated as a significant part of cultural heritage, and the conservation of vernacular buildings has become a field of study in itself. The establishment of The ICOMOS International Committee on Vernacular Architecture in 1976 illustrates this (Plevoets & Sowińska-Heim, 2018).

The one common issue that is pointed out about vernacular settlements in general and vernacular houses in particular is that they are no longer fulfil the requirements and expectations of people and therefore they are being abandoned. Abandonment negatively affects buildings and eventually causes damage. The best way of preserving buildings is to keep them in use (Feilden, 1994). Therefore, it can be stated that where there is abandonment, reuse, specifically—adaptive reuse, comes to the fore as an alternative to extend the life of a building. Adaptive reuse is defined by Campbell (1996) as 'converting an existing building to suit the needs of a new tenant or a new use—offers renewed vitality to tired, outmoded structures' (Campbell, 1996, p. 26). It 'is to make changes to accommodate a new use to continue the usefulness of a historic building' (Orbaşlı, 2008, p. 211).

The reuse of vernacular houses provides various benefits to the owners and to the community. The rehabilitation and reuse of outdated, old buildings is related to the preservation of cultural heritage in the circular economy (Vythoulka et al., 2021) and produces economic, environmental, and social benefits (Langston et al., 2008; Vythoulka et al., 2021). In the circular economy, the abandoned cultural heritage 'can turn from a "cost" to an "investment" for society,' contributing to the welfare of the community and creating job opportunities (Gravagnuolo et al., 2021).

Moreover, the reuse of vernacular houses enables the preservation of the rural architectural typology and rural architectural heritage. It helps to transfer cultural heritage to the following generations. Yet, if the new use is not appropriate for the typology of the vernacular house, then it might bring more harm than good. Before a decision is made, the issue of whether the new use is suitable for the building should be carefully considered, as well as whether the suggested new function and related changes will harm the cultural significance of the heritage (Orbaşlı, 2008). The original function is the most suitable option for conservation since it necessitates less change (Feilden, 1994). In contrary to this idea Campbell (1996) states that although traditional perceptions accept that reuse is the most appropriate when the new function remains close to the original function, sometimes radical new functions result in great success (Campbell, 1996).

If the intervention related to the proposed reuse causes serious damage to the heritage then the proposed function is not an appropriate one (Orbaşlı, 2008). For example, in some cases the originality of the historic building and its architectural elements were lost when the new functions were not suitable for the vernacular houses (Gazi & Boduroğlu, 2015). In other examples, vernacular houses experienced translocation and were reused for tourism purposes resulting in visual and spatial changes (Yusran et al., 2021), and vernacular houses that were reused as coffee shops experienced transformations (Pasha et al., 2021). In cases where issues may make reuse complicated, heritage buildings are frequently reused as museums (Ahunbay, 2011). In this respect, examples exist where vernacular

houses were reused as ethnography museums (Ahunbay, 2011). There aren't established conservation principles and methods for vernacular architecture, yet conserving this architectural heritage, making it a 'living heritage' and preventing 'museification' are general aspirations (Zhao & Greenop, 2019).

3 Methodology

Fieldwork was carried out for the data collection. The data collection tools were measured drawings, interviews, photographs and observations. Measured drawings of both the guest houses were prepared to investigate the plan typology of the houses and to explore the plan organization. In doing this, these houses were documented for the future. Interviews were conducted with the guest house owners. One of the interviews was face-to-face while the other was conducted via e-mail. The focus of the interviews was on the process of conversion, the realized changes and, the work carried out during the conversion. Photographs were taken and observations were noted to visually support the collected data, to introduce the guest houses, and to document the current condition of the guest houses.

4 Transmission of the Vernacular Typology Due to Reuse

Vineyard House and Ambelikou Guest House are the two guest houses in the village. These guest houses were explored in order to understand the transformation that they experienced while being converted from a house into

a guest house. The former is the first guest house which is not operating today while the latter is an active new guest house.

4.1 Vineyard House

The Vineyard House is a two-storey building (Figs. 1 and 2a–c). There are auxiliary rooms, two ovens, and a well situated in a courtyard. The guest house was converted from a house. The house belonged to the current owner's mother-in-law. The building was vacant for about 10–15 years and was in a bad condition before it was converted to a guest house. The idea to reuse the vacant house as a guest house arouse when the 'eco-village' concept had been introduced by the government, and the owners were encouraged in regards to this concept by the head of the society that was established to promote ecotourism. In total, there are three bedrooms in the guest house. The maximum capacity of the guest house is six people.

Originally the house was a one-storey building with two rooms—a kitchen and a multifunctional room that was used as a sleeping space and a living space. In addition, there were auxiliary rooms which were a laundry room, a traditional hammam, and a toilet. During the conversion into a guest house, the ground floor functionally remained the same (Fig. 3a, b). A window was added to one of the solid walls of the bedroom on the ground floor. The roof of the ground floor was removed and the house was transformed into a two-storey building. A wooden outdoor staircase, one wooden mid-floor, and one upper floor were added (Fig. 4a, b). The reason for adding an upper floor was explained as the need to have a sufficient number of rooms for a guest house.

Fig. 1 Vineyard house

Fig. 2 **a** Ground floor plan of Vineyard house **b** Mid-floor plan of Vineyard house **c** First floor plan of Vineyard House

(a)

(b)
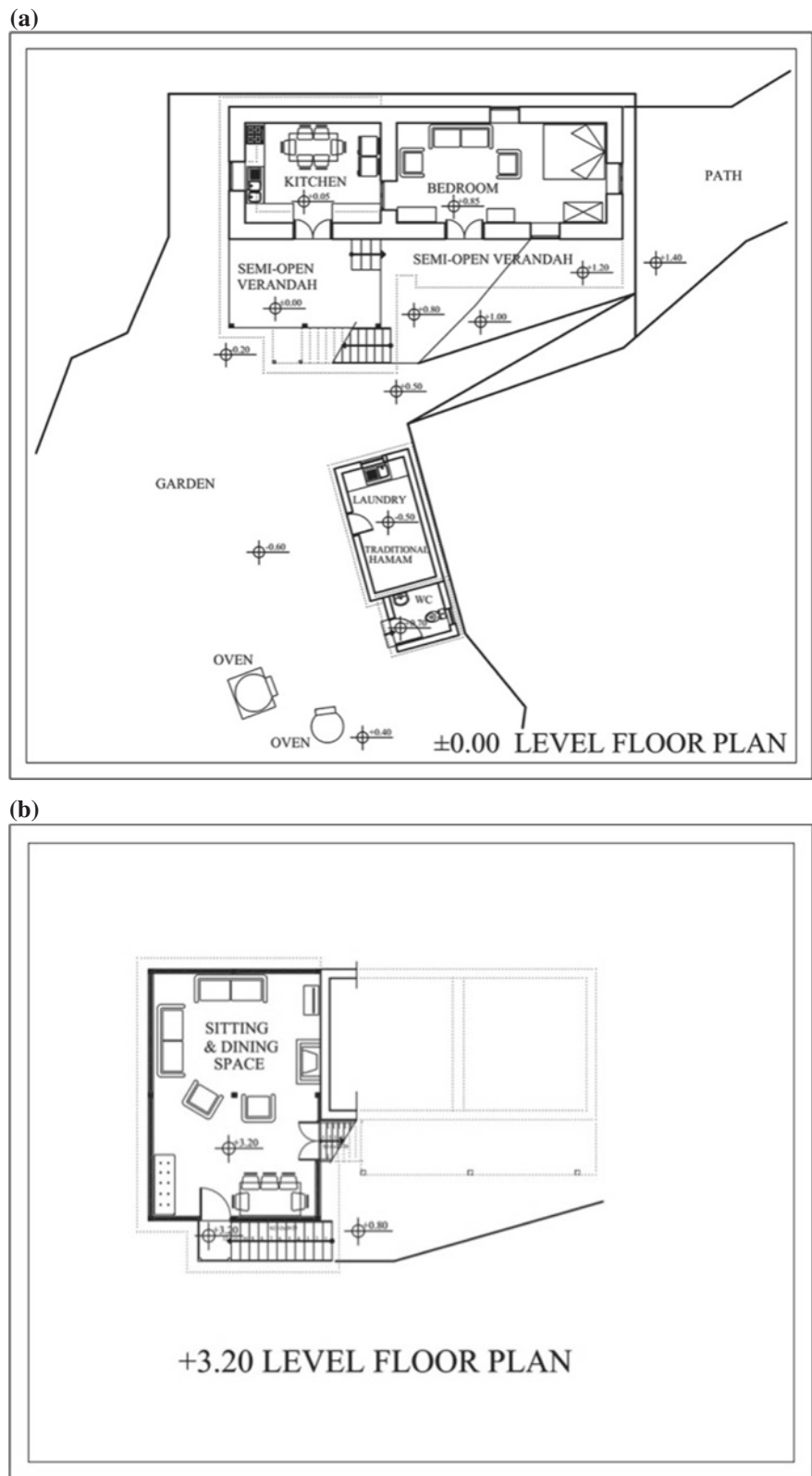
The wooden mid-floor is called 'çardak' by the owners. It is accessible via the wooden outdoor staircase from the courtyard and is used as a dining space and a living room (Fig. 5a, b). There is access from this mid-floor via a few steps to the semi-open wooden balcony of the first floor (Fig. 6a, b). Two en-suite bedrooms are provided on the first floor; both are accessible from the balcony (Fig. 7).

Fig. 2 (continued)

(c)

+4.80 LEVEL FLOOR PLAN
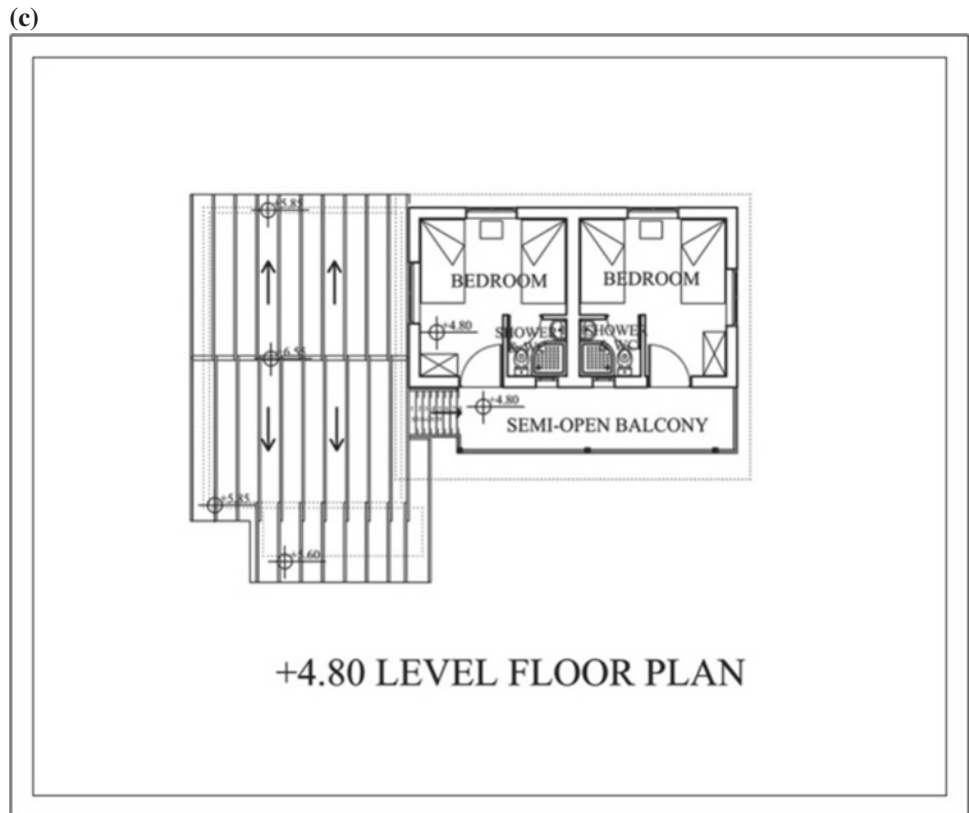
Fig. 3 **a**, **b** Views of a multifunctional space on the ground floor

(a)   **(b)**

The doors, windows, and flooring materials of the existing buildings were replaced with new ones. Courtyard was re-designed to serve for the new use and two ovens were built in the courtyard.

The planning process was overseen by the owners. No architect was involved in the planning and building process. The conversion took at least 2 years and was paid for by the owners. The project did not benefit from any

Fig. 4 **a** Wooden mid-floor and upper floor **b** Upper floor

Fig. 5 **a** View of a sitting area in the wooden mid-floor **b** View of a sitting and dining area in the wooden mid-floor

Fig. 6 **a** Wooden staircase, wooden mid-floor, and wooden balcony **b** Wooden balcony

funding. The owner likes every part of the guest house but the upper floor rooms and wooden balcony are her favourite areas.

As a result of the conversion process, the house visually and formally changed from one-storey building into a two-storey building. Thus, it can be stated that the vernacular typology of the building transformed as a result of renovation and reuse. However, the upper floor's wooden balcony was designed to be similar to those of vernacular houses (Fig. 8). Therefore, this element cannot be evaluated as an unfamiliar

interpretation. On the contrary, the wooden mid-floor is an unusual space and an unfamiliar design with no relation to the existing vernacular architectural typology. Although the wooden outdoor staircase is typical of vernacular houses in this rural settlement, the type and the position of the wooden staircase in this guest house are not the same as the ones in vernacular houses. Moreover, there is no functional change in the existing spaces. But, since the existing spaces were renovated in the process of reuse, there are material changes in this guest house.

Fig. 7 View of an en-suite bedroom on the first floor

Fig. 8 Example of a vernacular house in Bağlıköy/Ampelikou

4.2 Ambelikou Guest House

The Ambelikou Guest House comprises two buildings—a one-storey building and a two-storey building. The guest house was converted from a house. The one-storey building was the current owner's grandmother's house. Originally the house was a single room, and later—before the restoration—a toilet was added (Fig. 9).

The second building was two-storey (Fig. 10a, b). Originally the house was comprised of three rooms on the ground floor (a room, a kitchen, and a WC) and a single room on the upper floor that was accessible from the outdoor wooden staircase in the courtyard. Then, while in use as a house the owners added another room and included the outdoor staircase into this addition. In addition, the mezzanine floor was created. After this change, the ground floor

Fig. 9 'Şerife Nene' the grandmother room

Fig. 10 **a** Two-storey building of the guest house **b** 'Neriman Hanım' the mother room and 'Halil Usta' the father room

constituted of four rooms and the upper floor constituted of two rooms and a balcony (Fig. 11a, b).

The owner explains (P. Aziz, personal communication, February 6, 2022) how she decided to transform her house into a guest house as:

> The Bağlıköy Guest House project is one of the steps in the process of converting the village into an eco-village. Towards the end of 2011, some studies started which aimed to revitalize the abandoned village, to revive its cultural and architectural values, and to share its cultural heritage. The value and potential of the vernacular houses were explained to the villagers and they were encouraged to 'use' part of their houses for ecotourism purposes. However, only one house was transformed into a guest house. Although it received a lot of attention it closed as a result of various misfortunes. Experts who volunteered to convert Bağlıköy into an eco-village shared their opinion that I could be a role model in the village and that I could use my ancestral home for this purpose, and they encouraged me to take such a step.

There are four bedrooms in the guest house. The maximum capacity of the guest house is 10 people. The rooms are named after the ancestors of the current owner. The single room is called 'Şerife Nene' the grandmother, the room on the ground floor of the two-storey building is named 'Neriman Hanım' the mother, while the rooms on the first floor are called 'Halil Usta' the father (Fig. 12a–d).

There were no additions during the conversion to a guest house. However, the balcony on the upper floor was converted into a bathroom and a toilet. The building plan has mainly remained the same. Interior arrangements were made so that each room could operate separately.

In addition, new access points were provided. The kitchen window that was facing onto the courtyard was changed into a door. Thus, access was provided between the kitchen and the courtyard.

Fig. 11 **a** Ground floor plan of Ambelikou guest house **b** First floor plan of Ambelikou guest house

(a)

ŞERİFE NENE ROOM (GRANDMOTHER)

NERİMAN HANIM ROOM (MOTHER)

SHOWER&WC

BEDROOM

SHOWER &WC

COURTYARD

BEDROOM

WC

KITCHEN

RECEPTION

DINING ROOM

GROUND FLOOR PLAN

(b)

SHOWER &WC

BEDROOM

BEDROOM

VOID

TERACE

HALİL USTA ROOM (FATHER)

FIRST FLOOR PLAN
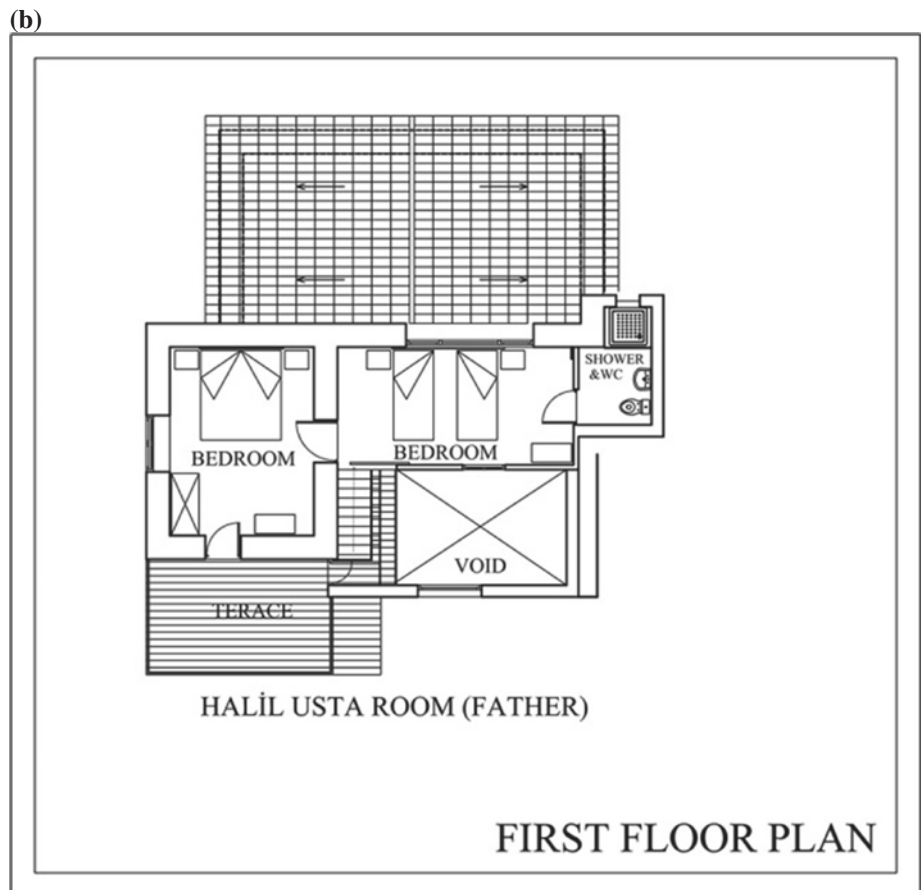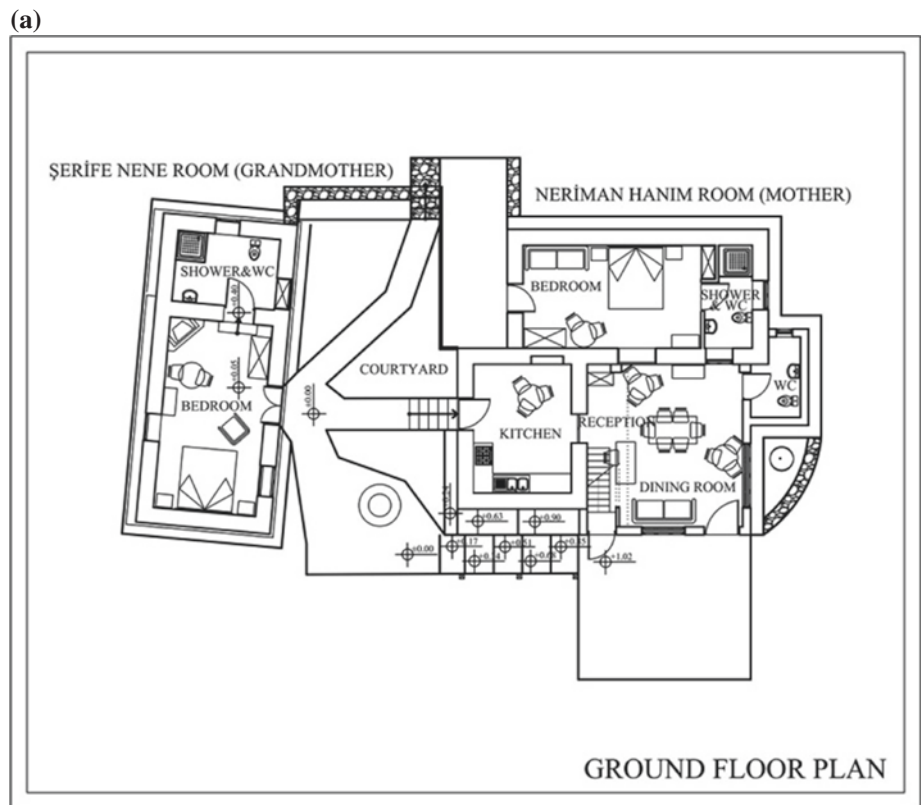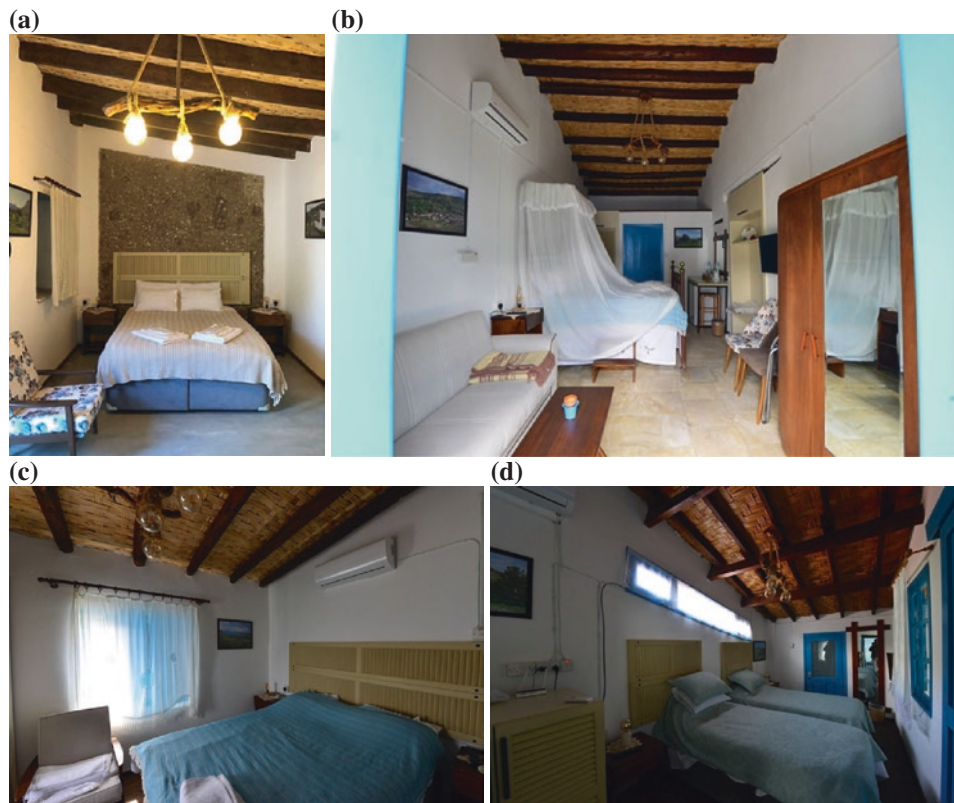
Fig. 12 **a** 'Şerife Nene' the grandmother room **b** 'Neriman Hanım' the mother room **c**, **d** 'Halil Usta' the father room

Fig. 13 **a**, **b** View of the reception space and dining hall

On the ground floor, the living room was reused as a reception space and a dining area (Fig. 13a, b). The access from this room to the 'Neriman Hanım' room was removed. The access to the 'Neriman Hanım' room was created by changing the window that is facing onto the courtyard into a door. An en-suite bathroom and toilet were included in the bedroom.

The staircase was separated from the reception room, and a door was added to the entrance to the staircases. By adding a door in front of the stairs, the access to the upper floor was made completely independent. An interior access was created between 'Şerife Nene' (the grandmother) room and a bathroom attached to it.

The conversion took one and a half years to complete. As explained by the owner, maximum care was taken not to use any material other than the original building materials. However, some new materials were used such as for the floor coverings. Also, the colour of the doors, windows, and

eaves was altered. The owner explained that this new colour is criticized by the villagers.

The project was directed by an architect who has experience converting vernacular houses into guest houses. The project benefited from the partial grant fund provided by the Turkish Republic of Northern Cyprus Ministry of Tourism, financed and supported by the Republic of Turkey Office of Development and Economic Cooperation and Çukurova Development Agency, within the framework of the development of tourism potential financial support programme.

The owner's favourite characteristics of the guest house project are that the unique character of the house and the connection between past and present have been preserved, that the house displays and preserves the culture, memories, and stories of their family, and that the old features and furniture were preserved and re-purposed as much as possible whilst decorating the house.

As a result of the reuse, there were spatial changes to the house such as alterations to the circulation within the rooms and within outdoor and indoor spaces, and changes to the use of space by adding bathrooms to the single rooms. There were also functional changes in relation to the new usage requirements. Also, the building's formal aspect has changed in one area where the balcony has been converted into a bathroom. Material changes occurred when the rooms were renovated. In fact, the house experienced formal changes while it was being used as a house.

5   Conclusions

The implementation of reuse as a tool to preserve cultural heritage might necessitate alteration to the vernacular typology. Alterations may be necessary in order to bring vernacular structures up to date and enable them to fulfil the needs and requirements of the time. Demand for new functions means a need for new spaces and/or spatial arrangements. Within this scope, two vernacular houses in Bağlıköy/ Ampelikou have undergone some transformations in the process of being reused as guest houses. One of the houses underwent serious alterations while the other experienced moderate changes. The one which experienced moderate changes had undergone a major transformation before the restoration, while it was in use as a house. Although the changes to both buildings cannot be ignored, it can be stated that the two vernacular structures have been structurally preserved as a result of the reuse process.

To properly preserve rural architectural heritage is significant in various ways. If the heritage building loses its originality and authenticity as a result of incorrect and inappropriate alterations then inevitably it loses its attractiveness. Consequently, it loses its role in tourism. In the rural settlements where ecotourism is an accepted tourism model this cannot be tolerated. Likewise, vernacular buildings that have lost their originality disrupt and mislead the vernacular architectural typology's transmission to future generations. Therefore, an understanding of the existing vernacular architectural typology is critical prior to adaptive reuse and also prior to any intervention.

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"Lessico Famigliare": Toward a New Paradigm of Spontaneous Rural Architecture in North-Western Sicily: From Historical Testimony of Peasant Culture to Sustainable Resource

Antonio Biancucci and Salvatore Oddo

Abstract

The research proposes a reinterpretation of so-called *spontaneous architectures* (Rudofsky, 1964) in the Sicilian north-western countryside, considering them as a system of "identity fortresses" and marking a paradigm shift in their interpretation, from a heritage of historical evidences of the consolidated structure of the countryside physical environment (Pagano & Daniel, in *L'architettura rurale italiana* [Italian rural architecture]. Hoepli editore, 1936), to a resource for the new housing needs of a contemporary society (Germanà, in *L'architettura rurale tradizionale in Sicilia: conservazione e recupero* [Traditional rural architecture in Sicily: conservation and recovery]. Publisicula Editrice, 1999). Single phantasmic entities are seen, not as isolated monads in the landscape, but rather intertwined by an invisible line, as protagonists of a narrative that reveals the *vital nucleus of architecture* (Culotta, *Insediamenti nuovi nella Valle dell'Eleuterio* [New settlements in the Eleuterio Valley]. Medina, 1990), allowing the construction of an identity through the recognition of the permanence of shapes in space. As dialectal phrases in the 1963 novel, *Lessico Famigliare* by Natalia Ginzburg, these sharp-edged prismatic volumes, embedded in the ground, mono-material and monochromatic from their base to the sky line, are a simple formal expression, having the strength to make a recognizable place and to establish their belonging to a specific territory. The relationship between territory and these small buildings is fundamental in the structure of the landscape which, considering the changes in the contemporary social and working organization, can drive toward the construction of a new *settlement geography*. Saving these lexical forms from oblivion, in order to pass them on to the next generations, does not simply mean *preserving* them but involves a further effort, finding the *right measure*, through even a minimal transformation, to re-establish a *natural relationship* with them (Collovà, in Piccole figure che passano [Small figures that pass]. 22publishing, 2012).

The identification of characters expressing a representative class of artifacts, reconfigured through the architectural project, is one of the objectives of this research, in order to produce new interpretative and operational keys of transformation, making these rural structures of north-western Sicily as places of an *in-fieri* tale, no longer simple historical attestations but places that serve the needs of individuals and communities, rediscovering the authenticity of the architecture *vital nucleus* in a contemporary Mediterranean setting.

Keywords

Spontaneous architecture · Rural architecture · Rural landscape · Mediterranean identity · Sicily countryside · Rural research

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1 Introduction

Spontaneous architecture is an expression that began to make its way into the architectural language since the mid-1950s to indicate buildings and artifacts located in the countryside. Before then, Giuseppe Pagano and Guarniero

Fig. 1 Epifanio (1922)

Daniel brought to light the theme of "minor", demonstrating how the small spontaneous architectures collected in the VI Triennale di Milano exhibition,[1] defined a-stylistic and pure,[2] were intended as pure *exempla*, the built expression of esthetical values linked to their functionality. The curators were interested in the origin and evolution of shapes, not in how the relationships between form and function are expressed in the architectural shapes but in the deep reasons that lead to these expressions and their connections with soil, climate, economy, and technology. Rural architecture represents the first and immediately effective achievement of man that takes his own nourishment from the earth, demonstrating the permanence of shapes that goes beyond the merely functional theme.

A few years later, in 1939, Luigi Epifanio studied the rustic architecture in Sicily and described it as the spontaneous fruit of the popular soul (Epifanio, 2021), permeated with naivety and grown, thanks to a particular feeling that on the island makes every house a sacred place (Fig. 1).

Nevertheless, a larger range of meanings and values were contained in these topics, more than a simple relationship between ethics and esthetics. Described by the title of Giorgio Muratore's essay, *Avanguardia e populismo nell'architettura rurale italiana fino al 1948*,[3] it could have been the perfect place where the principles of modern architecture merge with the peculiar problems of the Italian context. However, to fully understand the background of this event and its relationship with the Sicilian territory, it was notably the Fascist party that paid close attention to the development of agriculture and to expand lots of new settlements related to it, particularly in Central and Southern Italy, since its origin, aiming to reach the "ruralisation" of the entire society.[4]

Paradoxically the transition, craved by the fascist ideology, from the extensive parcels of privately owned lands to a small owner system of peasants, could be read as a short circuit that leads to the mythical origins of archetypical forms as in Marx's seminal point of view of the pre-capitalistic means of production. As described by Marx in his 1857–58's *Grundrisse*[5] the soil is the first natural workshop

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[1] See Ajroldi (2010), Ricchi (2021).

[2] Pagano and Daniel (1936).

[3] Muratore (1977).

[4] De Seta, C. (2008). *Introduzione* [Introduction]. Pagano (2008).

[5] Marx (1956). The book contains part of the famous Marx's *Grundrisse der Kritik der politischen Oekonomie* of 1857–1858 translated in Italian from its second version printed in Berlin in 1953.

of the worker, that has been dismantled by the dissolution of the system of small free landed property and of communal landownership. These conditions were organized in a network of relationships among equals, "co-proprietors", that constitutes a (natural) collectivity in fact, a "commune". This community is therefore a presupposition and not the result of the appropriation and exploitation of the soil. The earth, the soil, is the location, the "house", of the commune and its workshop, that supply raw materials, means, and instruments of work. Presence of individuals, as part of a community and as owner, is a natural prerequisite of the work and not its product, even if it is through the work that a real appropriation becomes a reality: thus, the land is the inorganic nature of individuals. Land ownership is the pre-bourgeois relationship of an individual with the natural objective conditions of his labor.

It is important to underline that the common ground, where the growth of this strange but effective architectural hybrid had been encouraged, was a mythological view of the Mediterranean, an epic and timeless sentiment of it, made of simple prisms, pure volumes with strong contrast of lights and shadows, an inner sensitivity to the construction of the landscape, with terraces following the sloping of the ground, pergolas, porticos, drinking troughs for herds, with practical and symbolic rule, all laying in a rarefied and captivating atmosphere, as well described for example by Benedetto Gravagnuolo.[6] Mediterranean culture is the point of a possible contact between European functionalism and national character, tradition, classic language in architecture, where it can still be found immutable, since they are timeless origins of form. Form is historical in itself, being on a thin edge among the intentional and arbitrary, even in the highest expressions of sophisticated architecture. We find these relationships in the work of various masters, Schinkel, Hofmann, Le Corbusier, Pagano, Neutra, Ponti, Michelucci, Cosenza, and many other important European architects working in this field and, not only idealistically but also physically, continuing the historical Grand Tour. The first half of the last century has been essential in this research on rural and vernacular architecture, particularly focusing on the idea of a common Mediterranean background, such that 1937 was described as the "year of Mediterranean fever".[7] We must remember here also the pivotal studies on rural architecture made by the historian Roberto Pane and by the geographer Renato Biasutti between 1920 and 1940, during a cultural period where the rural utopia of the fascist propaganda found its ideal environment.

The next cornerstone was laid by Giancarlo De Carlo who edited, in collaboration with Giuseppe Samonà and Ezio Cerruti, the exhibition "Architettura spontanea" as part of the Triennale di Milano of 1951. "Architettura spontanea" was based on small spontaneous buildings and on the unplanned growth of many urban settlements in Italy with photographic reportage in line with the Pagano and Daniel's Milano exhibition of 1936. Among the various contributions, particularly important have been the work *Rilievi di architettura rurale siciliana* made by a group of Sicilian architects led by Edoardo Caracciolo.[8] In Caracciolo's innovative reading of the territory there is a complex combination of history, economy, and social behavior where the primary knowledge can be found in the classical instruments of architectural drawing and surveying. Not only avantgarde and populism but also tradition and modernity were supposed to find their common cause in a new vision of the countryside. Even there, Caracciolo's operative idea of history was the river where everyone that would have liked to establish a true relationship with the environment, must have dived in.

A very special observer at IX Triennale di Milano was Carlo Doglio. In *Dal paesaggio al territorio*[9] we can observe his own fight to free the notion of landscape from a naïve conception of beauty that lingers on the surface of a perceptive comprehension, claiming for a more conscious understanding of the rules of its formation and development, so moving from the landscape to a scientific reading of the territory. Doglio's notion of landscape is an unreal stratification of contents originating by the transfer of our cultural mores and meanings, that rely on our feelings, since we can see, hear and perceive them. He dedicated an entire paragraph to a report of the "Architettura spontanea". From his comment we can learn that this section has been the most appreciated part of the whole 1951 Triennale.[10] His sharpened considerations take our attention toward the main question. Spontaneity is often intended as freedom but it's more important to see it as a kind of attribute that characterizes something that goes out from the well-known and strict schemes of the mainstream culture. We should identify spontaneous architecture not with some construction made freely by workers and bricklayers without a general plan or control by professionals but with every peculiar transformation of the environment, made by groups or individuals, where it is possible to individualize a step of innovation that brings everyday practise out from a sterile and fossilized tradition toward a better spatial expression of their specific needs. Doglio's interrogative is still relevant: how is it

[6] Gravagnuolo (1994). See also Rossi (2017).

[7] Irace (1988).

[8] Panzarella (2013b).

[9] Doglio (1968).

[10] *Ibidem*, pp. 185–190.

possible to make a positive evaluation, with an esthetic attribution of beauty, judging beautiful something that is related to a not always positive context, thus reflecting backwardness, poverty and negative conditions of life? Shall we just answer that it is only a matter of truthfulness, as truth and functionality could simply be synonymous, two sides of the same coin? Nobody had the strength to affirm that even if those buildings are functional, they also contain a lot of misery and that people living there would quickly buy a modern bourgeois flat if only they have been allowed to.

In order to enlarge our speech, we must also mention the contemporary research of Ernesto Nathan Rogers,[11] particularly referring to some pivotal points of his theory such as the environmental pre-existing conditions, the architectural phenomena and especially the idea of a monument. In Rogers belief we must intend a monument as "the House of Man", that is every architectural phenomenon able to meaningfully combine usefulness and beauty with ethic and esthetic. Since the second half of 1940s, in the context of academic courses and various writings and speeches, Rogers declared his interest in the evolution of a theory of monument, interpretating it not only as memory and exhortation but also as an archetypical event representative of a series of facts deriving from it and precisely thanks to its exceptional nature and character, so that it is possible to extend this role also to humble residential constructions overtaking the exclusively commemorative manufacts.[12]

In the following years, architectural culture became increasingly interested in the theme of spontaneous architecture.[13] Starting with the first exhibition of the cycle of events for the MoMA in New York in 1961 and continuing with his "*Architecture without architects*", Bernard Rudofsky brings spontaneous architecture into the world of architectural debate, demonstrating that the form of architectures without architects is built by adaptations, feeds on the minimal socio-cultural changes of history, collects the memory of peoples, yet at the same time has a character of timelessness and permanence. The beauty of the built forms is not accidental, because it is dictated by specific needs, but it is not intentional either, since it was not produced for esthetic purposes (Solano, 2017). It is an architecture without dogma.[14] In the search for a lexical connotation of the constructions of the countryside, over the years there has been talk of minor architecture, rustic, anonymous, vernacular, with more or less negative meanings. The term "spontaneous" instead commonly indicates an act, gesture,

or behavior made by free choice and decision of whomever carries it out, without imposition or coercion by others.[15] Starting from the observation of these small artifacts within the rural landscape of western Sicily, representative of the architectural heritage constituted by spontaneous architecture, their absence of dogma and freedom of expression lead us to question ourselves whether further processes of transformation of the existing environment can happen and by which ideological and cultural premises. This text, a prerequisite to an even broader research being defined, wants to prove yes: that is to say, the legacy constituted by such buildings can be the common background of a field of new forms of living.

2   For a Sensitive Transformation of the Rural Landscape

The Trapani countryside is dense with small objects that inhabit it in an apparently autonomous manner but which are appropriate in their shapes, sizes and relationships with their surroundings, as the result of a large-scale overall design of the landscape. Skeletons of residential and service buildings, "bagli" and single ghostly entities appear to us as isolated monads that have long been abandoned, reduced in some cases to more or less occasional storage rooms for agricultural tools or makeshift shelters for brief shelter from adverse weather conditions. So, is there still a link between contemporary society and these objects? Do we still notice their presence?

Yet these objects are testament to a complex past, which has known the large estates, the "fasces" of workers, the peasant strikes of the early 1900s (Costanza, 1996) and then the phenomenon of emigration, dictatorship and the rediscovery of the countryside thanks to Agrarian Reform, until the definitive abandonment of the countryside in the years of economic boom. Within the last century, "the assault on the Sicilian latifundium"[16] with the establishment in 1940 of the ECLS, Ente di Colonizzazione del Latifondo Siciliano (Sicilian Latifundium Colonization Authority), replaced in 1950 by ERAS, Ente per la Riforma Agraria in Sicilia (Agency for Agrarian Reform in Sicily) and then in 1965 by ESA, Ente Sviluppo Agricolo (Agricultural Development Agency), had great incisiveness for the construction of the rural landscape that we know today. As of December 31, 1965 (Fig. 2) in the province of Trapani 5

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[11] Rogers (1958).

[12] See also: Riegl (1985), Ruskin (1849), Giedion (1956), Gregotti (1988).

[13] See: Samonà (1954), Dorfles (1955), Gellner (1959).

[14] Rudofsky (1979).

[15] Item by *Il vocabolario della lingua italiana Treccani* [The vocabulary of the Italian language Treccani] (1987). Istituto dell'Enciclopedia Italiana.

[16] Basiricò (2009).

Attività	Province			
	Palermo	Trapani	Agrigento	Caltanissetta
1) *Terreni della riforma agraria*				
lotti	n° 3.838	n° 1.780	n° 2.806	n° 4.628
— terreni assegnati superficie	ha 18.047	ha 6.343	ha 10.185	ha 16.370
2) *Opere pubbliche*				
— sistemazioni idrauliche	ha —	ha 900	ha 1.980	ha 170
— dighe e traverse a scopo irriguo	n° 1	n° 2	n° 3	n° —
acque invasate	mil. mc 45	mil. mc 18	mil. mc 40	mil. mc —
— canalizzazione irrigua	km 55	km 321	km 456	km —
superficie servita	ha 650	ha 6.360	ha 8005	ha —
— borghi di servizio	n° 7	n° 5	n° 5	n° 4
— scuole extra borghi	n° 2	n° 1	n° 1	n° 1
— scuole professionali agrarie	n° 1	n° 2	n° —	n° 1
— strade di bonifica	km 110	km 50	km 55	km 34
— elettrodotti	km 62	km 37	km 13	km 7
acquedotti	km 20	km 8	km 15	km —
— approvvig. idrico bevai	n° 87	n° 53	n° 72	n° 20
3) *Case per assegnatari costruite dall'Ente*	n° 769	n° 470	n° 421	n° 1.000

Fig. 2 Activities of the E.R.A.S. in the western provinces of Sicily (as of December 31, 1965). From Valussi, G. (1968). *La casa rurale nella sicilia occidentale*

service villages[17] were constructed, representing an impressive built version of a De Chirico's painting, 2 dams, 50 km of reclamation roads and 470 farmhouses (Valussi, 1968).

The abstraction of the paintings of *Metafisica* combined with a deeply rooted tradition and reality could appear as the extraordinary features of an experiment that notwithstanding the failure of its naïve ambition left an important mark in the history of the Sicilian territory. All these interventions had many specific consequences on the development of a proper line of architectural language where paradigms of spontaneous building, derived from the observation of the tradition, were mixed with more polished features of classical composition and with the new contributions of modern architecture. Today in the Trapani area there are 37,255[18] rural buildings registered in the land registry, many of which belong to that forgotten past. Indeed they represent a resource that the architectural design can—and must—draw on for the construction of a new settlement geography and for the use of the agricultural landscape, in order to trigger new scenarios that can enhance the entire territory and to break down the countryside/city dichotomy that has characterized the past decades. This process is also possible in light of the current social and work dynamics that are increasingly allowing the individual to physically detach himself from the city to establish a new direct relationship with the natural environment,

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[17] Borgo Fazio (1940), Borgo Bassi (1940), Borgo Bruca (1952–54), Borgo Badia (1958–59), Borgo Runza (1954–60).

[18] Agenzia delle Entrate (2021).

without compromising the role he plays within the city community and the needs of everyday life.

But how to intervene? Which is the right approach for a "sensitive transformation" of the rural landscape and in particular of spontaneous architectures?

In 1997 Roberto Collovà answered these questions, talking about the *weight of history* that denies us a serene relationship, without the guilt of the remains of our past, so much so that it often leads us to specific and codified solutions, to choose between innovation and conservation, taking away from us the intermediate ground of transformation. The true task of architecture should be to train us for metamorphosis rather than to distinguish between old and new, between authentic and false. After all, the history of architecture is a process of metamorphosis made up of continuous tampering, changes, additions and transformations. The formation of a culture of sensitive transformation, hampered by ideologies and prescriptions, never based on a set of practices, can therefore offer a practical response to the modification of the agricultural landscape through existing resources inherited from the past.[19]

3   The *Vital Nucleus* of Spontaneous Architecture and the Reconstruction of a Story

A sensitive transformation can be defined as such only if it is able to maintain a continuity, or to establish the relationships between spontaneous and cultured tradition to weld them into a single tradition (Rogers, 1958). The role of Pasquale Culotta in this sense has been emblematic in the Sicilian modern architectural panorama,[20] in continuity with figures such as those of Edoardo Caracciolo and Giuseppe Samonà. Starting from 1978 he shifted the attention from the big cities toward a rediscovered interest in the rural territory, also through the publication of the "Quaderni neri",[21] in which written texts are confronted with photographic images and sketches, constituting a real narrative mechanism. In one of these texts Culotta refers to the novel by Natalia Ginzburg entitled "Lessico famigliare" (Family Lexicon), where the author finds in some local phrases and expressions the foundation of family unity, *«the testimony of a vital nucleus that has ceased to exist, but which survives in his lyrics».*[22] Ginzburg's writing is simple and the

reporting of phrases, words and idioms as they had been heard in the past brings the reader back to the spontaneity of the passing of family life. Culotta is linked to the concept of vital nucleus represented in the "Lessico famigliare" to draw a parallel with architecture:

> …anche nel territorio dell'architettura una semplice espressione formale, ripetuta nel tempo e nello spazio, ha la forza di far riconoscere un luogo da un altro e, in una certa misura, la stessa espressione formale con più efficacia di particolari aggettivazioni stilistiche, suggerisce l'appartenenza di una architettura ad uno specifico territorio. Il volume prismatico conficcato nel suolo, ritagliato da spigoli vivi e con facce dove prevale il pieno sul vuoto, è una forma diffusa in tutto il territorio siciliano. […] Scrutare tra queste ed altre forme lessicali dell'universo costruito facilita la scoperta del nucleo vitale dell'architettura, cioè rende possibile il riconoscimento del permanere delle forme nello spazio che perpetua l'identità di un luogo di vicende umane, storiche e linguistiche tra loro non sempre della stessa unità e composizione culturale. Al progettista questa scoperta apre straordinarie prospettive di attenzioni e di ricerca nei confronti dell'architettura costruita.
>
> (… even in the territory of architecture a simple formal expression, repeated in time and space, has the strength to make one place recognized by another and, to a certain extent, the same formal expression with more effectiveness than particular adjectives stylistic, suggests the belonging of an architecture to a specific territory. The prismatic volume embedded in the ground, cut out by sharp edges and with faces where fullness prevails over emptiness, is a widespread form throughout the Sicilian territory. […] Investigating between these and other lexical forms of the built universe facilitates the discovery of the vital nucleus of architecture, in other words it makes possible to recognize the permanent forms in space that perpetuate the identity of a place with its human, historical and linguistic features, that are not always part of the same unity and cultural composition. This discovery opens up to the architectural designer extraordinary perspectives of attention and research toward built architecture).[23]

It is important to underline that the concept of *vital nucleus* described by Culotta is not something theoretical or unreal but it refers to very precise physical and material characteristics by which the architectural shape is developed in the territory. For example, the various ways in which the prism is built represent the specific translation in the construction technologies of local expression of an area, as in the case of the milk of lime used to cover the volume in the area of Trapani, or the mix of mortar and vulcanic sand in the area of Catania, or again the siliceous mortar in the area of Palermo. These kinds of relationship makes particularly clear the connection between the vital nucleus of architecture and the various territories where it finds its own expressions. As we are going to see for the area of Trapani, the peculiar conditions of the area that we have examined are properly expressed in the features of the architectures,

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[19] Collovà (2012).

[20] See Biancucci (2010).

[21] The «Quaderni neri» was a series published first by "Regione e Design Editrice" and then by M.ED.INA. in which were published the results of the various Culotta's architectural design courses. The first issue, *Abitare a Gratteri*, was printed in 1978.

[22] Ginzburg (1963).

[23] Culotta (1990).
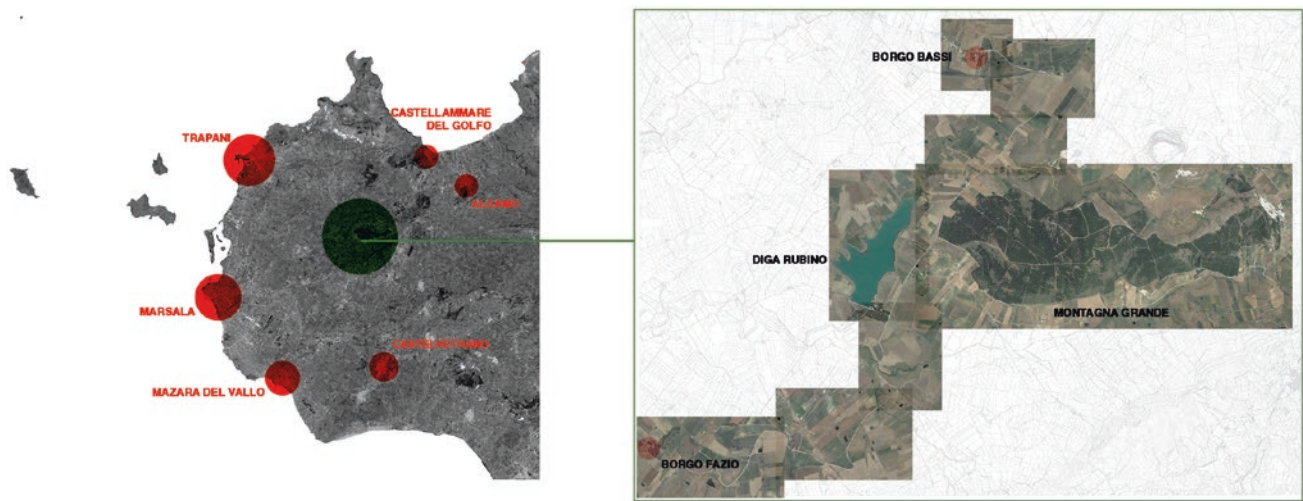
Fig. 3 Salvatore Oddo, geographical center of gravity of the "Libero consorzio comunale di Trapani"

representing a particularly interesting demonstration of the relationship between the small dimension of the object and the large scale of the territory and landscape. The search for the *vital nucleus* represents the prerequisite in architectural design for a reflection on spontaneous architectures that contains, from historical, social, territorial and landscape point of view, all the premises here described since now: the scattered settlement in the Trapani countryside.

The geographical center of gravity of the "Libero consorzio comunale di Trapani"[24] (Free Municipal Consortium of Trapani) is characterized by the presence of wide agricultural areas with low urban density. Precisely in this part of the territory (Fig. 3), 10 km away from each other, there are two rural villages (Borghi) built in 1940 by ECLS: Borgo Livio Bassi and Borgo Fazio. These two small villages, built as service centers around which the scattered settlement should have gravitated, were equipped with church, school, telegraphic post office, carabinieri station, pharmacy, artisan shop and food retailer. The distance of 10 km is not arbitrary, indeed the Ministerial Decree no. 7087 of 25 June 1940 concerning the land parcelization around the villages, required the colonization of the areas within a radius of 5 km from them.[25] In this area we find, in addition to the presence of the two villages, other important resources such as infrastructural (f.i. the Rubino Dam) and naturalistic elements (f.i. the Bosco di Montagna Grande—751 m).

Along the distance that separates the two villages, there are many spontaneous constructions that respond to the needs of rural families settled in the territory. These dwellings are made up of one or more buildings, organized along one or several axes, usually with gabled roofs. It is difficult to distinguish between permanent and temporary settlement houses, also because in the past they have often been transformed and adapted to the new needs of families and farmers. However, it is possible to hypothesize an occasional use, mostly in summer, for most of them; indeed, already in 1968, according to the researches made by Giorgio Valussi on the rural house in Western Sicily,[26] only 8.5% of the population, corresponding to less than a quarter of rural families, habitually lived in the countryside. Permanent and temporary dwellings, *bagli*, farmhouses and shelters are some of the types that can be observed in the portion of the territory investigated. In this paragraph we want to leave out the theme of the farmhouse, more structured from a pragmatic and constructive point of view. Instead, we want to linger on the temporary residences and shelters, often consisting of single or two-celled artifacts that, given their widespread presence within the territory, can be the starting point for future reasoning related to their refurbishment as constitutional elements of the landscape (Fig. 4).

3.1 The Temporary Settlement Houses

A large part of the temporary settlement, common in western Sicily, was used by many direct farmers who moved to the countryside with their families during the summer. Obviously this typology of houses, variable in shape and

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[24] Since 2015 it has replaced the regional province of Trapani.

[25] See Ajroldi (2019), Basiricò (2009, 2018).

[26] Studies conducted within the CNR "Research on rural residences in Italy" directed by Giuseppe Barbieri and Lucio Gambi.

Fig. 4 Spontaneous architecture in northwestern Sicily, ph Salvatore Oddo

size according to the title of ownership and the extensions of the land, was generally more neglected than the permanent dwelling (Valussi, 1968). Today we find mostly uninhabited houses, single-storey, two-celled or three-celled, with a main room, warehouse and a shed. In the main room, that rarely had large amounts of furniture, a small cooking area served by a shelf for dishes coexisted with a corner for rest (Fig. 5). The shed and the warehouse were often directly connected to the main room. Structures were made by load-bearing walls in local limestone or sandstone, with

a thickness ranging from 30 to 70 cm. Originally, the external surfaces were plastered with lime, but the wear of time and the characteristics of the material have caused the load-bearing masonry to emerge over the years. The generally shallow foundations are made with a simple enlargement of the wall section (Germanà, 1999). The roofs, today in some buildings collapsed due to a state of neglect and the degradation of the materials, are made up of wooden beams covered by the "coppi", a typical Sicilian roof tile. Internal floors are in beaten concrete, in beaten earth or in concrete

pinnata

pozzo-cisterna

f.

stalla
pagliera

cucina
camera

f.

f.

mangiatoia

0   2m

magazzino

stalla
camera

cortile

pozzo
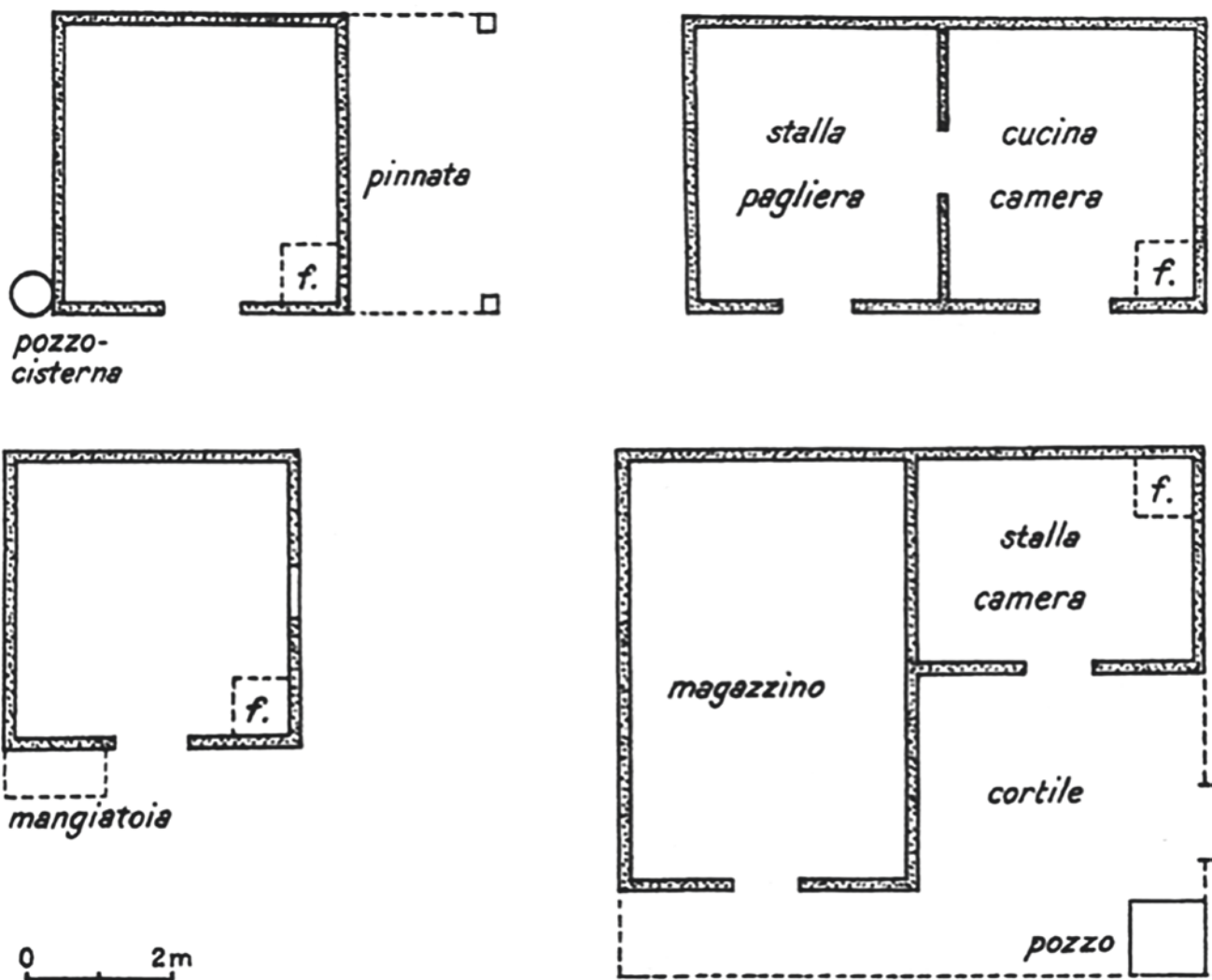
Fig. 5 Small shelter houses, From Valussi (1968)

tiles, commonly called "cementine", or even in irregular stone slabs. In some houses there are remains of "pinnate", the typical external shaded areas formed by ephemeral structures, metal or wooden covered with straw, which were often rebuilt annually.

3.2   The Small Shelter Houses

Even more common in the Trapani countryside are the *little shelters*. These are minimal units, mono or bicellular, spread with the division of landed properties and used by small landowners who cannot afford a temporary dwelling, or by tenants to deposit work tools, to keep cool food and drinks, to shelter from the sun during the hottest hours, possibly resting and to gain protection from sudden adverse weather conditions. The most common type is that of single-celled buildings, in the Trapani area also

called "macaseni" (warehouses) that have a better state of conservation than the other types, as they are still sporadically used as deposits. They have a rectangular plan, with dimensions of about 5×4 m and a modest height ranging from 2 to 3 m above ground. The walls are load-bearing in "tufo"[27] blocks joined with lime or cement mortar and often plastered only internally. Mostly they have a single opening toward the outside, placed in a strategic position respect to the land they serve and closed by an opaque wooden or iron frame. Sometimes there is a small window on the side of the door for the entry of light. The roofs are made of wooden beams covered with *coppi* but sometimes there are asbestos roofing still, widely used in the second half of the twentieth century in rural construction and today prohibited by law. Outside, in addition to the "pinnata" (a small

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[27] The typical local sandstone rocks still widely used in construction.

Fig. 6 Salvatore Oddo, Survey in the Trapani countryside. https://www.google.com/maps/d/u/1/edit?mid=1434Whng0SdqCQJcTuzZp-grKTxxltmL9&usp=sharing

attached external space with a light covering), we often also find masonry seats and a well.

Observing these objects we find ourselves in front of appropriate architectures, where everything seems to be present for a specific reason, and that enjoy a close relationship with the landscape. We read the changes, the new needs that have arisen, the small additions, the collapses, and the temporary solutions, where everything appears quite natural to us (Collovà, 2012). The landscape, understood as a living and changing entity over the passing of time (Zagari, 2006), teaches us that these stone testimonies, placed in the margins of historical events that led to the depopulation of the countryside, can be transformed and establish new relationships, useful as new housing for tourist-accommodation, for cultural needs or simply linked to the productive environment. The various surveys carried out and the cataloging of the analyzed heritage on the Google Maps platform highlight how their presence, not only within this area but extending to the whole Sicilian rural landscape, can be seen as a sustainable resource for

architectural design, generating new synergies between systems and thus allowing a reversal of the depopulation trend of the countryside (Fig. 6).

4   Rural Living in the Contemporary World

It is not possible to develop a design process on the theme of living without a deep knowledge of society, which must be incorporated within the totality of the elements of architecture and in its creative process (Rogers, 2006). The projects of Culotta and Leone[28] in their Cefalù studio, starting from the mid-1960s, express a strong connection with history and social dynamics, in search of a timeless monumentality, where the present instigates a moment of development. The prevalence of solids over voids, the skilful use of some elements derived by the regional lexicon, such as, for example, the oven, or "pinnata", are combined

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[28] Pasquale Culotta and Giuseppe Leone founded their architecture studio in Cefalù in 1965.

Fig. 7 Culotta e Leone, Casa Di Paola, 1976–78

with elements belonging to modernity such as the corner window or the large openings of the ground floor that allow continuity between inside and outside (Macaluso, 2017). The cycle of Cefaludesi houses[29]—Casa Ferruzza, Casa Di Paola (Fig. 7), Casa Kruger, Casa Migliore, Casa Cajozzo Facciolà, Casa Di Liberto, Casa Palermo, Casa Santacolomba—to which belong also their private houses in Timparussa and Piraro built respectively in 1978 and 1981, recently recounted on Domus[30] by Vincenzo Melluso and

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[29] See Panzarella (2013a).

[30] Costi and Melluso (2015).

Dario Costi, gives us an architecture that is placed in the panorama of the works of the *masters*.

The studies conducted in Eastern Sicily by Luigi Pellegrino and Fabrizio Foti[31] also move in the constant search for a local lexicon (Foti & Pellegrino, 2021). Their research embraces the heterogeneity of the types of rural architecture present in the Hyblean territory, from the "Masseria" to the "Villa", to the small single-celled building. Their design experiments are resolved in explicitly contemporary architectures, which use a modern lexicon, but are organically inserted in their specific historical and anthropic landscape, or, better, they build it because they belong to it (Cellini, 2020). Within the national territory, many young studios are now interested in the topic of spontaneous architecture and its refurbishment for housing purposes, without giving up their research of contemporaneity. Associates Architecture[32] exhibited the results of a 3-year research called "Spontaneous landscape" at the 12th Architecture Biennale of São Paulo and the 5th Lisbon Triennale, in 2019: *«The project consists of a catalogue of more than 200 anonymous architectures present in the places where we grew up that have been detected and redesigned»*. If in the previous decades the building the countryside was often interpreted as the creation of *ex novo* works, today architecture is increasingly called upon to deal with the existing, to preserve it, carrying out transplants, grafts, amputations, demolitions as constructions. Spontaneous architecture offers itself to the careful eye of the project to experiment with new possible forms of settlement linked to the theme of minimal living, which over the centuries has accompanied the history of humanity and which appears to us today as a duty. It is the task of architecture to manage the available resources, govern the metamorphosis of the landscape, seek a balance between the economic, cultural and social situation, and to focus on the essential characteristics, constantly working on that *vital nucleus* which is the soul of our lexicon, the link between past and future.

5   Conclusions

Architectural shapes are the result, as spatiotemporal reality and historical form, of the social structure that in its turn expresses the specific conditions of goods production. Spontaneous rural buildings are thus in a tight connection with nature, on a level of physical expression very close to it, rising from it. Abandoned volumes stand outside from the real time and space of life, purely laying in the abstract kingdom of capital. It seems to be as they don't have any physical consistency anymore since they are out from the domain of use, of usefulness, but exactly for this reason are turned into values now. The nature of this value that should be a socially established objectivity needs to be actually discovered in its relationships with society again. Indeed these artifacts are historically and spatiotemporally real but in lack of their "second nature", a specific social reality. Looking at these small forsaken volumes apparently scattered in the Sicilian country and surrounded by unrecognizable identities by now, we feel ourselves participating in the same feeling that Pier Paolo Pasolini described with challenging clarity of mind as "nostalgia for poverty",[33] as the lack of a definitively lost dimension of innocence. In the midst of the COVID-19 pandemic, what was argued by Pasolini during the energy crisis of the 1970s, when millions of people addicted to wealth and to the quality of life generated by progress and globalization were at the point of losing all their benefits gained until then, seems to be perfectly compliant to our contemporary condition. We have thus to interrogate ourselves about the true sense of distinction between "poverty" and "misery" again, evaluating the meaning of that maybe never existed image representing the proud smile of a culture, conscious of its conditions and not craving for progress, and the unbearable misery deriving from the loss of every point of reference. Now as then, Pasolini's prophecy tells us of an anxiety caused by the fixed belief of a history of mankind exclusively corresponding with the history of industrialization and wealth. As a result of this process of analysis, he resumed to write dialect poetry combining language and reality with an extraordinary effectiveness. We could establish an interesting comparison between the contrasting collision of the Italian language and regional dialects on one side, and the ruination of the rural vernacular architecture in front of the uncontrolled growth of silent concrete buildings on the other. What he described is the "italianisation" of Italy through the spread of an uncultured technical speech that obliged people to relinquish their regional "from below" cultures in order to achieve a national linguistic unity where literature has been replaced by some kind of corporate language. In Pasolini's vision, facing the apocalypse of modernity, a peasant farmer that speaks his dialect is the owner of his whole reality. The abandonment of spontaneous rural architecture in our built environment assumes the same role of the disappearance of dialects in the language, it means the loss of reality.

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[31] Researchers and professors of the SDS School of architecture of the University of Catania.

[32] Associates Architecture is an architecturar firm founded in 2017 by Martina Salvaneschi and Nicolò Galeazzi.

[33] Pasolini (1975). See also Venturi (2020).

Pasolini's topic helps us to introduce the work of the poet Ignazio Buttitta, a true master of Sicilian popular culture. The centralizing "fascistization" of our culture gradually but relentlessly growing by the development of capitalistic societies and consumerism that we have seen in the pauperization of the language and firmly rejected by Buttitta is the same that happened in architecture. In "*Lingua e dialettu*", one of his most known poems, he states how a community, even if it has been deprived of almost everything, continues to be "rich" by possessing its own identity and culture, even if this can mean a lack of freedom or misery in regard to the socially dominant class. As in language, we observe in architecture how popular identity and culture can be gradually dismantled when they enter in a continuous rapport with completely different economic conditions. This process generates a crisis that is similar to an itinerary of class awareness, in which serious results are a crisis of values, total loss of identity, a rejection of one's conditions, self-annihilation in the aim to reach a metamorphosis toward different ways of life. In a similar way, the destruction of dialect and the oblivion of spontaneous architectural expressions represent the break of a tradition. Remembering the words of Buttita from "*Lingua e dialettu*":

> Un populu/diventa poviru e servu/quannu ci arrubbanu a lingua/addutata di patri:/è persu pi sempri./Diventa poveru e servu/quannu i paroli non figghianu paroli/e si mancianu tra d'iddi./Mi n'addugnu ora,/mentri accordu la chitarra du dialetto/ca perdi na corda lu jornu.

> (The people/becomes poor and a servant/when their tongue is stolen/received from their fathers:/is lost forever./Become poor and servant/when words do not give birth to words/and eat each other./I notice it now,/as I play/the guitar of the dialect/that it loses a string a day).

As defined by Antonio Gramsci,[34] "canto popolare" is something that contradicts the official culture and demolishes it, as proper of its nature. If the community has modernized and lost its identity, being overwhelmed by the culture of standardization, therefore the popular poet, and we could also say the "popular architect"—considering architecture as a high expression of the community and its identity—can challenge his own people in the name of his own values. The turning point is not a return to vernacular but to reopen an experimentation matrix between high language and dialect, between "signature architecture" and spontaneous expressions. It's not a matter of escape but of "realism", targeting keywords, fundamentals and principles,

universally understandable and filtering them to elaborate a true modern synthesis.

As Marx indicated in 1857,[35] a single individual thus can't be an owner in isolation but this condition can happen only if he is a member of a collective in which he, in his turn, preserves an equality. An individual has a relationship with his language only because he is part of a natural collective, the same as with land ownership. Both are not possible as a product of a single man, both are ways of being of the community.[36] Capitalist development, since it's interested not in workers but just in work, reduced the possibility of keeping rural communities alive in the system of territory and agriculture. Agriculture was the occupation of free men in past classical civilizations that were founded on land ownership. In the modern age we have passed from the ruralization of the cities to the urbanization of the countryside. Therefore, now is the time to rethink the interrelationship between the individual and the community as expressed in the territory. Today the main point is how to move from this lost presence of the past community to that of tomorrow, proposing and experimenting in a positive short circuit the fundamental structures and relationships that connect man and nature.

In the present, being interested as architects in this field of research, means to test an integrated architectural design that includes a varying knowledge of restoration and re-use, structural reinforcement, energetic and environmental upgrading, agronomy, ethnography-anthropology, economics and territory marketing, regional planning, typology studies, and landscaping. These buildings can help us to generally rethink the relationship between cities and territories. Could our environment, since it is almost entirely urbanized, continue to keep an operative distinction between rural and urban space? Can we assume, as in many authors thinking, that the space of the city is spread throughout to the whole territory? That there is no longer any difference between artificial and natural? Is the system of built shapes our second nature exclusively, or is there still a chance to establish a positive process of redefinition of our relation with the environment through architecture? The rule of ancient peasants, as the "true builder of the human space", is no more replaceable than was intended by Branford and Geddes (1917) but our lands are not nature since they are mostly ruled and built by men. Maintenance and new ways of use are the key points where we absolutely need to invest.

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[34] Gramsci (1975).

[35] Marx (1956). The book contains part of the famous Marx's *Grundrisse der Kritik der politischen Oekonomie* of 1857–1858 translated in Italian from its second version printed in Berlin in 1953.

[36] See Sohn-Rethel (1974).

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The Most Common Problems of the Nineteenth-Century and the Early Twentieth-Century Apartment Building Structures and the Possibilities of Their Restoration

Klara Kroftova

Abstract

The nineteenth- and early twentieth-century tenement house is an important architectural phenomenon and a representative of the technical progress of rapidly developing European cities. In this context, the conservation of a large number of nineteenth- and early twentieth-century urban buildings of relatively high structural quality, in which many complementary structural elements such as windows, doors, floors, plaster, stucco elements, decorative paintings, etc., have been preserved, becomes increasingly important. The buildings of the nineteenth and early twentieth centuries often provide a very plastic image of the lifestyle of their time, while the principles and technologies of traditional craftsmanship are still preserved in their construction elements. However, the load-bearing and non-load-bearing structures of these houses nowadays show characteristic, recurring defects and failures, which are most often caused by defects in materials, degradation processes caused mainly by moisture, faulty design, execution, use and neglected maintenance. Not only the restoration of the wooden and stucco elements but also of the locksmiths and other exterior and interior components of these buildings often results in the loss of these elements and the deterioration of the expression not only of the building itself but also of the street frontage or the entire area. In many cases, knowledge of the nature of the disturbance can facilitate and accelerate the design of the restoration of a historic building without compromising its heritage values and without compromising the integrity of the building itself and the urban fabric. The paper presents an overview of the most frequently occurring defects and failures of the front elevation of urban apartment buildings of the mentioned period and, for selected examples, the possibilities of restoration.

1   Introduction

The construction of urban tenement houses in Central Europe in the nineteenth century accounted for a significant proportion of building projects. It can be stated that the floor area of these houses was directly proportional to the size of the city. In Prague, the capital of the Kingdom of Bohemia of the Austro-Hungarian Empire, three-, and in some cases, even four-storey houses were built in the most lively streets at the beginning of the nineteenth century. In the case of secondary streets, the construction of two- or three-storey houses prevailed (Fig. 1). Houses had courtyard tracts, often maximising the built space. The situation was different in other large Czech towns (e.g. Plzen or Ostrava), where two-storey houses were the most common, and one-storey houses in secondary streets. Similarly, in the former historical royal towns, one-storey houses were most often built, the two-storey house being the exception. At the same time, the smaller the city, the fewer rental flats.

The development of urban construction also brought the need to regulate it. Thus, during the nineteenth century, some of the most important areas of building law were clarified, especially in relation to fire safety. During the nineteenth century, three sets of building regulations were issued in the Austro-Hungarian Empire, which partly reflected the development of urban construction. The Czech Building Code (1833), the Moravian and Silesian Building

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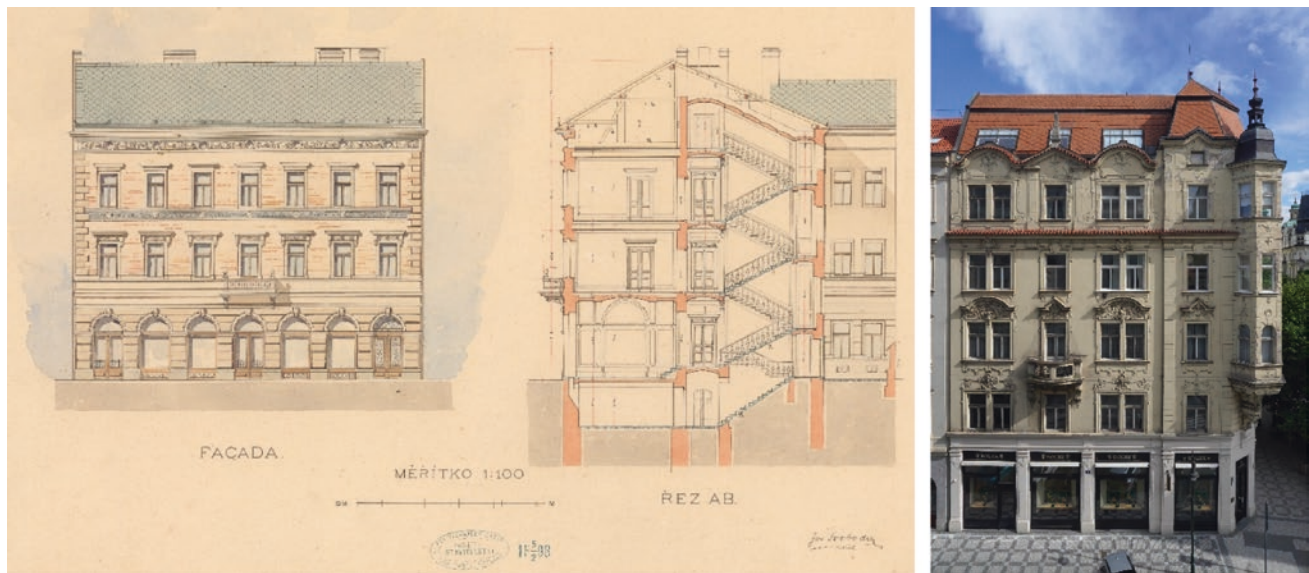
Fig. 1 **a** Elevation and section of a typical three-storey tenement house from the end of the nineteenth century on the student work of Svoboda (1898) (Drawing No. 315. Archive of the National Technical Museum in Prague: Fund 55—University of Technology Prague, Civil Engineering). **b** Photo of representative tenement house in Prague—Parizska Street, 1905 (photo by M. Bohac)

Code (1835) and a modified version of the Czech Building Code (1845) belonged to the wave of the first half of the nineteenth century. The second wave includes the Czech (1864), Moravian (1869) and Silesian (1883) building codes. The third wave is represented by the Prague Building Code of 1886, which was joined by other Czech towns in 1887: Plzen and České Budějovice, as well as the Czech Building Code of 1889, which applied to the rest of the country, and the two Moravian ones of 1894 (Ebel, 2007). These building codes remained in force until the end of the Austro-Hungarian monarchy and were largely adopted into the legal system of Czechoslovakia after the establishment of the country (1918).

2   Characteristic Details and Structures

The buildings, which were built in the second half of the nineteenth and early twentieth centuries, still form an important part of the city. However, many of them have defects and faults that damage their appearance and in many cases endanger their users. It can be summarised that defects and failures in the construction of urban tenement buildings are most often caused by design defects, defects in materials, degradation processes caused mainly by damp, incorrect use and neglected maintenance. The cause of the deterioration of the required properties of materials and structures is due, on the one hand, to the specific properties of the building materials (composition, structure, etc.) and, on the other hand, to the time-varying parameters of the external environment (temperature, humidity, etc.) that act

on the buildings and their parts (Roca et al., 2019). These parameters, together with material parameters, create conditions that initiate or accelerate mechanical, mineralogical, physical, chemical and biological degradation processes.

The topic of defects and failures of urban tenement buildings is very broad, this paper focuses only on the issue of defects and failures and the subsequent restoration of the parts that affect the image of the historic environment, i.e. the main façade—vertical load-bearing structures, external finishes and infill of openings.

2.1   Vertical Structures

Defects in vertical load-bearing masonry can be caused by poor design documentation or imperfect or incorrect execution. The most common execution defect is the failure to follow the principles of correct masonry jointing. The masonry defects that are subsequently manifested by the occurrence of failures, insufficient load-bearing capacity, low resistance to degradation processes and others include poor quality of mortar, poor quality of masonry elements and failure to maintain the flatness and verticality of masonry elements.

Failures of vertical masonry structures can be static, which require special attention (manifestations of these failures are excessive deformation and reshaping, cracks, crushing and local mechanical damage), or non-static, which do not have an immediate effect on the stability and static properties of the masonry structure (manifested in particular by increased humidity, chemical, mineralogical and biological

processes which deteriorate the desired properties of the structures and cause their progressive deterioration and disintegration—degradation processes, Fig. 2). The characteristic manifestations of mechanical failures of masonry are cracks (tensile and shear failures) and crushing (compressive failures), which occur as a result of insufficient bearing capacity, at points of stress concentration, as a result of load changes, long-term deformations, degradation and decay of masonry or as a result of non-professional interventions (Anzani et al., 2018; Witzany, 2018). The most common causes of this condition are poor quality and compressive and tensile strength of masonry and some other influences, such as different properties of mixed masonry elements, low compressive and tensile strength of masonry elements and mortar, etc. Another important factor that affects the quality of masonry is increased moisture and salinity and associated degradation processes (Cooper, 2018).

Stabilisation and strengthening methods for partially disturbed masonry include:

– For superficially disturbed masonry structures (masonry degradation and weathering), it is necessary to remove all disturbed parts of masonry elements and remove weathered mortar from joints to a depth of 30–50 mm (manually or mechanically, with pressurised water, etc.), to perform a deep grouting of all bearing and contact joints with activated fine-grained lime or lime-cement mortar, or with a special polymer-cement mixture. The mechanical properties and composition of the mortar mixture should match the original mortar, while the compressive strength of the mortar must be less than the strength of the masonry elements (Witzany, 2019, 2020).

– Damaged masonry elements must be replaced with new ones or partially replaced by so-called 'sealing'. The disturbed part of the masonry element is mechanically removed except for the intact, healthy part or the entire masonry element is removed and a modified 'seal' made of the same type and material of the masonry element is fitted into the resulting hole to the appropriate dimension. In some cases, after the removal of the disturbed material to a greater extent, a repointing is carried out.

– Partial disturbance of the masonry structure, e.g. at the location of ceiling slabs, penetrations, etc., requires first adequate structural protection and only then the removal

Fig. 2 The most common failures of structures from the second half of the nineteenth and the early twentieth centuries caused by degradation processes initiated in these cases by the combination of moisture, an incorrect design solution and neglected maintenance (photo by K. Kroftova)

of the disturbed masonry down to the intact part. The opening thus prepared is preferably made of similar masonry elements and bonding material to that used for the original masonry; in justified cases, a higher brand of mortar may be used in the area of, e.g. beam placement, or a load-bearing joint may be made in the thickness of the beam, 50–80 mm of fine-grained concrete reinforced with mesh.

– Brickwork with insufficiently load-bearing mortar can be strengthened by removing weathered and low-quality mortar to the maximum achievable depth (75–100 mm), after cleaning and moistening the joints, by deep filling the joints with high-quality mortar with a strength less than that of the masonry elements.

– Local cracks (active, passive) tensile and shear cracks require securing against their further development and propagation (Thomaz et al., 2014). If the masonry in the vicinity of local cracks is not disturbed or of poor quality, so-called stitching (stapling) can be applied using steel staples made of circular steel with a periodic surface of higher quality Ø 14–Ø 25 mm, or staples made of specially profiled high-strength steel (e.g. Helifix), properly anchored in the bearing masonry (Fig. 3). Careful consideration must be given to the possibility of new cracks forming, particularly at the anchorage points of the clips. The clips should be arranged perpendicular to the ongoing crack with a sufficient overlap of, e.g. at least 0.5 m on each side. Shear and tensile stresses are generated in the area of the anchorage of the staples, which can cause new masonry failure.

2.2 Surface Finishes, Plasters

Surface finishes belong to the group of the most exposed parts of historic buildings, often with a high degree of degradation and disturbance caused by permanent exposure to the external environment (both exterior and interior).

The most common defects of plasters include lack of binder, unsuitable filler properties (e.g. high proportion of clay components or wide granulometric spectrum, etc.), water absorption, unequal (different) thermal absorption of individual layers, different diffusion permeability of the plaster layer and insufficient adhesion to the substrate (Rovnanikova, 2002). The individual defects, or the synergistic interaction of the named defects, and the action of the surrounding environment contribute to the intensity and kinetics of the failures, which are manifested primarily by changes in the structure and overall disintegration, delamination and disintegration of plaster layers and finishes, loss of adhesion from the underlying structures, formation of cracks, and change or loss of colour and finish.

The primary and most frequent cause of progressive deterioration of external plasters is increased humidity (vhm' 4%), which is accompanied by chemical, physical and microbiological degradation processes (Fig. 4), which
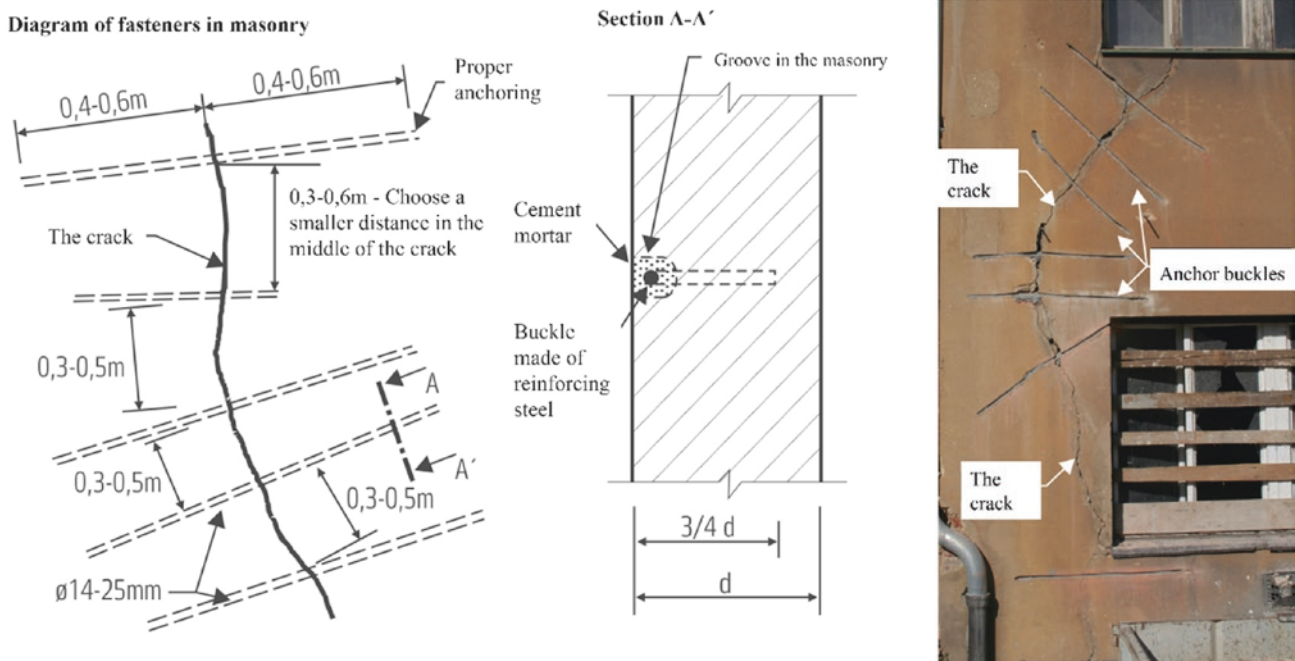
Fig. 3 Stitching of masonry breached by crack reinforcement inserted in the front of drilled grooves (Witzany, 2018)

Fig. 4 Examples of damaged exterior plaster surfaces caused by increased humidity and related chemical, physical and microbiological degradation processes (photos by K. Kroftová, T. Čejka)

induce corrosive and degradation processes of the plaster layers, associated with changes in their properties over time, colour changes and disintegration of the structure. Moisture, which has a multifaceted effect on building fabrics and structures, is decisively involved in degradation processes and ageing of materials and structures (ageing—gradual loss of initial physical and mechanical properties or other properties over time).

Characteristic manifestations of plaster degradation include:

– Alteration and disintegration of the plaster structure.
– Delamination and disintegration of the plaster surface layers.
– Efflorescence and the formation of surface crusts with different physicomechanical and chemical properties from the plaster core.
– Disturbance of the masonry-plaster adhesion caused by volume changes and interaction between the different plaster layers.
– Disruption of the plaster by cracks or other manifestations of mechanical effects (static and dynamic) on the plastered masonry.
– Disturbance of the plaster in places where moisture accumulates in the plaster (defective flashings, cornices and projections, grooves, welds, wiring and anchoring of installations and wiring, lightning conductors, etc.).
– Colour changes and the deposition of soluble salts on the plaster surface.

– Colour changes and distortion of the plaster due to differences in the thermal and moisture absorption of the substrate.

In relation to the manifestations of degradation, it is possible to choose an appropriate restoration procedure so that the requirements of the conservation of monuments are met, especially in the sense of preserving the values of the monument and its surface treatments. As part of plaster restoration, many actions are carried out, including consolidation, salinity reduction, cleaning, sealing and filling, removal of inappropriate additions and retouches, new retouches, etc. The consolidation and rehabilitation of plasters with a degraded bonding component, disturbed structure, insufficient adhesion of the individual plaster layers to the masonry surface, increased salt content in the pore system and surface crusts is a challenging task in terms of stabilising such disturbed plasters and finishes. The specific problem to be solved in these cases is in particular the restoration of plaster with wall or ceiling paintings or the restoration of neo-Renaissance sgraffito plaster.

The basic aim of consolidation is to improve the mechanical properties of the materials, to strengthen the subsurface and surface layer and to return to a state close to the original properties of the material being treated. The role of the consolidant is to stabilise the disturbed plaster system or to replace the 'stripped' original bonding material, ideally with a material of identical properties. Important prerequisites for the area and depth consolidation

of disturbed plaster material include open, capillary-active pores into which the consolidant can penetrate in liquid form (Dunajska, 2012).

Before any preservation or restoration steps can be taken, it is first necessary to conduct thorough historical, structural engineering, restoration and possibly other surveys of the plaster and associated structures. An important part of the preparation of the restoration is the analysis of the historic plaster, which can determine the chemical and mineralogical composition, organic content, water-soluble salt content, aggregate granulometry, pH value, moisture and porosity, etc. In order to choose the right rehabilitation procedure for the repair of the historic façade, it is also advisable to verify the strength of the existing plaster, its absorption, the adhesion of the different layers, the resistance of the plaster to tearing, the stratigraphy of the plaster layer and to specify the last finish and its adhesion to the substrate. Based on the results of the surveys, it is then possible to select an appropriate restoration procedure for the damaged historic surface.

When restoring the plaster, the primary task is to salvage the plaster, i.e. to stabilise the plaster surfaces with compromised adhesion to the substrate by grouting or by repointing and undercoating the edges with lime plaster. The stabilisation work also includes the addition of missing parts of the plaster, sealing of bricks, etc., while the new additions must be compatible with the original being added, i.e. they should be as close as possible to the original plaster in composition, properties and manner of execution. Differences in the properties and behaviour of the newly refinished and the original surviving surfaces and surface heterogeneity may cause disturbances in apparently undisturbed remnants of the original plaster (different heat and moisture absorption, volume changes, etc.).

The principle of plaster consolidation is based on returning the binder to the structure, filling the resulting voids and filling cracks, or increasing the adhesion of the plaster to the substrate and removing salts contained in the pores of the plaster. The added material should be as close as possible to the original material in terms of physical, mechanical and optical properties, the decisive properties being strength, porosity, structure, thermal absorption and adhesion or penetration. After the restoration intervention, the appearance, colour and texture of the new accessories and restored parts should be as close as possible to the original material.

The idea of reintroducing the missing binder into the plaster is based on one of the oldest methods of strengthening, which meets a wide range of conservation requirements (Girsa & Michoinová, 2015). This technology uses a solution of calcium hydroxide (lime water) to strengthen lime plasters, which reacts with airborne CO_2 to produce carbonates of the appropriate cations. The principle of mortar

strengthening by lime water saturation (Tichy, 2004) is based on the introduction (reintroduction) of the binder (i.e. dissolved $Ca(OH)_2$), the recrystallisation of the plaster and subsequent carbonation (Rovnanikova, 2016). The limitations of this method are based on the nature of the consolidant. With a water absorption of 25 to 30% and an average plaster thickness of 2 cm, 5 L of lime water per square metre, i.e. approximately 8 g of $Ca(OH)_2$, can theoretically be injected in one application cycle (Thus, after 60 applications, 480 g of active substance will be added per square metre, but this is only a fraction of the original amount (the original amount of $Ca(OH)_2$ can be calculated in kilograms; Gothic, Renaissance and Baroque mortars were rich in lime binder, where the ratio of lime slurry to sand ranged from 1:0.5 to 1:2.2, which corresponds to the use of approximately 100–120 kg of lime to prepare 1 m^3 of mortar. Successful lime water hardening only applies to the plaster layer itself, or to the close packing of the plaster. The advantages of consolidating plaster using this material include, in particular, its chemical and physical compatibility with the binder of the material being treated (Drdácký, 2015).

In recent years, dispersed and colloidal systems not only of organic consolidants but also of mineral systems with particle sizes in the nanoscale have taken an important position. The properties of nanomaterials with a particle size up to 1 μm are a kind of intersection between properties at the level of molecules and matter (Baglioni et al., 2012; Kotlik, 2012), they possess positive physical–mechanical characteristics such as high chemical performance, excellent plastic, consolidation and diffusion properties, cleaning abilities, etc. Among the nanomaterials tested are mainly nanodispersions based on hydroxides, carbonates, or sulfates (Baglioni, 2005; Giorgi, 2008; Grassi, 2007; Kroftova, 2019). Approximately 15 years ago (2006), the application of nanotechnology-based processes in the consolidation of plasters and murals provided successful evidence of the potential of nanomaterials for the preservation of cultural heritage (Fig. 5). Positive properties of these materials include excellent water vapor permeability, lack of chemical alteration or gloss effects and absence of surface hydrophilic film formation.

2.3   Fillings of Openings

During the restoration of historic or listed buildings, one of the important tasks is the restoration of window, door, entrance and other openings that show defects caused by natural ageing of the material, exposure to the external environment, use and neglected maintenance, etc. The basic prerequisite for the care of historic infills is their identification and recognition so as to avoid irreversible interference with older structures or their destruction (Solař, 2010).
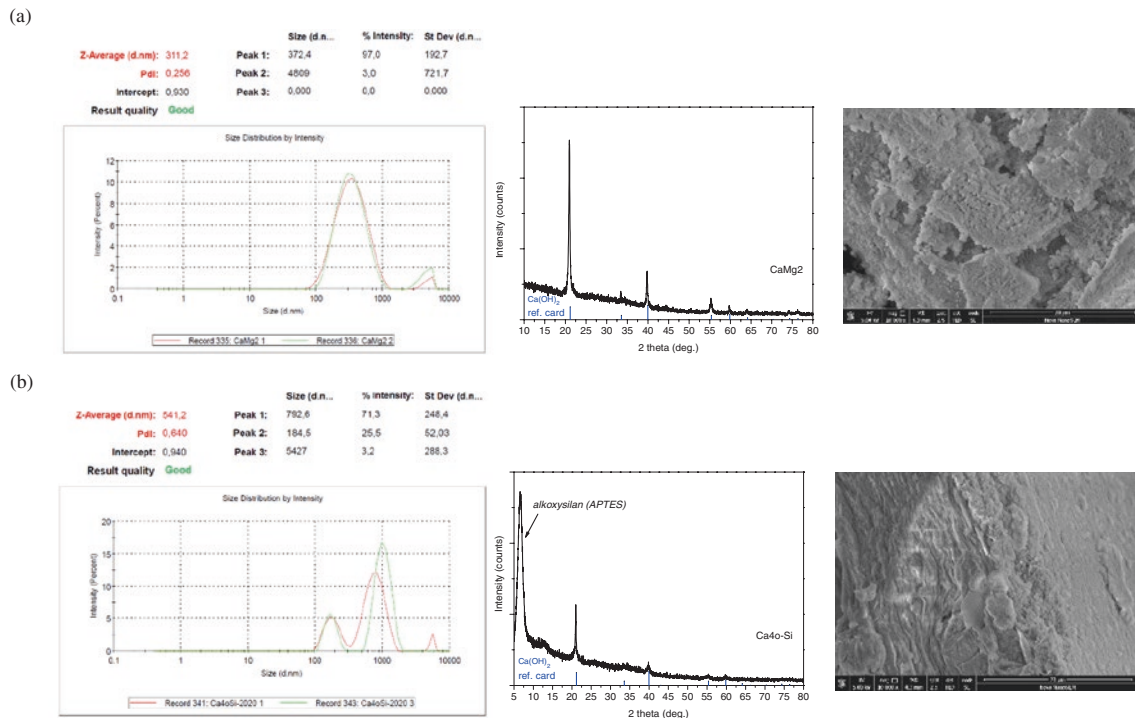
Fig. 5 The grouting agents based on calcium hydroxide nanoparticles were developed within the research project (NAKI II DG16P02M055) in cooperation with the Faculty of Civil Engineering and Centre of Polymer Systems (Tomas Bata University in Zlin). The highest degree of strengthening was achieved by "CAMg$_2$" nanosuspensions (by ca 50%), then "Ca$_4$O–Si" (by ca 35%). The main characteristics of the prepared samples were documented using the dynamic light scattering (DLS) method, the XRD diffractogram and the SEM microscopy, that show the morphology of the sample: **a** "CaMg$_2$"; **b** "Ca$_4$O–Si"

Detailed documentation will not only enable the recording of the structural and technical condition but also protect the fillings of the openings from being stolen during construction works (Kroftova, 2021).

During the restoration of infilled openings, we may encounter defects and failures that are easy to remove (e.g. degradation of finishes, puttying, etc.) and failures that require individual assessment and more extensive intervention to remove (e.g. wood rotting or sagging, etc., Fig. 6). When assessing the structural and technical condition of infill openings, it is advisable to pay attention not only to the timber (or metal) parts of the frames and infill but also to the glazing, paint and other finishes, fittings, flashing, the method of fitting the window or door infill, the relationship to the masonry lining, the plaster and its paintwork, etc.

The most common defects and faults in window and door openings are as follows:

– Paint degradation or surface degradation of the wood.
– Sagging of window and door sashes due to loosening or displacement of hinges.
– Leaks at the junction between the window or door sash and the frame or frame frame, which may be caused by minor sagging of the sash, wood shrinkage, too many coats of paint, etc.

– Twisting of window or door profiles due to loss of wood strength or uneven stress.
– Infestation of the wood by rot, wood-destroying fungi or insects and significant degradation of the parts exposed to the weather, or their complete loss.
– Non-functioning fittings, loose nails and fasteners.
– Defects and failures of glazing or framing.
– Unsatisfactory structural and physical properties, both thermal and acoustic.

In many cases of restoration of historic buildings, it is necessary to carry out, depending on the overall condition and functional characteristics of the building and its parts, craft repairs, conservation or restoration or even replacement (e.g. of unsuitable plastic windows, etc.) of existing window, door, entrance and other fillings. A specific approach is required for the reconstruction and restoration of windows and doors that are part of listed buildings. In cases where some of the destroyed part of an opening has to be replaced, one of the basic requirements of heritage conservation is to consistently preserve the authentic appearance of the replaced parts, i.e. to take care as far as possible to maintain continuity with the original design in the choice of materials and craftsmanship. For this reason, the complexity of the reconstruction of the opening fillings is closely

Fig. 6 Examples of the most common window failures—damage to the surface finishes, degradation of the window frame and damage to the sealant

linked, among other things, to the availability of original materials and parts or their faithful replicas (e.g. glass, hinges, handles, etc.). This places increased demands on the restoration and, above all, on the expertise and experience of the craftsman.

Particularly in the case of listed buildings, the valuable elements (of the whole or part of the infill) must first be identified so that the restoration does not disturb, damage or lose the heritage value of the historic infill or part of it. In cases of extensive disturbance to the historic infill, in accordance with the requirements of conservation, a copy or replica of the original windows or doors may be made without seriously damaging the overall expression of the monument or historic building.

The restoration of window openings in listed buildings should be based on an assessment of the structural and technical condition, identification of the heritage values (Schubert, 2010) and should be based primarily on:

– Craftsman's repairs, conservation or restoration of original parts of the opening filling.
– Preserving the original visual impact—in particular the shape and size of the window or door panels, their profiles and articulation, the use of similar paint or preservative products, the transparency and structure of the glazing, the preservation of the original fittings, hinges handles, etc.
– The preservation of the original parts and design principles of the infills or parts thereof.

In the case of small-scale modifications—e.g. hanging of sashes in hinges, loosening of joints of parts of window and door sashes, loosening of glass or wooden fillings and fittings, repair of local disturbance of wooden elements of window frames and sashes, etc.—it is possible to achieve preservation of original historical window and door openings with a qualified procedure in the form of a complex restoration. When adding extensively damaged sashes and frame parts, the original materials, design and workmanship must be fully respected. Attention must be paid to all other valuable components of the window and door infill, e.g. shutters, ventilation windows, built-in elements, glazing, hardware, sill plates and rainscreen, etc.

Components of window and door infill in historic buildings also include hardware and locks, shutters, metal grilles and other elements, the restoration of which is subject to the same rules as the infill itself.

In the case of openings with high heritage value, which are works of fine art and craftsmanship, it is appropriate to proceed to conservation or restoration, whereby sensitive removal of dirt and rehabilitation of damaged parts (e.g. infected by mould or wood rot, fixing of loose parts, etc.) is carried out while preserving traces of the age and layering of the element (e.g. preserving traces of missing fittings or worn areas). When preserving window sashes, no changes are made to address the problem of thermal performance; in this case, the heat loss through the window panes and the issue of condensation on the window frames and glass panes must be assessed and appropriate measures taken. The restoration approach should be applied to the restoration of all Baroque and Classical window and door openings.

The following procedures can be applied to the restoration of door panels in historic buildings (Fig. 7):

– Perfect craftsman's restoration, including reinforcement of door frame hinges or fixed hinges set in masonry or stone frames, straightening and fixing the shape of the

Fig. 7 Examples of the most common door wing failures—damage to the surface finishes and wood degradation

door leaf (depending on the extent of deformation, e.g. drooping of the door leaf), so as not to disturb the finish and the historic expression of the door leaf.

– Replacement or addition of parts of the original door frame and door panel damaged and disturbed by unprofessional intervention, including modifications to ensure the functionality of the door panel, restoration of the surface finishes, all interventions and modifications to be carried out using identical materials and technological procedures.

– The replacement of door panels, hinges and frames and the replacement with a new door structure whose material and shape and design correspond to and are in keeping with the original character of the historic structure.

Where there is a need to take into account current building physics requirements, four basic alternatives are offered for the treatment of window infill restoration:

– A perfect craftsman's restoration, which respects the original element and makes minor repairs to restore it while retaining the original fenestration, details and elements (i.e. clean the window frames of old and degraded finishes, fix loose joints and metal elements, and replace glass, gaskets, flashings and other components).

– Replacement of single glazing with special 'thin' double glazing that allows the original window sashes to be retained; however, in this case, the rigidity of the existing structure and its ability to cope with the increase in load without compromising sash opening and tightness, the possible increase in the size of the window frames (due to the new fixing of double glazing), the characteristics and type of glazing must be considered.

– The design of the new window profiles to allow the installation of double glazing while maintaining the proportions of the window panels as far as possible.

– Innovative additional solutions such as second internal glazing (i.e. if the external appearance is required), thermal pocket between windows, forced warm air flow in front of the window in the interior, etc.

On the basis of a careful survey of the condition of window and door infillings in the restored historic or listed building, decisions should be made about each separate infilling and its parts individually so as to give priority to the requirement to preserve as many of the original window and door infillings as possible on site and only in exceptional cases to the option of replacing the historic (original) infillings with copies or replicas. In terms of possible subsequent repairs, it is advisable (especially in the case of more extensive intervention in the design of the original historic infill) to preserve selected valuable segments and store them in the depository as a model (e.g. damaged window sash, fittings, part of the window frame and shutters).

3   Conclusion

More than 70% of the building stock needed for the development of society in the twenty-first century has already been built. This large stock needs to be maintained and adapted to new conditions and requirements. The renovation and maintenance of the existing building stock should be the subject of increased research interest worldwide. Research should focus primarily on the issues of objective assessment of the structural and technical condition

and residual life of buildings, addressing the increasing requirements for reliability, functionality, energy efficiency and healthiness of buildings, environmental impact, recycling of building materials, etc. The issues of defects and failures, degradation processes and the design of building reconstruction cover a wide range of issues of an interdisciplinary nature, from the natural sciences, materials engineering, mechanics, flexibility and statics of building structures to knowledge of historical materials, structures and technologies. Knowledge of historic structures, materials and construction methods used can prevent errors in the restoration of historically significant, especially listed, buildings.

This paper summarises the most common defects and failures of vertical load-bearing structures, their finishes and the infill of openings that occur on urban tenement buildings from the second half of the nineteenth and early twentieth centuries, given that the structural and technical condition of these structures is in many cases beyond not only their moral but also their physical life. Last but not least, the inappropriate care and materials used for their restoration play an important role, e.g. facade restoration carried out with materials with high diffusion resistance will not only result in failures of these finishes but also damage the plaster core and cause it to fall off.

When designing the restoration of urban tenement buildings from the second half of the nineteenth and early twentieth centuries, attention must be paid to a concise analysis of the causes and consequences of defects and failures, which is an essential prerequisite for the reliability and long-term durability of reconstruction and rehabilitation measures. An integral part of the restoration of historic buildings must be the elimination of the causes of failure and the removal of all defects that reduce structural safety, health and energy efficiency. Ensuring the durability of restored buildings should be based on continuous care and prevention of degradation and corrosion processes caused mainly by chemical and biochemical processes and the nonforceful effects of temperature and humidity.

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Challenges for Sustainable Urban Heritage Conservation in the Twenty-First Century: The French Perspective

Federica Appendino

Abstract

Over the past decades, the interest in urban sustainability has grown internationally through the implementation of a multitude of policies, initiatives, and tools. This growth is primarily due to the intensity of climate change, intensification of pollution, and rapidly increasing urbanization, among other factors. In this worldwide context, heritage conservation tools have often proved to be inadequate in handling contemporary challenges. The conservation community has called for a renewed approach to better integrate heritage management strategies within the larger goals of overall sustainable development. However, the convergence of heritage conservation and sustainability agendas is not evident despite the fact that the role of heritage in sustainable development is becoming unquestionable. To date, several publications on this topic tend to focus mostly on theoretical discourse. There is practically no general consensus in terms of how to update heritage conservation policies and tools to take the imperatives of sustainability into account. To address this gap, the current paper aims to discuss the need to implement a holistic and integrated approach to urban conservation by presenting the French case study. Indeed, since the beginning of the 2000s, France has revised its consolidated regulatory framework for the safeguarding of urban heritage to open up to sustainability targets. Recognizing sustainability as a primary challenge facing urban conservation, the paper is divided into three parts. Firstly, a comprehensive overview of the state of the art in the field of urban heritage conservation and sustainable development is provided. Secondly, the French context is presented, focusing on the influence of national environment and sustainability legislation on urban conservation tools. Lastly, the emblematic case study of Paris is investigated. The research finds that an integrated approach appears to be necessary, both at theoretical and operative levels, and some first-stage answers have been provided in this direction.

1 The Conservation of the Historic City at Issue

The current profound environmental crisis, as well as social and economic crises, caused by development models recognized as unsustainable, has brought studying the processes underlying urban sustainability to the center of an international debate about the future of cities (Joss, 2015). Urban centers are the focal points of this unprecedented crisis, having been affected by major changes and pressures that render it urgent to adopt policies and tools to ensure sustainable development models. Attention to this issue is so great that sustainability has come to be considered the major issue of the twenty-first century (Barthel-Bouchier, 2016; Wagner, 2011). In historic urban contexts, the unprecedented scale of this crisis is even clearer and presents a risk to protecting their related heritage and identity values (Bandarin & Van Oers, 2012; Leifeste & Stiefel, 2018). Exponential urbanization, climate change, insufficient resources, social imbalance, and pressure from tourism are all factors that appear to threaten the material and immaterial integrity of cities' urban heritage.

While makes it urgent to have operational strategies to achieve sustainable development objectives, it also leads to questioning the validity of current urban conservation policies and tools, considering the emergence of these new

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challenges. For these reasons, the need is often expressed to rethink current approaches to conservation, in the international literature, in the broader framework of sustainable development (Appendino, 2017) The main agencies in charge of protecting and enhancing heritage have also expressed the importance of an integrated approach to sustainability to address these challenges (UNESCO, 2011).

At first consideration, this seems to raise no problems. The concept of sustainable development does appear consistent with that of heritage conservation, as both have the same intent of incorporating different time periods, placing past, present, and future in a system of transmission and intergenerational solidarity (Garat et al., 2005) and offering humans harmonious living conditions in the environment we live in Rodwell (2007). Furthermore, heritage is a non-renewable resource itself, to be protected and enhanced on par with natural resources, which makes it a lever for sustainable development (ICOMOS, 2011). Nonetheless, despite the consensus on a theoretical level that heritage and sustainable development are inseparable and indispensable for the historic city's future (Civilise, 2012), there still seems to be general difficulty in incorporating sustainability principles and objectives in heritage conservation policies and measures (Albert, 2015). Although the concept of sustainable development has become central on a global scale in the urban agenda, the realm of heritage conservation has only recently started to consider the broader implications of its requirements for heritage conservation principles and guidelines (Cameron & Inanloo Dailoo, 2011). In practice, many experiences have shown a degree of difficulty both in finding the balance between these two imperatives as well as clarifying their relationship to each other and establishing how to implement this integrated approach (Albert, 2015).

This research originated, in this sense, from the intent to explore how principles, policies, and conservation tools for urban heritage could be integrated with sustainability objectives with the intention to add a piece to the larger debate, involving the academic world as well as institutional and professional ones. The aim of this article specifically is to discuss how these issues are addressed in France, where not only is there a particularly extensive debate on the matter but also several attempts to address the issue have been made. While on one hand, sustainability objectives are at the top of the agenda and have taken on growing importance in urban policies, on the other, attention to protecting urban heritage is very strong, and increasing areas of the cities are subject to protection through a variety of tools and policies. Considering the case study of the *Secteur Sauvegardé* of the *VII Arrondissement* of Paris lets us underscore some limitations of these attempts as well as identify good practices for revising the approach to urban heritage conservation.

2   Methodology and Research Objectives

This paper, which incorporates some results from my doctoral research,[1] is based on the starting assumption that in the current moment of great change and unprecedented pressures, the sustainability agenda sets new goals for policies to protect urban heritage and offers an opportunity to evolve the tools it uses. Sustainable development has not in fact been considered a priority in urban heritage conservation, at least until now. This article aims first to understand how the issues tied to sustainable development are situated in the context of the historic city and that of urban heritage conservation, and then, through a pragmatic approach, to reconstruct the field of action within which to encounter policies and tools of sustainability and conservation. We chose to study some innovative approaches by looking at the French context and a case study of Paris, which made it possible to explore operational tools, test them in the field, and have direct contact with those involved.

The objective of the research's first stage was to identify the issue within the current debate and focus on studying the current state of affairs and more specifically theoretical aspects, for which a thorough study of the international literature was needed. This stage also involved the critical analysis of institutional international and European documents. After studying the current situation and epistemological thinking, the second stage concerned choosing the French context. This stage lets us assess how the issues previously identified were addressed in this context, therefore focusing on French-language literature in order to understand the French version of these issues and the current debate. The third stage then focused on the local context by analyzing the city of Paris and the revision of the *Secteur Sauvegardé* management plan for the *VII Arrondissement*.

For the purposes of our study, these two stages of our research used sources of varying types, including planning documents at different regional scales, official documents, and legislative texts, as well as reports and documents for the general public, which proved important to our analysis. This body of material was studied in parallel to field work with interviews conducted with about 20 key players, including researchers, planners, officials, specialists, and representatives of local and national authorities.

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[1] The Ph.D. thesis, defended in 2017, was completed in co-tutelle between the University Paris-Sorbonne and the Politecnico di Torino. The dissertation title is "Challenges and opportunities for sustainable urban heritage conservation in the twenty-first century: the French perspective and case stud of Paris."

3 New Challenges for the Historic Cities: An Opportunity to Rethink Urban Heritage Conservation

The literature on urban conservation describes how the concept of urban heritage has undergone a progressive, gradual expansion over the years, both at the semantic level and the land planning level, which has led it not only to include intangible aspects, social factors, and cultural values (Dormaels, 2012) but also to accept constant development and change as intrinsic conditions (Duché, 2010; Fairclough, 2003; Giliberto, 2018; Labadi & Logan, 2015). This gives a view into a process already underway toward a new paradigm of protecting the historic city (Van Oers, 2010) as shown by the orientation of the current debate on protecting the concept of the "historic urban landscape," which, in effect, sanctions expanding the field of attention from individual properties to historic areas, the existing city in all its manifestations, and the historic territory in its cultural entirety (Gambino, 2013).

Nonetheless, though the rather static conception of urban conservation of the first part of the twentieth century has gradually given way to this more dynamic one, a study of the literature seems to suggest that the conservation discipline has not been able to keep pace (Bandarin & Van Oers, 2015). This takes on particular importance and urgency in the context of the new challenges to which historic cities are now subjected (UNESCO, 2009), which require sustainability. This goal was largely ignored in the previous century and now has become the primary rule of thumb for protecting urban heritage in order for historic cities to continue to be important in the global era (Bandarin & Van Oers, 2012).

This is why in the last decade, the main international organizations operating in the field of heritage have opened a discussion on the principles of conservation (Giliberto, 2018), thereby reflecting the development of a debate already underway in countries like France, Italy, and England. In the late 1990s, some scholars already started to question the adequacy of conservation measures and asked if "modern conservation should not be redefined in reference to the environmental sustainability of social and economic development within the overall cultural and ecological situation on earth" (Jokilehto, 1999). The problem of sustainable development has also started to affect the realm of conservation (Wagner, 2011), which has seen the need to align historic urban areas with sustainability objectives, i.e., the need for a management process that can ensure the continuity and historicity of the urban fabric (UNESCO, 2005). This idea later culminated in the 2011 Recommendation on Historic Urban Landscape, which reflects the need for a "rethinking of urban conservation" to make for more sustainable urban management

and development processes through innovative tools based on policies and practices sensitive to ecology and equipped to integrate economic, social, cultural, and environmental concerns (UNESCO, 2011). The major challenge that arises is being able to implement a holistic approach that can integrate the conservation of heritage and sustainable urban development in all its realms, which seems far from a common practice today (Guzman et al., 2014). This shifts the attention from the mere consideration of heritage as a resource to be protected to the contribution it can have in finding solutions for current urban problems (Labadi & Logan, 2015).

This is clearly a challenge for the conservation field, which until recently had never "presented its work in a way that links it strongly to issues of sustainability" (Teutonico & Matero, 2003), but it is also an occasion (Appendino, 2017) for a profound reconsideration of principles that now seem dated and inefficient (Fernandez et al., 2014). A review of the literature does indeed show that "very little attention has been paid to the question of how sustainability may influence and alter heritage conservation practices" (Cameron & Inanloo Dailoo, 2011). However, in order to earn "a place at the table of sustainability" (Wagner, 2011), the conservation discipline must understand that this could mean more than rethinking its fundamental principles and would entail dialogue and engagement with other disciplines (Bandarin & Van Oers, 2015). This is the only way that heritage conservation can "move forward in ways that permit the survival of memory, tradition, and a multiplicity of values, and that acknowledge limited resources and the fragility of our ecosystem while promoting manageable change, sustainable development, and improved quality of life" (Teutonico & Matero, 2003). Heritage conservation should, therefore, be integrated into the planning of general urban development policies, offering mechanisms to reconcile conservation and development, within the broader objective of sustainability (Bandarin & Van Oers, 2015). In order to address the challenges facing it, urban conservation cannot, therefore, be seen as some sort of nostalgic and elitist activity, but as a central aspect of sustainable development (Teutonico & Matero, 2003), giving up the illusion of "a walled precinct protected from the external forces of changes by plans and regulations" (Bandarin & Van Oers, 2012).

4 Urban Heritage Conservation and Sustainability: Divergences and Convergences

The intensity and speed of current changes are a major challenge to urban heritage conservation and make it essential that it be aligned with the sustainable development

goals. There seems, therefore, to be a consensus about the need for a new approach to conservation policies and measures that are often considered no longer sufficient and adequate (Bandarin & Van Oers, 2012, 2015; López Sánchez et al., 2020). However, while at the theoretical level, this appears to pose no problems (Nocca, 2017), at the operational level, it does raise some conflicts (Albert, 2015; Appendino, 2017; Carabelli et al., 2011; De Vita, 2012), which makes it interesting to investigate the relationship between conservation and sustainability.

A number of authors argue that these two concepts are close to one another, given that heritage is a non-renewable resource to be protected and passed on to future generations (Nijkamp & Riganti, 2008), as well as a major component of quality of life (Tweed and Sutherland, 2007) and enmeshed with issues of memory, identity, and aspiration (Auclair & Fairclough, 2015), all of which are central to the discourse on urban sustainability (CIVVIH, 2010). Other authors insist that the historic city is already sustainable and should be taken as a model (Rodwell, 2010). They note that it has key elements of the sustainable city, including compactness and density, which make it possible to reduce car travel and promote cycling and pedestrian mobility (Gehl, 2010); functional and social mixité, indispensable elements for a vibrant city (Fernandez et al., 2014); resource conservation and adaptive reuse (Plevoets & Van Cleempoel, 2019), an energy-efficient urban form (Salat, 2011). More generally, "conservation has always been about sustainability: […] about finding a way to have the past inform the present and future without compromising the need to improve and to assure a certain quality of life" (Teutonico & Matero, 2003).

Despite these parallels, several scholars have shown that there is only an apparent convergence between conservation concerns and sustainable development goals (Emelianoff, 2005) so that the two concepts are therefore often juxtaposed without being truly linked (Garat et al., 2005). For instance, there is the principle of urban renewal and densification, which while central to the discourse on urban sustainability (Jacquand, 2005), are in contradiction to the aim of protecting and making heritage last (Emelianoff, 2005; Garat et al., 2005). Another factor of contradiction involves the energy requalification of historic buildings (Mazzarella, 2015), as well as the difficulty of adding energy production systems from alternative resources (Webb, 2017), as well as adapting to new technologies and current living comfort performance levels (Wise et al., 2021). This is why reservations have been expressed about the "ecological tolerance of heritage" (Planchet, 2009) because heritage conservation implies, at least in theory, the principle of "touching as little as possible," and current regulations on the issue greatly limit the adaptability of these historic buildings. It is, therefore, legitimate to ask to what extent, effectively,

it is possible to make this heritage compatible with the energy-environmental needs of sustainable development (Ter Minassiah, 2011).

Beyond environmental sustainability, some authors have noted how heritage conservation and enhancement policies have a major impact on cities' social fabric, frequently leading to original businesses being pushed out and the resident population being gentrified. While it is true that heritage must be "made to last" according to the principles of sustainable development, it is equally true that heritage must be "made to live" (Gravari Barbas, 2005). This also involves functional mixité, which is very much challenged by tourism pressures that tend to undermine the identity values of heritage, turning historic areas into commercial opportunities for a transient population (Bandarin & Van Oers, 2015).

Another element of conflict is the trouble that the urban conservation sector has in managing change as an element intrinsic (Fairclough, 2003) to the very definition of the historic urban landscape. Some scholars consider this to be one of the most important obstacles to the development of urban conservation (Van Oers, 2010). It takes on central importance in the current debate around the verticalization process (Appert, 2008) happening in many historic cities, which threatens complex historic stratification and its distinctive characteristics and values, in the name not only of modernization and progress (Labadi & Logan, 2015) but of sustainability as well (Appendino, 2017). Replacing historic urban fabric with new energy-efficient, technological, and often vertical buildings is indeed often promoted by the local authorities in the name of density, reduction of land consumption, more efficient mobility, and lower carbon emissions. There seems to be, once again, a considerable gap between theoretical and operational principles: the traditional "innovation/conservation" dialectic (Cassatella et al., 2007) which appears to have been overcome on a theoretical level by recognizing that there can be no authentic conservation of values without continuous innovation (Gambino, 1999), in practice, it appears a still open question that has trouble defining the admissible limits for change (Appendino et al., 2016).

5 Toward the Sustainable Development of Urban Heritage Conservation in France

France has responded to the intensification of environmental issues and international awareness of the need to ensure that urban development is as sustainable as possible with an important legislative review process, which has seen urban planning evolve towards the establishment of sustainability objectives (Prévost et al., 2012). The turning point can

be considered the 2007 *Grenelle de l'Environnement*,[2] the start of a series of political objectives which introduced truly comprehensive reform of sustainable urban planning (Dubois-Maury, 2010). More recently, laws on the 2015 Energy Transition, the 2019 Energie-Climate, and 2021 Climate et Resilience have set ambitious objectives for environmental sustainability with a particular focus on the built environment.

Significantly, sustainability legislation has also had an important impact on the tools used to protect urban heritage (Versaci, 2016); all measures are now required not only to tackle sustainable development objectives set for a given area but also actively contribute to their achievement (Appendino, 2017). This is also the case for the *Secteurs Sauvegardés*,[3] the highest, most restrictive level of urban conservation, long considered an urgent measure based on the city's museum-like status (Choay, 1992), now asked to integrate with the urban sustainability policy (Planchet, 2012). In some cases, this has even led to a complete rethinking of some measures, which could call an "ecologization" (de Lajartre, 2012) of urban heritage management measures. This applies to *Aires de mise en valeur de l'architecture et du patrimoine*[4] (AVAP), introduced by the *Loi Grenelle II* of 2009 to replace the *Zones de conservation du patrimoine architectural, urbain et paysager* (ZPPAUP)[5] introduced in 1993 to meet the sustainability objectives. Leaving aside concerns about safeguarding heritage, other issues such as energy efficiency and renewable energy play a key role in the measure.

This is an important innovation in that, up until now, protected areas could be likened to enclaves with respect to the rest of the region, in terms of both regulations and objectives. The French urban heritage conservation system is one of the most well-established models in Europe and is highly complex (Molinié-Andlauer and Appendino, 2021). The conservation policies have evolved in parallel to the evolution of the concept of heritage (Gigot, 2012) and this led to a proliferation of conservation measures, whose structure often seems complex (Morand-Deviller,

2002). For example, there are many means of conservation on an urban scale: *Sites inscrites ou classés*,[6] *Abords des Monuments historiques*,[7] *Secteurs Sauvegardés*, ZPPAUP, AVAP, often leading to an overlap of conservation perimeters and complexity in structuring the rules and players involved. This is a full-fledged legal arsenal established to protect the urban heritage with an overwhelming number of possible measures (Leniaud, 2007; Vecco, 2009).

With a view to the "simplification, acceleration and modernization" of the conservation system, the new heritage law, Loi CAP, was adopted in 2016 and met with a negative reception from many experts who took a critical, dubious attitude to the proposed changes. The main change contained in the new law is unquestionably that introduce *Sites Patrimoniaux Remarquables* (SPR),[8] which stems from merging the *Secteurs Sauvegardés*, ZPPAUP and AVAP into a single integrated urban measure. These sites may be managed according to a PSMV,[9] an urban planning document that replaces the PLU, or a PVAP,[10] a public utility easement annexed to the urban planning land-use plan. Other significant changes concern the mandatory introduction of UNESCO heritage into planning documents, the possibility of revising the size of the perimeters in agreement with the superintendency, recognizing the heritage value of contemporary architecture by using a specific label and streamlining some procedures to expedite and simplify obtaining authorization to carry out works. It is worth noting no other major change has been made in the name of sustainable development, although the context of climate urgency underlying the new law is emphasized immediately.

6 Need for an Integrated Approach in the Case of the *Secteur Sauvegardé* of the *VII Arrondissement* in Paris

In this context, the Paris case is emblematic to examine the structure of the conservation and sustainability policies from an operational perspective. Paris is a leader in Europe in policies and initiatives promoting urban sustainability (Laurian, 2012), and due to its exceptional urban heritage, almost its entire area is under at least one conservation

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[2] A series of meetings and political consultations called the "Grenelle de l'Environnement," commissioned by the then President of the Republic Nicolas Sarkozy, for the purpose of dramatically rethinking the national strategy on sustainable development and the environment.

[3] Urban heritage conservation perimeters introduced by the 1962 Loi Malraux.

[4] Measure for the conservation and enhancement of urban heritage and the environment in accord with sustainable development.

[5] Local urban and landscape heritage conservation and enhancement measure. Introduced in the 1990s to replace the 500-m radius perimeters around historic monuments with a "smart perimeter," no longer based on the concept of co-visibility, which would support more consistent management of this heritage.

[6] Conservation measure introduced in 1930, though intended mainly for natural sites of landscape interest, it also applied to urban sites.

[7] 500-m circular conservation perimeter around each historic monument, with the aim of protecting the environment surrounding the monument as well.

[8] Perimeter of conservation for cities, urban centers, and neighborhoods whose conservation and enhancement is of artistic, historic or public architectural interest.

[9] Plan de Sauvegarde et de Mise en Valeur.

[10] Plan de valorisation de l'architecture et du patrimoine.

measure. Such a situation could have led to a ban on all innovation and development, but the city, unable to expand its boundaries, but densely packed with buildings, population, and activity, has always tried to evolve and change within itself (APUR, 1983). Nevertheless, some studies, focused on the building scale have demonstrated that heritage is often marginal in environmental sustainability policies, emphasizing the lack of thinking that references conservation policies as well (Ter Minassian, 2011).

The current challenge facing Paris is to find a balance between sustainable development and heritage conservation. Among the many urban heritage conservation measures concerning the Parisian region, the case of the *Secteur Sauvegardé* of the *VII Arrondissement* (now a *Site Patrimonial Remarquable*) is interesting as it seems to demonstrate that in practice this challenge is still ongoing. As mentioned, the Secteur Sauvegardé measure is historically the highest level of urban heritage conservation, and its provisions are contained in the PMSV. This is an urban planning document structured to reflect the urban land-use plan, which it replaces within the conservation perimeter. However, it differs from the latter in the level of detail contained in its provisions and the control exercised by the superintendency (*Architecte des bâtiments de France*). The *Secteurs Sauvegardés* were created for an urban area with an exceptional urban heritage, such to require ad hoc urban management tools. This is why the plan provides specific and detailed provisions for each individual built component or open space (Appendino, 2018). In the case of the *Secteur Sauvegardé* of the *VII Arrondissement* in Paris, a revision of its PSMV was needed to integrate the conservation sector into the more general framework of the sustainable development policy adopted by the city. The objectives were set for the entire urban territory and, as a result, for the perimeter included in the conservation measure as well, which, as such, needed to find a balance between conservation and sustainability.

The conservation sector in question started in the seventeenth century around the abbey of *Saint Germain des Prés* and the religious institutions that first covered the land around the abbey. Following the fall of the *Ancien Régime* and the dismantling of most religious orders, it became the bureaucracy district, which to this day is the site of a large number of ministries and embassies which effectively ensured the heritage's high state of conservation. In architectural terms, the sector is marked by the presence of several *hôtel particulier*, built starting in the eighteenth century. This makes the urban fabric of the secteur sauvegardé more fragile, not particularly dense and sparsely populated compared to the city's average, which in the 1960s was especially vulnerable to real estate development. Consequently, there was a need for an "urgent measure" to safeguard the historic urban fabric unique to France

(APUR, 1983), resulting in the adoption of the conservation sector in 1972. However, it was not until another 20 years later that it had a PSMV, a highly detailed policy that requires considerable financial resources as well as lengthy procedures and adoption times.

Given these timeframes, it is fair to say that when the PSMV was approved in 1991 it was already "dated" in a sense as many urban, economic, social, and cultural changes had taken place over the 20 years it took to complete it (APUR, 2004). By the early 2000s, there was, therefore, already a clear need to revise the plan in effect which, despite having ensured the conservation of heritage, appeared to be "too conservative" (Ville de Paris, 2016) to let the sector participate in new urban dynamics. In particular, there was a need to bring the content of the plan in accord with the sustainable development objectives set for the entire Paris area. While on the one hand, the *Secteur Sauvgardé* is excluded[11] from the *Plan Local d'Urbanisme* (PLU),[12] on the other, it is an integral part of the *Projet d'Aménagement et de Développement Durable* (PADD),[13] applied to the area as a whole, whose objectives it must support in order to be legally approved. This meant an evolution of the conservation policy, the updated version of which was to make the sustainable urban development objectives central, on par with those related to heritage conservation. The PADD of Paris, adopted in 2006, is a summary document containing the major guidelines for sustainable development of the urban area. The actions and objectives proposed in the document, which the PSMV was asked to engage with, can essentially be traced to a traditional view of sustainable development based on three pillars (environment, society, and economy).

To briefly summarize, the main changes that have taken place in the economic sphere are based on the new plan's underlying intent to preserve the neighborhood's traditional economic businesses, mainly based on craft and retail businesses, now threatened by a rise in real estate prices, and its residential function, threatened by an ever-expanding tertiary sector. From a social perspective, the new plan responds to the PADD's social mixité objectives, with the goal of achieving 30% social housing by 2030, through several ad hoc provisions. This aspect has turned out to be particularly complex in that the PLU identifies the

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[11] The *secteurs sauvegardés* are white areas, "gaps" in the land-use plan. The land-use plan does not apply to these areas and is replaced by the PSMV.

[12] The general local development plan.

[13] The PADD is a strategic document that sets an area's sustainable development objectives. It is a political document, usually short and concise, containing the plan that the community is committed to pursuing in the field of sustainable urban development in the medium and long term.

conservation sector as the area of the city most deficient in terms of social housing (Ville de Paris, 2016), with a social housing rate of around 1%. In particular, some state properties in the sector had to be acquired to achieve this objective; this gave rise to a dispute as there was no agreement in place between the city of Paris and the government on the sale price of these lands, on which social housing was to be built, resulting in a tug-of-war that was only resolved after many years.

Lastly, in terms of environmental sustainability, the new plan must refer not only to the PADD but also to the *Climate Plan*,[14] which sets a 30% reduction in greenhouse gas emissions by 2020. However, a distinction must be made: if the PSMV has to be compatible with the PADD in order to have legal validity, the *Climate Plan* need only be "taken into consideration", which is less binding.[15] This is why, despite the fact that the new plan confirms the energy-saving objective, it also specifies that the provisions of the *Climate Plan* must be adapted in the PSMV regulations in order to preserve the main objective of protecting and enhancing heritage (Ville de Paris, 2016). The plan's priority objective would therefore still seem to be heritage conservation, as reiterated several times in the document. The need to reaffirm this aspect is interesting and would seem to imply a specific hierarchy in which sustainable development is relegated to the background. Moreover, nowhere is it specified whether the goal to reduce greenhouse gases by 30% is mandatory, which makes it seem to be a reference point rather than a requirement, as it is for the rest of the urban area. Another two important points on which the plan focuses are the conservation of biodiversity and discouraging the use of private vehicles. In this regard, the plan prohibits building underground parking facilities and limits the creation of on-street parking. However, with regard to biodiversity, it is unclear why there is no mention of the city's *Biodiversity Plan*,[16] which is one of the cornerstones of Paris's environmental policy.

In conclusion, it can be said that the revised plan is still a tool primarily aimed at protecting heritage, though it sets itself the goal of preventing the city's museumization. Sustainable development goals have often been limited

or reformulated to better adapt to the sector's needs to the point of sometimes disappearing altogether. As such, the innovative scope of the plan revision that had been originally conceived seems to have been partly reduced due to integrating sustainable development objectives. Overall, the new PSMV, adopted in 2016, does appear substantially revised compared to the previous one as each individual provision is considered in detail. A change of perspective can be discerned from a museum-like view of heritage to a more dynamic one, open to change (Appendino, 2018). Only one element is unchanged, the perimeter of the conservation area. This aspect is unique as the perimeter had been established at a time in history in which there was a need to save historic heritage from the threat of urban renovation. Yet, current conditions have changed greatly and the need conveyed in the revised plan is first and foremost to ensure that broader urban dynamics take part in this heritage while ensuring its conservation. It is therefore striking that the boundary was left unchanged, dividing the Arrondissement into two virtually equal areas, the western one where the PLU applies, and the eastern one where the PSMV applies. Though many buildings have the same architectural features, the buildings on the east side are part of the conservation plan, while those on the west side are not. They are protected by the PLU instead, which is less binding. In the PMSV, environmental sustainability objectives, primarily for building energy efficiency, are to be implemented, whenever possible, dependent on the main objective of conservation, in the area where the PLU is applied, the Climate Plan is applied in compliance with requirements for energy retrofitting (Appendino, 2017) The interviews given show that the decision not to revise the conservation perimeter was implemented by the city of Paris precisely because this tool is still perceived as an obstacle to sustainable urban development.

7 Opening and Resistance of the Conservation Sector: A Nuanced Balance

Studying the French context clearly shows that there has been the intent and attempt to reconcile urban heritage conservation and sustainable development. The example of Paris presents some yet-to-be-resolved elements of conflict. Heritage conservation is asked to find compromises in order to participate in a comprehensive local plan in the difficult context of environmental urgency (Planchet, 2009). The interviews carried out with some institutional actors, researchers, and professionals working in the heritage conservation sector, on a national and local Parisian level, made it clear how difficult it is to find this compromise, which is confirmed by the outcomes. The first questions concerned

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[14] The Climate Plan is a strategic document that sets a number of objectives and concrete actions for a specific area to combat climate change.

[15] This aspect is not explained in the documents of the approved PSMV and has been ascertained through the interviews conducted. The difference is essential, because the PADD, while setting large objectives for the area, in terms of environmental sustainability refers primarily to the Climate Plan, a more specific document that quantifies the objectives to be achieved.

[16] Strategic document that sets goals and actions to protect biodiversity and ecological continuity in urban areas.

the concept of sustainable development applied to historic urban contexts, and then they focused on the impact that this has on their practices and professional approaches, and finally on the specific context of Paris and in some cases of the Secteur Sauvegardé studied.

The first basic factor emerging from these interviews as a whole is identifying four recurring points of view: the first, the most frequent, sees sustainable development as a threat to urban heritage conservation; the second perspective sees sustainable development as potentially risky to heritage but also considers it inevitable that they must now engage with each other; the third point of view that emerged sees heritage itself as already sustainable and lasting so that there is no genuine conflict; lastly, the fourth point of view, decidedly less common than the first three, sees sustainable development as an opportunity for heritage conservation, rather than a risk because it aims to achieve a broader balance that is beneficial for the sector. Interestingly, these four approaches mirror the theoretical debate. Table 1 shows these four approaches, along with some key quotes.

A second element that was found to be shared by all the interviewees was the strongly expressed need for a more holistic definition of the concept of sustainable development, currently focused purely on its energy-environmental dimension. Most of the interviewees saw that conflicts arise from an overly restrictive misinterpretation of the concept of sustainability. Another divisive element was the change of the ZPPAUP into AVAP, as set by the Loi Grenelle II. Several interviewees emphasized the reduction of heritage conservation being justified in the name of sustainable development; in effect, not only are the two objectives complementary here but also the role of the superintendency is reduced. In contrast, others supported the shift of this tool as it could reconcile two objectives that have often been seen as in conflict.

The interviews showed that the integration of sustainability objectives within the conservation measures has not met with support, which, from the perspective of some, is still far from being earned. The main criticisms raised specifically concerned the gradual loosening of some conservation provisions to meet the sustainability objectives. Some urban planning tools now make it impossible to prohibit works whose purpose is to improve the energy-environmental performance of buildings, including historic ones, unless they fall within certain conservation perimeters, which are, however, dependent on the same local community. Because the superintendent's opinion is not asked and the procedures for implementing this conservation have not been defined precisely, a great deal of autonomy and decision-making freedom are left to the individual municipalities. These concerns appear more understandable if we consider that almost all of the interviews took place at the same time as

the heritage bill and energy transition bill were presented, though their groundbreaking scope has since been reduced in the approved bills. Many exceptions were allowed in the name of sustainable development.

This was the origin of the wariness expressed by most of the interviewees. Though they recognized the need for the historic city to keep on evolving, keeping its heritage from museification, they questioned whether imposing the imperative of sustainability was not effectively just a pretext for urban works that are less respectful of existing heritage. In conclusion, it should be emphasized that this attitude, which might seem one of "closure," we consider mainly attributable to an absence of dialogue between actors who appear to have different interests. Our interviews showed that the Ministry of Culture and conservation professionals perceive sustainable development as something imposed on them without having the true possibility to share strategies that could instead give a proactive role to heritage conservation.

8 Conclusion

This research sought to bring two concepts into relationship, which, as we have seen are often placed in opposition: sustainable development and heritage conservation, focusing on the urban scale. The current context of crisis and unprecedented pressures that historic cities are under today make it urgent to achieve sustainable development goals in these contexts as well while safeguarding their heritage. While at least at a theoretical level, this assumption appears to be agreed upon, in practice it is still difficult to integrate these two imperatives, which are simultaneously called into action. Though the concept of urban heritage, which is always evolving, has gradually expanded over time, leading it to accept change as an inherent condition, conservation tools do not seem to have kept pace.

This study of the French context confirms this difficulty, which in our hypothesis, had shown harmonization of these two imperatives. Sustainable development has indeed been an opportunity to innovate conservation tools and policies; Protected areas are no longer urban niches focused only on heritage conservation but are now brought to play an active role in urban policies and sustainability of a global scope. However, the interviews conducted and debate arising from the new heritage law have led us to question this. A cross-analysis of the interviews carried out indeed allowed us to understand how the most widespread attitude still sees sustainable development as a potential risk for heritage and an unwelcome imposition. The research shows that this harmonization can generate conflicts, partly because it is often not defined in detail how the sustainability objectives will be integrated. The process of revising the *VII Arrondissement* PSMV

Table 1 Four approaches identified in the interviews

Sustainable Development = Threat	Sustainable Development = necessary	Sustainable Development = not necessary	Sustainable Development = opportunity
New technologies are incompatible with historic heritage	Though it is true that heritage has 'lasted' to this point, it is also true that there has never been a crisis like this before	Heritage is already sustainable in itself, it is our memory and our identity	Sustainable development brings a positive message
Sustainable development considers heritage a limitation. We aren't the ones who need to adapt	Sustainable development has become central in all realms. Conservationists must accept it	Heritage has proven that it lasts over centuries	Changing does not mean getting worse
Energy efficiency regulations are incompatible with the existing heritage	Research needs to be done to ensure that a compromise is found	Historic heritage is resilient	Heritage contributes to sustainable development, but it's not enough, we need to go further
External insulation is an attack on our historic buildings	We need multidisciplinary figures to address such a sensitive issue	The historic city is not the cause of the current environmental crisis	
Densifying means destroying our historic centers		Historic buildings are energy efficient	
No one asked our opinion		The historic city is a model of a sustainable city	

offers many insights on this point. Despite the intent to review conservation measures with a view to sustainable development, the case studies highlight some difficulties and contradictions in the integration and hierarchization of the principles of sustainability and conservation. The most critical issue involves environmental sustainability objectives; the conservation plan's many constraints indeed still make it a very "conservative" tool. The conservation perimeter remaining unchanged, for instance, which seems to confirm an approach to the conservation sector that still sees it as an enclave.

These results seem to suggest that the challenge of sustainability requires a more comprehensive rethinking of current conservation mechanisms, as well as profound innovation in the discipline and its organization on multiple scales. In our opinion, greater dialogue and cooperation are needed between the actors, in order to build a truly joint strategy, as well as updated tools that are suited to managing and supporting this harmonization and an expansion of the concept of sustainable development. As we have emphasized several times, this is not limited only to the environmental aspects. Despite the specificities of the case discussed, the results show that, on an operational level, managing change in historic urban settings is still an open problem and an urgent one, now more than ever. While in the literature, it is now widely recognized and agreed upon that the safeguarding of historic heritage means first engaging it in the contemporary realm and that the future of heritage cannot consist of policies of absolute prohibitions and restrictions, it must nevertheless be recognized that the case studied presents uncertain, disputable outcomes, reflecting the yet-to-be-resolved dialectic between the contemporary reality and the memory of places.

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A Methodology Proposal for a Brownfield Redevelopment

Beyza Karadeniz, Asli Agirbas and Merve Ozen

Abstract

Redesigning abandoned industrial areas (brownfield) requires the consideration of environmental concerns such as remediation. The design process should consider this context's economic and social sensitivities and environmental factors. In this study, a methodology for the redevelopment of the brownfield has been proposed. The proposed method consists of the parts which determine the design approach, collection, analysis, and synthesis of the data, determining the aims and objectives, determining intervention areas, the search for form with a visual programming language, layout plan, and architectural design. The methodology is applied in the context of an urban design project (Antalya Kepez Sumerbank Weaving Factory site). The process can be used in the conceptual design stage of brownfield redevelopment projects.

Keywords

Brownfield · Design methodology · Urban renewal · Urban design · Design competition

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1 Introduction

The transformation and renewal of the industrial areas in the city, which have lost their functions and values, have been discussed for many years in planning and architecture in developing countries. Industrial heritage, which emerged in the second half of the twentieth century, more specifically at the end of the 1970s, especially in the industrial regions, has become a current issue in recent decades in developing countries that have not completed their industrialization process yet (Özden, 2016; Aydın, 2014; Cengizkan, 2006; De Sousa, 2003; Dorsey, 2003). Industrial areas offered a particular lifestyle to the cities they were situated in with their equipment and functions. They play an essential role in developing and adopting societal awareness and lifestyle (Özgönül, 2007; Stiber et al., 1998). Therefore, areas containing a sector that significantly contributes to the national economy and the buildings and technical equipment in these areas are acknowledged as a product of the architectural culture (Aydın, 2011; Köksal & Ahunbay, 2006; Tanyeli, 1998). In addition to the tangible heritage regarding the engineering, architecture, and urban planning associated with the technology and manufacturing processes, the industrial areas include the intangible heritage, which is integrated with the memoirs, talents, and social lives of the workers and the societies they are connected with ICOMOS-TICCIH (2017).

Considering the environmental factors, processes that pursue public interest and enable the functional transformation to integrate with the city should be followed in the change of industrial areas (Özden, 2016). In this respect, Turkey is experiencing a transformation as the industrial areas, developed after the Republican era, lose their function. These areas are generally vast urban lands stuck in the city and have lost their operations. These abandoned industrial areas (Brownfield) have a national significance and are directly related to the growth and development of the cities (Nogues & Arroyo, 2016). U.S. Environmental

Protection Agency (EPA) defines a Brownfield as "a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (2016). For both new and old cities, brownfields have some potential as they are generally situated at the centers of the towns and contain a comprehensive technical infrastructure (Kaçar, 2017). On the other hand, environmental factors should be considered for reusing these areas since they cause ecological issues in their active use. Industrial areas and buildings are essential components of the socio-economic history of a country with their mechanical hardware that realize manufacturing. They have also played a significant role in materializing modern life forms in the cities they are built in. They lose their functions primarily due to rapid technological advancements and policies (Cengizkan, 2006; Özden, 2016). These inactive city areas are redeveloped as cities have become finance-capital spaces, following similar approaches.

The areas which are subject to industrial heritage in Britain, where the conservation theory emerged for the first time, are transformed into sites in which all the structures are conserved, the designs are conserved partly, and new areas of use are created, and in which the area is cleansed of all structures and new areas are created (Aydın, 2014). In Turkey, industrial facilities started to be built with the development plans of the Republic in the 1930s. These facilities on vast lands created production and employment and presented a physical, social, cultural, and economic model of living to the citizens with their social infrastructures (Köksal, 2012; Tanyeli, 1998). Many cities contain such industrial areas. These abandoned areas are tried to be regained via revitalization and transformation programs. These programs, in general, are comprised of redeveloping the industrial area, defining and shaping the new profile of the industrial population living in the city, and redefining and shaping the employment and production possibilities and alternatives in the relevant area (Köksal & Ahunbay, 2006; Özden, 2016). The transformation projects and practices, examples of which are seen frequently in Turkey, should be scrutinized considering their urban effects. The concept of redevelopment has emerged as a combination of the economic concerns of the conservation approaches (Cengizkan, 2006; Saner, 2012). In this respect, Turkey's design contents have been organized toward industrial structures and areas in recent years.

Urban transformation and renewal topics related to identity development or preserving the present urban identity have gained importance with current urban design projects (Tendero & Plottu, 2019). In this respect, renewal projects for transforming urban areas have become the locus of current urban design practices. Transformation is the physical, functional, social, economic, and ecological intervention to use land connected to the city or in separate areas by connecting them with the city (Hasse, 2012; Hees et al., 2014; Özden, 2016). Put differently; transformation is a phenomenon that affects and alters the urban macro form. Since transformation includes changes in time, it requires understanding the development of any city and recognizing and perceiving the city (Günay, 1997). The transformation of industrial areas has recently become subject to urban design competitions.

Urban design competitions in Turkey have become popular, especially after 2000. The urban design competition in Turkey is based on the "Architecture, Landscape Architecture, Engineering, Urban Design Projects, Urban and Regional Planning and Fine Arts Works Competitions Guidelines" as per Article 23 of the Public Procurement Law no 4734 dated 4 Janury 2002. The urban design projects are defined with the expression, "These are competitions that cover the plans and projects, identity-image studies in the upper scale, mass-open areas regulation studies aiming at a holistic design of the structures and their environment in the mesoscale, and the environmental design of the spaces between the masses in the lower scale, all of which determine the urban identity and are prepared for the public areas, of which the priorities have been determined in the strategic plans, to include special application details for the parts of the cities which have particular importance in their use concerning natural, cultural, historical and social aspects of the city" (Republic of Turkey Official Gazette, 2002). Although the competition requires expensive and time-consuming processes in the production of projects, they provide benefits for both the citizens culturally and the design discipline educationally (Erten et al., 2005; Kahvecioğlu, 2011).

In the general sense, project concepts are essential in that they support the experts in the design discipline via their knowledge of theory and practice and thus provide opportunities for developing a discourse (Çimen, 2010). Urban design is a hybrid discipline that takes its theories from various intellectual roots, such as sociology, anthropology, psychology, political science, economy, ecology, natural sciences, health science, and urban geography. Urban design practices require a partnership of experts from architecture, landscape architecture, planning, law, engineering, and management (Carmona, 2014). The previous use of the area, especially in transformation projects, determines the methods to follow and precautions to take. Certain environmental precautions should be taken in the relevant area in projects developed in an industrial area that has lost its function (De Sousa, 2003). In addition to environmental and economic sustainability, the most critical issue in the transformation of these areas is establishing the social context. Design actions affect the message the relevant area or structure conveys to society while they change the

appearance and function of the structures; therefore, it is vital to preserve the symbolic value of the area in transferring the industrial heritage to the future (Özgönül, 2007).

This study proposes a methodology for redeveloping abandoned industrial areas (brownfields). The proposed methodology has been tested in a case study (Antalya Kepez Weaving Factory site) in the context of an urban design competition project. The developed project aimed at creating an authentic urban area with an alternative design approach, grounded on preserving the industrial heritage and which pays regard to the public interest and the profit balance in the area in which Antalya Kepez Weaving Factory is built, which is a large functional area in the city center.

1.1 Antalya Kepez Sumerbank Weaving Factory

Antalya's coastal position played an essential role in the settlement and development of Antalya city. The city, which had been built where the gulf penetrated Anatolia the most, is the starting point of roads connecting the inner parts of Anatolia and the Aegean region. Although Antalya has changed hands from time to time due to its commercial significance, it is a city that has developed to preserve its significance (Aru, 1998). In this respect, recent developments in different sectors have continued the city's growth in the historical period. These developments had some economic, social, environmental, and demographic repercussions. Especially the agriculture sector, which developed in the 1950s, was supported by the developments in the industry. Antalya Weaving Factory of Sümerbank, which became operational in 1961, played an essential role in developing the city's industry and the agriculture sector. Antalya has been a critical organized industry center with its weaving, oil, ferrochrome, and battery factories (Tuncer, 2011) (Fig. 1).

The weaving factory changed the city's social structure and daily life from the first day it was built and got

the citizens to adopt various habits. In these years, in which particular dynamics such as urbanization had emerged and the entire infrastructure of modernism had begun to form, the weaving factory offered many opportunities to its employees and citizens. The most important of these is the educational and socio-cultural activities developed for individuals employed in the industry. The factory, which had made an impression in the city's memory in a short time, exhibited a modern life ambiance for the citizens and an innovative business model. The aspect of industrial heritage being acknowledged as cultural heritage is that they have an "artistic value" and thus causes a change in the environmental understanding of the individual (Köksal, 2012).

In this context, industrial areas have also influenced the growth of cities and individuals. The developments in the city were not limited to these two sectors, the city has become an important tourism center with its natural beauties, and the city population has continued to increase rapidly (Aru, 1998). In addition to the developments in the tourism sector, specific changes in various industrial sectors caused the weaving factory in Antalya to close, as they did in many other cities.

The case study is about a project as part of an urban design competition in the 25-ha area on which the Antalya Kepez Sümerbank Weaving Factory is built. The project area, located to the south of the Kepez District and near the borders of the central district, is one of the examples of industrial heritage in close connection with the central function areas. Historical competition and urban dynamics are the essential components in the area as it is an area where the settlement is rapid, and the profitability pressure is felt intensely. The D650 highways entering the city from the north comprise the western border, the D400 highway the southern border, and the Namık Kemal Avenue that provides access to the city center comprises the area's eastern border. The close environments of the project area contain large urban function areas such as public institutions, a university, a hospital, a fairground, a bus terminal, and a military zone (Fig. 2).
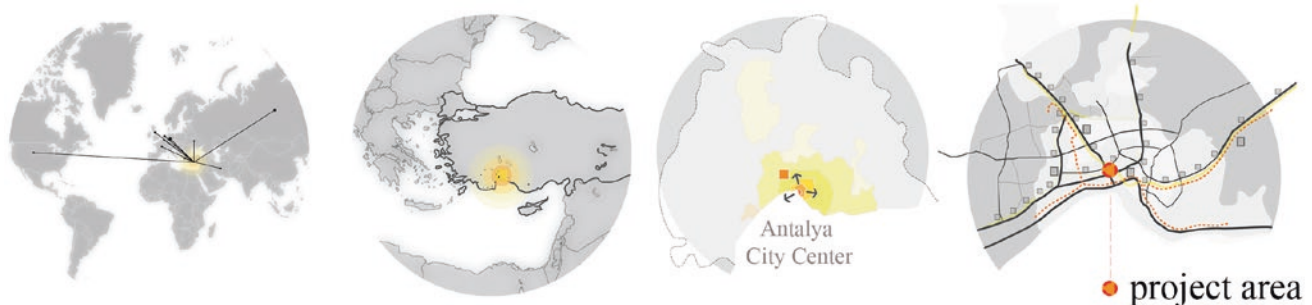
Fig. 1 Antalya city regional connections (The authors, 2018)
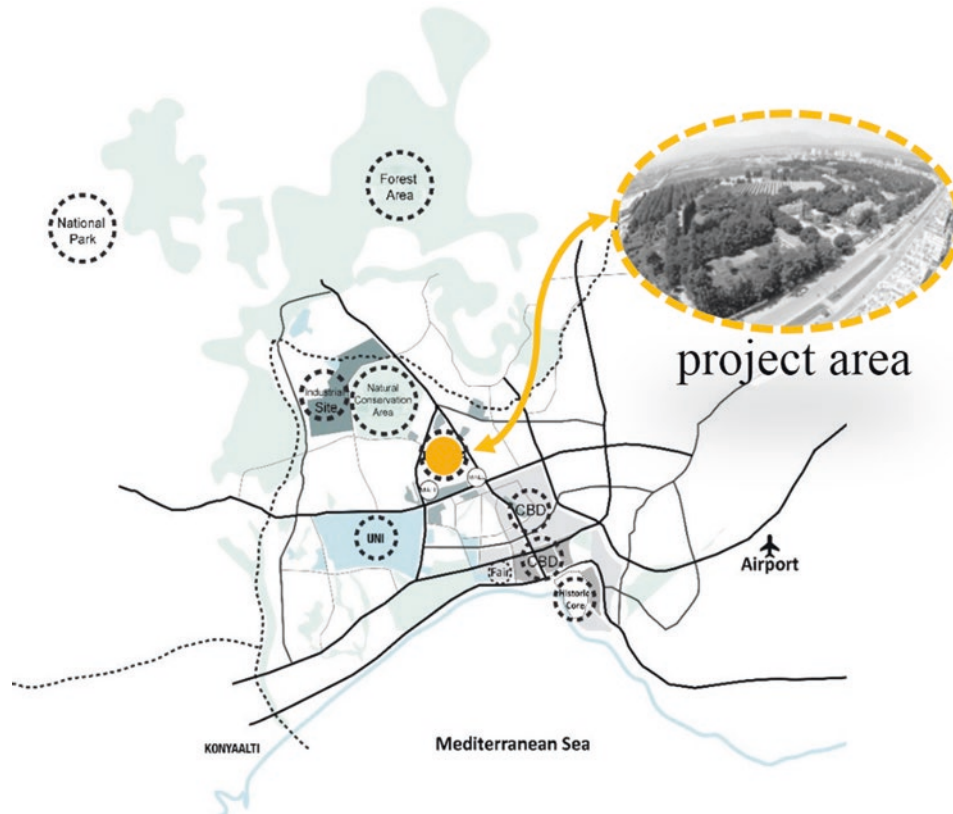
Fig. 2 Project area and close surroundings connections (The authors, 2018)

Fig. 3 Design approach followed in the project (The authors, 2018)

2 Methodology

After determining the general approach and the borders, the environmental, social, and economic data about the area should be collected. The spatial analyses followed the conceptualizations of the place and importance of the area in the district and the city. The project area, being an industrial area that has lost its function (Brownfield), requires a design on this area to be realized considering particular environmental sensitivities. In this respect, after establishing the connection with the environment, environmental factors such as the removal of contaminants should be considered in the search for forms, in addition to the economic and social sensitivities in the analysis of the area.

In the case study, for form-based concerns, Grasshopper software, which runs as an add-on to the Rhinoceros software and is a visual programming language, was used to determine the traces related to conceptual design and different function layers. The design process was carried out with an interdisciplinary approach by a team comprising architecture, landscape architecture, and urban planning disciplines.

The steps followed in the project were realized in a workflow presented in Fig. 3. The process definitions developed by urban planning and urban design areas experts and theoreticians were used in determining these steps (Alkay, 2014; Batty, 1978; Carmona, 2014; Chadwick, 1978; Shirvani, 1985; Suher et al., 1996).

2.1 Determining the Design Approach

The first step of the design process comprises the design approach and the decision-making process, which depends on the general definitions given in the competition terms and conditions. In this respect, first, the competition terms and conditions and the data were examined.

… The subject of the competition is to develop ideas on the regaining of the Dokuma area to urban life in an integrated and sustainable manner by integrating the area with its historical heritage and reestablishing its connections with the city through new plan decisions, urban and architectural solutions, and landscape design to be recommended for the lot no 27718/1 of the Dokuma area, which is planned as the urban and regional business center. The purpose of the competition is the research the values the Dokuma Area would contribute to the urban life in Kepez and Antalya and receive ideas reflecting designs that would enable the contribution to the social and cultural identity of the city by establishing the connections of the area with the city and its environments; emphasizing human-nature relations with open and green areas; suggesting modern and economical solutions considering urban development, architecture, and landscape architecture; and encouraging fine arts…. (Antalya Kepez Dokuma Competition Regulations, 2018)

A design approach conforming to the rules of the competition was determined by the reviews and the expectations related to the area. While configuring the design approach, the industrial heritage and transformation approach in the literature were reviewed in parallel with the competition project. After determining the theoretical framework, the basic principles of design were determined, and design studies were conducted following these principles. The design principles developed in the project are as below:

- It is a project developed with creative thinking and collaboration that considers the spatial value of the project area.
- Considering the intervention's regional and urban scale dimensions to the structures in the project area.
- It was a project that considered social environment demands and properties and pursued a public interest in the redevelopment of the area.
- Aiming to re-establish the spatial and social connections following an approach that considers the urban context.

2.2 Collection, Analysis, and Synthesis of the Data

As a standard process in planning and urban design, the data are evaluated and synthesized after the data analysis concerning using these data within the context of the design approach. At this stage, the area's potentials and limitations were determined via the thematic analyses (Historical and Cultural Layers, Natural and Social structured Environment Connections, Morphological Context, and Environmental Sensitivities) and the data layering in the synthesis stage. The aims and objectives were determined depending on the data obtained in the analysis and synthesis stages.

A connection between the history of the area with the city was established. In this respect, while the configuration of a Central Business District (CBD) was being realized in

the project area, the industrial heritage was paid attention to. The tourism sector could partially continue the industry's innovation throughout the city. Therefore, an approach was followed that continued the innovative identity in the weaving factory area and is aware of the infrastructures and activities required in the future. Today's needs, local connections, and cultural values were considered in the design process. In addition to the historical connections, the project area and its environs were not only considered as an area close to the city center but historically an important locus of the region. Apart from all these connections, the adoption of the weaving factory area by the local people is one of the fundamental driving factors in the project. The people's reactions to the profit-oriented interventions at different times are evidence that the area should be developed with conservation.

Depending on the analyses of the area, the data on the project area were analyzed, and the problems and potentials were determined. The problems were considered opportunities, and the project area was synthesized. The synthesis was considered under three main titles social and physical, economic, and environmental (Table 1).

2.3 Determining the Aims and Objectives

The fundamental aims and objectives were determined with the analysis and synthesis studies. This stage is essential because it orients the next stage of determining and functionalizing the intervention areas. While configuring the development scenario in the project area, the aims and objectives were determined in line with enabling social, economic, and environmental sustainability. The urban memory was cherished against urban pressures. Table 2 presents the aims and objectives determined for the project.

2.4 Determining Intervention Areas

After determining the aims and objectives, the main intervention areas regarding the area and its close environs should be determined. This stage is essential in orienting the project area's search for form and realizing the principles determined by the approach. In this project competition, determinations were made regarding "accessibility and transportation system, activity patterns and area use, public and green open spaces and integration with the environmental texture."

Accessibility and Transportation System; The targeted accessibility of the area is defined in the urban integrity, over the highway connections, and public transportation systems. In parallel, it is envisaged that Akdeniz Avenue will be transformed into a tram line integrated with the

Table 1 The synthesis conducted for the project area

Social and physical	–New employment possibilities—equality in transportation –A comfortable center for pedestrian and bicycle use –Meeting the car parking demand –A vivid urban atmosphere –Safe and qualified urban environment –Enabling social interaction and control –Open and half-open spaces where spontaneous relations could be established –Residential solutions for different user groups –Vast public areas on the surface via underground parking –Redesign of the Weaving Factory as a new but historically-connected social locus
Economic	–Developing commercial status of the Dokuma area –New spaces for business activities –A denser and more attractive commercial structure –Redirection of customer flow and consumers to the CBD –New investment opportunities and increasing business activities –New employment opportunities –Increase in the real estate prices –Positive business plans, self-sufficient investments –A new center attracting the new workforce –Supporting the increasing demands of the city center
Environmental	–Using the present infrastructure left by an industrial area, which has lost its function –Encouraging pedestrian and bicycle use in the area with policies dissuading motor vehicles –Preservation of green areas and the urban ecosystem –Preventing the destruction of a green area elsewhere with the reuse of the industrial area –Supporting the biodiversity in the area –Providing access to a large public area –Surface water control –Remediation of contaminated soil –Use of environment-sensitive construction materials –Removal of organic material and salts on the surface –Removal of metal and other contaminants and the balancing of the soil –Using plants remediation of the soil by removing and controlling the contaminants on the surface and in the surface water (phytoremediation)

city's rail system. In this respect, due to its CBD aspect, the area's transportation system was configured considering its connections with the city center, the airport, and the bus terminal.

Activity Patterns and Area Use; The fundamental principle in determining the program in the project area is establishing the connections between the space, user, and functions. These connections were established via functional abundance and diversity in user profiles. In this respect, an urban central business area design was done with the configuration of production, sharing area that gathers multiple activities. This planning and design strategy aimed to bring together investors from various business sectors and individuals from lines of work searching for partnerships with their innovative ideas.

It was configured as a base to develop automation and innovative intelligence to be used in agriculture and tourism with its start-up offices and workshops to contribute to the urban economy and its environment.

Public and Green Open Spaces; Attention was paid to forming a landscape characteristic compatible with the natural plant cover of Antalya. The landscape barriers in the

form of hills were formed to transition to the green space east of Dokumapark. Endemic species and species that provide umbrage suitable for the region's climate were used in this region. Considering the hot climate of the area, tall species that provide umbrage were preferred.

Transformation in the Environmental and Urban Texture; It is incorrect to define the area's connection with its environment only over the transportation system. With its increasing accessibility levels, the newly developed CBD would affect the close-built environment, and tendencies to increase the building density would emerge. The increasing land values would create transformation pressure, especially on the 75. Yıl and Ulusoy streets to the west and Mehmet Akif and Mithatpaşa streets to the east. In this respect, it is inevitable to control, in a planned manner, the physical development and transformation of the urban texture, which is within the Dokuma area's sphere of influence, which would be developed and transformed spatially. Thus, the design approach in the project was configured to balance profitability. In the section to the west of the area, which developed as detached buildings, an attached building order, with commercial uses on the first floors, was recommended to enable integrity in the urban texture.

Table 2 Aims and objectives

Aims	Objectives
Reinforcing the center by redeveloping the industrial heritage and Antalya identity, which has begun to be forgotten	–Enabling the project area to integrate with the city –Providing a holistic function to the area by establishing connections between Dokuma Park and the large recreation areas of the city –Emphasizing the historical and cultural value domains of Dokuma Park
Organizing the Project area as a space accessible by all kinds of users	–Facilitating access to the area by regulating the high-speed highways passing to the east and west of the area (rail systems, bicycle roads, new stops, city bikes, etc.) –Clearing the area of the motor vehicles and reinforcing transportation by alternative vehicles such as bicycles or a pedestrian-intense circulation system
Creating an accessible center by reinforcing the close and distant transportation infrastructure to enable the functioning of the area as a central urban business area	–Reinforcing the connections within and around the area with different transportation means –Enabling access to the area by integrating the shared-bicycle system with the public transportation stops encompassing the old Castle and the present central district of Konyaaltı
Creating an area absorbing the present center and sub-center pressure of the city and enabling diversity in the new central business area through urban functions	–Redeveloping the area, which has its place in the citizens' memories, as a city park by conceptualizing the project—reinforcing the perception that Dokuma Park is a new locus integrated into the city center –Creating a vivid urban locus that meets the demands of the new functional areas in the new city center, contrary to the traditional CBD approaches
Enabling the physical/functional integration of the area with the residential areas in its close vicinity while reinforcing, at the macro level, the accessibility of the project area, which is an attraction center for the city and the region	–Developing architectural solutions and sensitivity that would orient the future development and transformation of the built environment near the area, which would be directly affected by the transformation in the project area –Serving new experiences to both the citizens and the tourists visiting the city in the new development area of the city, as an alternative to the tourism-oriented developing function areas that apply pressure to the coastline

2.5 A Search for Form with the Visual Programming Language and Conceptual Design

After determining the intervention areas, the conceptual studies of the competition area were conducted with the digital sketching method. The deformation of the competition area was realized using the visual programming language since the relevant area was an industrial one that had lost its function (Brownfield). The Grasshopper software, a visual programming language that runs as an add-on to the 3D modeling software Rhinoceros, was used. The software is generally used to develop forms in architecture and urban design (Stein & Veirum, 2005; Çalışkan, 2017). In addition, individual performance (structure, light, energy, cost, etc.) criteria could also be included in the process. Thus the search for optimum form could be done regarding the criteria defined (Woodbury, 2010). In this project, maximizing the open spaces and distributing them to the whole area balanced was adopted as a criterion for the urban-scale search for a form. Several add-ons could be included in the Grasshopper software. The Pufferfish plug-in was used in the form search. Using the "tween two curves" command of this plug-in, the competition land was overlaid with a grid

toward the desired direction. When using this command, two lines were drawn to the boundaries of the relevant area. Later, the number value for the desired partitioning between these two lines was assigned (Phase 1) (Figs. 4 and 5).

When this number is assigned using the "number slider," the partitioning of the grid system could quickly be decreased or increased. This speeds up the preparation of the different versions of the digital sketches drawn in the design process. This method is efficient, especially in conceptual studies in project competitions, which have time limitations. After forming the grid system, many points should be determined on the grid for the curves to be deformed. The curves were partitioned with the command "divide curve." To determine the number of points on the curves, the "count" section, one of the inputs of the "divide curve" command, entered the number value using the "number slider" (Figs. 4 and 5).

After this phase, the "Pinch and Spread" command of the Pufferfish plug-in was used to change the shape of this grid system. This command has two essential inputs. One is the location (at what location the pinch would occur), and the other is the points (the points to be pinched). The points input was assigned all the points defined on the curves. The location input was assigned the locations of the points
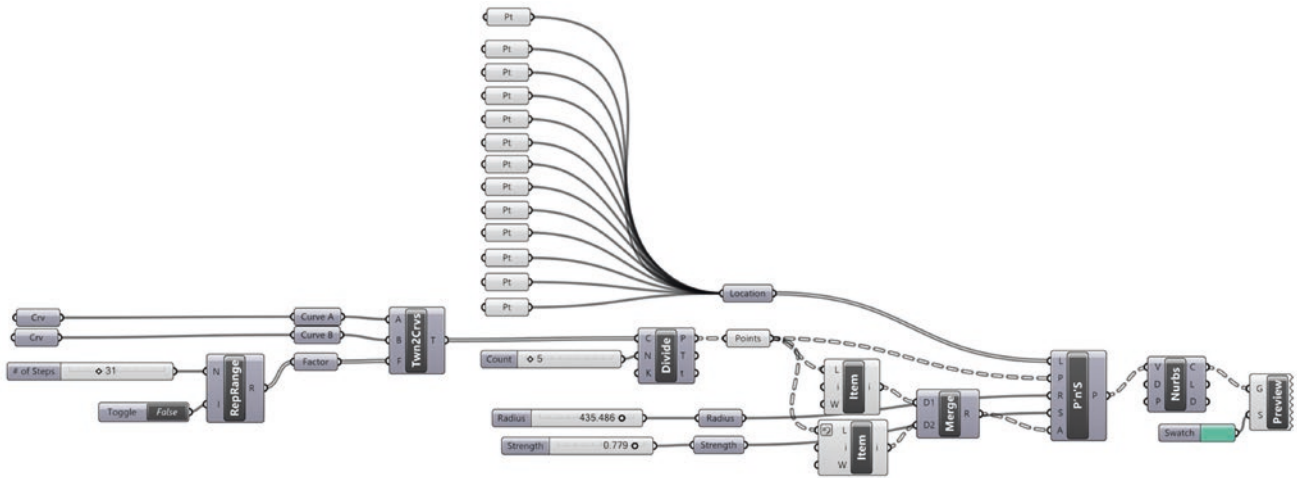
Fig. 4 The commands used in the search for form in the Grasshopper software (The authors, 2018)
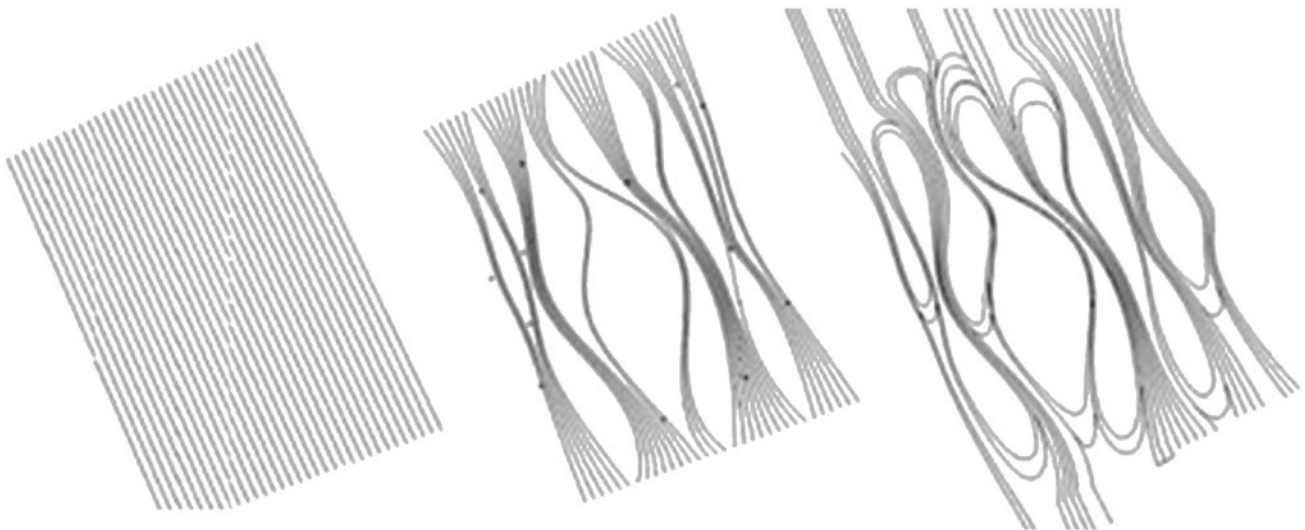
Fig. 5 Phases of creating a form in Rhinoceros software (Phases 1–3) (The authors, 2018)

determined by the designer. The complex surface-green space ratio was considered in determining these points. The locations of these points can easily be changed since they are defined parametrically. The number slider was assigned to the other inputs of the Pinch and Spread command, i.e., strength and radius (the radius value for the circles formed taking the defined location points as a center that enables the deformation). Thus, this value could easily be changed parametrically. This, in turn, diversifies and speeds up the form-finding process of the designer since it creates many variations. Another input of the "Pinch and Spread" command, the "anchors" input, was assigned the points at the grid's boundaries. Thus, a new parametric grid system, which could be deformed, was created (Phase 2) (Fig. 5). After working with this parametric system, the grid to be

applied in the project was determined, and the layout plan's form was created by making several adjustments (Phase 3) (Fig. 5).

2.6 Layout Plan and Architectural Design

The sensitivities in the planning stage were oriented toward creating the architectural forms, selecting the construction material, and forming the infrastructure. In this respect, instead of developing an intense and multi-story structure frequently seen in the traditional CBD (Central Business District) approaches, the intense center perception was moderated with mass solutions hidden under the artificial hills. In establishing the connections between the structures

and Dokuma Park, the traces of the present factory structures and their functioning styles were reflected in the Dokuma Park area with an approach evolving from order to chaos and then from chaos to order. Also, the distribution of structures with different functions from common spaces that converge to each other following a similar pattern was ensured when the open spaces and transportation system were configured (Fig. 6).

An architectural program that enables all kinds of use and transformation with its flexible building plans with dynamic urban planning that flows toward each other with the emphasis on solid flexibility, the area was transformed into a new center accessible without any obstacles, which is freely experienced and provides many opportunities.

Creating shady spaces with half-open areas formed with eaves. Following the changed topography, half-open spaces were created with the installation of eaves to the buried structure bodies. These spaces could be used, especially in the summer, as all-day cool spaces for both local people and tourists. Enabling natural air conditioning by the orientation of the topography. A cooling effect would be ensured with the orientation of the topography with the southwestern winds, which is the dominant wind direction (Fig. 7).

In addition, the eaves and the buried masses, protected from the winter's harsh winds, would enable natural air conditioning in the area. Also, the artificial hills created in the project would enable the removal of the contaminant in situ without removing the soil mass containing contaminants to another area—using renewable energy sources. The energy for the whole area could be generated with the solar panels installed on the roof of the Central Business area

mass. Intense use of open and green areas. Considering the scarcity of green areas in close vicinity, dense green areas are planned in the project area. With the green passageways in the city, the ecological balance of the area would be protected, and biodiversity would build up.

3   Conclusion

Due to the rapid changes in the changing and transforming urban space, the use of certain areas ends. The industrial areas, which were the fundamental employment areas in the center of the cities when they were built, are now stuck in the urban space, and their transformation is inevitable. In addition, the buildings in these abandoned areas have become unusable and unproductive. The first examples of the industrial areas are now on the most valuable lands of the cities concerning their location and the area they cover. Therefore, the use value of the area is one of the most critical factors in transformation and renewal projects to be applied to these areas.

These areas are tried to be revitalized and regained by the city through programs for redeveloping, conserving industrial heritage, enabling sustainability, and recreation and tourism. The local administrations generally perform the transformation of the area via the privatization administration. These areas' renewal and transformation applications should be carried out with a holistic and innovative design approach considering the economic, environmental, and social contexts.

This study proposes a methodology for redeveloping abandoned industrial areas (brownfields) in the context of an urban design competition. The methodology consists of

Fig. 6 The layout plan developed in the competition (The authors, 2018)

Fig. 7 Aerial views showing the topography and CBD (The authors, 2018)

the parts related to determining the design approach, collection, analysis, and synthesis of the data, determining the aims and objectives, determining intervention areas, the search for form with a visual programming language, layout plan, and architectural design.

Recently, urban design competitions have emerged as a sub-discipline that makes more room for itself in the urban design discipline. The increase in the number of projects and the discussions on the resulting projects have become popular among different groups in the design principle and have started to influence the disciplines. The realization of the projects in minimal time due to the terms and conditions of the competition creates a limitation that the opinions of the individuals, the dwellers, are not reflected sufficiently. This study exhibits a systematic narrative of how the design team handles a competition project conducted on a particular area constituting urban memory. The practicability and economy of the project could be questioned. Despite its limitations, this study, with its content about the competition processes, is essential in that it analyzes and documents the discourse and debates holistically in the competitions and determines theoretical and practical contributions of the competitions to the urban design discipline.

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The Recovery of Coastal Flooding Archaeological Heritage Sites Through Nature-Based Solutions and Community Needs

Francesca Ciampa and Carla Sofia Santos Ferreira

Abstract

Flood phenomena linked to anthropogenic actions, such as large-scale urbanization, massive tourist flows and climate change are some of the main causes of degrading coastal archaeological heritage sites. In the field of Architectural Technology, the study investigates the degradation status of these sites and its causes and identifies recovery and adaptation strategies based on technological and nature-based solutions to mitigate the problem. Starting from the application of the alignment check of the demand-performance approach (UNI 8289, 1981) to nature-based solutions, this research proposes a recovery strategy to mitigate degradation of coastal archaeological sites threatened by floods. The strategy focuses on mediating conservation and transformation of the surrounding built environment, preserving the archaeological heritage for future generations and promoting sustainable tourism. The integration of technological and nature-based solutions in the cultural heritage sites may allow the reactivation of parts of the sites no longer able to communicate with the contemporary settlement system in which diaphasic landscape, environmental and technological dimensions are grafted. This topic is explored by focusing on the example of archaeological site of the *Villa di Pollio Felice* (called also *Bagni della Regina Giovanna*) in Sorrento, Southern Italy. The urbanistic position of this site makes the maritime villa and its promontory of artificial terraces a site of infrastructural interest accessible from both sea and land. This gives the site's recovery actions an ambivalent value to operate both in the sense of material culture, exposed to flooding, and immaterial culture, exposed to degradation and the risk of losing the cultural identity of the community. This study provides a rehabilitation model of coastal archaeological sites which encourages the appropriate relation between material and immaterial built heritage, by improving the integration of nature-based solutions. The model links the need to conserve the cities of the past and transform the nowadays cities. Exploiting the flooding phenomena can be an opportunity to empower the recovery tools for the cultural heritage and its built environment.

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1 Introduction

Coastal archaeological sites are complex systems of intertwined relationships between the protection needs of the existing infrastructures settled by past local communities and the expected uses from current communities, often associated with the expansion of the built environment. Such sites have to deal with cultural heritage valorizaiion processes capable of governing the numerous variables that characterize the environmental, technological, social, cultural and economic elements of the coastal archaeological site (Pinto et al., 2021). Under current global climate projections, coastal cultural heritage sites will have to face

adaptation and implementation of mitigation measures to face consequences of expected sea level rise and increasing floods on the built environment (Blöschl et al., 2017; Ciampa et al., 2021). The built cultural heritage should become resilient to the evolution of time, by making use of tools and recovery models capable of combining the innovation of the latest mitigation solutions (including both technological and nature-based solutions) with the cohesive participation of the community (European Parliament, 2018). Rebalancing the relationship between resilience and social capital acts on the systemic relationships affecting and determining the realignment between conservation and transformation of coastal cultural heritage (Yung & Chan, 2012). This realignment makes coastal heritage a newly accessible and therefore attractive resource for the community and the tourism sector. The involvement of stakeholders in the regeneration processes is necessary to identify forms of enjoyment of coastal archaeological sites that do not conflict with the local economy and the environment, and are co-evolutionary (Bullen and Love, 2011). The recovery of coastal flooding archaeological heritage sites must take into account benefits for the community, the ecosystem and renewed economic forms of using them (Pinto, 2010).

Coastal heritage is a non-renewable resource but itself represents a trace of the identities and evolution of communities in time and space (European Commission, 2018, 2020). Acting on coastal archaeological heritage sites means intervening on the cultural dimension, by developing the capacity to mediate between conservation and transformation actions, influencing the living places of the coastal areas, the prosperity of the settlement systems that are linked to them and the relational continuity between the *genius loci* and the cultural identity of the local communities (CHCfE, 2015; Conference of Ministers of Culture, 2018). The uniqueness and unrepeatability characteristics of these sites determine the need to intervene in its multidimensionality to accelerate processes of valorization and re-appropriation and slow down processes driving environmental degradation and loss of material culture (Douglas, 2016). For these reasons, interventions on this type of cultural heritage must be supported by critical-evaluative actions for the construction of an effective model within a systemic perspective. This means that the study of possible solutions, strategies or exercisable participation methods must be based on the relationships that the coastal archaeological site has with the built environment in terms of its environmental, social, economic, cultural and technological aspects (Pinto, 2008). This model must therefore be developed based on a reticular vision between architecture, nature and man (Ciampa, 2021). The vulnerability of coastal archaeological sites must be

appropriately considered by taking into account both the quantitative metabolism of the site (Fusco Girard & Vecco, 2019), related to the market demand for advanced technologies and territorial tourism attractors, and the qualitative one related to the intangible values attributed by the communities to such sites as collective identity testimony (Hosagrahar et al., 2016). The adaptive recovery of archaeological sites must therefore be able to make the built environment a generator of new but also renewed values even if the environmental context affects its integrity (Pinto & Viola, 2015, 2016). The vulnerable cultural heritage of coastal archaeological sites must be recovered in coherence with the dynamics of the context in which it is embedded, in the light of its identity and memory (Jokilehto, 2006).

The coastal archaeological heritage is considered as a common cultural resource, covering 6% of the total sea area of the European Union (European Commission, 2015). The area binds not only collective identity values (UNESCO, 2016) but also the most significant continental economic flows, involving more than 300 000 people and a market of 7.8 million jobs indirectly linked to the heritage (UN-HABITAT, 2016). Safeguarding coastal archaeological heritage means protecting 26.7 indirect jobs in the tourism and protection sectors for every other local job linked to the leavibility of the city (Pinto et al., 2021). Intervening in these areas has therefore impacts on cultural, social, economic but also environmental dimensions. In fact, coastal degradation related to climate change, flooding and coastal erosion have led to approximate losses of €200–300 billion per year (European Parliament, 2018). The increasing danger of flooding has become one of the main problems in recent decades for the restoration of coastal archaeological areas (UNESCO, 2016). Over the last 75 years, changes in the magnitude of tides and increasing frequency of flooding have revealed the need for action to recover coastal archaeological heritage (Blöschl et al., 2017). Flooding events such as those that affected sites in north-central Europe in 2002 (Miller et al., 2013), 2013 (Blöschl et al., 2013) and 2015/2016 (Barker et al., 2016), and those that affected southern Europe in 2009 (Petrow & Merz, 2009), 2011 (Villarini et al. 2011), 2014 (Mediero et al. 2014) and 2020 (Ciampa, 2021) highlight the need and urgency of the aforementioned intervention. The magnitude and frequency of flooding have increased between 1965 and 2005 (Bertola et al., 2020), and this trend is expected to continue until 2025 (lobalRunoff Data Centre-GRDC, 2016; Mangini et al., 2018).

In Italy, from 1970 to 2020, coastal flooding events have tripled, affecting 46% of the sandy coast mainly in central-southern regions (Antoniadis, 2019). Increasing sea level and flooding induced by climatic variations, together with large-scale urbanization and massive tourist flows, have led

to concerns regarding degradation and the need for preservation of coastal archaeological sites in Italy. The damage to these sites implies the loss of a tangible cultural heritage related to environmental and architectural aspects as well as flora and fauna and the disappearance of portions of land that bear witness to the community's cultural and archaeological identity. Due to its ambivalent nature of historical-monumental and naturalistic nature, coastal archaeological heritage needs strategic interventions, based on redevelopment of the waterfront system. Intervening in the coastal archaeological heritage affects the dynamics of their built environment and the quality of life of local communities. Given the greater attractiveness of economic, cultural and social flows, the protection of coastal heritage sites will support the achievement of some of the Sustainable Development Goals (SDGs), such as SDG 11 (Make cities and human settlements inclusive, safe, resilient and sustainable), SDG 13 (Take urgent action to combat climate change and its impacts) and SDG 15 (Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss) adopted in the 2030 Agenda and formulated in 2015 by the United Nations General Assembly (United Nations, 2021). Intervening in archaeological coastal areas will make these sites more inclusive, safe, resilient and sustainable, highlighting the link between the development, regeneration and reuse operations of settlement assets and quality of life (United Nations, 2021). The achievement of this objective is most evident where coastal archaeological heritage is in a state of abandonment or degradation. In this context, recovery intervention also aligns with SGD 13 (Take urgent action to combat climate change and its impacts). The achievement of this objective requires coastal archaeological site recovery interventions to strengthen resilience and adaptive capacity to climate-related risks by integrating site value-conscious strategies. Furthermore, intervening by restoring coastal sites of interest aligns with SDG 15, focusing on protecting, restoring and promoting the sustainable use of coastal ecosystems (marine and terrestrial) and halt their degradation (United Nations, 2021).

This study aims to review the threats of coastal arechaelogical sites and present a recovery coastal flooding model, based on the integration of nature-based solutions and encouraging the appropriate relation between material and immaterial built heritage. The model links the necessity to conserve the cities of the past with the need to transform the cities of the present. The paper is divided into five sections: the first provides a theoretical background about the importance of coastal cultural heritage located in sites of archaeological interest, their environmental vulnerability, and the recovery actions to preserving the archaeological heritage for future generations and fullfill the needs of current users.

The second section presents the 'Villa di Pollio Felice' in the municipality of Sorrento, Italy and the third section introduces the methodology used. The fourth section discusses the opportunity to integrate nature-based solutions in the study area to mitigate degradation of coastal heritage sites. The fifth section presents a model for improving the management, usability, environmental protection and technological safety of coastal archaeological sites. This defines a support for recovery strategies based on technological and environmental actions for the mitigation of flooding conditions in coastal archaeological sites.

2 Study Site

Of the 360 km of Italian coastline, more than half has been subject to urbanization and massification of tourism (Angrilli, 2018). Urbanization affects 25% of the coastline, while the remaining 39% and 36% are covered by sandy and rocky surfaces, respectively (Antoniadis, 2019). The coastal urban areas are occupied by infrastructure works (mostly port) and productive activities (28 km), settlements with lower density (102 km) but also high-density urban landscapes (51 km). Only 17 km of coastline can still be considered agricultural landscapes. The stretches of coastline considered 'intact' extend over 162 km, driven by the complex morphological profile which make urbanization extremely difficult (Fig. 1).

The sites of archaelogical interest with high historical and cultural value are subject to the constraints laid down in the Italian Cultural Heritage and Landscape Code Villa di Pollio Felice (also called Bagni della Regina Giovanna) in Sorrento, in Campania Region placed in southern Italy. This site is characterized by the urban position which makes the maritime villa and its promontory of artificial terraces a site of infrastructural interest accessible from both sea and land (Fig. 2). The relevance of investigating this site is because it is located in a marine protected area, near the centre of a town but not related to its infrastructure. It is recognized by the community as a significant collective place and with a high potential for recovery.

The Villa di Pollio Felice is a seaside construction dating from the first century BC to the first century AC on the Capo di Sorrento promontory. The site extends over 2 ha and contained a domus on the sea and an upstream building dedicated to agricultural purposes (Franchino, 2006; Franchino et al., 2011). The two units were connected by roads and tunnels that allowed the site to be used through a system of artificial terracing in *opus reticulatum* which made it one of the most advanced Roman villae in the Gulf of Naples (Fig. 3).

A stone bridge over a natural basin connects the two sections of the promontory and leads to the rooms of the
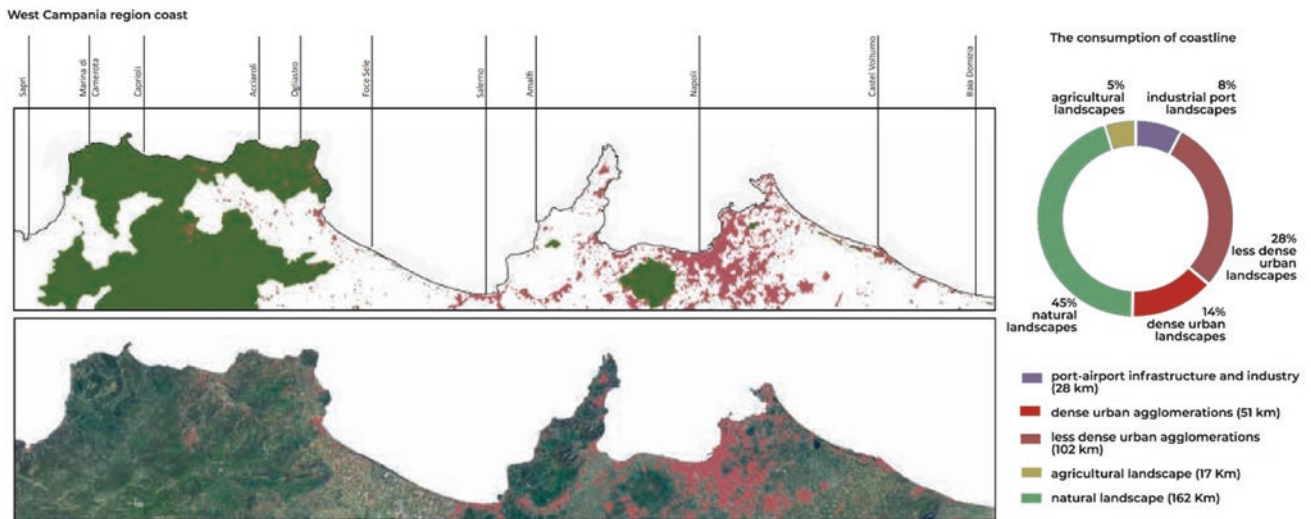
Fig. 1 The Campania coast, readjusted from regional data

Fig. 2 Villa Pollio Felice Coastal Archeological Heritage Site, Author

domus. The spatial articulation of the rooms was distributed around the peristyle characterized by *cocciopesto* floors (a building material used as a waterproof coating for both indoor and outdoor floors and wall cladding, composed of finely crushed brick fragments and fine mortar made from air lime). In contrast, the floors of the upper rooms were mosaics. The villa was characterized by a functional partition: the private quarters in the east of the dominus and the section devoted to servants and services on the west. In particular, the lower part of the domus had direct access to the sea with shops and a pathway for a thermal bath. The latter used the apse of the caldarium to maximize the use of water channelled from the small port below, which it overlooked (Frettoloso, 2010). The port was articulated in a natural basin that was, at the same time, a dock and a private swimming pool (Fig. 4). Unlike the seaside construction devoted

(a)   (b)

Fig. 3 Villa Pollio Felice, **a** sea view and **b** planimetric view, Author

Fig. 4 Villa Pollio Felice Natural Basin, Author

to otium and luxuria, the inland villa carried out the productive activity of negotium, in which oil, wine, fish and shellfish represented the main commodity of exchange with the inland territory.

This site is peculiar because it is impossible to separating the archaeological remains from the coastal environment, which together represent the only key to understanding the accessible archaeological ruins (Fabbri, 2007). The morphology of the site, from the sea to the coast, is characterized by a naturalistic conformation that aggravates the coastal erosion phenomena and whose slopes give back the environmental complexity of the site where it is difficult to identify the boundary between the site and the context (Fig. 5).

The complexity of the site is enhanced by its natural context, as the Villa di Pollio Felice is located in the Marine Protected Area of Punta Campanella. In Italy, Marine Protected Areas are protected by the Law for the Defence of the Sea no. 979/82 and have the function of protecting the coastline, the marine environments, the seabed and the biophysical characteristics of flora and fauna (Fig. 6).

Fig. 5 Agricultural and residential parts of Villa Pollio Felice ruins, Author

Marine protected areas are considered to be ecological garrisons of scientific importance due to their economic, cultural and educational value. Amendment no. 394/91 provides a series of constraints in these areas dedicated to the conservation of animal and plant species and the application of management and/or environmental restoration methods suitable for achieving integration between man and the environment. In particular, the Punta Campanella Marine Protected Area was established by Ministerial Decree no. 46 of 12 December 1997, subsequently amended by Ministerial Decree of 13 June 2000, which protects not only the archaeological site but extends over 40 km of coastline. A further element of peculiarity of the site concerns not only the natural protection but also the proper management of the territory for eco-tourism and for the maintenance and development of local economies. The archaeological site is located in an area with a high density of tourism, which leads to an unregulated use of the site that is aware of its cultural value (Bai, 2003). The unregulated accessibility of the site represents a threat from urbanization linked to the improper use of the area (Budetta et al., 2013). However, this site has been exposed to flooding and degradation, which affects its material culture, and the risk of loss of community cultural identity (Arinat et al., 2007). These

problems raise the need for an integrated solution capable of combining the conservation of environmental values with the sustainable use of the built environment, as well as the archaeological cultural and identity importance.

3   Methodology

The methodology is focused on a multi-criteria approach based on a comparison matrix to identify possible solutions for flood mitigation and coastal recovery by suggesting a strategy focused on nature-based solutions. The methodology consists of 4 main phases interlinked over time to allow for continuous improvement. This occurs within an iterative logic whereby the output obtained is re-entered as input within the processological method to refine it. The methodological phases are divided into:

- the first phase consisting of the elaboration of a 'criticism matrix'. This is based on questions about the system, namely, the hazards affecting it and which can define the sub-systemic dimensions. This matrix allows to construct a response between the aforementioned attributes of the sub-systemic dimensions and the

Fig. 6 Villa Pollio Felice built environment details, Author

UNI8289:1981 (Bosia, 2013). This standard identifies the classification criteria for defining classes of need, which can basically be conceived as an explication of the needs of the end user, assessed according to environmental, cultural and economic factors. The need classes represent the first level of analysis of the demand-performance approach, i.e. they group both the needs of the users and of the different actors involved in the regeneration process. The need classes straddle the needs of direct users, managers and planners. The classes of requirement explicitly identified by the standard are Safety; User well-being, hygiene and health; Usability; Appearance; Management; Integration; Environmental protection; and Rational use of resources (Pinto, 2004). For this reason, based on the literature review, the needs that the communities must have satisfied by the interventions of recovery and mitigation of the built environment are inventoried.

- the second phase consisting of the elaboration of a 'solution matrix'. This is based on a SWOT analysis (evaluation of Strengths, Weaknesses, Opportunities and Threats) (Shearmur, 2016) of the flood mitigation solutions implemented mainly in the countrys' vulnerable regions. This happens because the study follows a place-based and context-aware (Kelman, 2018) solution principle for which solutions responding to criticalities in comparable sites on a national scale can be masses in the system by verifying their compliance with the requisites necessary to satisfy the needs (Indovina et al., 2006) identified in the matrix developed in the first phase.
- the third phase consisting of the elaboration of a 'compatibility verify matrix'. This matrix systematizes the sub-systemic analysis of the case study with the needs, requirements and expected performances (deriving slab matrices of the previous phases). This allows the identification of mitigation and recovery criteria to be adapted

CRITICISM MATRIX (NEED)

- Archeological Coastal System composition
- Archeological Coastal Vulnerability, Hazard, Problem
- Respondance to NEED CLASSES (UNI8289:1981)

SOLUTION MATRIX (REQUIRE)

- SWOT evaluation of the best context-aware nature-based solutions
- Sub-system respondance requirement

(Environmental protection, Well-being, Usability, Management, Safety, Integration, Appearance)

ELABORATION OF REHABILITATION MODEL OF COASTAL ARCHAEOLOGICAL SITES (CRITERIA)

- Elaboration of the criteria for identifying the principles comprising the model

COMPATIBILITY VERIFY MATRIX (PERFORMANCE)

- Case-study systemic composition
- needs, requirements and expected performance analysis
- identification of criteria to select best strategies

Fig. 7 Methodological framework

and replicated in similar contexts for an appropriate integration of nature-based solutions.

- the fourth phase consisting of the iterativity of the model, including the reintroduction of what has been obtained, and transforming the output of the process into an input for the improvement of the model over time. It provides a circular strategy allowing to act in a scalar strategy, keeping the site-specific dimension together with the general one as a multiple (Fig. 7).

4   Degradation of Coastal Heritage Site

This section discusses the opportunity to integrate nature-based solutions in Villa Pollio Felice Coastal Heritage Site, allowing the reactivation of sections of the city no longer linked to the contemporary settlement system in which diaphasic landscape and environmental and technological dimensions are grafted. In this phase the elaboration of a model, validated for the case study, is presented aimed at improving the management, usability, environmental protection and technological safety of coastal archaeological sites, following the UNI 8289 (1981) standards. This defines a support for recovery strategies based on technological and environmental actions for the mitigation of flooding conditions in coastal archaeological sites.

4.1   Vulnerabilities of Coastal Heritage Site

The dynamic dimensions that characterize the coastal archaeological system change asynchronously, determining the loss of relationships with the contemporary built environment. In this perspective, we must consider the response capacity of a vulnerable settlement system in relation to its resistance to disturbance linked to the speed with which it returns to a condition of equilibrium (Davoudi, 2013). The latter, having proved fallible in dealing with the destabilization event, will have to rebalance itself according to a new order for future responses. The stability and resilience to external shocks of a vulnerable settlement system is due to its speed of recovery from both an engineering and ecological perspective (Ahmed & Kelman, 2018). In the former case, it refers to the ability of a system to return to equilibrium or a steady state after a disturbance classifiable as a natural disaster (e.g. a flood) or social upheaval (i.e. lack of awareness of the site's identity significance) (Holling, 1987). On the contrary, from an ecological point of view, it refers to the extent to which the disturbance can be absorbed before the system changes its structure with reference to the time the settlement system takes to recover after a shock and remain within critical thresholds (Holling, 1996). Therefore, a vulnerable settlement system should be understood according to a bipolar view, pursuing

the balance between all its respective functions (Caterina & Pinto, 1997). The complexity of the coastal archaeological system drives research to examine it according to a systemic logic typical of Architectural Technology. This is due to the typological capacity of these heritage sites to be the relational poles of intersection between human, technological and urban capital. In this perspective, the built environment is seen as a multidimensional aggregator, within which different subsystems are related to each other: environmental subsystem, economic subsystem, technological subsystem, social subsystem and cultural subsystem. The link between these subsystems is strictly dependent on the constructional and functional characteristics that make up the archaeological site, and the external factors, i.e. natural and technological, to which they are generally subjected. Each of these subsystems can be associated with vulnerabilities, hazards and related problems about the loss of material and immaterial culture (Bottero, 2017).

From the point of view of the environmental subsystem the main vulnerability is flooding, the related hazard is coastal erosion and the consequent phenomenon is the loss of the material culture of the coastal archaeological site. From the point of view of the cultural subsystem the main vulnerability is neglect and abandonment of the site due to lack of awareness, the hazard of which is the involution of the cultural identity of the community with the consequent loss of intangible culture. From the point of view of the social subsystem, the main vulnerability is the lack of participation in the mitigation dynamics, which is associated with the hazard related to the misuse of the site, which generates the loss of intangible culture. From the point of view of the economic subsystem, the main vulnerability is the massification of tourism, which is associated with the site degradation, and generates the loss of material culture. From the point of view of the technological subsystem, the main vulnerability is the loss of functional performance, which generates the incompatibility of integration of mitigation solutions, linked to the phenomenon of loss of material culture. What is interesting is the possibility of associating to this discretization the system of classes of needs present in the UNI8289 standards. The latter, as provided by the Technology of Architecture, describes several requirement classes. The Environmental Protection class is defined as a set of conditions related to the maintenance and improvement of subsystem states of which the coastal archaeological system is part (Pinto, 2004). The requirement class of Appearance is the set of conditions related to the perceptual enjoyment of the coastal archaeological system by users. The requirement class of well-being includes a set of conditions related to the state of the coastal archaeological system appropriate to the life, health and activities of the users. The requirement class of Usability sets the conditions related to the ability of the

coastal archaeological system to be adequately used by users in the performance of activities. The requirement class of Management comprises a set of conditions related to the economy of operation of the coastal archaeological system. The requirement class of Safety includes conditions related to the safety of the users, as well as the defence and prevention of accidental damage in the operation of the mitigation solution. Finally, the requirement class of Integrability describes conditions related to the ability of the units and elements of the building system to functionally connect with each other (Bottero, 2017) presents a comparison matrix that returns the link between subsystems and need classes (Table 1).

4.2 Possible Nature-Based Solutions to Mitigate Vulnerabilities of Coastal Heritage

The identification of the typical state of the art of coastal archaeological areas concerning the dimensions of vulnerabilities, hazards and resulting problems allows us to reflect on the relationship between the different subsystems and their relative fragilities. This relationship is of particular importance in the light of the direct link between the need for conservation and the need to use the asset to mitigate the flooding problem. This makes it necessary for any action to protect the archaeological heritage to be closely linked to a solution to mitigate the impact of climate change and anthropic activities, orienting the intervention towards nature-based solutions, especially when they are oriented towards making a coastal archaeological site accessible. At this point, the choice of appropriate mitigation solutions must address flooding while safeguarding the cultural identity and enjoyment of the site from degradation. In order to respond to the interconnection of the coastal archaeological site with the contemporary city, the choice of an appropriate mitigation solution for touristification and urbanization must meet the main characteristics identified. Technological integration of these sites must follow a demand-performance perspective based on recovery and land protection actions. This should consider technological integration in order to subsequently identify the most compatible solution. This discretizaiion guides the potential interaction between the technological and environmental dimensions of the territory. Discretization of the overall system in the previous matrix (Table 1) makes it possible to identify the needs to be satisfied in the solutions matrix by meeting certain requirements. A requirement is a fundamental need linked to the performance of a given activity. The latter may be associated with a requirement for a necessary quality or a condition required to perform a function, transposing a need into technical terms. This requirement may then respond to a performance,

Table 1 Criticism matrix

Coastal archeological subsystem	Vulnerability	Hazard	Problem	UNI8289:1981 Classes of Need
Environmental Subsystem	Flooding	Coastal erosion	Loss of material culture	Environmental protection: the set of conditions relating to the maintenance and improvement of the state of the supra-systems of which the coastal archaeological system is a part
Cultural Subsystem	Neglect and abandonment of the site due to lack of awareness	Involution of community cultural identity	Loss of immaterial culture	Appearance: a set of conditions related to the perceptive enjoyment of the coastal archaeological system by users
				Well-being: a set of conditions related to the state of the coastal archaeological system appropriate to the life, health and activities of the users
Social Subsystem	Lack of participation in mitigation dynamics	Improper use of the site	Loss of immaterial culture	Usability: a set of conditions related to the aptitude of the coastal archaeological system to be adequately used by users in carrying out their activities
Economic Subsystem	Tourism maximization	Degradation of the site	Loss of material culture	Management: a set of conditions relating to the economy of operation of the coastal archaeological system
Technological Subsystem	Loss of functional performance	Incompatibility of integration of mitigation solutions	Loss of material culture	Safety: a set of conditions related to the safety of the users, as well as to the defence and prevention of damage due to accidental factors, in the operation of the mitigation solution
				Integration: a set of conditions related to the ability of the units and elements of the building system to functionally connect with each other

i.e. a service rendered, a work provided, an operation or a behaviour occurring in the performance of a given function of the nature-based solution. This behaviour under certain conditions of use and stress is related to a specific use. Requirement system operates as an interface between the needs and performance of the system, formulating demands and quality responses expressed in functional terms. For this reason, the requirement classes guide the selection of mitigation practices for the recovery actions of coastal archaeological sites as placed-based and context-aware excellent cases. The latter were then evaluated through a SWOT analysis that allowed to use their compliance with the requirements and their relative performance (Table 2).

The nature-based solutions respond through the requirements to the needs of the subsystem examined above (Environmental Subsystem, Cultural Subsystem, Social Subsystem, Economic Subsystem, Technological Subsystem). This determines the possibility of identifying those connotative characteristics that can guarantee an appropriate recovery of coastal flooding archaeological heritage sites. The choice of a solution should meet the requirement of flood mitigation. This is aimed at the conservation of local resources and the connection between the historical, environmental and landscape values of the area for a complete enhancement of cultural heritage sites. It is therefore important to identify a strategy in which protection and preservation can optimize the configurations of coastal archaeological sites in relation to the control of the transformations of the built environment with the objective of conservation.

The choice of a solution to mitigate the subsystem vulnerabilities of coastal archaeological sites is the basis

Table 2 Solution matrix

Nature-based solutions implemented in coastal heritage sites	Strength	Weakness	Opportunity	Threat	Subsystem respondance requirement
VENETO_ *Velme* and *Barene*: Re-use of sediments from dredging the coast to form deposits, which over time, with the energy of the tide and waves, have become naturalized, forming habitats. This solution protects the coast from flooding by trying to mitigate the damaging action of both the impact of the wave and the ecosystem ruin linked to the disruption of the rising tide	Progressive evolution from sediment deposit to tidal habitat; it takes a period of 5–10 years to restore vegetation and nesting species (Arinat et al., 2007)	Need for more suitable techniques to forming the initial deposits, and structures to protect their edges	Bio-stabilization and regulation of surface elevation around normal high tides	Impact of sea level on sediment deposit erosion	Environmental protection: high Well-being: medium Usability: low Management: low Safety: medium Integration: high Appearance: high
CALABRIA_ Revegetation with *Limonium hyblaeum B*: It is based on a root arch plant that grows around the structure and defends the architecture from the erosive action of water. This solution protects the coast from the action of flooding by attempting to mitigate both the damaging action of waves on the built environment of the coast and the effects of the tide on the construction technology of the buildings present	It has a high technical and biotechnical functionality (consolidation, vegetation cover, bioremediation); low cost for construction/management, which is linked to a generation of cultural inducements	Aesthetic functionality with distinctive colours and scents, consistent with the ancient state of the plants	Naturalistic functionality in full respect of the chorological level	They are interventions that have never represented damage to the artefacts but appear as retrofit	Environmental protection: high Well-being: medium Usability: high Management: high Safety: high Integration: high Appearance: low
PUGLIA_ Cylindrical geotextile container: maritime barriers constructed with geosynthetic containers filled with sand, directly exposed to wave motion and located below the average sea level. This solution protects the coast from flooding by attempting to mitigate the action of rising waves by counteracting the solution that responds and dampens the impact before it reaches the coast	Fast construction time and reduced cost compared to traditional cliff works (Arinat et al., 2007)	Experience gained only on the basis of checks on early applications and not verified in the long term, and therefore, supported by greater reliability	The limited impact on the built environment of construction operations that makes possible to carry out interventions even during the bathing season	The absence of an appropriateness code for products available on the market and therefore the possibility of incompatibility between the choice of application and the available product	Environmental protection: medium Well-being: medium Usability: medium Management: high Safety: high Integration: high Appearance: high

(continued)

Table 2 (continued)

Nature-based solutions implemented in coastal heritage sites	Strength	Weakness	Opportunity	Threat	Subsystem respondance requirement
SICILIA_ Parapet fences: are timber structures offering great flexibility in design. They can be used in tourism management systems and are often readily accepted by the public. This solution protects the coastline from flooding by trying to mitigate the action of rising waves through barriers that counteract the rise in the waves	Timber structures are easy to repair or extend compared to concrete structures	The design must anticipate the evolution of shoreline erosion, which can lead to disruption, overtopping or bypassing, causing structural deterioration	The fences will reduce the visual impact, offer additional protection from erosion and re-establish a natural succession of habitats through local wood	The need to insert new or recycled protective vegetation screens generates the need for frequent maintenance of the inserted apparatus	Environmental protection: high Well-being: medium Usability: low Management: high Safety: medium Integration: high Appearance: low
LAZIO_ Semi-emersed breakwater with ph-neutral shell composition. This solution protects the coast from flooding by attempting to mitigate the impact of the tide on the coastal area	Public access routes should be clearly defined and fenced, if necessary, to prevent them from leading to potholes through trampling	Walkways or other temporary surfaces should follow the natural asset rather than cutting them with straight lines exposing them to the risk of wind erosion	This type of operation often originates with an integrated management, i.e. one that provides for and incorporates short and long-term maintenance operations	The management of access routes to the barriers must be planned and implemented in such a way as to minimize material diversion	Environmental protection: high Well-being: medium Usability: low Management: high Safety: medium Integration: high Appearance: low

for outlining an appropriate land management strategy. Therefore, the inclusion of nature-based solutions would allow, on the one hand, the development of ecological corridors and, on the other hand, the safe and conscious use by the stakeholders.

5 Model for the Rehabilitation of the Coastal Heritage Site

By transposing the method previously proposed to a case study such as the Villa of Pollio Felice, it is possible to verify the concomitance of significant variables. This operation allows the identification of criteria, responding to the needs but at the same time to the performances necessary to build a model for the rehabilitation of the coastal archaeological site. This strategic structure is built to guide and identify the different actions of intervention so that they act appropriately in relation to the single subsystems. These criteria make it possible to act with the objective of protecting the archaeological site through a system of transformative actions linked to its dimensions:

– Environmental protection: climate mitigation interventions on an eco-sustainable basis;
– Protection of the built heritage: structural reinforcement through education to solutions related to the uses of the site;
– Protection of stakeholders: intervention that allows the fruibility of the site through an appropriate use by stakeholders;
– Protection of economic flows: intervention allowing the circular nourishment of the site through the regeneration of protective forms, guaranteeing the continuity of cultural and tourist use;
– Protection of management circuits: cost-saving and sustainable intervention with high possibilities (Table 3).

The model to recover the coastal archaeological sites relies on the reconnection between the protection of the past and the needs of the nearby contemporary city. Through a sustainable interpretation of the tools for the technological recovery of the built environment of cultural heritage, it is necessary to make these sites usable in order to pass them on to future generations starting from the possibility of integrating a mitigation solution for climatic and anthropic threats. This has the purpose of empowering the site by returning it to its interlocutors and allowing them to educate themselves on its safe use and identity value. From the five criteria for an appropriate recovery of archeological coast (Table 3), it is possible to determine a model consisting of four principles identified in Fig. 8.

The model derives from application to the case study whereby it is possible to identify the different subsystems of which the coastal archaeological area is composed: environmental, cultural, economic, social and technological. The latter proves to be particularly significant as the choice of mitigation solution affects all the remaining subsystems. From the case study, it is possible to identify five criteria that derive precisely from the application of the needs and requirements coming from the elaboration of the first two matrices applied to the experimental case (Tables 1 and 2). These criteria are addresses for an appropriate recovery of archaeological coast and have been identified in Environmental protection (climate change mitigation interventions on an eco-sustainable basis), Built heritage protection (structural reinforcement by means of education on solutions related to the native uses of the site), Stakeholder protection (an intervention that allows the fruibility of the site through an appropriate use by stakeholders), Economic flows protection (intervention allowing the circular nourishment of the site through the regeneration of protective forms, guaranteeing the continuity of cultural and tourist use) and Management circuits protection (cost-saving and sustainable intervention with high possibilities). Reflecting on this outcome it is possible to notice how some of them can participate in the fulfilment of the requirements, and therefore of the performance needs for the solutions, with more subsystems at the same time. This reveals the need for a multi-criteria action as anticipated within the methodological approach to determine an appropriate recovery of the coastal archaeological area. From this model, it is possible to identify traits, defined as principles, that unite the design action of the above criteria in the subsystems. These four principles are self-generation, the capacity for self-sustaining through the ability of the natural and archaeological environment to generate an economic attractiveness to support the site's recovery operations; valorization, once the built environment has been recovered, not only to preserve but also to generate new values of the built heritage; integration, i.e. the ability to stimulate a symbiosis between the needs of the stakeholders and those of the built environment, contributing to the economic evolution of use; appropriateness, regarding the recovery of the built cultural heritage becoming appropriate when the solution introduced generates values to be placed at the base of the governance tools. The research returns those connotative characteristics that can guarantee an adequate recovery of the archaeological heritage sites, which come from the alignment between the requirements of the user needs and the expected performance (Table 3). This, highlighted by the matrix, stresses the need–requirement–perfomance relationship. In particular, these characteristics can guide the transformation

Table 3 Compatibility verify matrix

Villa di Pollio Felice system	Stakeholder needs	Tecnological requirements	Environmental performance	Criteria for an appropriate recovery of archeological coast
Environmental Coastal Archeological Subsystem	Mitigate flooding risk and coastal erosion to avoid the loss of material culture	Semi-emersed breakwater with ph-neutral shell composition	Dampens the force of wave motion, mitigating flooding without damaging the living ecosystem	Environmental protection: climate change mitigation interventions on an eco-sustainable basis
Cultural Coastal Archeological Subsystem	Site recovery due to lack of awareness to avoid the involution of community cultural identity and its immaterial loss	Timber parapet fence	Allows for the tourist management of the site by determining the walking and community care of the site	Built heritage protection: structural reinforcement by means of education on solutions related to the native uses of the site
Social Coastal Archeological Subsystem	Participation in mitigation dynamics avoiding the improper use and value loss	Root of *Limonium hyblaeum B* defends the architecture from the erosive agents	The use of a root architecture plant allows stakeholders to make a conscious choice that develops from the rediscovery of its origins, as it is a plant native to this place	Stakeholder protection: an intervention that allows the fruibility of the site through an appropriate use by stakeholders
Economic Coastal Archeological Subsystem	Mitigation of tourism massification to avoid site degration and its material loss	Velme and Barene	Re-use of sediments resulting from dredging for coastal maintenance, reducing management costs and making the site usable in the short term	Economic flows protection: intervention allowing the circular nourishment of the site through the regeneration of protective forms, guaranteeing the continuity of cultural and tourist use
Technological Coastal Archeological Subsystem	Empowerment of functional performance to avoid the incompatibility of integrated mitigation solutions	Cylindrical geotextile container	Maritime works with geosynthetic containers allow ecological integration in less time and cost than traditional technologies	Management circuits Protection: cost-saving and sustainable intervention with high possibilities

Fig. 8 Recovery of coastal archeological heritage strategy
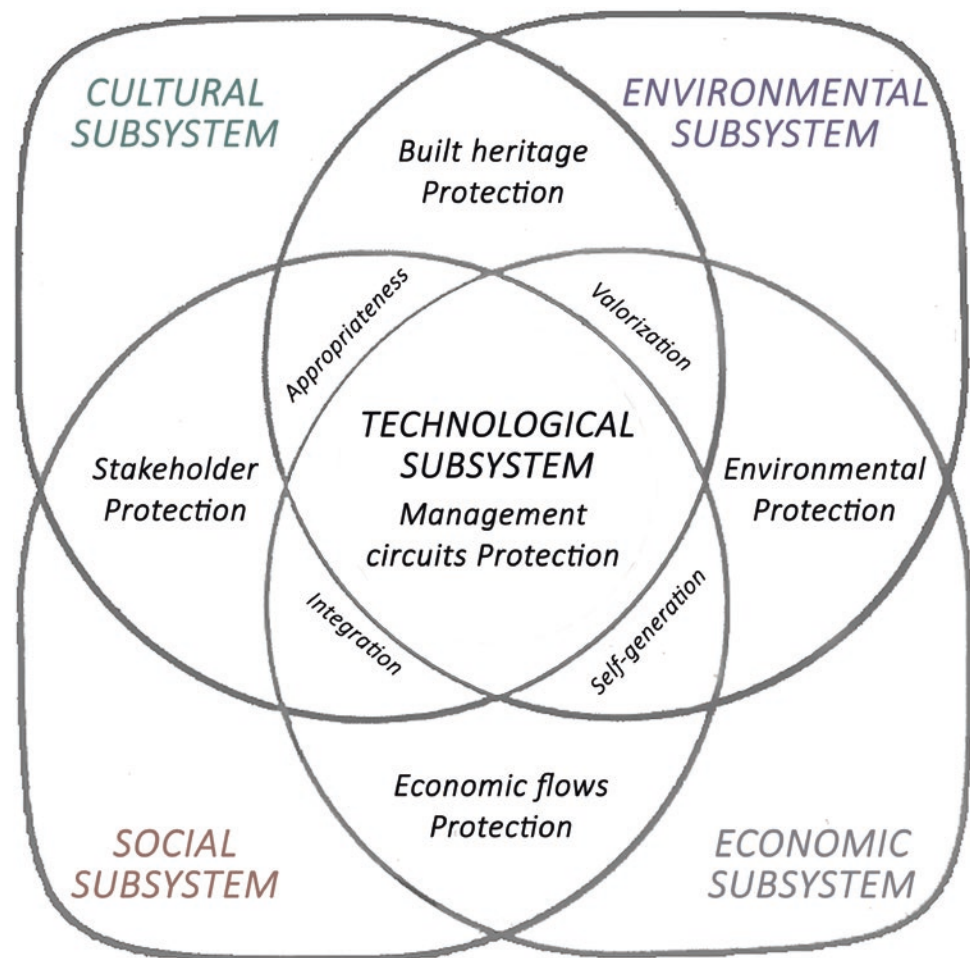
of the built environment, of archaeological interest and under climatic stress, through criteria strategies. These range from a general order of direction determined by its own class of reference (e.g. Environmental protection: climate mitigation interventions on an eco-sustainable basis; Protection of architecture: structural reinforcement by means of education on solutions related to the native uses of the site; Stakeholder protection: an intervention that allows the re-appropriation of the site through the safe use of stakeholders; Protection of economic flows: intervention allowing the circular nourishment of the site through the regeneration of protective forms, guaranteeing the continuity of cultural and tourist use; Protection of management circuits: high-speed intervention, savings and sustainability with perpetual possibility) up to a specific vision related to each of the sub-systems (social, technological, environmental, cultural and economic). This interscalarity allows not only to intervene on the individual parts and general strategies but also on the existing relationships between the transformation and mitigation elements of the built environment of archaeological interest under climatic stress.

6   Conclusion

The proposed strategy supports the choice of a mitigation solution which provides sustainable development, based on environmental protection and cultural and economic mitigation of flooding-threatening coastal archaeological sites. Intervening in these sites means, therefore, allowing the stakeholders to safely enjoy the site, making them responsible for the surrounding space and avoiding a mere musealizaiion or degradation. This study provides a strategy based on management criteria holding together the environmental, architectural, human, economic and management space. In particular, these criteria are capable of guiding, while respecting the sub-systemic needs identified, the complex dialogue between the balances of immaterial and cultural safeguarding and the physical approaches for protection and design transformation. The research opens up to an integrated and multi-sector methodological scenario composed of interconnections and appropriateness measurements. Replicability of the research consists of the transferability of the methodology plastically adaptable

to similar case studies with the technological and environmental decomposition matrices. The discretization of the built environment in a systemic vision, a concept typical of Architectural Technology, allows for a reading according to cultural, economic, social, technological and environmental as well as demanding-performance meanings. This opens up to a practical experimentation of the results to validate what emerged from the research and analysis phases, in line with what was obtained from other Italian coastal heritage sites. The model proposed aims to integrate strategies that have multi-scalar impacts and that represent transformation drives of the dimensional dynamics of the built environment with cultural value.

Author Contributions Conceptualization, F.C.; Data curation, F.C.; Investigation F.C.; Methodology, F.C.; Resources F.C.; Validation, F.C.; Writing—original draft, F.C.; Writing—review and editing C.S.S.F. and F.C.

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Microclimatic Monitoring for Archeological Shelters Across Indoor Comfort and Conservation: The Case Study of the Villa del Casale in Piazza Armerina (Sicily, Italy)

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Abstract

Conservation and use raise priority and complementary needs in the archeological built heritage and, within the contemporary paradigm, they are no longer conflictual activities. The minimum intervention principle and compatibility are key objectives to avoid altering the values of the heritage. However, the musealization process also requires a double focus: on the one hand, the conservation of the material asset; on the other, the well-being of the users. The influence of environmental parameters on material decay is a well-known item: this occurs through chemical, physical, and biological processes, which contribute to reducing the expected life of archeological finds. Furthermore, the conditions of thermo-hygrometric comfort are necessary to guarantee the correct use of the site. The paper focuses on the thermo-hygrometric well-being in archeological sites and, in particular, on the case of Villa Romana del Casale, in Piazza Armerina, Sicily, which is a UNESCO site. A complex restoration project was performed on this site a few decades ago, aimed at improving the conservation of the mosaic apparatuses and users' well-being, through the redesign and consequent replacement of the shelter system. The microclimate monitoring, aimed to verify the environmental conditions created by the new covering system, has been focused on sample room, on which the new covering system has been completed, and rooms that still are covered by the methacrylate old system. The comparison between the environmental parameters related to the old covering system, which caused undesired effects both for use and conservation, and the data related to the new covering system, allowed verifying the improvement in microclimatic conditions after the intervention. Data have demonstrated that the new one has reduced temperature inside the rooms and has increased humidity values. These analytical data demonstrate that the conservative intervention provided a positive impact on microclimatic conditions. Indeed, the comparison also showed the absence of the dangerous greenhouse effect. The conclusion of the paper will propose a comparative analysis of these results and other general aspects of the quality of the intervention, which cannot be measured or can only be measured indirectly.

Keywords

Archeological built heritage · Archeological shelters · Indoor comfort · Natural ventilation · Microclimatic monitoring

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1 Archeological Shelters: A Multifaceted Issue

The ruderal conditions of the archeological built heritage make protection from atmospheric agents essential, especially in those cases where the level of perishability is higher (raw earth, mosaics, and plasters). At the same time, the need to integrate traces from the oldest past with contemporary life reinforces the desire to see them put to use and valorized. These two considerations constitute the poles with respect to which the theme of archeological shelters develops. Numerous references are available on this subject, which highlight the plurality of aspects that must be

considered in archeological shelters (Ashurst, 2007; Aslan et al., 2018; Di Muzio, 2010; Pesaresi and Stewart, 2018; Ranellucci, 1996; Ruggieri & Sposito, 2004; Ruggieri Tricoli & Germanà, 2013; Sposito, 2004), that—one can say in synthesis—represent something far more than a simple protective item, becoming an instrument for presentation and reinterpretation of the archeological construction, and an element that contributes to more thorough all-round fruition.

The extent and importance of archeological construction in Sicily has drawn general attention to the theme of shelters, which in this region make up a wide-ranging and heterogeneous assortment, "not always the fruit of focused and informed project-design, but choices that are often made in conditions of necessity, which in many cases have led towards ready-made and low-cost solutions" (De Coco et al., 2008, p. 217). But also in the case of shelters "aimed specifically at permanent protection and with museographic pretensions, results have raised numerous issues in terms of adequacy and efficiency; often the test of time has brought to light serious damage to archeological constructions, something which may have been avoided with a minimum of foresight and common sense" (Germanà, 2013, p. 190). The case study of the Villa del Casale in Piazza Armerina (Sicily) is among other controversial examples of Sicilian archeological shelters designed by Franco Minissi in the 1960s of the last century, well known at the international level (Rizzi, 2008, 2013; Stanley-Price & Jokilehto, 2001), like the glass positioned on the earthen bricks at Capo Soprano in Gela and the perspex steps on the *cavea* of the theatre at Eraclea Minoa. Despite that these interventions are very significant as museographic solutions still now, they have failed because they were the result of a conception of the architectural project that did not take into account the requirements of maintainability and the environmental quality. Neglecting such technical requirements has made the shelters ineffective, harmful, and unlivable for visitors.

This paper is in line with the quote "In most cases, the primary function of any archeological shelter should be the modification and control of a deleterious environment so as to produce benign conditions for the site and artefacts. It is required to be aesthetically sensitive in order that it can support the effective presentation of the site rather than detracting from it. Both elements of the design are important, however in order to enable successful conservation it is essential that the environmental performance of the shelter is effective rather than that it is a thing of beauty, although this is also a desirable attribute. In short, the design of the shelter should be led by the environmental and conservation performance rather than the aesthetic" (Curteis, 2018, p. 49).

2 The Importance of Microclimatic Monitoring in Archeological Shelters

Archeological sheltering processes require a double focus: on one hand, the conservation of artifacts; on the other hand, visitors' well-being. As a response to both needs, the microclimatic environment must be designed and monitored over time. Environmental parameters affect material decay processes by triggering chemical, physical, and/or biological alterations; moreover, even though the priority is to guarantee the environmental conditions for the protection of the heritage, thermo-hygrometric comfort is needed to ensure correct fruition.

Indoor microclimatic monitoring is the possibility to guarantee suitable levels of indoor comfort, by regulating the thermal exchange between outdoor and indoor through active or passive systems, possibly combined. In the first case, the achievement of the comfort goal is demanded to the technological and thermo-physical characteristics of the building envelope: depending on the context, they can favor or block the passage of air flows, thermal energy, and water vapor from the outdoor to the indoor environment. Indoor microclimate depends on the building components and systems that separate the indoor environment from the outdoor environment. The envelope must guarantee high thermal inertia, to protect indoor environments against heat and cold, and ensure thermo-hygrometric comfort, so as to prevent superficial and interstitial condensation phenomena. Regarding the control of microclimate with active systems, the current technologies allow automatic management of the parameters and provide the possibility to control remotely the machines. These systems are called domotics and consist of products and software (BAC—Building Automation and Control) for the automatization of one or more activities of the systems integrated into the building structure. When it consists of a coordinated technological infrastructure between several systems, that is called the BAC System (UNI, 2017). BACSs optimize the functions of technological systems by realizing controllers, and actively operating on the energy needs of the whole built environment, by adapting HVAC (heating, ventilation, and air conditioning) system regulation according to outdoor climatic conditions.

If such systems are not opportunely designed according to local climatic conditions and/or not opportunely realized, they can trigger sudden variations of the indoor microclimate, being one of the major causes of decay phenomena of the building materials on the site, in addition to producing discomfort for the users. Moreover, material decay phenomena are accelerated by the combination with the chemical environmental processes (for example,

sulfate or chloride attack) that frequently occur in places in direct contact with the ground, or in contact with sulfate or marine water. In archeological sites, thermal stress leads to the volumetric dilatation and contraction of artifacts, especially for organic hygroscopic and anisotropic materials (Amoroso & Camaiti, 2002); consequently, tensions are generated between materials with different thermal dilatation coefficients, and internally to materials. These tensions lead to microcracking: in addition to weakening mechanical resistance, these are access points for water and soluble salts. The presence of water, in its various forms (capillary rise humidity, infiltration, condensation, stagnant water, large meteoric water) is one of the main causes of degenerative pathologies in masonry walls. The temperature has both a direct and an indirect effect on conservation, as it also affects relative air humidity. The relative humidity is involved in several decay mechanisms that influence the conservation of archeological artifacts: dry environments become dusty, leading to an electrostatic charge build-up; damp environments increase the chemical reactivity of gaseous pollutants (Aghemo et al., 1996). Moreover, humidity has a synergic effect with light, temperature, and other environmental factors on the acceleration of material chromatic alteration.

Even under controlled thermo-hygrometric environmental conditions, the absence of air streams could lead to the condensation of cooler surfaces. Over a long period, this could produce biological decay, consisting in the colonization of autotrophic microorganisms (bacteria, algae, molds, parasites, etc.) that could affect the substrate irreversibly (Morando et al., 2019). The presence of water is the main direct and indirect trigger of some more decay mechanisms, too. Water contains saline solutions and acts as a catalyst for the activation of chemical reactions; if it moves inside the substrate, it can enact a disintegrating action because of the crystallization pressure of the salts inside the pores. According to the material typology, this can produce alveoli of variable size, often interconnected, the delamination of entire parts, or even detachment. On the surface of calcareous materials, sandstone, and travertine, the prolonged presence of humidity in a protected environment produces a high probability of the formation of concretions, with salt build-up and mineralization. If temperatures are moderately low, water can solidify in the substrate, and produce the bulge of superficial layers. Effects on materials are strictly related to their micro-structural characteristics, above all frost resistance and porosity.

In order to prevent or limit damages, it is important to set periodic diagnostic campaigns aimed at determining accurately the characteristics of the phenomena. The following items are examined in the evaluation: local outdoor and indoor climatic conditions, exposure and sunlight, rainwater collection and disposal systems, morphology, and geological characteristics of the site with the identification of the aquifer, the verification of the integrity of envelope and roof. At the excavation level, the examined items are the conservation state of the artifacts, the mechanical and chemical–physical characteristics of the materials, and the isolation of the artifacts from the ground, if present. Concerning the parameters related to indoor microclimate, diagnostic surveys must be applied both to the environment and to materials. For materials, the surveyed items' porosity, water content, water vapor permeability, and superficial sulfation degree. Accelerated aging tests can also be performed: for example, thermo-gravimetry allows measuring the weight variation in a sample subjected to heating, outputting a thermal composition. Air current and turbulence degree can be monitored within the indoor environment at given time thresholds (for example, with a globe thermometer); moreover, thermo-hygrometric measurements can be performed with a thermographic camera: it also allows surveying superficial temperature, to draw humidity maps (Corgnati & Filippi, 2010).

The UNI 10829 standard "Beni di interesse storico e artistico. Condizioni ambientali per la conservazione—Misure ed analisi" prescribes a methodology for the in-field measurement of thermo-hygrometric parameters. It also provides indications concerning modalities for data processing and synthesis and outlines the reference parameters for the design of microclimatic environments in archeological shelters. For stone, rock, and mineral mosaics the following ranges are accepted: temperature between 15 and 25 °C, relative humidity between 20 and 60%, and a daily humidity variation up to 10%. Regarding wall paintings, frescoes, and sinopias, a temperature between 10 and 24 °C and relative humidity between 55 and 65% are recommended (UNI, 1999). In Italy, scope VI "Reference values to guarantee the optimal conservation conditions of artifacts" of the D.M. 10/05/2001 on guidelines on technical-scientific criteria and operating standards of museums, outlines the recommended thermo-hygrometric values to guarantee the optimal conditions for artifacts in archeological shelters: for mosaics and wall paintings, relative humidity must be kept within a range between 45 and 60%, while temperature should not be below 6 °C in winter, or above 25 °C in summer (Italian Ministry of Culture, 2001).

The microclimate of archeological shelters is majorly altered during visits, as temperature and water vapor levels grow with the influx. This issue must be controlled through site management policies: through monitoring and environment evaluation during visit hours, a maximum influx should be set. Visitors must be guaranteed the best fruition conditions, and thermal comfort is one of the most important ones. Temperature, relative humidity, and air velocity must be opportunely regulated so that the human body—with a small effort by thermo-regulation mechanisms—does

not feel hot or cold sensations, or air currents. Thermal comfort assessment in conditioned spaces is regulated by the technical standard UNI EN ISO 7730:2006, through the calculation of the synthetic indicators for comfort or Fanger indices: PMV (predicted mean value, which expresses the difference between the real situation of the thermal environment, compared to the perceived well-being) and PPD (predictable percentage of dissatisfaction, related to PMV). The standard reports the following design criteria: 24.5 °C as summer operational temperature, and 22 °C as minimum winter temperature, both with an accepted tolerance of 1 °C, and 0.12 m/s as maximum air velocity (UNI, 2006). A variation in air temperature variation by 1 °C produces a variation of PMV by 0,1. Unlike the conservation state of materials, relative humidity represents a secondary parameter for the users' well-being, as a 10% variation of its value changes PMV by 0.06 (UNI, 2006). In Italy, D.P.R. 16 April 2013, n. 74 recommends that the weighted mean of air temperatures should be equal to or below 20 °C+2 °C of tolerance during the winter conditioning period, and equal to or above 26–2 °C of tolerance in the summer conditioning period (R.I., 2013).

3 Case Study: The Villa Romana del Casale in Piazza Armerina (Sicily, Italy)

3.1 The Recovery Intervention

The design of the intervention recalls the original volumetric image of the ancient site, yet following an abstraction and simplification process. The design is aimed at allowing visitors to perceive the spatial relationships between the rooms, by suggesting volumes that suit the building typology of the imperial villa. The state of fact, that is the state of the villa before the intervention, showed many of the design intentions in Architect Minissi's project from 40 years ago: over time, several modifications have altered the overall shape of the site, and the perspex transparent roofs in with steel structure; several parts of the roof have been substituted, the false ceiling has been removed and the original Venetian blinds have been dismantled (Fig. 1a, b).

In the new intervention, the previous roofs have been completely substituted with opaque materials; laminated timber has been employed for the roofing system and the covering of the roof trusses, while steel has been used for the whole load-bearing structure, consisting in the chords and web of the trusses. Thermal variations have been reduced, to guarantee high performances of insulation, aeration, and permeability. For this purpose, an insulated roof in vegetal fiber has been chosen; it is provided with a ventilation chamber and covered by a shaped tegument constituted by a pre-oxidated, color-shifting green copper foil (Fig. 1c). To contribute to the microclimatic optimization of the rooms of the villa, a book-shaped chimney opening has been realized on the ridge, in order to recall the configuration of the ridge tile (C.R.P.R., 2007). Ventilation chimneys have different dimensions, according to the volume of the single rooms. Wood has been treated to avoid the occurrence of biological decay, and to ensure the required degree of fire protection; hot-dip galvanized steel has been sandblasted and pre-oxidated in order to guarantee high durability over time and to realize a Corten-like effect, which blends well with the context (C.R.P.R., 2007).

The design of the new structure has respected Minissi's structural intuitions and his technological choice, confirming the "autonomous" and reversible structure, without interferences with historical masonry (C.R.P.R., 2007). However, the perspex roof produced a sunlight filtration, altering the relationships between the different chromatic components of the incoming light as a result: this led to an opaque effect on the mosaics, without contrasts, which revealed the negative effect produced by the salts crystallized on the surface. Thermal issues, dimensional and optical instability arisen over time, high thermal expansion, and the impossibility of using low-emissive layers, confirm that perspex is unsuitable for this kind of situation, characterized by a high solar irradiance. Conversely, the choice of an opportunely insulated opaque roof is aimed at overcoming physical-technical and structural problems: in fact, it allows reducing the unbalance of indoor thermo-hygrometric parameters and improving the visual aspect of the environment. The adopted vertical enclosures, placed along the external perimeter of the monumental complex, are opaque, insulating, and irradiation-reflective. These enclosures have been realized with plasterboard panels, anchored to the load-bearing structure under the roof and detached from the masonry to create a natural ventilation stream, which inflows in this joint and outflows from the chimney on the roof. The set goals are the ergonomic well-being at the boardwalk level, and the near-zero reduction of convective movements at floor level; the latter is aimed at avoiding the acceleration of saline migration, which is constant from the underground toward mosaic tiles.

3.2 Microclimate Monitoring: Aim, Materials, and Methods

The control of the microclimate plays a crucial role in the correct conservation of the objects in indoor and semi-indoor environments. For this reason, it is necessary to carry out the microclimate monitoring of a museum site, before any other planned action. This is necessary to

(a)   (b)   (c)
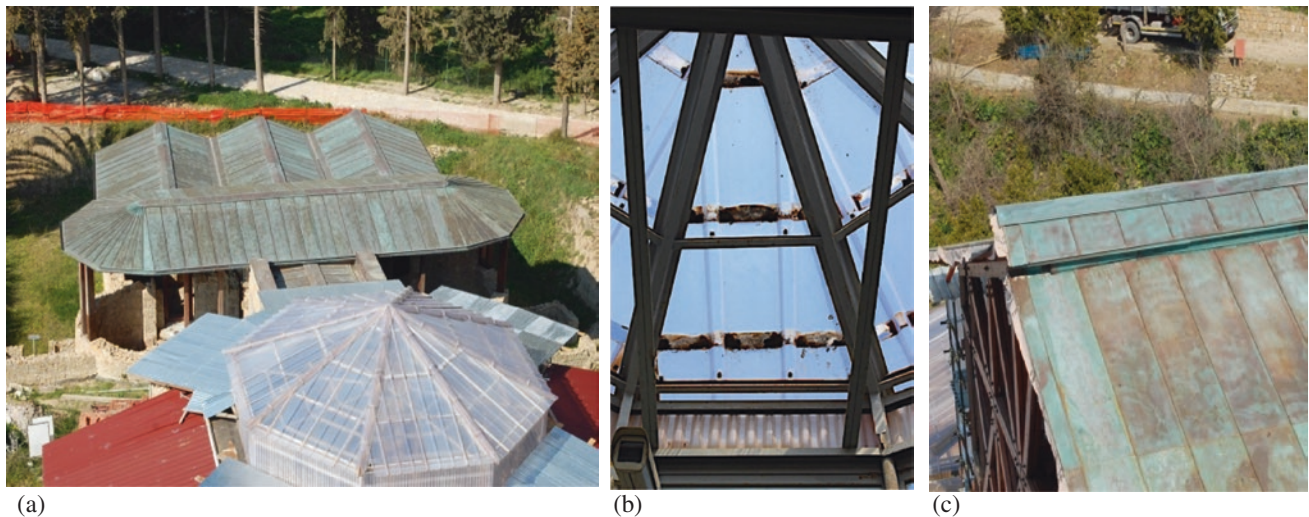
Fig. 1 Villa del Casale (Piazza Armerina, EN); **a** Part of the site covered with the new structure and part with the old one. Parts covered with sheet metal can also be seen. **b** Detail of the old methacrylate coverings with biological deposits accumulated in the interstices of the roof panels; **c** Detail of the ventilation chimney of the new roof. (Photos taken during the construction phase by Elvira Nicolini)

characterize the exhibition environments from a physical standpoint and to highlight the influence of environmental parameters on the state of conservation of the site, of the valuable surfaces that are present, and of the artifacts in general. The monitoring is fundamental also to evaluate the effects of microclimate on visitors' fruition concerning their well-being during the visit (Camuffo, 2019; Gugliermetti, 2007). The knowledge of the environmental conditions, aimed at understanding the effects on conservation and fruition, is even more crucial for the archeological heritage, as it is often located in semi-confined or external sites, and therefore more difficult to control and manage.

The Villa del Casale in Piazza Armerina represents an exemplary case of difficult conservation management due to the effects generated by the archeological coverings. In fact, Minissi's roofing system created a thermal and luminous environment, which is not suitable for the conservation and the fruition of the archeological site. The initial design choice was modified by the deterioration of materials, and by the changes to the original project performed over the years. Many of the vertical structures were replaced, including the enclosure toward the Peristilium, causing a reduction of the ventilation inside the rooms (Fig. 2). Consequently, this led to the greenhouse effect, further increased by direct sunlight on the mosaics, due to the transparent coverings, and the projection of shadows from the metal supporting structures. In fact, a microclimatic monitoring campaign had already been conducted in 2003/2004 by C.R.P.R. Regione Siciliana in six rooms of the Villa, specifically chosen for their structural characteristics and the relevance of the contained artifacts (Cacciatore & Prestileo, 2007; Cacciatore et al., 2008; Prestileo, 2005). This annual survey campaign was carried out after the removal of the false ceilings, as a cognitive investigation of the microclimatic conditions inside the different rooms of the Villa, preliminarily to the restoration project and the following musealization of the archeological site (C.R.P.R., 2007).

At the end of 2011, a second thermo-hygrometric monitoring campaign has been carried out by S.T.Art-Test sas in collaboration with the Parco Archeologico Villa del Casale during the restoration works. Moreover, the choice of the positions of the probes was made, where possible, according to the conditions of the site, and following the previous microclimate monitoring in 2003/2004, so as to obtain more comparable data (Fig. 3). This second microclimatic survey campaign was carried out between September 2011 and September 2012 and was aimed at detecting and analyzing the environmental conditions generated by the new covering system of the Villa (Alberghina et al., 2012). The survey was performed on some test rooms, such as the Basilica and the North Apartments, and rooms that still have the old methacrylate covering system, including the Triclinium, designed by Arch. F. Minissi in the 1960s of the last century and modified several times in the following decades. In the present paper, we show, as an example, the thermo-hygrometric data recorded between 2011 and 2012 inside two rooms, the Basilica and Room 35: in the former, the new covering had already been completed, while the covering of the latter was replaced in April 2012.

These data were compared with the data related to the outdoor environmental conditions recorded in the same
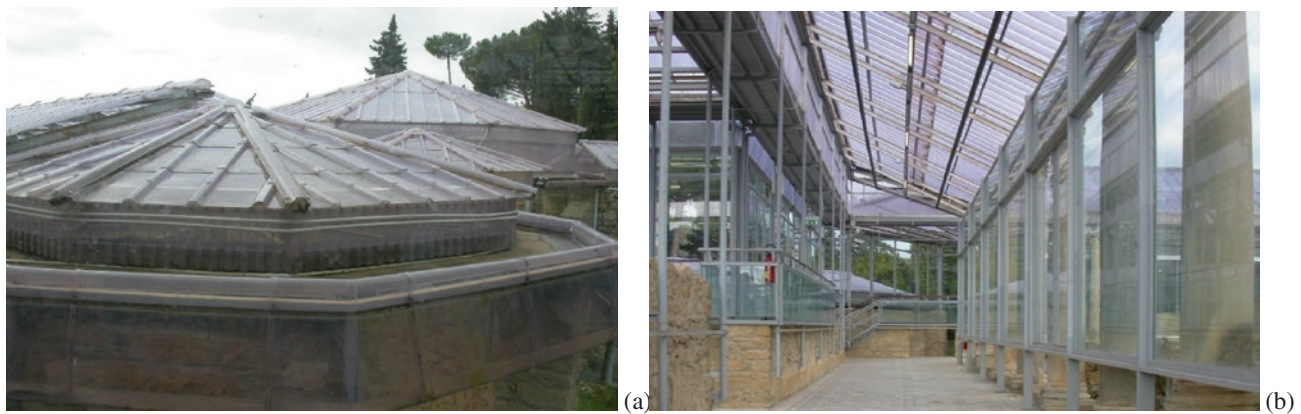
Fig. 2 Villa del Casale (Piazza Armerina, EN): **a** detail of the old methacrylate coverings; **b** detail of the closed Peristilium with the vertical elements (© C.R.P.R, Regione Siciliana, Palermo, Italy)
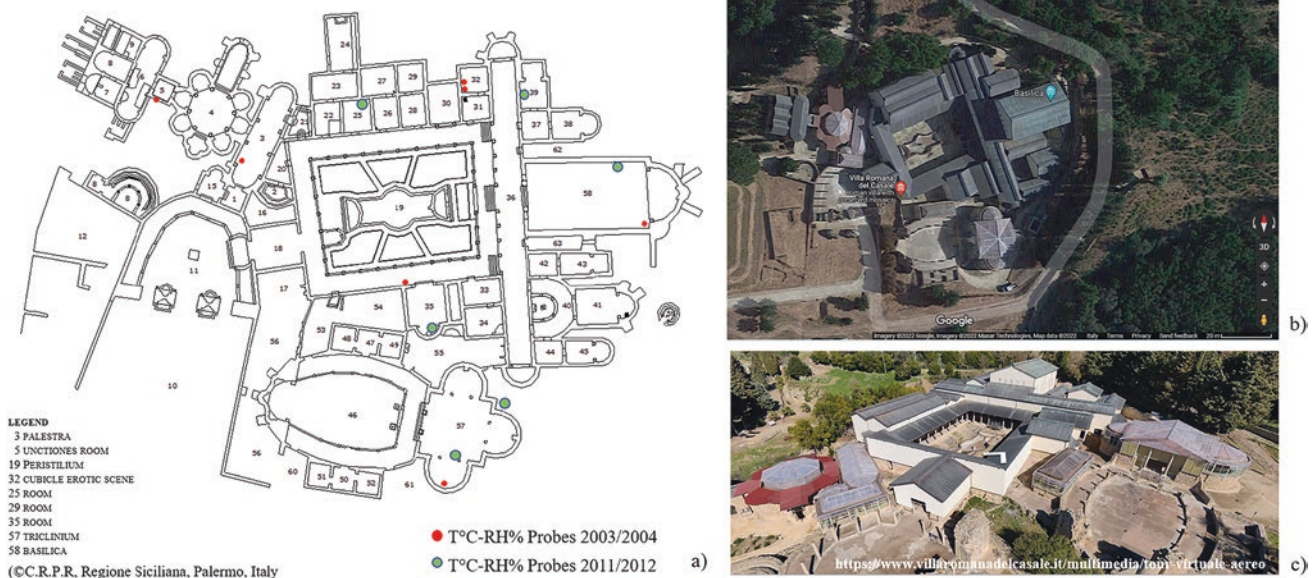
Fig. 3 **a** Map of the Villa del Casale with localization of probes: (red circles) microclimate monitoring 2003 (*source* Prestileo, 2005); (green circles) microclimate monitoring 2011 (*source* Alberghina et al., 2012); **b** site plan view, images from above (*source* Google Earth); **c** rendering from a virtual tour of the archeological site available in the official web site of the Villa del Casale (*source* https://www.villaromanadelcasale.it/multimedia/tour-virtuale-aereo)

reference period and to the indoor conditions of the rooms that were still affected by the methacrylate covering. These were characterized by extreme thermo-hygrometric conditions both in winter (very low temperature and high relative humidity values) and in summer (very high temperature and very low relative humidity values).

Both measurement campaigns in 2003/2004 and 2011/2012—the former being carried out before the start of the restoration works of the archeological site and the latter during the restoration intervention, and at its completion to verify the new conditions—were aimed at:

– detecting the situation of the thermo-hygrometric parameters, temperature (T°C), and relative humidity (RH%), in the appropriately chosen rooms of the Villa;
– processing the collected data to examine the per hour, daily, and annual trends and their influence on the state of conservation of the mosaics (stone and glass tesserae) and wall paintings;
– comparing the obtained values with the specific microclimatic limits for the different types of materials, defined by the technical standard (UNI, 1999) and indicated by the D.M. 10/05/2001 (Italian Ministry of Culture, 2001);

– analyzing the daily fluctuations in temperature and relative humidity and comparing them with the values indicated in the same UNI standard;

– comparing the microclimatic conditions with the temperature and relative humidity trends of the environment outdoor the Villa, to evaluate the inertia of the covering structures (old and new roofs) with respect to external stress (day-night excursions and seasonal fluctuations).

The microclimatic survey of the examined rooms was carried out using HOBO® U12-011 datalogger probes (Onset, Cape Cod, Massachusetts, US) with two channels, able to record automatically and continuously the values of temperature and relative humidity. The probes were placed in situ at 150 cm height from the floor in Room 35 and other rooms, and at about 200 cm in Basilica and Triclinium, after an initial inspection necessary to identify the most significant sampling points for the microclimatic survey of the environments under examination according to the technical standard (UNI, 1999; UNI EN, 2010; UNI EN, 2012).

One probe was placed outdoor so as to be able to also evaluate the inertia of indoor environments with respect to external climatic variations. In particular, the results presented in the following section are drawn comparing the data of RH% and T°C between old and new covering solutions and with the recommended values of these parameters for mosaics and wall paintings by D.M. 10/05/2001 (Italian Ministry of Culture, 2001): T°C range 6–25; RH% range 45–60; ΔT°1.5 and ΔRH% 10 (UNI, 1999). However, these values are intended for the indoor environment of buildings: keeping these same values in outdoor environments in a Mediterranean climate, without air conditioning, is evidently difficult. Then, the values have been used as an approximate reference to determine whether the microclimate is favorable for the conservation of the decorative apparatuses and their fruition. A general rule—adopted in this case, as well—is to consider as optimal values those with the lowest variations, since abrupt fluctuations of RH% and T°C produce undesirable phenomena, such as contraction and expansion in the construction materials.

The data were processed by calculating for each day: minimum, maximum, and average temperature values; minimum, maximum, and average relative humidity values; specific humidity; dew point; daily temperature fluctuations; and daily relative humidity fluctuations. The simultaneous survey and comparison between the environmental parameters related to the already existing methacrylate covering system designed by Minissi and those produced by the new covering solution, has allowed verifying the new microclimatic conditions obtained after the replacement of the obsolete and deteriorated covering.

3.3 Results of the Annual Microclimatic Monitoring 2011–2012

The analysis of the data obtained in the 2004/2003 C.R.P.R. monitoring campaign (Cacciatore & Prestileo, 2007; Cacciatore et al., 2008; Prestileo, 2005) related to daily and seasonal trends, made evident the absence of thermal inertia of the architectural structure. The microclimate was influenced by the presence of large access gates that connected the inside with the outdoor of the building. At the same time, in the 2004 microclimatic monitoring an accentuated greenhouse effect was confirmed due to the roofing structures, especially in some poorly ventilated rooms, such as the Basilica, where, in the summer months, the temperatures recorded were even 20 °C higher than the maximum external temperatures detected. Starting from this documented evidence, the second annual monitoring allowed to give an overview of the microclimate of the archeological site of the Villa del Casale, verifying and documenting the improved effects on preventive conservation actions, after the replacement of old covers.

The data of the annual microclimatic monitoring campaign from September 2011 to September 2012, clearly showed the total absence of the greenhouse effect in the spaces surmounted by the new covering system, even if, from the comparison with the indoor and outdoor data, the microclimate of the entire environment of the Villa still does not have thermal inertia. These results were found for both the winter and summer months.

The case of Room 35 is exemplary, as its roof covering was replaced in April 2012. Indeed, this room displayed a clear change in thermo-hygrometric behavior, previously similar to that of the Triclinium (until April 2012), and subsequently, its microclimatic conditions are aligned to those of the Basilica. Figure 4 shows the mean T°C and RH% values recorded in February 2012 for the Triclinium, Basilica, and Room 35 compared with the data acquired outdoor, respectively, in the same periods. It can be seen that for the Basilica, mean temperature and relative humidity values were close to the respective outdoor mean values. Triclinium and Room 35 clearly show, for the entire monthly trend, a systematic increase in temperature and a simultaneous decrease in humidity, compared to the values measured outdoor.

On the contrary, as shown in Fig. 5, the mean daily and per hour values of temperature and relative humidity recorded in August 2012 clearly show the absence of greenhouse effect in Room 35 as well. In fact, in the Triclinium, which still had the old methacrylate structure, a systematic increase in temperature can be noted, as well as a simultaneous decrease of humidity, compared to the values
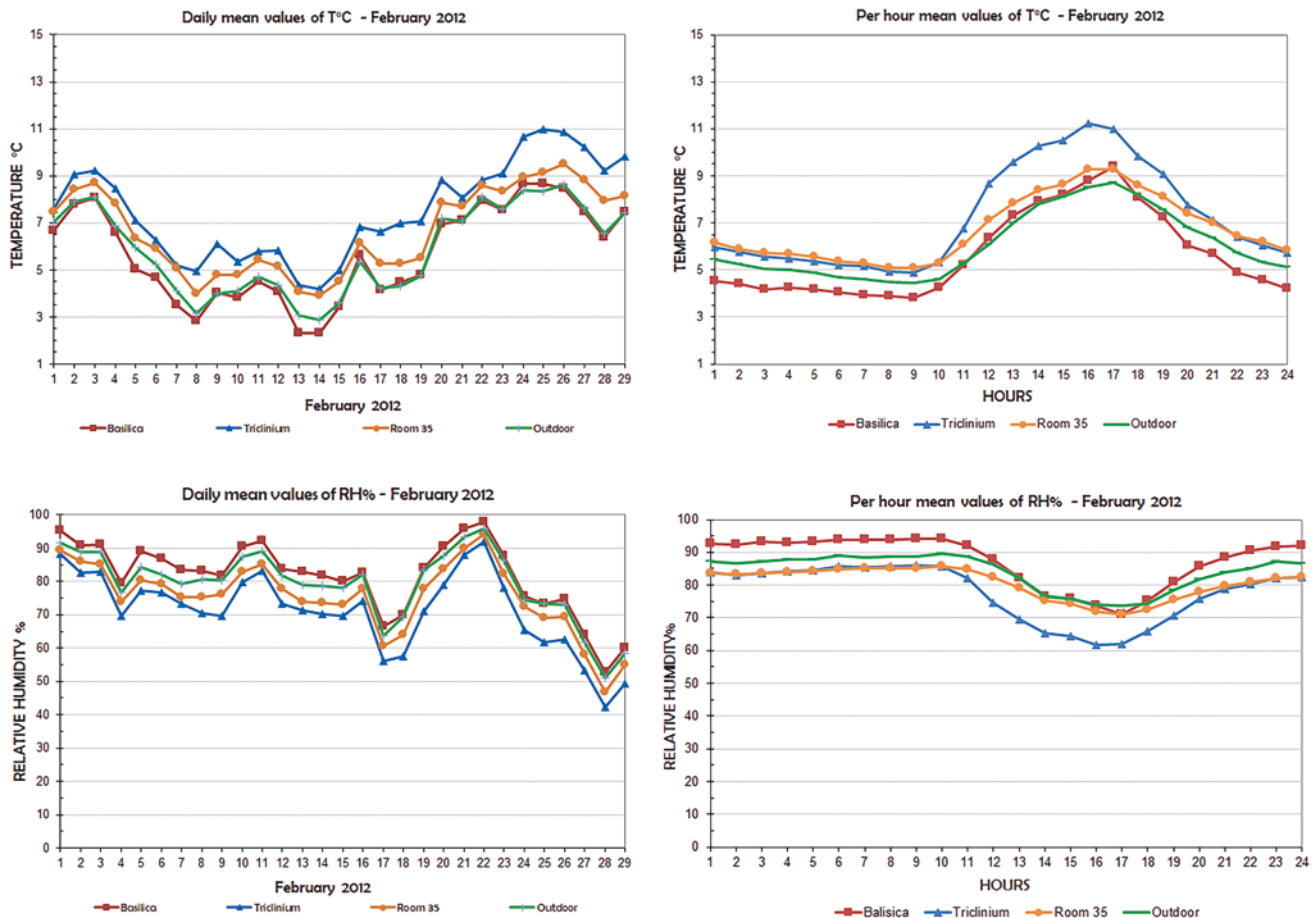
Fig. 4 Daily and per hour mean values of temperature T°C and relative humidity RH% recorded in February 2012 for Basilica, Triclinium, and Room 35 compared to the trends measured outside the Villa

measured outdoors and in Basilica and Room 35 in the same period.

As clearly shown in Figs. 6 and 7, throughout the year, the characteristic trend of RH% that rises for the night and falls during the day, conversely that for temperature, has been recorded. The RH is close to the optimum values in spring and summer. However, during the whole monitored period, the main problem is clearly the consistent variation of the RH% value during the day. Temperature values are closer to the optimal values, with the exception of summer when they reach their maximum values. Low temperatures during the winter month coupled with the high RH% value is the main cause of condensation phenomena on stone surfaces of mosaics. Moreover, as expected in a typical Mediterranean climate, abrupt fluctuations in RH% and T°C in the outdoor have been observed; this strongly influences the indoor environment.

The graphs of recorded per hour thermo-hygrometric values both for autumn–winter (Fig. 6) and spring–summer

(Fig. 7) periods show that the indoor thermo-hygrometric daily fluctuations are very similar to the outdoor ones, except for Room 35 in the second period (Fig. 7), due to the replacement of the covering system (for this room in April 2012), characterized by a decrease of night–day changes. This was indeed the second expected effect—in addition to the elimination of the greenhouse effect—of the new covering system: smoothing the outdoor daily variations of RH% and T°C to achieve the most stable environment possible.

Regarding the Basilica, the replacement of the covering has generated a minor improvement of inertia to external stresses, both in terms of temperature and relative humidity. This can be related to the large dimensions of the room and to the wide openings, which favor direct thermal exchanges with outdoor and other semi-confined rooms, making it more difficult to keep stable thermo-hygrometric conditions in Room 35.
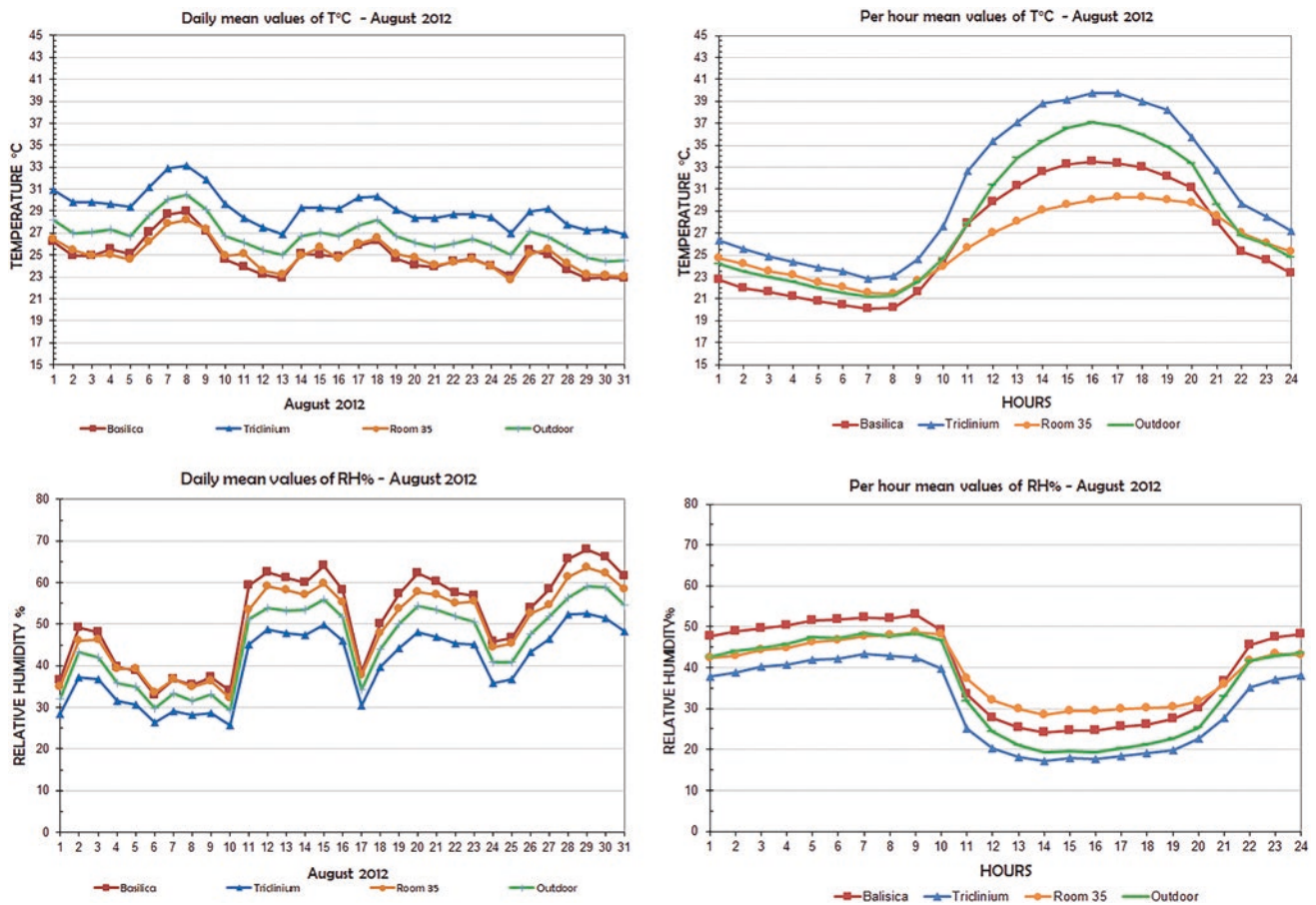
Fig. 5 Daily and per hour mean values of temperature T°C and relative humidity RH% recorded in August 2012 for Basilica, Triclinium, and Room 35 compared to the trends measured outdoor
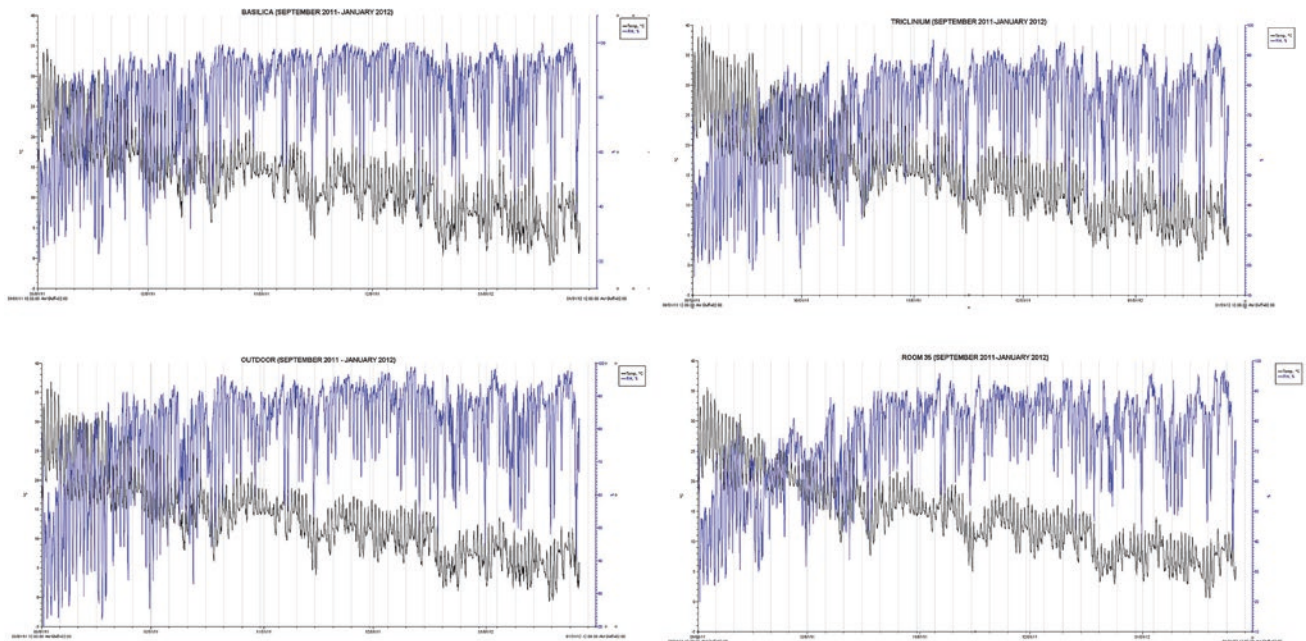
Fig. 6 Plots of temperature (T°C, black line) and relative humidity (RH%, blue line) values recorded per hour in the whole September 2011–January 2012 period by the 4 probes placed in situ: Basilica, Triclinium, Room 35, Outdoor
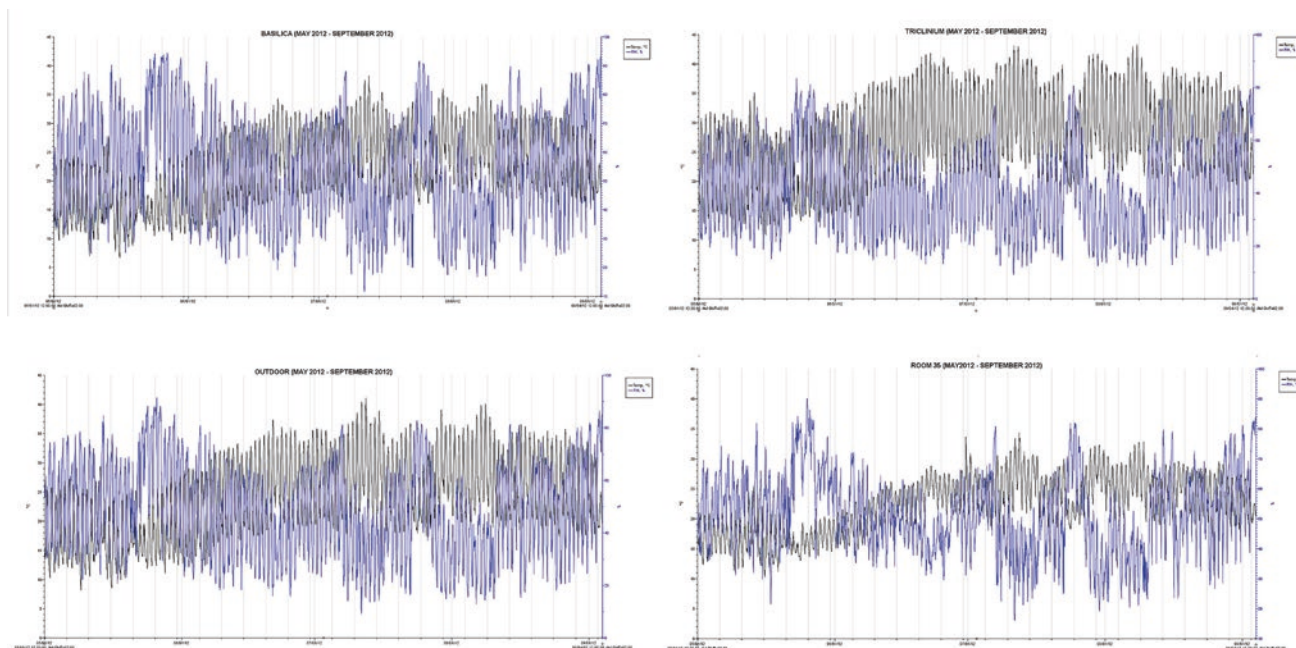
Fig. 7 Plots of temperature (T°C, black line) and relative humidity (RH%, blue line) values recorded per hour in the whole May 2012–September 2012 period by the 4 probes placed in situ: Basilica, Triclinium, Room 35, Outdoor

4   Conclusion

The microclimatic monitoring of the Villa del Casale was carried out for a full year in order to ensure the data significance with respect to the real climatic condition characterizing this archeological site. It has demonstrated the effects that the conservative intervention, concluded in 2012, has produced within this complex physical system. As expected for the type of site (semi-confined), the thermo-hygrometric values recorded in all the indoor environments in the monitored period were, even if in a more or less evident way, far from the recommended ranges for the conservation of mosaics and wall paintings. Moreover, the monitoring has revealed a scarce inertia with respect to the external conditions, resulting in high daily and seasonal excursions. At the same time, the intervention has positively affected microclimatic conditions, which are more suitable both for the correct conservation of the site and for the visitors. In particular, the most critical condition, related to the greenhouse effect—especially in the summer period—has been solved. This allows avoiding the consequent physical–mechanical stress of materials and the soluble salts migration due to the lower RH% values and higher T°C values in the indoor environments, compared to the outdoor environmental conditions.

Hence, it can be affirmed that the intervention of roof reconstruction has improved indoor microclimate by applying basic principles of bioclimatic architecture, and by using materials that are compatible with the archeological context. In addition to the elimination of UV radiation and greenhouse effect, indoor thermal loads have been reduced, mainly thanks to the air circulation and exchange, realized through a passive natural ventilation system. Cooling and humidity control result from the convective motion produced by the thermal differences, and by the Venturi effect, generated in correspondence of the openings at the base of the buffer walls and the chimneys on the roof. Technological choices are compounded by the use of some natural materials with a low environmental impact (timber and vegetal fiber), and of recyclable materials (steel and copper). Together with the solutions described above, these can contribute to facilitating the management of the museum complex.

After ten years, the intervention is still valid and the visit itinerary, thanks to the new musealization, is a pleasant experience for visitors in terms of thermo-hygrometric comfort, even during the hottest period of the year. Until now, the greenhouse effect seems resolute, with a consequent control of the temperature variations that previously generated sudden variations with physical and chemical stress consequent, salt by rising damp and more. The management of the tourist flow containment and the planning of the visit itinerary also contribute to comfort indoor.

In fact, the Management Plan of the Villa Romana del Casale, edited in 2012 and updated in 2020, is a fundamental tool in order to contain the risks that environmental

(a) (b) (c)
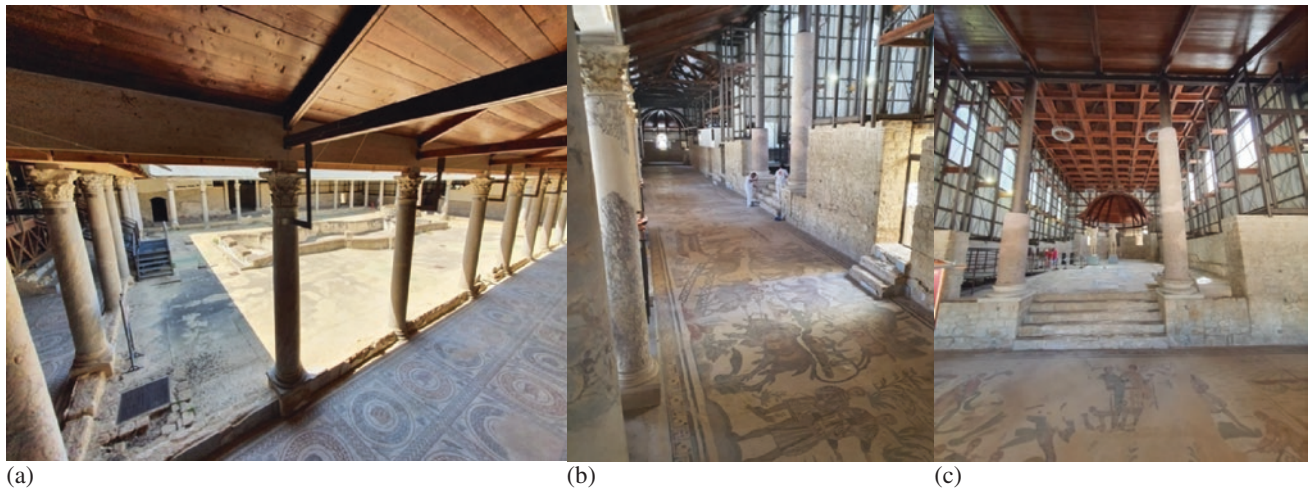
Fig. 8 Current state of conservation of the Villa Romana del Casale in Piazza Armerina. **a** image of the peristyle; **b** image of the "Grande Caccia"; **c** image of the "Basilica" (Photos taken in July 2022 by Fernanda Prestileo)

and anthropogenic causes can produce on the archeological remains. Some actions of the plan, in fact, include the state-of-use monitoring of the Villa and scheduled conservation measures of the archeological finds.

A significant data in favor of the new musealization is the positive response to a flood that occurred in October 2021. The meteorological event hit, with exceptional power, the central-eastern part of Sicily, also involving the area where the Villa and for the first time, in the history of its existence, the archeological site has not suffered any damage, although this flood proved to be disastrous for other neighboring contexts (Prestileo et al., 2022) (Fig. 8).

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Innovating Processes to Mitigate the New Emergencies: Proposal for a Collaborative Approach to Maintenance in the Archaeological Park of Pompei

Maria Giovanna Pacifico

Abstract

The COVID-19 pandemic, which has interrupted and slowed down the fruition of the built environment, had a significant impact on the regular planning of maintenance activities. The research is in the field of heritage maintenance and management, with particular reference to the facilities to support the fruition of archaeological sites. The paper discusses innovative procedures and methods, with the involvement of citizens and tourists, for archaeological area maintenance. The common citizen becomes, in continuity with the contents of the Faro Convention, the guardian of the built environment, in contexts where planned maintenance is struggling to become an established practice. The methodology provides an analysis of stakeholders to identify the contribution they can make to the maintenance process and their needs, the analysis and identification of the requirements that have emerged as a result of the current pandemic situation, and the critical elements of the building system. The case study concerns the buildings that support the fruition of the Archaeological Park of Pompeii. The result is a framework of actions that through the involvement of common knowledge can improve the maintenance service to preserve the identity of the built heritage and at the same time generate knowledge and awareness of the community.

Keywords

Maintenance · Pompeii · COVID-19

1 Introduction

The study fits into the research on heritage maintenance and management, with particular reference to the service facilities for the fruition of protected heritage, such as ticket offices, guardhouses, barriers and green areas.

The reference scenario is the current condition, which is uncertain and characterised by intermittent lockdowns resulting from the ongoing COVID-19 pandemic. Indeed, the pandemic had a significant impact on the regular planning of inspection, monitoring and maintenance activities of the built heritage: the work interruption affects the deadlines and the distribution of resources to carry out the interventions for the maintenance of buildings' expected performance levels. The research is intended to outline a transferable and adaptable proposal, that is a shared strategy to reduce the vulnerability of the built environment.

The aim is to define the methodological process and the requirements for designing a digital tool for an active monitoring of the built environment that could be used by common knowledge, such as users and tourists of fragile areas (e.g. archaeological sites). It is proposed to test an operational monitoring strategy in the Pompeii Archaeological Park that is then scalable and transferable to similar areas. The basic hypothesis is the ability of common knowledge to recognise, if appropriately guided, all the faults and anomalies that can be detected in the technical elements of the technological systems within the Park area. The relevance of the present research lies primarily in the attempt to strengthen the dialogue between expert and common knowledge and to provide a significant contribution to the improvement of management and maintenance strategies for archaeological areas.

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2 Background Scenario

2.1 COVID-19 Pandemic Impact on the Management and Fruition of Cultural Heritages

The COVID-19 pandemic, which has interrupted and slowed down the management and maintenance of urban built heritage and systems, has a significant impact on the regular planning of inspection, monitoring and maintenance activities of the built and cultural heritage. One of the recorded consequences of lockdowns is the reorganisation of the methods of access, use and management of museum and archaeological areas. These new methods are well-defined in their boundaries and have a strong capacity for attraction, in terms of controlling access, overcrowding and air quality, to prevent contagion from COVID-19. Work interruptions affected the deadlines and the distribution of the resources needed to carry out the interventions for the maintenance of the required buildings' performance levels (Di Giulio, 2007). The impact was felt on several fronts: acceleration of digitisation processes in all their possible forms, the need to reorganise access to exhibition areas as a whole in order to comply with anti-infection provisions, the impact on contractual relationships regarding museum exhibitions in progress or those already defined, the combined implementation of the safety regulations already present in the system, together with those, extremely complex and detailed, specifically aimed at preventing COVID-19 infection (Garzia, 2020).

This premise becomes a pretext and a starting point for the identification of innovative maintenance and management strategies for fragile systems such as the Pompeii Archaeological Park, based on innovative digital tools used by common knowledge (i.e. citizens, tourists, occasional users, etc., here proposed as a new actor in the maintenance process), to be implemented in ordinary and emergency conditions of use; the feasibility of the proposal is related to the modern studies and solutions developed in the field of information technology, which made it possible to think of mobile and web-based digital tools that allow common knowledge to monitor the built system and send alert signals (D'Angelo et al., ND).

The research concerns the topic of heritage maintenance and management and intends to investigate strategies to cope with the pandemic crisis in order to build a broader response and shared strategies that are also able to reduce the vulnerability of fragile systems (Cecchini & Sanna, 2020).

2.2 Strategies for Assets Planned and Participated Maintenance

In recent decades, we have witnessed the recognition of maintenance as a programmatic, strategic and organisational service (Talamo & Molinari, 2010), with the overcoming of the categories introduced in Title IV of Law 457 of '78, ordinary and extraordinary maintenance. These methodological guidelines need further experimental investigation so that the maintenance practices achieve the realignment of performance, supported by appropriate planning and implementation of controls and inspections. The desired outcome is the improvement of management models, in order to maintain the benefits achieved over time.

Maintenance, understood as a programme (Talamo, 1998), is a service offered to plan and guarantee built systems quality (Pinto, 2012a, 2012b) over time, because the care of the heritage is the primary objective for the proper management of resources. It is necessary to invest in planning, identifying technologies and methods of inspection and expertise to be involved, defining a timeline for the medium and the long term, through a demand-performance approach. Designing preventive and planned maintenance processes means reduced intervention costs, improved conditions of asset use and new economic development with the demand for specialist skills (Torricelli, 2012), for a sustainable asset management.

The UNI 10951 (2001) standard defines the information system for asset maintenance and management (SIGeM) as a 'decision-making and operational support tool made up of databases, procedures and functions aimed at collecting, filing, processing, using and updating the information necessary for setting up, implementing and managing the maintenance service'. The structure of the IS (Information System) is not unambiguous, but in general, it is defined starting from an accurate survey, from a codification of the elements that allows their unambiguous identification and it should be organised according to files that contain personal information, about accessibility, state of preservation, scheduling of inspection visits. It should also guarantee the possibility of documenting the achievable conservation and economic benefits deriving from the implementation of preventive and planned maintenance strategies (Cecchi & Gasparoli, 2011). The IS must be a platform for communication and management of information related to the maintenance processes implemented and to the assets monitoring, understandable and readable by a plurality of subjects.

The present research promotes experimentation with innovative procedures and methods in the field of

maintenance of fragile settlement systems, such as archaeological areas, identifies the requirements that have emerged as a result of the current pandemic situation to preserve the identity of the built heritage, and involves the ordinary citizen in the dynamics of knowledge, who becomes, in continuity with the contents of the Faro Convention (2005), the guardian of the built environment, in those contexts where planned maintenance is struggling to become a consolidated practice.

The literature analysed (Arca & Prado, 2008; Au-Yong et al., 2014, 2015, 2017; Viola & Pinto, 2015), related to the concept of user participation in the maintenance process in the building sector, has shown how participation can be a harbinger of improvements in maintenance management, in the effectiveness of the procedures implemented and increases the sense of belonging to buildings. Johnston et al. (2012) theorised the potential benefits of user inclusion in the maintenance process in terms of inclusion, productivity, responsibility and control, showing that if the user feels in control of the state of the asset, a sense of ownership and responsibility for the building asset will mature; on the other hand, a lack of user involvement could lead to dissatisfaction, anger and disputes.

2.3 Maintenance Management in the Archaeological Park of Pompeii

The Pompeii Archaeological Park has been a UNESCO World Heritage Site since 1997, covering 66 ha, and is a unique set of elements of extreme relevance to the history of archaeology and antiquity. In addition to being characterised by a vast territorial extension, it is also a fragile system that requires a proper approach to mitigate existing vulnerabilities by minimising risks from conflict situations between the main stakeholders, and by providing maintenance strategies for those buildings related to the use of the Park. In 2010, the Schola Armaturarum collapsed, this emphasised the devastating consequences of failed maintenance strategies. So on 29 March 2012, with Decision No. C (2012) 2154, the European Commission funded the Pompeii Project (defined as the Grande Progetto Pompei (GPP), as it involved more than 50 million euroa), which was entrusted with the protection and enhancement of the UNESCO site of Pompeii, as well as safety and restoration work. GPP implemented a paradigm shift in the management of site maintenance, moving from a state of permanent emergency, where the limited economic and operational resources available hindered continuous and proper management and planned maintenance, and where most of the resources absorbed were reserved for reparation of existing

faults (Gasparoli et al., 2013), to a logic of conservation based on planned maintenance. The GPP is an extraordinary programme for the site, aimed at solving the existing problems inherent to the conservation of the assets. The programme gives Pompeii a new image, transforming it into a place where knowledge and conservation, maintenance and innovative technologies are not only focused on individual houses but also included the entire archaeological area with a project that tends to make the site safer, with a considerable increase in the state of conservation of the entire context (Osanna & Rinaldi, 2018). In Pompeii's maintenance service, the theory of preventive and planned conservation translates into regular maintenance under the constant supervision of scientific personnel; in fact, the archaeological park has a multidisciplinary team specifically dedicated to monitoring and maintenance (Nistri & Osanna, 2014).

In Italy, where conditions of fragility of the cultural heritage are widespread due to the scarcity of financial resources and personnel, and maintenance is struggling to become established practice (Pinto, 2019), the Pompeii site stands out as a forerunner and promoter of a culture of planned maintenance that is unanimously considered by the scientific community as the most effective protection strategy for the extension of the life cycle of the built heritage (Rockow et al., 2019). In addition, an Information System has been designed that, by integrating technical-descriptive data with geographical and cartographic ones, has made it possible to analyse all the archaeological and architectural components of the ancient city, assessing their state of conservation and the elements of degradation, in order to implement planned conservation with periodic inspections and the planning of interventions no longer linked only to moments of emergency (MIBACT, 2016).

The UNESCO Site Management Plan (2016) also devotes an entire paragraph to maintenance, defined as a valid tool for the conservation of the site and, at the same time, of the local cultural heritage. Planned maintenance actions are also described as strategies that, through constant monitoring of the assets for all those faults and anomalies that compromise their state of conservation, are able to mitigate structural, environmental and geographical risks.

The UNESCO Site Management Plan (2016) and GPP represented the start of a general rethinking of the use and management models of archaeological sites The Plans introduced the application of an innovative methodology of intervention that adopts and makes operational the conservation (and therefore the protection and safeguarding) of the archaeological area as a programmed system of organisation and implementation of interventions for knowledge and restoration.

3 Methodology

3.1 Survey of the Assets for the Fruition of the Protected Heritage: Conditions of Use and Performances Offered

In the first instance, an expeditive survey was carried out to investigate the consistency of the heritage and the characteristics of the buildings. It was preliminary to a master plan for the identification of the buildings related to the use of the Park, in order to understand their relationship with the archaeological heritage, their construction typology, dimensions, state of use and conservation.

The compilation of master data sheets, containing information on accessibility and state of preservation, was the starting point for a database created for the analysis of recurrent failures, the identification of critical elements of the building system and, therefore, the maintenance sets (UNI 10874:2000).

Preliminary to the failure analysis phase was the breakdown of the technological systems, conducted on the basis of UNI 8290-1:1981. Then a technical database was defined for each building constituting the asset. For research purposes, the elements constituting the building envelope were selected, because, on the one hand, they are more vulnerable as they are subject to the weather, and on the other hand, they are the elements that the tourist or occasional user of the area has the opportunity to observe.

The discretisation of the elements of the technological system to be analysed was then followed by the identification of recurrent faults. They were then inserted into a matrix of correspondence between the type of building, technical element and fault. In this regard, the research (Croce, 1993; Caterina et al., 2000; Pinto & De Medici, 2007) concerning the failure processes and the failure chains has been functional; in particular (Pinto et al., 1999) the different failure processes that can be triggered by the same alteration are investigated. The evolution from one alteration to the next depends on the initial alteration and, in general, can be of one of the following types:

- Metamorphic (the form of decay is completely transformed into another without leaving any trace of itself in the area affected by the facade).
- Incremental (the transition to the next event involves the preservation of all forms of degradation that have occurred over time).
- Predisposing (simultaneous occurrence of other forms of degradation originating from the establishment of particular favourable conditions).

Recognising the failure chain becomes strategic when the frequency of non-systematic failures is high. This is because several events combine with each other leading to an evolution that is not always predictable. Further insight to evaluate a fault is the correlation between the fault itself and the expected performance of the investigated system: the effect of faults on the conditions and performance of a building depends on the functional requirements of the building (Olanrewaju et al., 2015).

3.2 Identification of Stackholders

The requirements identification and, therefore, the performance assessment depend on the analysis of the actors involved in the process. Specifically, attention is focused on the monitoring phase. The analysis of the actors is the starting point, on the one hand, to define the needs that are the basis for calibration of the inspection and maintenance interventions and, on the other hand, to identify the specific information flows that must reach the area manager through ad hoc calibrated digital tools.

In this case, since the heritage is small and diffuse, excluding some architectural emergencies, it is possible to experiment with an information and management system that is not traditional and that obtains information on failures affecting the monitored systems through mobile applications. The latter is designed with differentiated flows according to the type of user and the type of information required: building system failures, pathway system failures, inspections and interventions. This allows a circular and constant dialogue between the different actors involved in the process:

- Users/Tourists;
- Managers;
- Maintenance technicians.

In view of the centrality of the role of people as users and operators in maintenance processes, the design of the tool to collect data necessary for the maintenance management needs to start from the recognition of different levels of complexity and specialised skills of stakeholders (Bossi, 2007). The information tool must therefore be scalable and flexible to better manage the information that needs to be selected at the outset in order to not run into the risk of an overabundance of information that may be redundant and at worst incorrect.

3.3 Post-pandemic Requirements

The current pandemic situation has also led to the emergence of new and additional demands, compared with what has already been identified in previous studies (Pacifico, 2020). Some of them are mandatory, as they result from decrees issued to reduce contagion, while others derive from users' own needs. In accordance with the scientific literature, it is necessary to implement strategies that aim to reduce the transmission of the virus, through:

– physical distancing;
– reduction of virus transmission by contact.

Therefore, the answers to the needs related to user safety, usability and management take into account the broad range of requirements that have emerged. The proposal relates to the identification of a strategy for monitoring technological systems—in particular those fragile systems such as archaeological areas—using mobile devices available to the common knowledge. As a result, the inspections needed are reduced, and targeted scheduling of interventions and inspections is ensured through constant monitoring. In addition, inspections can also be carried out with the same tool used for monitoring, and by a single person; this minimises the operations to be carried out in team by maintenance operators, and the contact between the operator and the manager communicating through mobile and web devices.

3.4 Requirements for a Web and Mobile Application for an Extended Use

The application for the in-progress monitoring of the processes that affect the built environment, that we propose to design and validate in the research presented here, requires a rethinking of traditional maintenance procedures. Maintenance coordination service has taken on a

forecasting and anticipatory value, and it opened to the possibility to propose an evolution of the relationships between the actors taking part in the maintenance process: the user, also considered as common knowledge, is inserted at the level of the diagnostic area and is also present in the needs identification and control phase (Fig. 1).

Using innovative digital tools, common knowledge (citizens, tourists, occasional users, etc.) is presented as a new actor in the maintenance flow, assuming a key role in the monitoring process (Fig. 2), through the signalling of alerts related to the built environment.

The mobile application must guide users to the recognition and recording of failures in the maintenance sets; it requires the construction of an inclusive interface to induce the user to report failures that affect the components of the archaeological system for the creation of a database. Thanks to user's input, the database stores useful information for the performance realignment of the elements affected by the maintenance debt and the improvement of reliability at the first signs of alert. The fault must be not only recognised but also localised, both by unambiguously identifying the building affected by the fault and by identifying the observation area (façade, pavement, etc.) and the maintenance assemblies (UNI 10874:2000).

The users identified are the maintenance manager, tourists, Public Administration employees and maintenance technicians and operators; each of them has a specific role in the process and has needs that must be taken into account when designing the application. The maintenance support system also has two fundamental components:

– web-based application: i.e. the dashboard displayed by the managing user and the technician, which is in practice a multi-level synoptic picture of the organisation and an aggregation of input data.
– mobile application: i.e. the application with which each type of user makes the specific reports pertaining to their role.
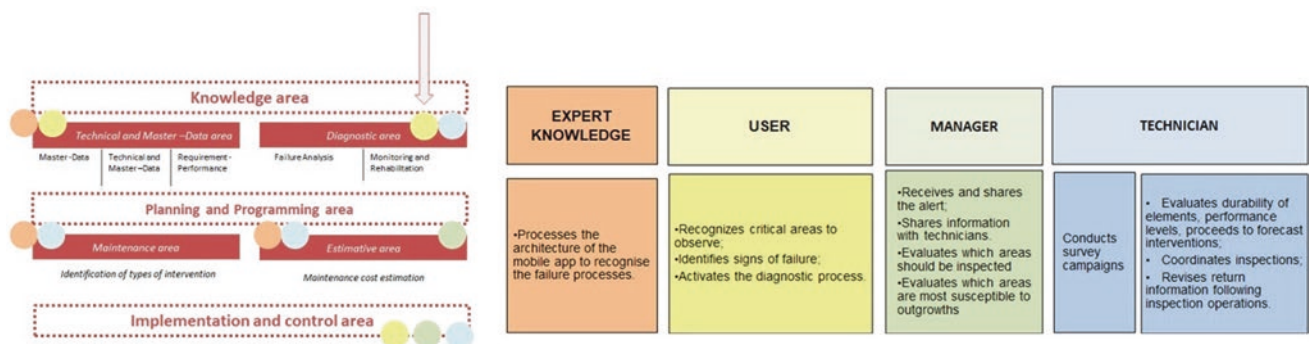
Fig. 1 Proposal for an innovative scheme of actors in the maintenance process (author's own, 2022)

Fig. 2 New actor in the monitoring process (author's own, 2022)
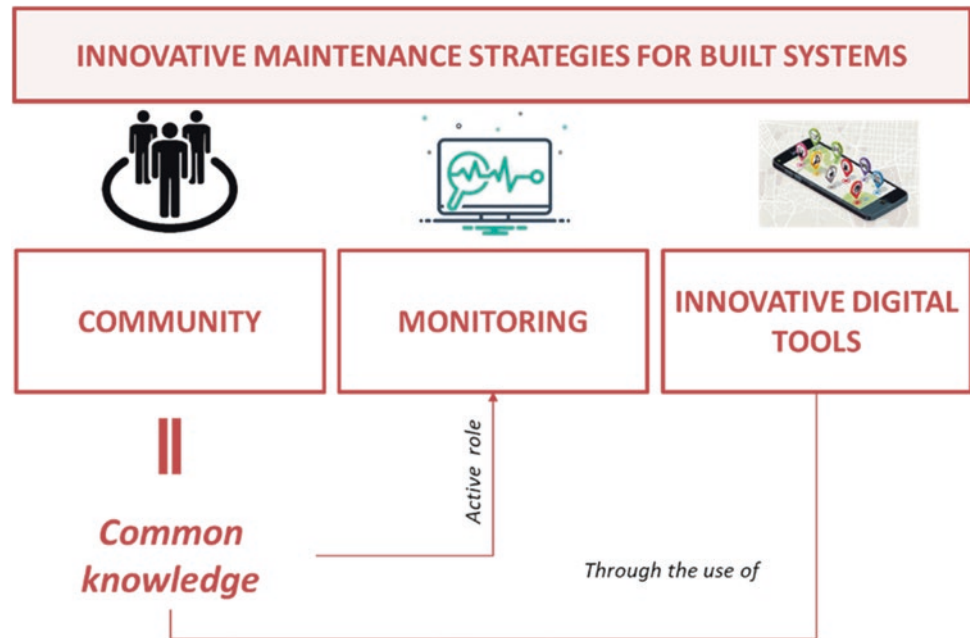
The Application, designed to acquire and organise the information collected from users and to obtain a database of failure processes, represents an opportunity to share information with the community, according to an open data and citizen science perspective, that can contribute to the optimisation of maintenance planning processes.

Guaranteeing the quality of the built environment over time, by foreseeing and preventing performance modification processes is a commitment that calls for the development of a maintenance culture and practice, based on control and planning. This kind of culture and practice requires monitoring as an essential activity.

4 Case Study

4.1 The System of Building the Fruition of the Archaeological Park of Pompeii

The object of the analysis is the system of buildings serving the use of the Archaeological Park of Pompeii, which are very often strategic for the proper performance of the park's activities.

The selected buildings are 27, and they do not have a scheduled maintenance plan, or a reference information system. They are configured as a constellation of poles located both inside and outside the park, which are functional to the support activities of the park system and are rather heterogeneous in terms of consistency, type, materials and state of preservation; the range of uses includes offices, laboratories, exhibition halls, guardhouses and ticket offices, as well as toilets. The condition of the various assets also encompasses disused assets (very rare), assets under construction or undergoing restoration, and assets that are completely or partially used (for different reasons). Each building has its own peculiar typological and compositional characteristics and, with the exception of some of the more interesting ones (Casina dell'Aquila, Casa Bacco, Direzione Fiorelli, Uffici a San Paolino), we are mostly talking about mediocre architecture, in some cases subject to protection only by mandatory regulations.

Innovative maintenance strategies have been hypothesised for these buildings which are used for remote monitoring by common users who take an active role in the maintenance process, thanks to mobile devices and digital tools. The above-mentioned heritage, which is of modest size and widespread, has made it possible to experiment with an information system which, on the basis of diagnostic sheets, simplified and designed for a mobile application, allows constant monitoring by users of the site, whether they are park employees, tourists, etc.

At the basis of the information system described above, there is an analysis of the users inside the Park, which determines a set of information depending on the different kinds of actors that can take part in the maintenance process. The conservation of this asset has a positive impact on the conservation of the archaeological system itself. This

innovative strategy derives from a vision that is based on the promotion of a 'collaborative knowledge' model, and that assigns users an active role in the constant implementation of services. Moreover, it promotes cooperative strategies supported by knowledge-sharing structures, based on the alliance between public and private sectors. The main function becomes facilitating the presence and permanence of an active user within the site, with reference to shared care processes (Viola, 2017).

4.2   Casa di Bacco

In particular, the paper exposes the specific case of 'Casa di Bacco', which is one of the intramoenia buildings and one of the offices for the management of the Park. A system in which archaeological elements coexist with contemporary elements necessary to meet the needs of the users.

Casa di Bacco (Fig. 3), with access from via del foro, excavated between 1824 and 1826, bombed in 1943, occupies insula 4.10 within Regio VII.

As already mentioned in the section dedicated to methodology, the critical elements of the technological system and the recurrent failures associated with them were identified following the expedition survey.. Casa di Bacco is a complex system where, in order to meet the contingent needs of the established function, it was necessary to reuse the Roman rooms so that the technological system would be adequate from a performance point of view.

In particular, the office spaces were organised within the Roman structures. Using drywall structures, an interspace with the Roman part was created. These structures present evident phenomena of washout and surface deposition, due to incorrect design and installation of the structures; the entrance hall, for example, presents visible problems of washout on the plastered parts, due to problems deriving from the incorrect design and installation of the impluvium roof. The original masonry structures, on the other hand, mostly present phenomena of dampening, biodeteriogens, fungi and efflorescence due to incorrect drainage of water from the building or a lacking/inefficient protection at the top; in addition, the presence of vegetation or the deposit of material is another risk factor for the onset of failures which compromise the performance of the elements of the technological system in terms of appearance, well-being and, in more serious cases, even usability and safety.

The usage patterns of the archaeological area have changed, affecting the Casa di Bacco and other similar systems with the reduction of inspections aimed at monitoring the performance status of the system components. This has led to a reinterpretation of the critical issues on the basis of the new needs of the actors and the potential of the acceleration of digital models following the COVID-19 pandemic. The application for monitoring here proposed affects the scheduling of inspections, interventions and thus the timetable.

The flow of the application is based on the succession of a number of fundamental steps to send a clear and

Fig. 3 Localization of Casa di Bacco in the system of the Archaeological Park of Pompeii (author's own, 2022)

unambiguous report; this allows the user to make a guided report reading the fault. At the same time, the operator receiving the report can read it easily, correcting the labels if necessary (if they are not reported correctly by the user). The application is equipped with a simplified interface that requires the user's geolocation so that they can easily identify the building system to which the technical element belongs; the reports reach the georeferenced database already in the possession of the Archaeological Park.

In order to define a flow that was specific to the case study, it was necessary to identify the recurring faults and relate them to the technological breakdown of the system, the plan of which is shown in Fig. 4. The two procedures were carried out in parallel and led to the selection of the critical elements of the system, such as horizontal and vertical closures, windows, protection elements. They represented the preparatory act for setting up the interface design of the sections of the mobile application related to the labels of technical elements to be suggested to the user when reporting a fault of the specific technical element and to the identified faults. The individual technical elements are associated with a list of faults from which the user can easily choose.

In its main function, the application makes it possible to respond to the management needs of the individual building and site, because it allows constant updating of the database with reference to the performance status of the technological system under investigation. It is possible to plan inspections and interventions based on real data and needs and therefore an appropriate modulation of the expenditure budget to be allocated annually to maintenance. It responds to the need for user safety since, through geolocation, it records the position of the user and is able to monitor abnormal gatherings. Finally, it also improves the accessibility of the building and also the use of the entire site, indicating on the map viewer the presence of routes closed for maintenance and also areas of danger due to faults recognised by the users themselves.

The selection of maintenance interventions in accordance with a construction that follows the logic of the original system has the aim to ensure its conservation.

The geometric survey is property of Project Automation S.p.A. Monza (Italy) and valerio maioli S.p.A. Ravenna (Italy), revised by the author.

Fig. 4 Plan details of Casa of Bacco (author's own, 2022)

Maintenance activities must be carried out with the aim of controlling, over the years, the functioning standards of the elements, preventing failures and degradations that lead to a reduction in performance level. Maintenance activities must be able to detect any defects of installation or physical–mechanical, chemicals or biological from the first alert coming from the mobile application. The web platform provided allows maintenance managers to programme a set of inspections led by maintenance operators in order to identify any factors that could lead, in a short time, to degradations or failures which can accelerate the natural ageing process and affect the conditions of other elements of the building system. These kinds of inspection affect the interventions already programmed within the maintenance plan, allowing for a rescheduling. The identification of maintenance strategies, in this case, falls on a combination of preventive threshold programmed maintenance, cyclical and preventive under conditions.

5   Conclusions

The process outlined above, which makes use of digital devices to monitor the critical elements of the technological system, is proposed as a trigger for innovation of traditional processes, with a view to rethinking them by virtue of new requirements that emerged as a result of the pandemic, methodologies and tools available today. This proposal brings with it the revision of inspections, schedules and timetables, through the use of new instruments and technologies that allow the state of the assets to be monitored even remotely and by non-specialised users.

The criteria to be identified, which constitute the support tool for the decision-making process, could be sought in the optimisation of the resources available during lockdown periods, guaranteeing the safety and well-being of operators, and the use of remote monitoring technologies for building systems. With respect to the management of maintenance activities, the criteria allow the reduction of side effects and inefficiencies (Gasparoli & Scaltritti, 2011) resulting from contingent limitations caused by mandatory directives to mitigate the spread of the virus, the maintenance of satisfactory performance levels with respect to the safety of users, the increase of the durability of components, the control of management costs. The strategies to be implemented in the framework here outlined must be pursued through integrated (visual, empirical and instrumental) controls (Cecchi & Gasparoli, 2010), thinking about inspection methods, carried out by teams consisting of a number of people respecting the limits imposed by the regulations, that meet the requirement of user safety. The aim is not to interrupt the necessary action of monitoring the state of preservation of the building and its components, being at the same time a means for implementing the knowledge of the behaviour of the built system and for the early detection of the onset of failures and/or anomalies, therefore essential to pursue the objectives of a prolonged life cycle of the buildings and mitigated risks related to lack of maintenance.

The results obtained can be used in the identification of strategies to improve accessibility, usability and safety of users and to reduce management costs. Finally, the data collected and elaborated in the framework of the above-mentioned research could converge in the implementable information system elaborated in the framework of the GPP Knowledge Plan.

The relevance of the research lies mainly in the attempt to foster the strengthening of a dialogue between expert and common knowledge, also in order to consolidate synergies between the field of planned maintenance of fragile settlement systems and that of digitisation of the processes of management and knowledge of the built heritage. Shared maintenance strategies are conducive to the dissemination of a culture of maintenance deriving from the active role that communities, tourists and users could play within the maintenance process of archaeological sites, developing a deeper sense of belonging, having as primary objective the protection and transmission to the future of the values of the built heritage.

The line of research thus outlined, started during the Master's thesis, following an internship within the Pompeii Archaeological Park, therefore aims to provide a significant contribution to the improvement of strategies for the management and maintenance of archaeological areas in terms of objectives, methodology and content.

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Sustainable Conservation of Built Heritage for the Houses Casbah of Algeria: The Case Study of the Casbah of Algeria

Med Boudiaf Saouane and Ghellab Bachir

Abstract

The history of the Casbah of Algiers bears witness to the importance and status that this medina had. The subsequent passage of different civilizations, mainly Berber and Ottoman, made the Casbah the medina that has survived time and that we have inherited. The Casbah of Algiers is a historical site classified in the list of universal heritage, mistress of the Mediterranean since 1992. Unfortunately, given the development of the peripheries, we are now witnessing a marginalization and devaluation of historic cities. The modern city becomes a machine that produces urban voids in the historic centers; Spaces, as if left to their fate, are the negative of the built space and pose the problem of discontinuity and break with urban dynamics. Through this article, we try to go a way to understand the functional and spatial organization of the traditional house and the ancient way of life of the occupants, through a survey that has analyzed the current situation of the house and all the changes that have taken place. They produced. We can reuse the old architectural housing conservation project of the Algiers Casbah, but with a fundamental one.

Keywords

Sustainable · Conservation · Heritage · Casbah of Algeria houses

1 Introduction

Heritage is an inheritance produced by preceding generations attaining destiny generations. "It offers them the cap potential to take fee in their very own future whilst having an easy identification drawn from the legacies left with the aid of using the ancestors" (Amougou, 2004).

The Casbah a site occupied since the Phoenician period of Icosim; lived a Roman period by Icosio Djazaïr Banu Mezghena was founded in the tenth century by Bologhine, son of Ziri, Founder of the Zirid state dynasty and became the capital of El Djazaïr under the Ottoman period from the 15th century (1516). The city under the Turkish reign was a single entity and core. The lower part (Lawta) will retain commercial, economic, and commercial functions, and in the upper part (Ladjbel), the old Casbah has been moved about 300 m west of the old one. Piazza and Palazzo Jenina were the seat of power. Immediately after their arrival, the French built their city in the plain of the lower Casbah, where the slope is gentle. At the beginning of the French occupation, the main axes of the city were enlarged and regularized, with the main objective of establishing a perimeter of headquarters and thus controlling the city. They bring changes to the city, demolishing much of the lower Casbah and building what is now known as "Place des Martyrs" (Babaci, 2019).

According to experts, people choose travel destinations where they can experience traditional and different cultures in their historical context. Given the importance of 'heritage' for the development of tourism, hotels, and restaurants and the little attention given to heritage, the question of heritage tourism arises. Competing land use demands, the introduction of new economic activities, and the commercialization of heritage resources place significant strains on local heritage stakeholders.

Buildings have been declared dilapidated or in poor condition in the Algerian medina, the State has therefore instituted a program of rehabilitation of buildings, some

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completed, others in progress. Several researchers have conducted studies on different aspects of the city, from streets to housing and public facilities.

Documentation of these matters related to the Casbah continues to be produced to clarify the many secrets the city hides from its visitors. In recent years, new policy mechanisms have emerged to reconcile conflict and development conservation needs by applying sustainable development policies in historic cities. Therefore, our work will focus on the additional house, which is a milestone in the history of Algerian architecture, and more particularly, for its spatial and functional organization.

These themes are explored through the case study of the Casbah of Algiers in Algeria, a World Heritage site in danger of decay and loss. During this case study, this article concludes how to apply the general implications of sustainability and conservation of built heritage to the houses of the Casabah of Algeria.

2   Methodology

It will consist of an urban analysis aimed at understanding the logic of formation and transformation of the urban fabric of the medina from the macro scale to the micro scale (the medina, the neighborhood, the house). It is true that our goal is not the study of the medina or its structure per se, what interests us is the study of the houses that turn their backs on the city and, taken on their own, form another endogenous world, the traditional house being the basis is the module of the urban structure of the medina. However, the study of the Medina is essential to understand the principles of the traditional House of Casbah in its original and current state.

At this level, the research will be based essentially on fieldwork to study the transformations carried out on the dwelling over time and to understand all the reasons which explain these modifications. To achieve relevant results, our work will consist of two parts:

1. An architectural component, with an analysis of the design. This analysis will be based on the collection of all documents (diagrams, photos, plans, sections, and facades).
2. A social component, to better understand the situation of the inhabitants and their points of view on housing. We will interview the families who still live in Casbah.

3   Built Heritage Conservation and Sustainable Development

Sustainable development is often understood intuitively as a development that may last, or to be "sustainable" if one desires to translate additional specifically the adjective of English origin sustainable. This objective focuses on the connection between surroundings and societies, as well as the environmental vulnerability of companies, that it develops principles and strategies. Its field can cowl each of the supply and resource environments, in industrial or non-industrialized societies, then more specific themes reminiscent of global climate change and multifariousness or territorial ecology (Zaccai, 2018).

It is also seen as a process based on local culture, on the equitable distribution of citizen services, on the application of democratic principles of governance, and on the maintenance and renewal of traditional social values and practices. the maintenance, rehabilitation, and reuse of old buildings can play a fundamental role in the sustainable development of the city. In many cases, they make a positive contribution either The conservation of built heritage has a contribution to make to achieving environmental balance in human affairs, or "sustainable development".

There are many overlaps between building conservation and sustainable development. Although very straightforward, some commentators have pointed to the difficulties of applying the breadth of the sustainability agenda to build environment conservation agendas. Conservation can talk about "heritage" as if we were talking about an inheritance, an inheritance; things that one generation gives up when it dies and that are passed on to the next.

We can view the built environment as a social and public good that we have essentially inherited for free. Most of the built environment that surrounds us and is the backdrop to our daily lives was built before we, this generation, were born. We can choose to place a high or low value on this inheritance that has been given to us. development. From a sustainability perspective, cultural heritage is understood as a non-renewable resource. It contains some of the most important intangible values of society (identity, memory, self-awareness, and history). In addition, it is a good ability to value new things by creating new processes based on consolidated values. As an artificial product, a city is an artifact made up of various historically recognizable parts (Murray, 2012).

4   The Casbah and Its Unique Lost Architectural Character

The city of Algiers is located between latitudes 36° and 37° north and longitudes 0° 4°. It is part of a fabric that develops along the sea (the northern part), at the edge of which extends a coastal plain 1-km long, bordered by hills 200–250 m high, which extend extend from Bouzarèah to Harrach. Casbah) it is located on the western slope of the Bay of Algiers, on one of the slopes of the Bouzareah massif, and faces east. The coasts are the boulevards OURIDAD MEDAD and HAHAK ADELKADER.

The site considered is the medina of Algiers, the historic district of the capital known as the Casbah. This site is located in the bay of Algiers "See Figs. 1 and 2", in the most favorable part, sheltered from the winter winds and ventilated by the sea breeze coming from the east winds under construction and summer architecture. It defines an authentic architectural and urban heritage. The Casbah of Algiers, urban co-king of the city of Algier. A city that has married the site and the topography to give an extraordinary landscape with a particular architecture.

The Casbah is part of a traditional urban fabric made up of different elements of the urban form which are not distinct entities. They represent complex morphological

Fig. 1 Core map Casbah of Algiers. *Source* National Center for Studies and Applied Research in Town Planning CNERU

interactions, clearly captured by an analysis method: a tool that reveals the qualities of the place and prescribes conservation and development actions. The interest of this type of analysis (of the morphology type) is to identify the relationships between the different components of the urban fabric, as well as the contradictory or convergent relationships that are established between the forms of roads, buildings, and territories. An integral part of the urban form, itself an integral part of the urbanized territory. These systems are registered in homogeneous zones by lot, building type, construction period, and street network. Five homogeneous zones are identified "See Fig. 3", each of which is divided into sub-zones:

Zone 1: Located in the eastern part of the study perimeter and consisting of a single and Nat, the "Khair Eddine Pier" of the Admiralty. This area is identified as a unique element of the building which characterizes its general position vis-à-vis the urban fabric and allows its identification.

Zone 2: Located in the western part of the study area, it includes three districts that make up the Upper Casbah: Sidi Ramd ane Amar Ali Mer Rouge, a dense and traditional fabric with a flat construction system and a tree-lined street. Unique elements: La Cittadella, Bastione 23 and SIDI ABDERFRAHMENE.

Zone 3: Located in the eastern part of the study area, it includes three districts that make up the lower Casbah: Amar el Kama Souk el Djemaa and part of Lalahoum, "See Figs. 4 and 6" as well as the buildings that make up the enclosure of the Boulevard de la Victory, a traditional structure dotted with colonial openings that interrupt the four original systems of the region.

Fig. 2 General view of the Casbah. *Source* National Center for Studies and Applied Research in Town Planning CNERU

Fig. 3 Integration of the built environment into the morphology of the site. *Source* National Center for Studies and Applied Research in Town Planning CNERU

Fig. 4 Boulevard Che Guevara. *Source* National Center for Studies and Applied Research in Town Planning CNERU

Fig. 5 Victory Boulevard. *Source: Google photos 2022*

Zone 4: This zone surrounds the entire perimeter of the studio and includes the colonial structure, the school, and the security equipment. The fabric is a linear road network with regular weave. The existence of conflict zones is inevitable due to the interaction of two fabrics: traditional and colonial. There is an orthogonal obedience between the paths and the properties that delimit them. There is therefore directional independence between the street and the property. The buildings are generally contiguous along the street, hence the different treatment of the "rear" and "front" facades of the building.

Zone 5: is located in the eastern part of the site, precisely in the maritime district. This is a one-off intervention after the colonial era. The four systems are defined without hierarchy by the disappearance of the traditional system, which has been replaced in the urban landscape in an unstructured way. It is a rather functional area (CNERU, 2012).

The problem of housing in historic centers is generally a complex issue whose points of reference concern both the architectural and historical value of buildings, legal forms of ownership, inventory, and other more typical variables of the object. Sociology of urbanization of living space in the Casbah plans to consider the factors that caused the changes in the old city, as well as the original and historic qualities of the houses. It is also important to remember the spatial and social changes that the Casbah underwent in the following periods, which often decided its destiny as a municipal work: after examining the typologies of the study models of the Casbah house, there are two types of dwellings: The introverted house, structured around a central space called the patio, onto which all the living spaces open, drawing in air and light (Communication, 1992).

The interior courtyard benefits from an exceptional decoration, while the exterior facades are blind. Two variants of this type of house have been developed: the "wast al dar" house and the "shebak" house. The extroverted house; where we note the non-existence of the central space (patio). All living spaces are lit and ventilated through openings in the exterior facades. This type of house is forever. As for the relationship between the structure of the Muslim family and socio-religious Islam, it is characterized by two concepts: the separation between men and women and the protection of intimacy with others. The configuration of the house had to take into account the geographical position of the land within the block, its surface area, its orientation, the slope of the land or the street, and the level of the house or building of the owner (Figs. 5 and 6). The irregularity of the lots is captured at the level of the "wast al dar", which, whatever the shape of the land, is always quadrangular and tends to regulate the shapes of the houses (CNERU, 2012).

Fig. 6 Place des Martyrs. *Source: Google photos 2022*

5 Factors Contributing to the Extinction of the Urban Heritage of the Casbah

The Casbah of Algiers appears as a significant example of a historic Algiers city which had a great influence on town planning in the western part of the Mediterranean and in sub-Saharan Africa.

In this living complex where nearly 70,000 people live, very interesting traditional dwellings, palaces, hammams, mosques, and various souks are still preserved, whose urban form represents the testimony of a stratification of several tendencies in a complex and original system which adapted, with remarkable flexibility, to a very rugged site.

Despite the changes and seismic hazards, it has undergone, the Casbah of Algiers still retains its integrity "See Fig. 7". As a whole, the aesthetic characteristics, the materials used, and the architectural elements keep their original aspects which express the values that prevailed when the site was classified in 1992 on the World Heritage List. Maintaining the residential function has made it possible to consolidate the viability of the site as well as the integrity of its image. The restoration operations of the Casbah's built heritage undertaken within the framework of the Safeguard and Enhancement Plan meet local and national standards and contribute to maintaining the integrity of the site. However, there are threats to integrity linked to over-densification and uncontrolled interventions. Other risks come from earthquakes and fires, as well as landslides and floods (UNESCO, 2018).

In 2003, the National Administration of Protected Cultural Sites was created, an agency dedicated to the protection of the Casbah, which in 2012 drew up a coordination plan for the conservation and restoration of buildings. However, the harsh conditions and management issues remain epic and unresolved.

Ownership issues: Restructuring is complicated by the lack of clear land ownership rights, which over time could be divided among hundreds of descendants. Dozens of owners of abandoned houses and empty buildings were often occupied by squatters. Encouraged by a 20-year policy of relocating families from the Casbah to newly built government housing, these squatters have moved into unsafe buildings in hopes of finding new homes. Things are not better in the public domain: 60% of the Casbah's assets belong to its cultural heritage and Islamic law requiring that it be managed for the good of all requires more public funds than are available (Zacks, 2019).

Besides the problem of collapsing housing, many important public structures have disappeared. Mosques and zaouias (Koranic schools) have suffered heavy losses, out of 130 mosques and 18 zaouias only 10 mosques and 2 zaouias have survived, whereas originally only six hammams (public baths) remain out of a hundred. As there were no planning laws and controls to protect the Casbah, each time a house was demolished, it was replaced by an apartment building, destroying the historic streets and blocking the view of the sea on local residents. This cycle of decay and decay has led to a situation where the Casbah is perceived as an urban slum in the heart of the capital (Fig. 8) (Boussaa, 2012).

6 The Place of Heritage in Urban Policies

This would provide a general overview of the state of conservation of the property in all its dimensions and the relationships between them. For this, the historic urban landscape approach pursued by the UNESCO Recommendation of 2011 remains the most appropriate tool. Although the old medina is classified as a historical monument, it is inexorably deteriorating.

The buildings are deteriorating day by day, while there are numerous restoration works on the heritage and monumental remains in order to mitigate or eliminate the sources of degradation, whether natural, climatic, or seismic, or due to the anthropogenic wear. But unfortunately without convincing results because badly done, and this is often due to tearing or failure of the current construction materials to match the materials that were present in the past. We began to convene foreign and then national companies in the early 1980s following the promulgation of law 98/04 for the protection of heritage.

Fig. 7 Picture of a demolished house in the Casbah. *Source* author 2022

Fig. 8 Appearance of saltpeter on elevation. *Source* author 2022

However, the companies which undertook the delicate restoration work, which required, demonstrated this mastery of certain techniques and processes, in reality only the construction companies which worked with concrete and plaster in Paris, where the binders and coatings of origin had to be analyzed. and analyzed as far as possible, reproduced identically. This is the case of Bastion 23 (Palais des Raïs) which was restored in 1990.

Unfortunately, more than 70% of the work carried out do not respect the rules for the restoration of historic

monuments, and the authorities proposing temporary solutions, which is why it is necessary to train specialists. Staff with proven intervention, it is hardly forbidden to hire foreign restorers to restore our heritage, in fact, they take care to preserve it well. Unfortunately, this built heritage suffers from a lack of maintenance, and is degraded, vulnerable, and fragile. This degradation is due to several criteria, namely construction techniques and materials, the state of conservation, and, in particular, natural phenomena such as earthquakes. These damage the structures cause irreversible deformations and, unfortunately, in some cases lead to the collapse of the structure (LESPES René, 2003).

The state of conservation of the building will guide the choice and the type of intervention, the durability of this architecture will only be guaranteed by the application of regular maintenance. An intervention aims at stabilizing the building and increasing its chances of survival while maintaining these authentic architectural values inscribed in the typology of the building, with traditional/modern consolidation techniques according to the rules of the art.

7 Discourses on the Casbah City: Sustainable Development and Conservation of Built Heritage

Cultural heritage and sustainable development are two terms that have certain similarities and express the same desire to better integrate the temporal dimension, to better articulate the past, present, and future of societies in a logic of transmission and solidarity between generations. Cultural heritage can be considered a non-renewable resource that must be protected, safeguarded, and preserved. Reference to heritage and its need for conservation and transmission has in fact become one of the preferred means of legitimizing sustainability on a planetary scale. Heritage is not only a symbolic resource, closely linked to the themes of memory and identity, and easily accessible to local elected officials but also an economic resource, particularly from a tourist point of view, represents a means of enhancing an "unused" space (Isabelle Garat, 2005).

As a starting point, a series of steps and measures must be taken to make the preservation of the Casbah a reality.

Referring to the United Nations Sustainable Development Goals (SDG 2030) and the policy adopted by the General Assembly of States Parties to the World Heritage Convention to integrate a sustainable development perspective into the processes of the Heritage Convention global. the interest and importance of seeing local communities not as passive partners but as supporters of World Heritage sites and of establishing participatory governance mechanisms that result in consultation with local communities before taking action. Thanks to the support of all partners, this ensures the

sustainable conservation of World Heritage and its transmission to future generations (UNESCO, 2016).

In this context, buffer projects and reconstruction works should be planned to provide adequate housing for the local population and promote tourism in the Casbah. Heritage tourism can be a catalyst for heritage center preservation thanks to the introduction of hard currencies. In this way, tourism revenue could be used to fund the restoration and modernization of the remaining accommodation in the Haute Casbah, while at the same time revitalizing life in the old town (Boussaa, 2012).

The "life cycle analysis" of an existing Casbah building helps to better understand and assess the advantages of an existing building compared to an as-yet-unbuilt building and creates a more complete comparison picture. The assessment measures the overall environmental impact of a building's construction process, from the extraction and transportation of materials to the cost of running the building over a long period of time. It remains simple because it does not take into account the cultural and social value of old buildings.

Due to increasingly demanding environmental certifications, the concept of building life cycle analysis (LCA) has become essential. LCA encourages taking into account the environmental impacts of all the phases of production of a good: from the extraction of the natural resources necessary for its production until its end of life Or, the phase of construction of a building is extremely consuming of materials and energy (stgm, 2022).

These principles are fundamental for the development of tourism in historic city centres. While most urban centers lack the resources to safeguard their cultural heritage, tourism can provide the hard currency needed to fund restoration work. In this way, maintenance and renovation Maintenance and renovation can be carried out throughout the territory for the entire historic city center. In summary, these principles aim to prevent heritage tourism from becoming a ruin, but rather a blessing for all, the host community and the tourist (Boussaa, 2012).

Strengthen the links between immovable cultural heritage and mobile and intangible cultural heritage to provide a holistic understanding of meaning that can guide conservation and management decision-making. Link current global concerns to specific challenges and opportunities, as well as practical requirements for the conservation and management of the built Casbah Site-wide cultural heritage Respond effectively to the need to protect the values of living heritage sites while ensuring their continuity and development: Integrating cultural heritage into sustainable development to counter the general perception of conservation as anti-development. and regularly monitor the impact of changing environmental conditions on built heritage and rethink the materials and techniques used in the conservation of built heritage to take into account social, economic and environmental sustainability. Development of innovative planning strategies to integrate heritage cultures into urban development Emerging processes to respond effectively to rapid physical, social, and economic changes in cities Development of tools and strategies for holistic, sustainable, and resilient restoration of built heritage after disasters and conflicts (iccrom, 2016).

8   Recommendations

Natural hazards such as earthquakes, climatic, and human risks are the main factors that threaten the built heritage, but there are also other pathologies that can damage the materials and the structure of the latter. The main causes of material degradation are due to the presence of water and humidity in all its forms. This degradation may be due to chemical (efflorescence and saltpeter, fungi, and mold), physicochemical (freeze–thaw), physical, and/or mechanical actions linked to the reduction (overexploitation, reduction in the bearing capacity of the soil, earthquake). The state of conservation of the building will guide the choice and the type of intervention, the durability of this architecture is only guaranteed by the beauty of the urban facades and the application of regular maintenance, and the adoption of the following precautions:

- All cultural heritage and natural sites are an expanding universe. To deploy all the possibilities of the universe of historical values, it is not enough to act on things: it is also useful to educate people, to form their sensitivity, and to help them to acquire cultural, scientific, and techniques. If we have qualified human resources, we will be able to better respond to certain key issues in the policy of conservation and enhancement of historical heritage.

- The field of reinforcement is vast and the techniques are numerous, they vary according to different criteria, that is to say; the construction system, the various pathologies affecting the building, the level of disorder and degradation, as well as other parameters relating to the structure in question, because any intervention on the old building (especially the traditional ones) is based on a good knowledge of the construction as well as the materials used and the spatial typologies of these constructions. This variety of strengthening methods and approaches represents protection and safeguard of old constructions, especially historical monuments. Therefore, a protection of the cultural identity it represents.

- In the case of intervention on the entire structure, a complete technical diagnosis is carried out beforehand, which leads to an analysis of these various defects, often obvious, probing the masonry to identify possible weak points. Depending on the case, if the condition of the walls (cracks and deformations) requires major interventions, the structure will be consolidated by its restoration at the level of the foundations, otherwise the execution of reinforced chains, buttresses, or spacers.

- The repair mortar must be prepared taking into account the conditions of the old masonry. This must transpire and guarantee the exchange of gases between the inside and the outside. It is therefore not necessary to use a compact hydraulic coating which makes the wall waterproof and causes many monsters based on basic properties such as mechanical resistance, pore volume distribution, capillary water absorption, water vapor permeability, and aging resistance. The mechanical properties of the coating must be lower than those of the support. This coating must resist their movements without deforming. Likewise, the content of soluble salts must be as low as possible, as they can cause structural and aesthetic risks. New mortars mainly produce sodium and potassium salts, which lead to the risk of efflorescence of insoluble calcium carbonate. For these reasons, the use of cement in old masonry is prohibited.

- Today, for various reasons (budget, timing, etc.), it is difficult to remove all the coatings used during the restoration of the building and replace them completely with other more compatible ones. In order to permanently install your facades and bring them back to a permanent balance, regular inspections are required every 5 years to prevent malfunctions that can lead to further deterioration under the influence of atmospheric agents, the environment, and other harmful causes. Each pathology corresponds to an appropriate treatment by purification, repair, protection, or improvement. These treatments use both traditional methods and much more modern procedures.

- In order for moisture to escape from the masonry, an organized gas exchange must be ensured from the inside to the outside. To help them, all obstacles must first be removed with good ventilation. all watertight and vapor-impermeable coatings must be eliminated in favor of a waterproof but vapor-permeable coating. All cementitious coatings and bastard mortars must be eliminated. Then plasters containing capillaries allowing the ventilation of the masonry are applied, in particular plasters based on aerial lime. In the presence of mineral salts in the wall, before applying a new coating, it is necessary to use suitable injection products and apply a primer.

9   Conclusion

Algeria, and Algiers in particular, is characterized by the use of an invaluable heritage of conventional Ottoman houses, the latter of which hide advantageous architectural characteristics and values, organizational, hierarchical, and spatial typologies, as well as various structural typologies, among which we find The Casbah, the Mediterranean par excellence, has followed a large number of penal texts and methods of intervention in defense of ancestral sites, including the Casbah of Algiers, declared a World Heritage Site. However, many shortcomings remain in its restoration. Monuments are difficult to decay and change. Its restoration requires strategies and information on the difficulty.

The distinction in maintaining the Casbah is simply too complex; it represents one of the few dichotomies between providing decent housing for low-income citizens and the urgent need for rehabilitation. Now that the Casbah is still on the "world history list", it shouldn't stop. The preservation of the Casbah does not consist in restoring a few houses, but in preserving the vitality of the entire historic center. The problem of the Casbah is shared.

The observation of the Casbah of Algiers made us understand that its typological specificity has been compromised, showing a sudden change in construction techniques and new materials that do not adapt to old construction techniques and materials. The analysis of the root causes of this situation leads us to conclude that this degradation has multiple origins, causes, and manifestations linked to various technical, natural, and human factors. However, this is also largely due to the lack of technical knowledge and processes that strengthen old buildings.

Documentation of these Casbah-related issues continues to be produced to clarify the many secrets the city hides from its visitors. In recent years, new policy mechanisms have emerged to reconcile conflict and development conservation needs by applying sustainable development policies in historic cities.

The concept of built heritage incorporates these notions of transmission, continuity, and permanence. The constructions of the pre-war Casbah have shown their resilience: they have withstood the changing seasons and certain extreme climatic conditions; its materials are local, natural, and reusable. They are the synthesis of an experience born at the end of a long process of trial and error which has enabled us to develop effective solutions.

The sustainable development of cities is indeed a topical issue, to which the protection and enhancement of cultural heritage make an important contribution. The two concepts overlap in several respects. The objective of sustainable development is to find a coherent and sustainable balance

between the three pillars of the environment, society, and the economy in order to ensure the development of future generations.

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A Model of Functional-Spatial Transformation of Medieval Urban Structure. The Example of Krosno in the Subcarpathia in Poland

Anna Maria Martyka

Abstract

Cities of historical origin are a key element of European cultural heritage. Currently, they face a socio-economic crisis and spatial degradation. The subject of this study is the historical spatial layout of a medium-sized provincial town that obtained its municipal privileges in the late Middle Ages. It was a royal town founded under Magdeburg Law in the fourteenth century as a part of an important initiative of Casimir the Great for the urbanization of old Małopolska. The research problem was to find an answer to the question of how to make use of this valuable material historical heritage in the development processes of medium-sized towns in the context of contemporary threats such as unfavorable demographic, climatic, and economic changes. The main objective was to determine the potential of historical spatial structures in the process of regaining lost identity and distinctiveness, while the application objective was to create design and programming guidelines that would be useful in conducting potentially effective spatial policy. The research procedure was conducted in several stages, from the perspective of an architect-urbanist. It began with an outline of the historical urban structure and was followed by its morphological analysis and urban planning analysis. The analyses took into account aspects such as compactness, clarity of separation from the surrounding landscape, topography-dependent morphology, clarity of separation between public spaces, and mobility. It was concluded that the form of the historic urban fabric can largely determine the character of the city and its functional surroundings, can also be its brand and a symbol of cultural continuity, but at the same time can be a friendly place to live.

1 Introduction

Cities as an organized spatial structure evolve under the influence of internal and external conditions. Evolution does not mean the total loss of previous spatial forms, but their adaptation to new conditions. In many contemporary cities, new structures, and the organization and functioning of the city are anchored in earlier structures. The complexity of the urban organism, its functional, spatial, and social diversity generates not only a difficulty in formulating a conceptual apparatus of the city, but also in searching for scientific concepts that are based on combining historical values with contemporary conditions in a synergic bond (Prokopska & Martyka, 2017). The state of constant changes related to the development of urbanization, political, social, and economic transformations does not facilitate building a structural model of modern cities and creating optimal development strategies (Zuziak, 2008). Studying past patterns allows us to see contemporary urbanized organizations more clearly. Noteworthy is the initial stage in the evolution of a city, i.e., the stage that is its historical documentation, used in order to study the process of transformation of one structure into another and the relations between them (Zuziak, 2015).

By looking for inspiration from the past, we can better understand the functioning of the city today, especially when the medieval spatial layout, which is considered an ideal model, is preserved. Medieval towns at a certain stage of civilization's development were optimal places providing security from both strangers and nature, which was extremely difficult to tame. Concentrations of settlements built to provide security for their inhabitants became local, regional, or global points of exchange and trade, which

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allowed for their continuous development. The medieval city was extremely diverse in its spatial forms, but extremely flexible both in adapting to the changing nature of trade and to specific internal and external conditions throughout history (Mironowicz, 2016). The layouts of medieval towns, together with the main square in the form of the market square, have always constituted the heart of the city while strongly influencing and determining the individual landscape of the city (Martyka, 2020). Towns of special importance and especially the extremely valuable ones from the medieval period are very often still the most expressive component of the city with a symbolic meaning crystallizing its structure (Wejchert, 1984).

In Krosno, the medieval urban layout is a priority element of the cultural landscape and a part of the cultural heritage of Poland. The material heritage of Krosno is mainly the medieval urban layout, which has been largely preserved to the present day. The layout model of the market and the marketplace blocks in the existing urban tissue is readable. The original premedieval transportation system, which influenced the layout of the town, is also clear. The streets leading from the corners and the center of the square are visible. The historic layout is protected by law through an entry in the register of immovable monuments of the Podkarpackie Voivodeship with number decision A-376. However, it is not the monuments that have made Krosno famous in Europe and worldwide but its traditions linked to the oil industry and the manufacture of decorative and functional glass, but this can also be extended to the heritage of medieval urban planning.

2   Methods

This paper presents a multidirectional characterization of the historic spatial layout of Krosno, which belongs to the group of cities of medieval provenance. The aim of the presented research is a synthesis of previous historical research on the process and conditions in the initial period of shaping the structure of the city, which was formed over 670 years earlier. Another objective was to analyze the contemporary urban layout in the context of the preserved elements and its authenticity, as well as a proposal to enhance the attractiveness of the layout and its current protection. The main application objective of this work is to define guidelines useful in strategic and operational documents regulating the direction of Krosno's development and to search for principles that will be helpful in directing structural-creative processes in selected categories and objectives, such as continuity of public spaces, integration of structure, or revitalization of key areas.

The research procedure was managed in several stages from the perspective of an architect-urbanist encompassing scientific knowledge, experience, and practice in the field of architecture and urban planning and the history of city construction. It began by outlining the construction of the historical urban structure on the basis of research techniques such as queries, literature, and archival research. The historical city structure depicted in the First Military Survey (1779–1783, Josephinische Landesaufnahme—First military survey) was confronted with the nineteenth-century cadastral plan and the contemporary composition of spatial elements. An important stage in the research procedure was field research and inventorying of the town area delineated during its incorporation, with particular emphasis on the market square, the block of buildings surrounding the market square, and public buildings such as churches and the town hall. Photographic documentation of buildings and urban interiors was also made.

After a review of the literature and a search of archival material, the current state of affairs, primarily spatial but also infrastructural and social, was identified and analyzed. An urban analysis was carried out on two scales; on the first scale the distinctive elements of the historic urban core were articulated and directions for its harmonization with the immediate surroundings were indicated. The second scale articulates the regions of the city by defining their dominant functions (Lynch, 1960). Urban composition and public space play a key role in defining the relationship between historic spatial and urban layout. The harmonious composition of spatial structures means integrating the urban system at appropriate levels and establishing harmonious relations with individual morphologically distinctive areas of the city (Wejchert, 1984). The analysis of the above parameters interpreted in the form of graphic diagrams made it possible to read the specific structural logic which can contribute better to the orientation of the city's development processes in selected categories and objectives. Those would be, for example, the continuity of public spaces and the integration of structures with priority given to the protection of the medieval urban layout. All of this is in line with the noticeable demand to look for new spatial planning tools in Poland in order to be able to face the threats typical of today's developed world, such as suburbanization and the blurring of urban identity (Zuziak, 2017).

3   Planning Conditions

The Polish Planning and Spatial Development Act (2003) defines the local plan as an operational act of local law, which should specify the principles of protection of cultural heritage and historical monuments, as well as the rules of shaping public spaces. This is also the case in Krosno. The central area of Krosno is covered by the Local Spatial Development Plan (2019). The regulations contained in

the plan also concern the market square as the main public space in relation to the functions of the surrounding quarters, where service, residential and administrative functions are planned.

The Municipal Programme of Monuments Protection of Krosno is another document that covers the spatial policy in the field of cultural landscape protection. Its findings specify the scope of cultural landscape protection of the historical urban layout of the old town complex, as well as particular immovable and archaeological monuments entered in the register of monuments of the Podkarpackie Voivodeship and buildings entered in the communal register of monuments. There are general and specific guidelines related to the development of buildings concerning, among others: protection of cultural assets, development, environmental protection, spatial order shaping, and visual communication. The program for protecting historic monuments is a document that needs to be updated periodically. However, the first one, for the first 4 years, seems to be crucial for the further programs in this respect, as it is based on a broad recognition of the complexity of the issues. It also determines the priority directions, which are an important point of reference for the programs constructed for the subsequent several years. Future modifications of the program should take into account new legal and administrative conditions; changing social, economic, and cultural conditions; new evaluation criteria; and the current state of resource preservation, as well as periodic evaluations of the effects of implementation of the current program.

4 Literature of the Subject Synthesis

The history of the spatial development of cities during the medieval urbanization campaign in historic Lesser Poland is the subject of many valuable scientific publications that deal with issues such as politics, society, and economy. The fundamental publications of this type include items such as the following: Berdecka's (1982) "Lokacje i zagospodarowanie miast królewskich w Małopolsce za Kazimierza Wielkiego, 1333–1370" ("Locations and Development of the Royal Cities in Lesser Poland in the Years of Casimir the Great, 1333–1370") (1982), Kiryk (1985) "Rozwój urbanizacji Małopolski XIII-XVI w: województwo krakowskie (powiaty południowe)" (Urbanization of Lesser Poland thirteenth-sixteenth centuries: Cracow Province (southern counties)) and Malczewski (2006) "Miasta między Wisłoką a Sanem do początku XVI w: powstanie, zagospodarowanie, układy przestrzenne" ("Cities between Wisloka and San rivers until the beginning of sixteenth century: establishment, development, spatial layout") as well as Krasnowolski (2004) "Lokacyjne układy urbanistyczne na obszarze ziemi krakowskiej w XIII i XIV wieku" ("Local

urban systems in the Cracow region in the thirteenth and fourteenth centuries").

The first study dealing with the history of Krosno was started by Sarna (1898) "Opis powiatu krośnieńskiego pod względem geograficzno-historycznym" ("Description of the Krosno County in terms of geography and history"). The urban planning and architecture of Krosno, a town located on the border of Lesser Poland, was the subject of numerous studies and papers. Typical urban studies in Krosno were initiated by Zychiewicz (1953) in "Studium historyczno-urbanistyczne miasta Krosna" ("Historical and Urban Studies of the Town of Krosno") and the history of the medieval town was one of the first studies conducted by Lewicka (1934) in "Krosno w wiekach średnich " ("Krosno in the Middle Ages"). Garbacik (1972) reconstructed a hypothetical plan of the town in his article "Zabudowa Krosna w XVI wieku " ("Development of Krosno in the sixteenth century").

Archaeological research in Krosno, as in other medieval towns in the region, has been conducted only at points, but unfortunately there is a lack of research on the entire historical urban layout. In the 1970s and 1980s, archaeological and architectural research was conducted on several buildings in Krosno. The results of these investigations were used in Teodorowicz-Czerepińska's study (1974) "Krosno. Studium historyczno-urbanistyczne dla planu szczegółowego" ("Krosno. Historico-urbanistic study for a detailed plan"). Later archaeological discoveries on the market square, in the years 1999–2001, during which a stone town hall building and an alderman's house were discovered in the western part of the market square, were described by Muzyczuk and Bicz-Sukmanowska (2002) in an article titled "Odkrycie dwóch obiektów architektury monumentalnej na rynku w Krośnie" ("The discovery of two objects of monumental architecture in the market square in Krosno"). The chronology and situation of the town's defensive system was researched by Proksa (1990) "Miejskie mury obronne w Krośnie w świetle źródeł pisanych i badań archeologicznych" ("Town walls in Krosno in the light of written sources and archaeological research").

5 Historical Background of the City of Krosno

Krosno was founded on the tear of dynamic urbanization of the historical Lesser Poland. It was carried out by Casimir the Great during his reign from 1333 to 1370. The location of towns in previously poorly urbanized areas was a consequence of the king's ambitions and the search for favorable economic, social, trade, and communication conditions. Krosno was a medium-sized city situated at the crossroads

of important trade routes to Hungary and Ruthenia. On the eastern edge of Lesser Poland cities were not founded due to the expected external threat. Few settlements took into account the need to strengthen the defence of Poland. Casimir the Great's expansion into Ruthenia accelerated the hitherto slow urbanization of the area. From that time onward, a planned economic policy of the King was noticeable, which was expressed in the location of a network of new towns in the area incorporated into the Kingdom of Poland (Berdecka, 1982, p. 96).

Prior to the incorporation of Krosno under German law, the settlement of the same name was owned by the bishops of Lubus, and it is not known when and how it came into the possession of the king. The first mention of the settlement dates back to the end of the thirteenth century, when Leszek the Black granted the Bishop of Lublin immunity in exchange for 34 Lesser Poland settlements. The fact that Krosno belonged to Sandomierz Land proves that it was within the range of Polish settlement expansion and was settled by Polish population before the location. The exact date of Krosno's incorporation is unknown, as the incorporation privilege has not survived and was probably burned in the fire at the town hall. However, it is known that the incorporation charter was issued before 1348, the year from which the oldest source that mentions Krosno as a town comes from. The inhabitants of the young town were still involved in farming. To facilitate the development of uncultivated land and forests, the residents were exempted from paying taxes for 20 years on the areas around the town that had been granted, as it was founded in difficult borderland conditions. Over the following centuries, Krosno developed dynamically and became an important element of the settlement network. Krosno was the most populous town in the Sanok region in the second half of the seventeenth century and at the beginning of the eighteenth century, when it was inhabited by craftsmen of more than 36 specialities and 10 guilds functioned, and their products were exported to Slovakia and Hungary (Motylewicz, 1993). The area around Krosno is regarded the center of the Polish oil industry. The privilege of lighting the town with rock oil appeared as early as the sixteenth century in documents kept at the Franciscan monastery. Oil resources in the vicinity of Krosno are mentioned in subsequent sources from the seventeenth and eighteenth centuries (Cząstka, 1973).

From the seventeenth century, the development of the town started to regress, which was caused by wars and disasters. The most devastating events for the town's population were invasions and passages of both the Polish army and the Swedish, Tatar and Hungarian invaders, as well as frequent attacks of robbers. The first Swedish troops appeared in the region in 1655. Swedish troops were stationed in Krosno for a short time. The well-fortified Krosno was no match for the Hungarians, who in retaliation plundered the suburbs and the surrounding villages (Motylewicz, 1993). Further defeats befell the towns, including Krosno in the early eighteenth century. The stay of foreign and national troops in cities and suburbs was accompanied by frequent fires. Documents testify that Krosno was hit by a fire in 1714, which caused great damage to buildings abandoned by fleeing townsmen. Epidemics of infectious diseases carried by the army, diseases of livestock were another pestilence, the latter drastically reducing their numbers on burgher farms. In addition, attacks and blockades of major roads by bands of brigands, which particularly severely weakened the economic southeastern areas of the Republic of Poland.

At the end of the eighteenth century, Krosno was considered a center of greater importance, but it still ranked sixth among the eight largest towns in the Podkarpackie region. Krosno was still in crisis in the nineteenth century. In the middle of the nineteenth century, the basis of Krosno's economy was still agriculture and farmers dominated the socio-professional structure of the town's inhabitants. Although the Austrians created an administrative and judicial district in Krosno, this decision did not significantly influence the economic revival of the city. In the last decades of the nineteenth century, the life of the town was still concentrated in the historical center with its old buildings. It was the basic substance on the basis of which the center performed its administrative function. Housing problems were solved by making use of existing buildings. For a number of years after 1867, the year in which the Galician Autonomy began, the local authorities did not manage to erect a single new public building. Only the former Jesuit complex was partially rebuilt from the ruins. The railway station was the first completely new public building, but it was far from the center. Thanks to the development of the railway, crafts, and the oil industry, Krosno finally broke through the period of economic stagnation. Krosno became an important center from where oil was exported by rail to the whole world (Kosiek, 2001). Today, Krosno is a district town located in the southern part of Podkarpackie Voivodeship, which it became part of as a result of the last administrative reform of the country in 1999. In the years 1975–1998 it was a voivodeship town. Currently the city has a population of almost 46 thousand inhabitants (Statistics Poland, 2022).

6 Development of the Spatial Layout of Krosno

The medieval town model has evolved over the centuries. In terms of typology, it was divided into irregular and regular cities. In Europe, the idea of the regular city, which was based on an orthogonal grid of streets, was widespread. The

layout of the square and streets created an infrastructure of trade that allowed for the export and distribution of goods, linking local manufacturers with visitors, and organizing the exchange of goods while ensuring the safety of all participants in this process (Benevolo, 1980). In the center of the city there was the main square: a quadrilateral market square performing commercial and administrative functions surrounded by blocks of buildings on an orthogonal grid of streets within strictly defined boundaries marked by defensive devices. Monumental buildings such as churches and town halls, gates, towers, and towers, in addition to performing important urban functions, were architectural dominants (Adamska, 2019). Such a city model was also realized in Krosno.

Krosno was located in a place with particularly favorable defensive qualities in the Wisłok and Lubatówka forks on a naturally formed hill, which is still limited in some places by an almost vertical high escarpment (Fig. 1). The town was delimited in the direct vicinity of the existing settlement on its southern side and its spatial layout was integrated into the plan of the newly located town becoming a part of the entire layout of the emerging town. In the northern part of the medieval town layout, the triangular square, which constituted its center, is still visible. Even today in the urban layout of Krosno, in the northern part of

the old city, the wide layout is clearly visible. At the fork of the roads, often found in precolonial layouts, a market square was formed. In the north-eastern part there was also a church before the foundation of the town, and on its other side there was a manor house of Przemysl bishops. This is an example of joining one urban organism into two differently shaped settlement units of a pre-localization village and a town located on an orthogonal plan (Malczewski, 2006).

The plans of medieval towns had a regular layout based on simple numerical ratios. Most of the towns in the region established in the Middle Ages were laid out on a measuring module of the so-called big rope, the length of which depended on the size of the smallest component of the foot (1 big rope = 10 rods = 150 feet). As established by researchers, Krosno was measured on the basis of a foot of 30 cm (Berdecka, 1982). The city area was divided into building blocks and plots—the smallest spatial units. The layout and delimitation of the market, or main market square, took place at the beginning of the location action. Krosno, as already mentioned above, had two squares in the Middle Ages. The older square was originally situated in the place of today's trapezoid-shaped square adjacent to the former palace of the Przemyśl bishops palace by the main street leading from the market square to the Cracow Gate (Fig. 2).

Fig. 1 Contemporary silhouette of the historic layout of Krosno built on a naturally formed escarpment. Photo by Author 2022

Fig. 2 The view of the triangular square, which is a relic of an earlier settlement than the city. To the left of the shot is the Przemyśl bishops residence, which now houses the Subcarpathian Museum. At the end of the street view axis is the Parihs Tower. Photo toward the southeast. Photo by Author 2022

The new city square was the central point of the structure mainly due to its size. The square was laid out on a rectangular plan, the shape of which was distorted by the lying of the land and the location of older buildings that were adapted to the new layout. The Krosno Market Square has a parallel layout in terms of the direction of the roads that lead out of it. The market had six entrances and the main trade route from the south to the north, from the Hungarian Gate to the Cracow Gate, ran through its center, dividing the town and the market into two parts. The southern and northern fronts of the market were three strings long, and the eastern and western fronts were two strings long each. The northern frontage was slightly shorter by about two rods,, and the shape of the market was similar to a trapezium with dimensions 135.90×90 m (123.5 m), i.e., 3×2 ropes and the rope dimension was 45 m. The market was surrounded by individual blocks of buildings divided into location plots of varying size (Fig. 3).

The location plot formed the basis of the rent and in the early days of the town was built up with wooden houses. One of the characteristic features of market squares dating

back to medieval times was the exceptional rank and role of market buildings. It was here that the most attractive plots of land in the whole layout were located and it was here that the wealthiest residents lived. The buildings built in the fronts stood out compared to other quarters, not only because of their size, but also because of their architecture and functional solutions subordinated to commercial functions. These buildings were subject to numerous reconstructions over the centuries under the influence of not only changing architectural styles, but also as a result of frequent fires (Adamska, 2019).

A residential block, one of the main components of a medieval town, consisted of residential plots. The widths of the plots varied over the centuries, sometimes quite significantly compared to the state in the planning period. In addition to the dwelling house, the plot also housed a workshop. The plots in market square blocks were six rods long. A town hall was located on the square. The location town and the existing settlement were surrounded by a single line of defensive fortifications with two gates. The area of the city within the defensive perimeter was more than 7.5 ha. Krosno had a well-developed street network. The network of main streets leading from the market square was complemented by farm streets serving the rear of the market blocks and back streets leading to fields and farm buildings. The most impressive housing plots were oriented toward the main streets, with less impressive buildings along the lower streets. The width of the main streets was approximately two to three rods (8.6–13 m), the width of the second category streets was one to two rods. After the fortifications had been built, substructure or subaltern streets were created, which allowed access to the defence equipment (Malczewski, 2006).

Buildings in most of the towns were still made of wood in the first half of the eighteenth century. Only in a few larger towns such as Krosno, Jarosław, Przemyśl, and Sambor there were brick buildings. The Krosno Market Square was dominated by two-story tenement houses. Only in the northeastern frontage stood houses with wooden extensions and arcades. The street was built with brick buildings mixed with wooden ones, but the farther away from the market square the more there were only wooden buildings. In Krosno, the south-eastern block of the market square was completely built up; in the remaining blocks there were farm buildings and gardens behind the residential buildings. In the eighteenth century, the widest plots were 24.1 cubits, 29–33.8 cubits, or even 43.8–53.1 cubits. The depth of a plot also varied in Krosno. The short plots reached dimensions of 62.72 and 87 cubits. The deepest plots reached the length of 241 and 132 cubits (Motylewicz, p. 217).

The reconstruction of cities after the fires was usually chaotic, with no respect for the original assumptions about the planning of the town. The hastily constructed

Fig. 3 The Krosno Market Square was laid out on a rectangular plan with proportions 3:2. A view of the urban interior of the market square. Photo by Author 2022

buildings were at odds with the city's previous planning principles. Some of the houses were extended beyond the building line into the market area. In the economic topography of the city, tenement houses and houses around the market square were of primary importance for trade. Their use is evidenced by the arcades, which had architectural and economic dimensions and served as a place for the display and sale of goods. House owners rented arcades to foreign merchants. The market houses and the tenement buildings had cellars and shops for commercial purposes. The tenement house at the Krosno market belonging to the nobleman Jakub Rojewski had a cellar and two brick shops, which were accessed from the arcade. There were also three living rooms and a porch. Another house had an even more modest usable area. Apart from the arcade, it had an alcove with two rooms, a larger and a smaller one, a cellar and a shop upstairs, and two stables at the back of the plot. The entrance house was arranged differently. A hallway with equipment for horse stabling ran through its entire length.

Apart from the hallway, there was a shop, a kitchen and a small chamber, a porch and two cellars, a stable and a drying room (Motylewicz, 1993, p. 214).

Churches, together with town halls, constituted urban dominants. In Krosno, the parish church plot was located outside the town block, and the church together with the square was an extension of one of the market blocks. Sometimes the church yard occupied the entire corner block of the town (the one closest to the town). The church was a permanent element of the townscape, which was the result of the natural close relationship between the church and the bourgeoisie, which had existed for centuries. The purchase of plots of land by the Jesuit order was met with dissatisfaction by the Krosno burghers. Interestingly, the Jesuits' purchase of land on the south-western side of the square was resented by the citizens of Krosno, who feared impoverishment (Motylewicz, 1993, p. 221).

The public buildings built in medieval towns were connected with the control of trade and the representative

function was secondary. The town hall was a place for council meetings, holding court, authenticating transactions, or holding prisoners. Thus, it was related to the service of trade conducted by merchants, manufacturers, or bankers (Mironowicz, 2016). Town halls were the most important buildings within the market, but in most cities they appeared later than the first commercial buildings. In Krosno, there was an alderman's tower built during the reign of Casimir the Great, which served as the oldest town hall. Most probably, this building was completely destroyed during the fire in 1500 or 1512, as it was not rebuilt, and the material from its demolition was used to build a new Renaissance town hall located on the eastern wall of the market square, as evidenced by the elements of Gothic stonework. The seats of town owners, bishops, and aldermen played a very important role in the defence system of towns. There was a defensive seat of the Przemyśl bishops in Krosno, which was first mentioned in 1386, but it is known to have existed earlier. Located at the Cracow Gate, it strengthened the defence system of the whole town (Malczewski, 2006).

The defensive system was an integral part of the medieval town, which influenced the shape of the town and set the strict boundaries of the legal zone covering the town area. The town walls had defensive and controlling functions. They allowed effective control and taxation of trade, which allowed the city to exist and grow. However, only a few towns could afford to build defensive walls (Motylewicz, 1993). The medieval fortifications of Krosno were built in stages, and the work on their construction lasted practically throughout the whole period of their existence. From the beginning of the construction on the initiative of Casimir the Great, through the works continued under King Władysław Jagiełło (Fig. 4). Until the early sixteenth century, the walls were constantly extended, repaired, and superstructured with new elements increasing their defensive effectiveness. In 1473 and 1474, Krosno repulsed the attack of the Hungarian army, as it was surrounded by walls additionally reinforced with a rampart and a moat, which together made the access of siege machines and artillery difficult. The key elements of the fortifications were the gates and towers. The Cracow Gate and the Hungary Gate had drawbridges. The gates were of great importance functionally, militarily, and in terms of communication.

The Cracow Gate was built during the construction of the fortifications in the reign of Casimir the Great, while the Hungarian Gate was probably built later in the reign of Władysław Jagiełło. In the Middle Ages, the full perimeter of the defensive walls was created with a length of up to about 1200 m and its thickness in the lower parts varied depending on the conditions of defence, ranging from 180 to 240 cm reaching only 40 cm along the steep slope. It was a massive wall topped with a blank crenellation, the height

of which ranged from 5.5 to 8–9 m. Sandstone blocks with lime mortar from the quarry in Bialobrzegi on the other bank of the Wisloka River were used to build the wall. There were towers already in the fourteenth century; their exact location is not known, but by the end of the fifteenth century there were probably five of them. In the system of fortifications, there was a quadrilateral tower, which at the same time served as a bell tower in the complex of the first parish church, and it could also serve as an observation and guard point. Interestingly, around the fifteenth century, near the later Jesuit college, a half-cylindrical tower was built, which did not appear in any other town in Lesser Poland, and the nearest area of their occurrence was Silesia (Proksa, 1990).

The area of the town was relatively small compared to the suburbs and the area under the jurisdiction of the town with agricultural and raw material functions. Outside the police-defence area there were buildings and economic facilities such as mills, breweries, malthouses, brewing factories, and brickyards. In the areas granted to the town there were suburbs and town villages, apart from the fortifications there were also hospitals and hospital churches, town pastures and gardens and townsmen's farms. In Krosno, the sources speak of two suburbs, one by the Cracow Gate, the second suburb stretched by the gate and the road to Hungary. A suburb was probably also a small settlement near St. Adalbert's Church, which was adjacent to the town from the Korczyna side. For sanitary reasons, hospitals were usually located outside the walls, but remained in strong ties with the town. In the area of the suburb by Cracow Gate, there was the Holy Spirit Hospital with the Church of Our Lady of the Snows, which was dependent on the city, but also benefited from the foundations of townmen and other donors. At the turn of the fifteenth and sixteenth centuries, a second hospital for widows was founded, probably by the town council (Malczewski, 2006).

A careful review of the source material shows that the process of building up most of the towns within the fortifications ended before the middle of the seventeenth century. In the following periods, as a result of destructions, the spatial development of towns was significantly slowed. It was not until the second half of the eighteenth century that the process of development outside the town walls could be observed. This occurred under the influence of changes in military technology, as a result of which the former defensive systems lost their previous significance. The towns took on more and more the character of open settlements.

The nineteenth century brought the development of the oil industry in the area of Krosno, as well as a number of public buildings in the city, such as the building of the former Credit Society; the building of the "Sokół" Gymnastic Society; the Male Teachers' Seminary; and at the beginning of the twentieth century, the County Council building, the

Fig. 4 Preserved fragment of the original city walls on the south-western side of the urban layout of Krosno. Photo by Author 2022

building of the "Zgoda" Bourgeois Society, and the Court building. The complex of the oldest buildings of the glassworks and the so-called "Lnianka" are high-class examples of historic industrial architecture created before World War II (Stojak et al., 2009).

7 Inventory of Krosno on the First Military Map (1779–1783) and on the Cadastral Plan from the Nineteenth Century

The urban layout described above can be found on archival maps, the first of which waxes to date from the eighteenth century, but much of it is legible in today's layout. Military maps, so-called Mieg's maps, made on the basis of the first topographic picture of Galicia, i.e., southern territories of the Republic of Poland occupied by Habsburg monarchy in the first partition of Poland, drawn up in a scale of 1:28,000, are the first cartographic documentation of a city's structure in relatively high precision (Fig. 5). Although it was drawn

up in the modern period, it contains a huge, and often the first resource of spatial information from the medieval period. According to many medieval town researchers, towns in the former Lesser Poland developed extremely slowly, and many of them, including Krosno, did not outgrow the town outline delineated during the settlement.

In the second half of the eighteenth century, Krosno concentrated its buildings within the outline of the walls laid down in the first phase of the town's functioning. The perimeter of the walls is closed, with two visible gates to the city. The peripheral fortifications are not marked as masonry, but as earthwork on a natural slope. Fragments of the peripheral walls are visible and are single, with a visible quadrilateral outline of towers by the parish church and behind the western block of the market square development. On the eastern side, the walls are even more fragmentary. The square has a clear 3:2 ratio, with the town hall in the middle. The houses in the square blocks on the market are built of brick with narrow outbuildings along one edge of the plot. In addition to the compact market development, the

frontage development is distinct, formed by several houses on today's Slowackiego street in the north-eastern part of the town. Outside the square, there is a parish church to the north and a Franciscan monastery complex to the south-east. The most impressive building is the Jesuit college with an inner courtyard. Outside the town, on the southern side of the Hungarian road, there is a spatially impressive Capuchin monastery surrounded by full walls. See Fig. 5.

The cadastral map from the nineteenth century is definitely more accurate (Fig. 6). It marks the plots of brick and wooden buildings and the land use. In the nineteenth century, masonry buildings were concentrated around the market square forming full frontages. The town hall on the square is no longer visible. Comparing the width of the market plots shown on the cadastral map with the current state, it can be concluded that the vast majority have remained unchanged. There are two dominant elements in the square in the form of perhaps wooden wells. The buildings on the streets leading from the northern side of the market in the direction of Cracow Gate are much less imposing and the frontages of the streets, apart from brick buildings, are made of wood. Interestingly, gardens are visible on many plots of land. Monuments such as the parish church and the Franciscan Monastery, the Przemyśl Bishop's Palace, and the Jesuit College Stand Out in the spatial structure. Outside the outline of the former fortifications stands the Camaldolese Monastery with its park, and on the city side there is an organically shaped town square in front of the former Hungarian Gate. See Fig. 6.

8 The Historical Layout of Krosno Today— Selected Aspects of the Urban Analysis

In this article, the analysis of urban morphology has been narrowed to a qualitative description of forms that are considered elements that make up the spatial structure of a city. The formal analysis is based on field observation, whereas the morphological analysis focuses on the issue of the historical genesis of the forms. The analysis of the elements of the city plan, available from direct observation, is in line with Conzen's (1960) research. It is also based on the Polish school of morphology, which has methodological foundations laid by Dziewoński (1962). The study of the city's spatial structure includes the characterization of the elementary distribution systems and also the determination of the spatial and functional relations occurring between these systems. The analysis presented here was also constructed with the help of a profile based on
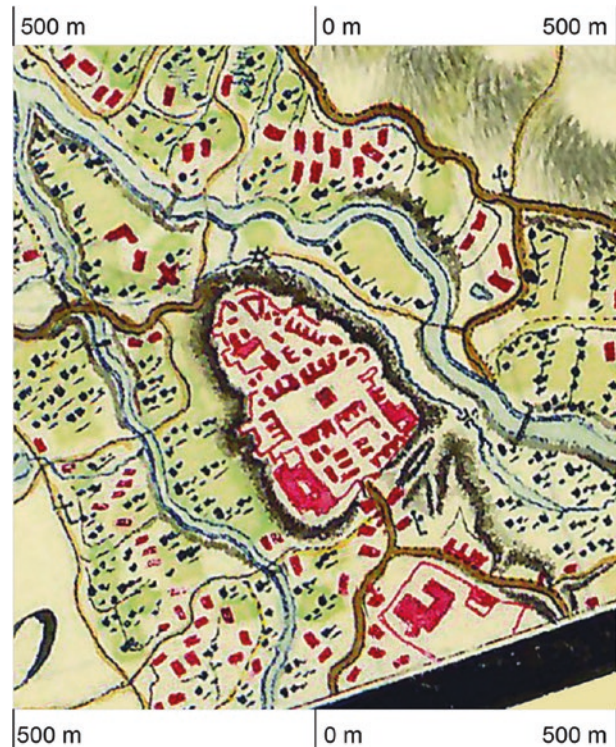

Fig. 5 a. Eighteenth-century old town area depicted on the First Military Map (1779–1783). *Source* Austrian State Archives. Signature: z.B B "IXa 242"
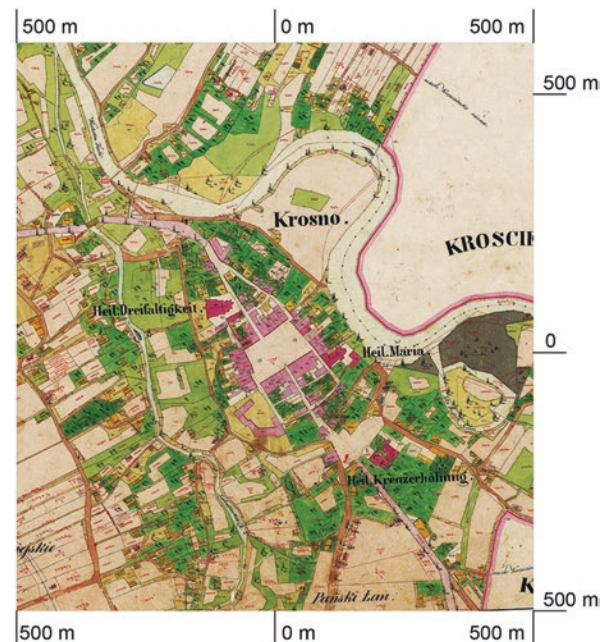

Fig. 6 b. The area of the old town is depicted on the cadastral map of 1849. *Source* State Archive in Przemyśl. Signature: 56 AP/815 M

available documents and a synthesis of its essential elements, in terms of functional and formal solutions. Due to the varying nature of urban and planning studies, graphical schemes that synthesize important parameters of spatial structure have been prepared in this article. See Fig. 7.

Krosno has a heterogeneous, regular, and irregular layout. The reason for that may be the development of the city over a long period of time and the change in spatial layout along with the socio-economic transformations. In the central zone of Krosno, several prominent functional-spatial units can be distinguished:

- downtown area with a regular layout, where the public life of the city is concentrated within the historical center dating back to the Middle Ages;
- residential areas with diversified development, forming several development zones, mostly created during the twentieth century;
- industrial areas located mainly within the belt pattern between the railway line, the oldest part of the zone, the old town, and the nineteenth-century railway line;
- areas with specialized functions such as sport, commerce, communication, religion, or leisure with their origins at the turn of the twentieth and twenty-first centuries;
- areas with mixed functions, created in the late twentieth and early twenty-first centuries.

As can be observed in Krosno, the level of coordination of urban planning activities in terms of composition and spatial interrelations is relatively low. The observation of urban reality indicates that the chances of such logical relations appearing are far too rare. Even if the provisions indicating the necessity of ensuring functional and compositional links between individual areas can be found, the arrangements of spatial development plans can be found (including in areas of key importance for the city development strategy), such arrangements are not implemented in practice (Zuziak, 2017).

The square is located in the southern part of the old town on the axis of the main established historical route. The trapezoid-shaped market is surrounded by compact buildings with two floors. Inside the market square in the middle there is a model of the town, fixed in the pavement contours of the historic buildings of the town hall and the alderman's house on the market square. The market area is characterized by a concentration of restaurants with summer gardens.

Currently, around the square there are historic houses from different periods. Some of them have characteristic arcades. The arcades in the eastern part of the northern and southern frontage date from the sixteenth and seventeenth centuries, while those in the western part of the southern frontage are a reconstruction from the turn of the nineteenth

and twentieth centuries. The outline of the walls discovered during the archaeological works on the remains of the alderman's tower and the town hall was marked on the square with a different surface. See Fig. 8.

Multifunctional use is a characteristic feature of the market square, differentiating it from other urban squares. The functioning of the market square has undergone changes of varying intensity, but some of its functions have remained the same, such as shopping, services, and housing. However, the communication function has decreased due to the expansion of the road network and the administrative function due to a change in the location of the municipal authorities. In recent decades, the representative function has increased, expressed in the form of celebrations held on the surface of the square. The new market functions that have emerged in recent years are tourist and recreational functions. The specificity of the market is the varied intensity of individual functions, which depends on the size of the city, its importance in the region, as well as the seasons, and the occurrence of local initiatives and activities of local authorities. Together, however, they complement each other and enrich the attractiveness of the square and of the entire historical establishment (Adamska, 2019).

9   Summary and Conclusions

The research related to the history of urban spatial development is a key element in the process of protecting and revalorizing historic urban complexes, especially in the face of socio-economic and ecological crises that can lead to spatial degradation of this valuable cultural heritage.

Over the centuries, the structures of the location town have been subject to transformation, but a harmonious continuity of functional and spatial characteristics has been maintained. In recent history, cities have been able to build their image on the basis of the preserved heritage and contemporary requirements through the creation of an attractive image and public spaces with a multifunctional structure responding to the needs of its users. The medieval historic structures are a valuable national heritage. They carry tangible values in the form of a defined layout, and intangible values in the form of the tradition of the place and building local identity, as well as creating the marketing of the city. Their protection and proper care and the way they are used are also in the context of sustainable development.

Kantarek (2019) argues that at the core of thinking about the city is reading the city and, more specifically, reading its physical form. Reading the city can be done according to several approaches. The first approach, by Conzen (1960), is based on the assumption that the physical form of a city is built by three basic elements: roads, plots of land, and buildings. This rather simple assumption is thus a tool to
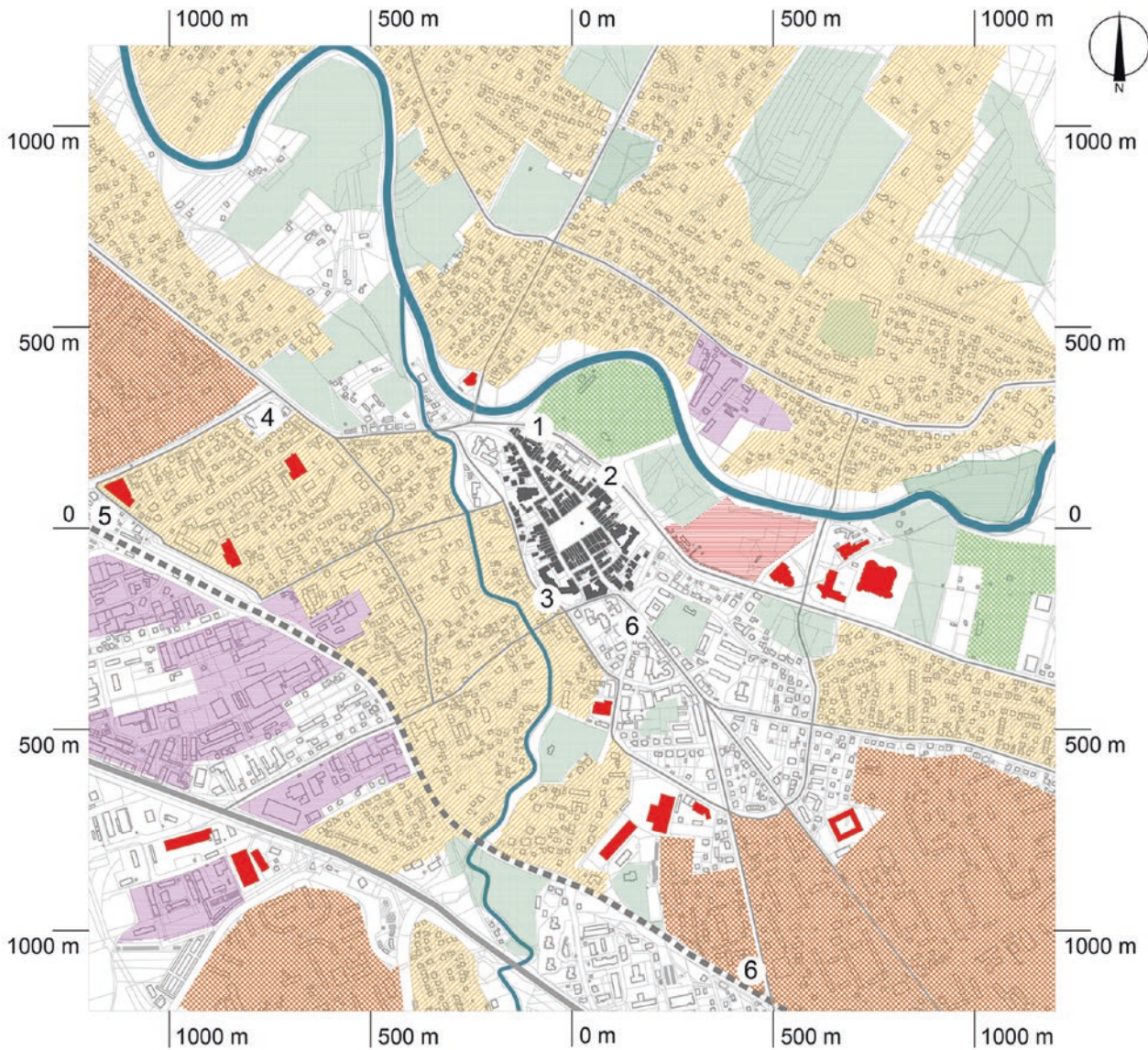
LEGEND

BUILDINGS ON THE OUTLINE OF THE MEDIEVAL TOWN WITH MAIN MARKET

AREA OF LOW INTENSITY RESIDENTIAL DEVELOPMENT

AREA OF HIGH INTENSITY RESIDENTIAL DEVELOPMENT

AREA OF CONCENTRATION OF INDUSTRIAL AND WAREHOUSE FUNCTIONS

GREEN AREAS WITH DIFFERENT FUNCTIONS

AREA OF CONCENTRATION OF SPORT AND RECREATION FUNCTIONS

CITY MARKET AREA

BUILDINGS WITH COMMERCIAL AND SERVICE FUNCTIONS

AREAS OF MIXED FUNCTIONS

RAILWAY

RIVER

MAJOR ROADS

1 BISHOP'S PALACE NOW SUBCARPATHIAN MUSEUM

2 GLASS HERITAGE CENTRE

3 CARPATHIAN NATIONAL UNIVERSITY

4 REGIONAL CENTRE OF BORDERLAND CULTURES

5 TRAIN STATION

6 TOWN HALL

Fig. 7 Spatial-functional analysis of the central zone of Krosno 2022—selected aspects

LEGEND

| | BUILDINGS OF THE MID-XIII TO THE XV CENTURY |
| BUILDINGS OF THE XVI CENTURY |
| BUILDINGS OF THE XVII CENTURY |
| BUILDINGS OF 19TH CENTURY |
| BUILDINGS OF THE 20TH CENTURY |

OUTLINE OF THE AREA INCLUDED IN THE REGISTER OF MONUMENTS A-376

COMPOSITIONAL AXIS

CONTEMPORARY NEGATIVE DOMINANT

THE MOST IMPORTANT PUBLIC SPACE MAIN MARKET

VIEW POINT

RIVER

GREENERY AND TREES

PUBLIC SPACE AND DIRECTIONS OF ITS INTEGRATION WITH OTHER SPACES OF THE CITY

Labels on map:
PALACE OF PRZEMYSL BISHOP
PARISH CHURCH
SOCIAL INSURANCE BUILDING
CONTEMPORARY MARKET SQUARE
OUTLINE OF THE RENAISSANCE TOWN HALL
FRANCISCAN CHURCH
OUTLINE OF THE MAYOR'S TOWER
JESUIT COLLEGE
ADVANCE SOCIETY BUILDING
COURTHOUSE BUILDING
CAPUCHIN MONASTERY

Fig. 8 Spatial-functional analysis of the old town and its immediate surroundings Krosno 2022—selected aspects

show the genesis of the original form and its transformation to the present structure. Another approach is based on examining the structure of the city on three scales: building—plot, street—block, and city—region, which are suitable for analyzing relationships. The third approach, the most generally defined, is based on the assumption that an understanding of urban form can only come about by studying its history (Kantarek, 2019).

As Rossi (1984) pointed out, in deciphering the city, it is also worth remembering that urban space is a record of

history, culture, social life style, and tradition. The author stresses that the spatial structure of a city, developed over centuries, is not only a reflection of the historical changes of a given city, but it is also one of the most important elements of its identity. Zuziak (2015) additionally notes that the reflection of a city's development processes is its architecture and urban form. Moreover, the changes in urban space, considered against the background of cultural processes, are therefore among the most important tasks of cultural heritage protection (Zuziak, 2008). Deciphering the form of a city, regardless of the perspective adopted, can assist in plotting contemporary scenarios of city development, or, as Zuziak argues, in modeling the development of a city and creating directions for spatial policy. A variety of approaches and time perspectives should be taken into consideration in order to understand and read the process of change, and that is what this study sought to prove.

This paper outlines the history of the founding of the city of Krosno and characterizes the urban layout and the model used for its layout as well as an ex post analysis of the monumental layout. During its over 670 years of history, the layout of the city was subject to constant transformations, but the genius locci and the basic elements of the spatial structure in the form of the market square, monuments, and the main communication system were preserved. Nowadays, traditional functions such as trade and services are being continued, as well as new ones focusing on social life and tourist and recreational functions. An important factor for the future development of the city as a whole is the skillful promotion of cultural heritage and the participation of local communities in decisions on the directions of transformations.

The city center with its historical heart is a place that, due to its values of spatial development and other values that determine the attractiveness of the place, is of key importance for contemporary forms of urban life. Public spaces and places and objects of particular cultural value are an important determinant. Following the example of other cities at the forefront of sustainable development, strengthening the competitiveness of the city center should be one of the main objectives of spatial policy.

Based on the analyses and studies carried out, the general principles of shaping the spatial policy of Krosno were formulated. As a basic guideline, not only the protection of the historic fabric but also the improvement of its quality and attractiveness of the public space is the reorganization of communication in the market square and within the historic compound. This concerns car traffic and parking spaces, and bicycle mobility on foot. The key issue in terms of shaping the high-class tissue is the manner of renovation of historic facades and facades of buildings from the modernism period. The way of shaping visual communication should be continued, but extended to the surroundings

of the historic center. The chaos of advertisements and their number do not harmonize with the noble neighborhood. It is also recommended to secure the salty corroded masonry fragments on the stairs leading to the basement.

In terms of spatial policy, a holistic vision of the area's development is important while taking into account spatial, social, and economic aspects. As far as spatial issues are concerned, the synthesized conclusion in this research is the preservation and authentication of urban interiors and the building of a coherent network of public spaces both in the old town area and in the legible connections with the rest of the city structure, and shaping the continuity of the urban composition in a proper balance with the historical layout of the city. The functional diversity in the old town area is also important. It is worth creating some kind of facilitation and encouragement for residential function, which has seen the greatest downward trend in recent decades.

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Knowing is Saving: Italian Architecture in Libya and the Case of Benghazi Cathedral

Carlotta Coccoli, Alberto Arenghi, Francesca Tanghetti and Ahmed El-Rida

Abstract

This paper presents the first results of research carried out under a Memorandum of Understanding signed in 2021 by the University of Brescia and the Berenice University of Architecture and Urbanism of Benghazi that is focused on the conservation, reuse, and accessibility of Libya's Italian building heritage. In Benghazi, this colonial heritage has become an integral part of the community. The analysis phase that has already been concluded concerned preliminary study of Benghazi Cathedral, currently in a poor state of preservation. The first part of the essay describes the characteristics of Italian colonial architecture in Libya in the early twentieth century, with particular emphasis on the works of architects to whom we owe the cathedral's construction. The history of the building is studied, together with the design and construction techniques. The main building-related deterioration present in the cathedral is examined and the most probable causes hypothesized. The aim is to define guidelines for a future project for the building's restoration and reuse, with an emphasis on accessibility. This first study should be used to promote the Italian architectural heritage in Benghazi, which, as a common cultural heritage, can encourage cooperation to preserve it and pass it on to future generations.

1   Introduction

Libya has an impressive architectural and cultural heritage that is the result of the stratification produced over the centuries—by the Greeks, the Romans, then the Arabs and the Ottomans until the end of the nineteenth century, and then the Italians at the beginning of the twentieth century.

Since the Italian colonial occupation, however, this great heritage has been endlessly threatened by more or less intense war events that have inevitably damaged and transformed it: the Italian-Turkish war (1911–1912), the Italian-Libyan war (1913–1932), the First World War (1914–1918), the Second World War (1939–1945), Muhammar Gaddafi's coup d'état (1969), the First Civil War (2011), and the Second Civil War (2014–2021).

In 2011, a study was drafted on threats to Libyan heritage that focused on the urgent need for action to protect not only UNESCO-recognized sites (such as Cyrene, Leptis Magna, Sabratha, Ghadames, Tadrart Akakus), but also historical-architectural testimonies of Arab, Ottoman, and Italian origin (Teijgeler, 2011).

Furthermore, in 2016 an international expert meeting on the safeguarding of Libya's cultural heritage was held in Tunis, organized by UNESCO and ICCROM with the support of the US Embassy in Libya. The main objectives of the meeting were to draw up a priority action plan and to involve youth and civil society in the protection of cultural heritage (International expert meeting on the safeguard of Libyan Cultural Heritage, 2016).

Awareness of the need to protect and safeguard cultural heritage should have been accompanied by concrete protection actions. However, there are few reports of such genuine action. In Benghazi, actions to clear and secure buildings

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and monuments from ordnance were undertaken during the last years of the second civil war (Raynolds, 2017).

Despite the climate of instability and uncertainty, there is a strong and pressing need on the part of local authorities and communities to rebuild what has been lost and preserve what remains. However, the tools for achieving this are lacking: there is not enough data to establish a picture of the severity and extent of the destruction of both the urban fabric and historical monuments.

The aim of this study is therefore to try to respond to local requests for reconstruction work by proposing a method of intervention that can be applied by local authorities to tackle the serious problem of the reconstruction and conservation of the historical and architectural heritage.

Starting with the construction of a knowledge framework of Benghazi, in particular of the Old City district, the complex issue of how to intervene in the devastated city is addressed, from the general (the urban fabric) to the specific (the case study of Benghazi Cathedral) (Fig. 1).

2   Italian Colonial Architecture in Libya

At the beginning of the last century, after a long Turkish-Ottoman domination, the territories of Tripolitania, Cyrenaica, and Fezzan were occupied by Italian military troops. After more than two decades of war and guerrilla warfare (which lasted well beyond the formal end of the Italian-Turkish conflict in 1912), Italy gained control of a new colony, Libya (Labanca, 2012).

During the years of colonization, there were many important military, civil, and economic initiatives undertaken by the Italian state, particularly under the Fascist regime. More than 70 architects worked in the colony, carrying out hundreds of projects, from the construction of monuments and civil dwellings to defining urban planning for the main city centers, such as Tripoli and Benghazi (Baricchi, 2018).

During this period, it is possible to identify several distinct phases of architectural style and language. The first
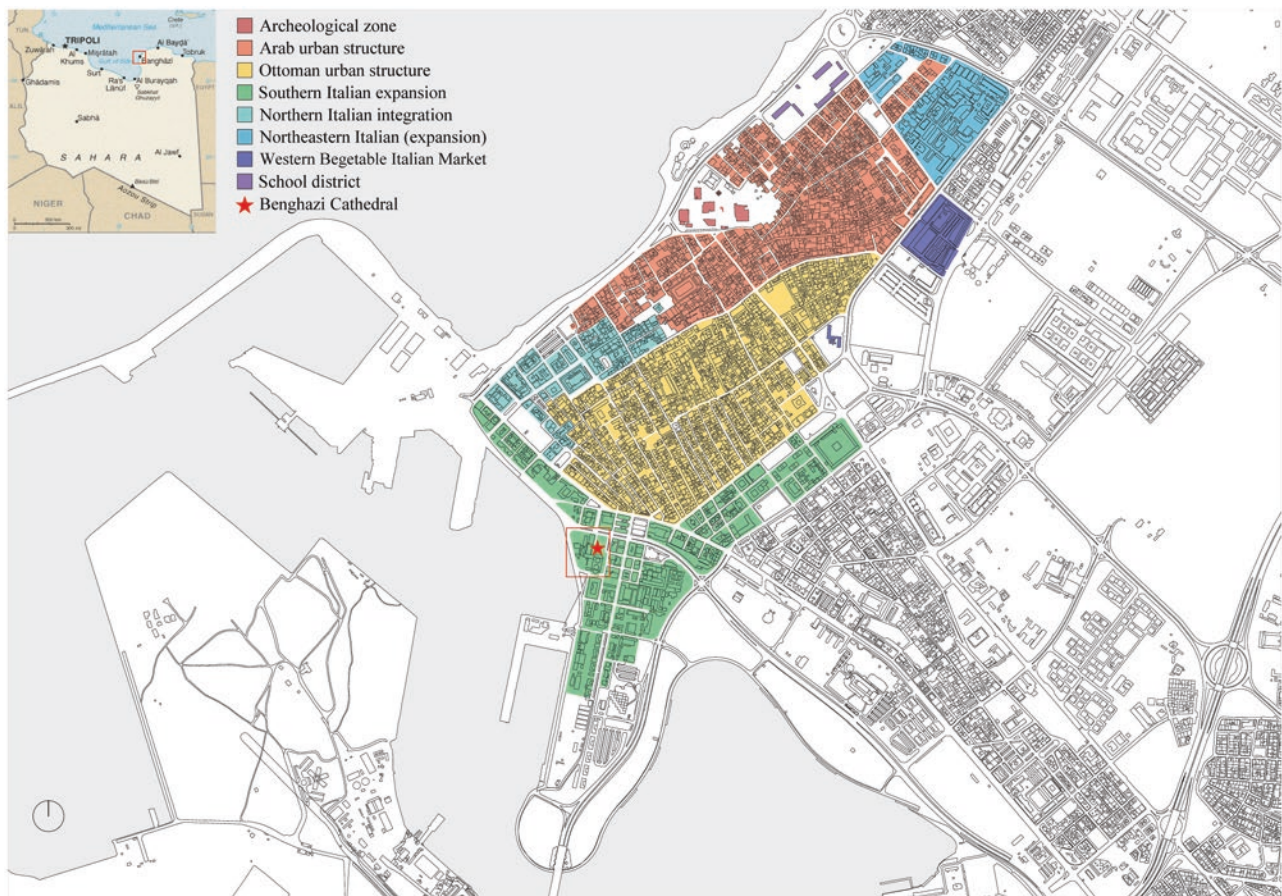

Fig. 1 Map of the Old City of Benghazi showing the progressive enlargements of the city by Arabs, Ottomans, and Italians (Reworked version on the basis of: Ben-Ali, n.d.)

coincides with the initial occupation of the Fourth Shore (i.e., Libya). During the early years of colonization, more urgent matters necessarily prevailed over architectural style. New towns were founded and those existing were expanded and improved with new roads, sewers, and water services. Due to the instability of the colony and limited economic resources, only the most urgent public works were completed. Most utility buildings were not built from scratch. Instead, existing buildings were modified and adapted to meet the new needs of the colonizers. The few buildings that were constructed by the Italians are characterized by the important presence of elements of Libyan architecture. Therefore, we cannot speak of a colonial style (Fuller, 2010; Talamona, 1992).

A radical change took place from the 1920s onward. This second phase was characterized by intense architectural activity. This was the season of town plans for the major cities, including Tripoli and Benghazi: the urban agglomerations in the colony were remodeled to be as similar as possible to their European counterparts. The new image of cities was complemented by intense architectural production. In the absence of a general direction for architectural works, the result was a juxtaposition of different styles and languages, some Arabic and Ottoman, others more distinctly Italian and classical. The result was a mixture of characteristics that did not represent Italy in the colony (Talamona, 1992).

The beginning of the last phase was marked by the appointment of the architect Alessandro Limongelli as "artistic consultant" to the municipality of Tripoli. It was during this period that the debate began concerning the "true" Italian colonial style (Talamona, 1992). This style should represent Italy in the colony, but should also have a link with the colony itself. During these years, Fascist interference in the field of architecture also became more insistent and predominant: the regime demanded that architecture, especially colonial architecture, be "Italic", "Mediterranean", and "classical", but at the same time also "imperialist" and "autarkic" (Gresleri, 1993). Architecture, therefore, became one of the instruments for affirming Fascist power and Italian superiority over colonial populations and their cultures (Fuller, 2010).

Besides Alessandro Limongelli, who drew on the Roman monumental tradition, among the most important architects who worked in the colony over the years were Marcello Piacentini, the "architect of the regime"; Carlo Enrico Rava, who used so-called minor, non-monumental Libyan architecture as his model; and a group of Milanese architects: Alberto Alpago Novello, Ottavio Cabiati, and Guido Ferrazza. To the latter in particular we owe the "creation" of a new architectural language, in which elements of local architecture and the characteristics of classical architecture are merged and harmonized, and which was recognized at the time as the "true" Italian colonial style (Talamona, 1992). This group was also responsible for the new town plans for the major cities, traces of which can still be seen today in the historic centers (Zanella, 2002).

3 Knowing is Saving: An Overview of the Old City of Benghazi

With the end of the Second World War, Italian colonial rule also came to an end. Libya, by this time unified, gained independence and, in 1951, the first king was crowned: King Idris I of Libya.

The monarchy, however, suffered an abrupt interruption following Colonel Muammar Gaddafi's coup d'état in 1969. With the expulsion of Italians still living in Libya, relations between Italy and Libya were interrupted. From 1970 onward, the regime oversaw a process of destruction of Libya's cultural heritage, in particular, the legacy of the Italian occupation during the Fascist period (Baricchi, 2018).

Following the fall of the Gaddafi regime in 2011, a period of crisis and instability began for the country. Italy's architectural heritage, already eroded during Gaddafi's rule, was further endangered during the first civil war (2011) and was heavily damaged during the second civil war (beginning in 2014).

A study conducted by the American Society of Overseas Research (ASOR) in 2017 identified the areas of Benghazi's Old City affected during the war years. In November 2015, the damage corresponded to less than 10 percent of the area. As the conflict continued over the next 2 years, the percentage of buildings damaged increased dramatically, reaching almost 50 percent of the total area in July 2017 (Raynolds, 2017).

In Benghazi, the devastation caused by the war has indiscriminately affected the entire urban fabric, most noticeably in the Old City, where the scheme designed by Italian urban planners in the early decades of the twentieth century was still recognizable. In this homogeneous area, alongside the many Italian buildings—which, before the conflict, had been preserved almost unchanged over the decades—some traces of previous dominations are also preserved, such as mosques and Ottoman palaces.

In the current debate about how to rebuild Benghazi, there is a tangible risk that the war damage will be used as an opportunity to redesign the entire city from scratch, indiscriminately wiping out its history and identity, making it look anonymous and like many other places around the world. Instead, the conservation and enhancement of the Old City of Benghazi should be one of the essential and most qualifying aspects in the project of reconstruction and modernization of the city.

In the post-war Libyan context, the interest of the international community—and of UNESCO in particular—has so far focused mostly on the need to safeguard main archaeological sites, while it is from Libyan civil society and local communities that an awareness of the importance of safeguarding Italian heritage is emerging.

Elsewhere in the world, evidence of colonialism (or, more generally, of totalitarian regimes) has been experienced as a difficult past, to the extent that statues, monuments, or entire buildings have been torn down or their removal has been demanded because of a memory that is now unacceptable. This process can be described using the concept of "dissonant heritage". Introduced by Tunbridge and Ashworth in 1996 (Tunbridge & Ashworth, 1996), colonial heritage is the focus of numerous academic studies published over the past two decades (Liu et al., 2021).

While it is true that the preservation of colonial heritage may be a sensitive issue, in Benghazi this potentially dissonant heritage does not provoke negative reactions; it has become an integral part of the community that has overcome its "dissonance" and has, in fact, "renegotiated" its meaning. This aspect is even more important when considering the specific case of the Catholic cathedral in Benghazi. Indeed, the preservation of Christian churches built in African countries during the European colonial period is a particularly complex challenge, due to the widespread reluctance to consider these buildings as heritage assets (Sabri & Olagoke, 2020). In the case we have examined, the positive attitude toward a potentially uncomfortable heritage is, therefore, an important starting point, since the first step in preserving a place is recognizing it as part of one's history, as the bearer of values that one wishes to pass on to future generations.

Recognition of the value of a place or building, of its uniqueness, leads to the awareness that its destruction would be a serious loss, not only culturally, but also socially and economically. Therefore, this awareness should be the basis of any evaluation of future transformations in the city. Elsewhere in the world, too, questions have been raised about the fate of colonial heritage and how to understand and value it so that it contributes to local development. This is happening, for instance, in Asia, where strategies for preservation are being developed in numerous cities. In Vietnam, recent examples include the city of Da Nang, where knowledge, preservation, and valuing of French colonial-era buildings were considered the basis of local development and the cultural tourism policy (Son & Dang, 2019). Another example is in Indonesia, where the infrastructure and buildings that the Dutch government constructed for its officials in the nineteenth century are now threatened by the growing need for new tourist facilities (Kurniawan et al., 2021).

The most emblematic example, however, is African, and a close parallel with the Libyan case. This is the modernist city of Asmara, the capital of Eritrea, built in the 1930s during the Italian occupation. Since 2017, "Asmara, a Modernist City of Africa" has been a UNESCO World Heritage Site as "an exceptional example of early modernist urbanism at the beginning of the twentieth century and its application in an African context" (https://whc.unesco.org/en/list/1550/). This important milestone can be seen as a source of inspiration regarding the role that the preservation of Italian buildings in Benghazi can play in the city's reconstruction process. To understand its value and uniqueness, it is essential to know this heritage in all its aspects. The technicians who will be called upon to plan the restoration and reuse of this built-heritage will need to know the characteristics of its architecture and construction, the materials used to build it, its structural and deterioration problems, and the potential for reusing its spaces. Potential users should be able to appreciate the historical value and architectural importance of the buildings, and be encouraged to visit the restored spaces in the knowledge that they are in an authentic place that has no imitation in the world.

On the basis of these premises, it can be said that the key to a culturally conscious reconstruction plan for the Italian area is the preliminary definition of the knowledge framework, which will be indispensable in guiding consequent project choices.

The cognitive base will have to be built starting from the analysis of the historical framework of reference, through bibliographic and archival research, from the urban scale down to the detail of each building. This type of research will have to be carried out mainly (but not exclusively) in Italian archives, where, in most cases, documents, metric calculations, project reports, and graphic drawings relating to urban plans and construction projects are still held. We should not make the mistake of considering this information interesting only from the point of view of historical curiosity. Instead, as already stated, the documentation provides essential technical information, which are indispensable data when dealing with a conservation or reconstruction project.

Moreover, in a broader program that would include a future tourist development of Benghazi, the fact that many of the most important Italian architects of the first half of the twentieth century carried out important works there constitutes a highly attractive aspect that deserves to be known and valued.

A second essential element for building the knowledge framework is a direct survey of the site. The first objective will be a precise survey of each building to establish its current condition and the extent of the damage suffered as a result of the conflict and lack of maintenance. In particular, it will be necessary to verify which buildings (or portions

thereof) have been completely demolished, which are seriously affected but restorable, and which need less invasive restoration interventions.

The comparison between the current situation and that deduced from the historical plans will further clarify the extent of the losses and will make it possible to identify the best strategies for conservation and subsequent reuse, providing the basis for a reconstruction project that is respectful of the historical memory and authenticity of the old Italian area, and which will be framed within the broader project of the entire city's reconstruction.

In this regard, analyses aimed at laying the foundations for appropriate restoration work will have to proceed in parallel with hypotheses on the reuse of the buildings. What vocation should the old district assume as a whole? To what uses (original or new) will each building be put? Are the hypothesized uses compatible with the conservation of their formal and material integrity, or would the modifications necessary to adapt them involve unacceptable transformations?

The answer to these questions is complex and implies preliminary political, economic, and social assessments that cannot be addressed by a single urban or architectural project.

It is also true, however, that these preliminary evaluations cannot be separated from an awareness of the historical and cultural value of the old Italian district—its uniqueness, but also its fragility—which requires a specific method of intervention different from that applied to the reconstruction of the rest of the city.

4 Case Study: Benghazi Cathedral

4.1 Construction History of Benghazi Cathedral

Benghazi Cathedral overlooks the sea at the waterfront redeveloped in the 1930 town plan, adjacent to Guido Ferrazza and Ottavio Cabiati's Governor's Palace (now Al Manar Palace) and Marcello Piacentini's Grand Hotel Italia (formerly Hotel Roma) (Fig. 2).

The earliest information about the cathedral project dates back to 1926, when the Governor of Tripolitania commissioned the building from Engineer Danusso (Reggiori, 1930–1931). He was responsible only for the design of the load-bearing structure, while architects Alpago Novello, Cabiati, and Ferrazza were appointed to draw up the
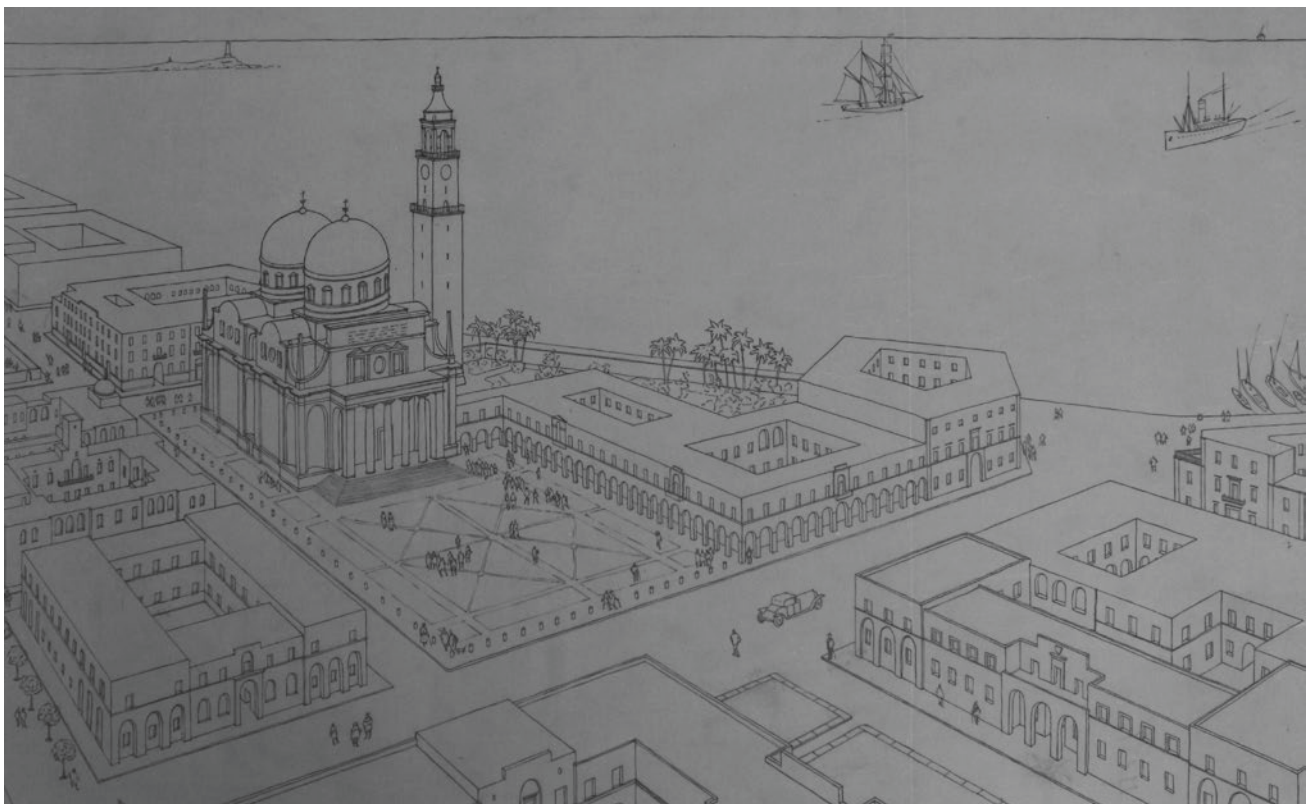
Fig. 2 [Alberto Alpago Novello, Ottavio Cabiati, Guido Ferrazza], 1920s. Detail of a drawing of the perspective view of the cathedral and its surroundings (CSAC Parma)

architectural plan and supervise construction (Gresleri, 1999).

Construction work on the cathedral began in 1929 and the interior decoration was carried out at the beginning of 1934. The cathedral was opened for worship the following year, but was not consecrated until 1939 (La cattedrale di Bengasi e l'arte sacra missionaria, 1934; Prestopino, 2020) (Fig. 3).

During the Second World War, Benghazi Cathedral was affected in bombing raids, but with only minor damage, probably limited to the interior marble decoration and window frames (The air war day by day, 1940).

With the accession to the throne of King Idris I (1951) and Libya's declaration of independence, the cathedral slowly fell into disuse. After Muammar Gaddafi's coup d'état of September 1, 1969, the cathedral was abandoned by the ecclesiastical authorities. From 1970, it was used as the headquarters of the Libyan Arab Socialist Union. Probably as a result of a fire inside the cathedral in 1976, the building was abandoned again in 1977 (Benghazi Cathedral. An abandoned symbol of Lybia's Civil War, n.d.).

The neglect and disuse of the cathedral caused it to slowly deteriorate until the early years of the new millennium. In 2008–2009, Italian architects began surveys and preliminary designs for the restoration of the cathedral and adjacent buildings. However, the work was interrupted following the worsening of political conditions in Libya. Traces of the beginnings of the work remain, such as the scaffolding that still covers the exterior and part of the interior of the church.

4.2   Cathedral Design, Construction Techniques, and Materials

The cathedral has a single nave consisting of two squares placed side by side and ending with a semicircular apse. It has no transept, but has four chapels along the side walls. Two twin hemispherical domes arranged on the symmetrical longitudinal axis stand on each square base.

The architectural language is inspired by a classicism revisited in the typical model of fascist architecture, as can be seen from the planimetric layout, the use of the stone columns and pronaos on the façade and the white plastered exterior walls (Fig. 4a). The classical style is also echoed in the interior's marble finishing and decorative elements. The only features that deviate from a canonical classical
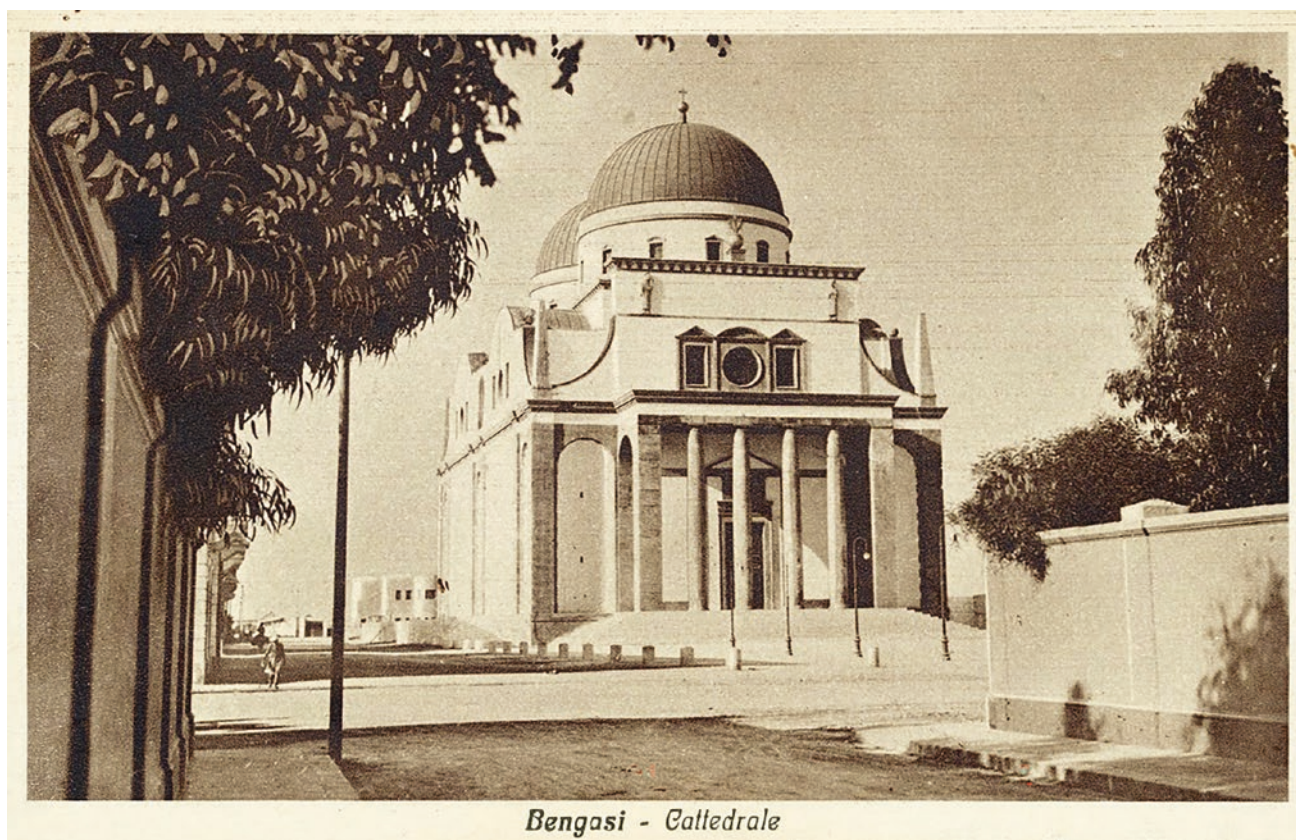
Fig. 3 Benghazi Cathedral in a postcard, 1930s (Private archive)
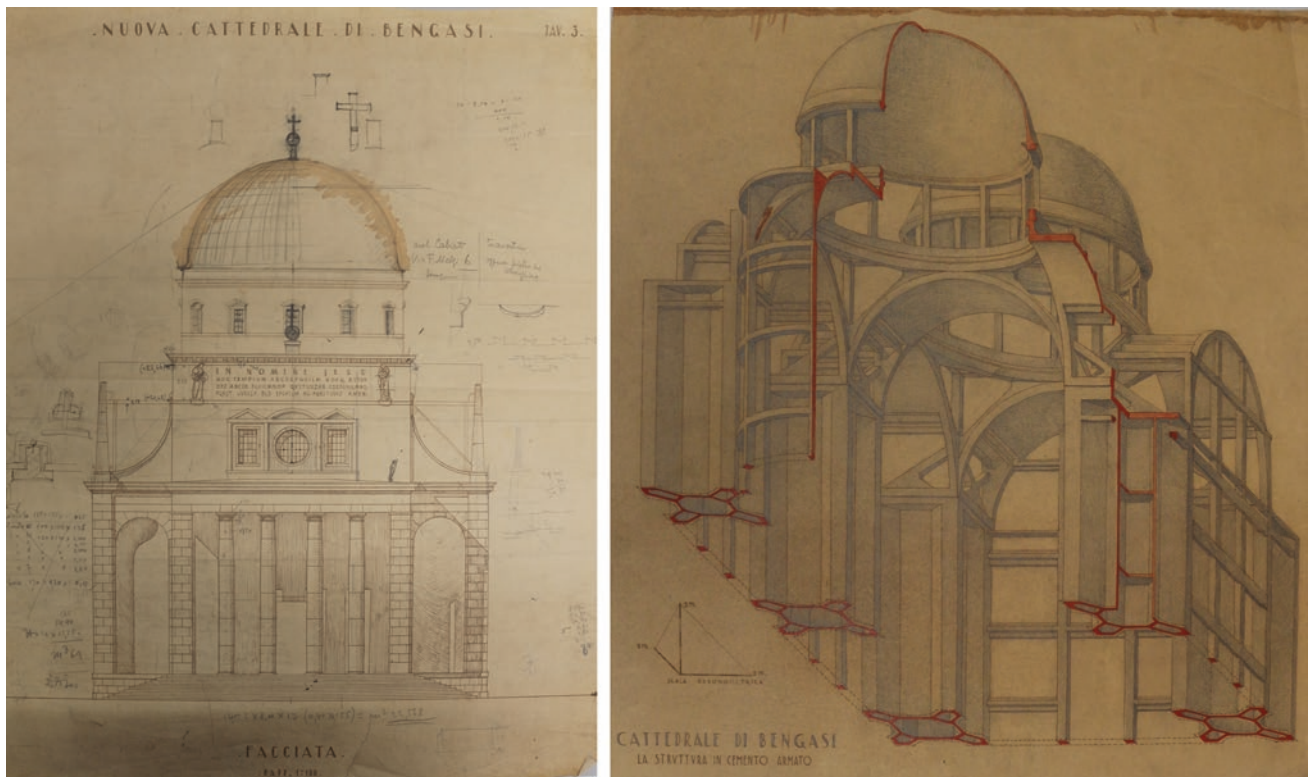
Fig. 4 a [Alberto Alpago Novello, Ottavio Cabiati, Guido Ferrazza], 1920s. Cathedral project elevations (main front), original drawings on a scale 1:100. (CSAC Parma). **b** [Alberto Alpago Novello, Ottavio Cabiati, Guido Ferrazza], 1920s. Colored axonometry of the cathedral load-bearing structure in reinforced concrete (CSAC Parma)

inspiration are the two hemispherical domes that rest on the nave. They could be a reference to the Byzantine style, but are perhaps more directly reminiscent of Arab architecture.

The building has a reinforced concrete load-bearing structure consisting of six cross-shaped hollow pillars. The cage structure is completed by a series of "very wide mesh trusses" consisting of pillars and perimeter beams, also in reinforced concrete (Tommasini, 1932). The beams have a "T shape" and are arranged on three levels. They are straight in the central part of the building, while those of the semicircular apse have a curved geometry. The domes are also made of hemispherical concrete caps (Gresleri, 1999), while the roof vault of the apse (quarter sphere) is made of brick, as specified in a note by the architects. The thin perimeter walls are also made of brick, within which the structural mesh of reinforced concrete develops (Fig. 4b).

Regarding the materials used to construct the building, reinforced concrete is used only to make the load-bearing structure and is not left exposed. Instead, the cathedral is embellished by the use of traditional materials for its visible parts: Italian travertine marble for the columns and pillars of the pronaos and the decorative elements of the exterior elevations, and a very fine-grained white plaster (*intonachino*) to finish the external surfaces (Architetture coloniali italiane, 1933). In addition, slabs of copper cladding are used to cover the vault of the apse, the lateral barrel vaults, and the extrados of the two hemispherical domes, where it is attached directly to the reinforced concrete structure and is largely preserved, despite some damage. The covering of the vaults, on the other hand, is almost completely missing.

The interior of the cathedral is characterized by a great variety of materials, colors, and finishes. The polychromy is applied to both the wall coverings and the floor. As emerged from consultation of the original plans, the materials—chosen for their colors and positioned to form geometric patterns—are mostly of Italian origin, as is the company that supplied the construction site with building materials.

Apart from the presbytery area and the pillars, which are embellished with marble cladding, the interior walls and ceilings are finished with a very fine-grained plaster. As can also be seen from some old photographs, the original coloring appeared to be in warm brick or ochre tones, but today the color is considerably darker and has been altered by deterioration.

4.3 State of Conservation

Due to the impossibility of the Italian members of the research group carrying out onsite inspections, analysis of the building's state of conservation was based on accurate photographic support specifically made by Libyan colleagues. It must therefore be considered as an initial evaluation of a general nature, which will necessarily be verified on the basis of further in situ analysis, and with the execution of diagnostic investigations.

However, the experimentation of carrying out a survey "from afar" was itself part of the research and had the aims of testing its degree of reliability and sharing a working method.

Despite the long period of neglect and exposure to the risks of war, structurally the cathedral appears to be in a fairly good state of preservation. The reinforced concrete support structure, where exposed, shows no significant signs of deterioration, nor are there any major structural deformations or visible cracks that could indicate a static problem.

Degradation phenomena can be classified according to natural or manmade causes. The former involves exposure to the elements and the proximity to the sea, aggravated by a lack of maintenance for over 40 years, in particular, on the roof and the windows, that have led to infiltration of rainwater and the formation of severe humidity stains and salt efflorescence, which affect most of the internal plastered surfaces of the building.

Compared with other historic buildings in Benghazi, the cathedral has only been superficially affected by the civil war of the last decade. In particular, holes and loss of building materials are visible on the outer walls, probably caused by the explosion of bullets and small-caliber bombs. The state of neglect and the ease of access to the building have encouraged numerous acts of vandalism, including graffiti and several holes in the perimeter walls both inside and outside the building. Many valuable materials—such as the interior's marble cladding—have been progressively removed from the most easily accessible areas of the walls (Fig. 5). The latter are covered with a layer of carbon black on the inside, probably caused by small explosions or the lighting of fires. The current situation of the monument, with piles of rubble on the floor and collapsed scaffolding, provides an image of abandonment that deserves to be redressed.

The results of visual assessments of the state of conservation were represented graphically on an available geometric survey base. This locates the various areas of deterioration in greater detail and indicates their probable causes, as illustrated in Fig. 6.

In addition to the graphical drawings, identification forms were also prepared for the main deterioration phenomena. These will form the basis for the subsequent diagnostic investigation phase to support the conservation project.

Fig. 5 Internal view of the presbytery of Benghazi Cathedral. Degradation phenomena caused by long neglect and manmade damage are evident (Photo by A. El-Rida, July 2021)
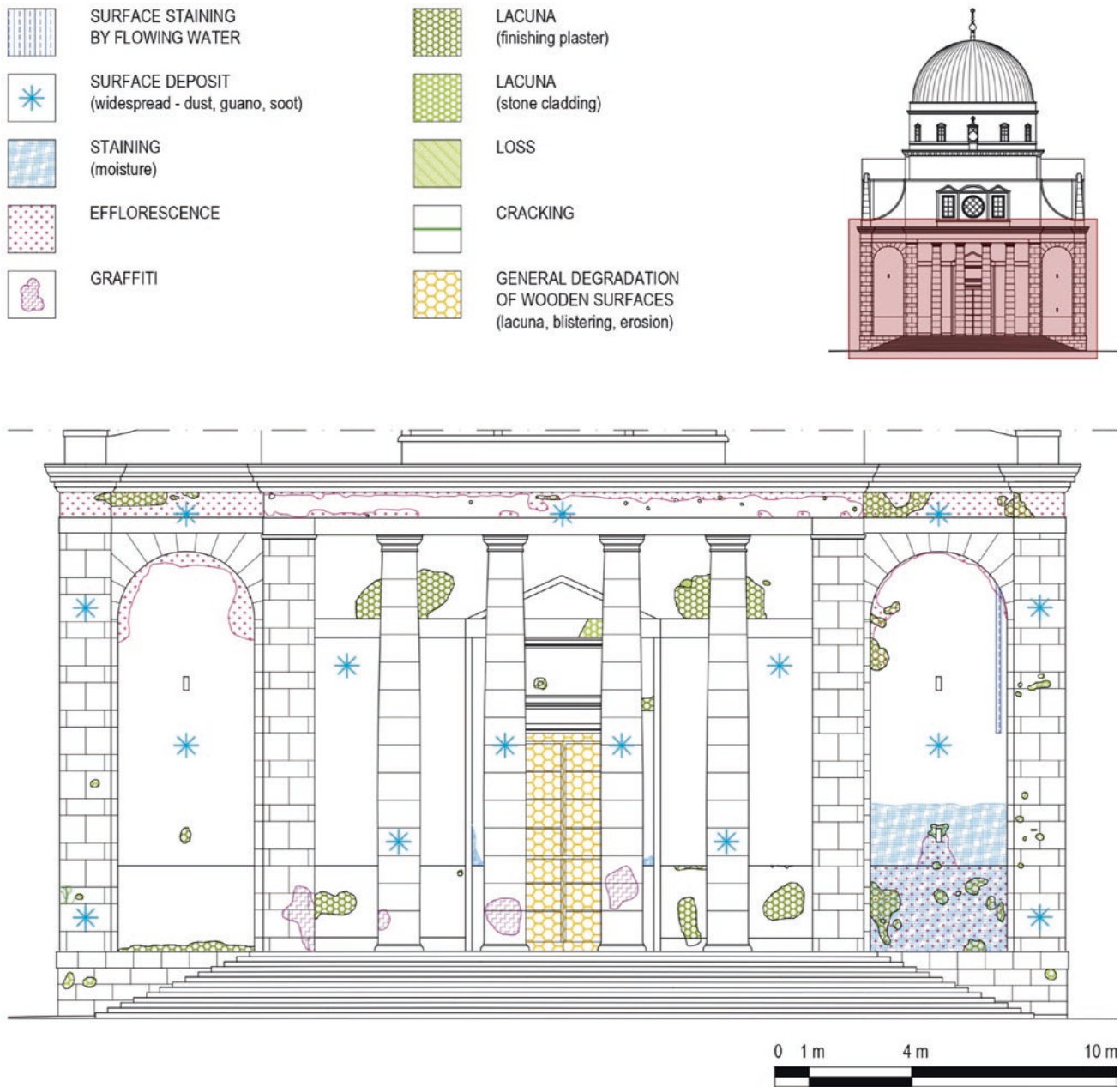
Fig. 6 Benghazi Cathedral, detail of degradation analysis of the lower part of the main façade

4.4 Hypothesis for the Conservation, Reuse, and Accessibility of the Cathedral

The restoration project for Benghazi Cathedral will have to eliminate the causes of material deterioration and mitigate its effects, and also reuse the building.

In the first case, in-depth study of the characteristics of the building materials used by Italian architects in the 1920s, and the diagnostic analyses that will have to be carried out to investigate the reasons and types of deterioration, will make it possible to intervene in the most appropriate way to guarantee the restoration of degraded elements, as will be specified in detailed intervention datasheets. The integrations must therefore be carried out in such a way as to guarantee recognition of the intervention and compatibility with the existing materials.

However, the objective of the intervention cannot be concerned with the restoration of "wounds" alone. In fact, only an adaptive reuse of the building (intended as repurposing for a new use) can guarantee its survival.

The reuse project must move from the stages described above, consider the building within its urban fabric, and find an appropriate and compatible function. Consequently, a new function for the cathedral can only be public, which also implies addressing the building's accessibility. Specifically, the idea for the cathedral's "new life" is to transform it into a museum of the city's history: because of its shape and size and almost total absence of architectural barriers inside the building, the cathedral is suitable for transformation into an exhibition space, without the need for heavy construction work that would distort its characteristics. The adjacent buildings (the former monastery and bishop's palace) could house a study center, archives, administrative offices, and other related services.

From this perspective, the first asset to take into account is the relationship between the building and the square in front of its façade. This strong link, which is now interrupted by the street (also used as parking), must be rebuilt so that a better understanding of the cathedral (cultural permeability) can be reached, and the issue of accessibility (physical permeability) can take advantage in terms of both architectural design and functionality from re-organization of the square. The staircase in front of the cathedral is composed of 13 steps with an overall 1.95 m difference in height, which is not easy to solve.

According to the principles of Universal Design, the solution for the architectural barrier represented by the staircase must ensure opportunity for all to reach the cathedral's pronaos and permit entrance from the main door.

The proposed solution is a ramp divided into three parts on the left side of the façade. This system becomes part of the re-drawing of the entire square, which assumes a geometric pattern within main, secondary, and tertiary paths (Figs. 7 and 8a). The spaces among these paths are filled with vegetation (green areas), water (ponds, *specchi d'aqua*), and different stones (travertine, gray granite, and gray "beola" stone), which recall the stones present in the cathedral and along the Benghazi waterfront designed by Alpago Novello, Cabiati, and Ferrazza. Parallelepiped-shaped seating in travertine is provided adjacent to the secondary paths. The overall drawing of the square is rigorous, geometric, and symmetrical and the ramp becomes part of it as a new layer of the cathedral's history, the layer of modernity that encompasses accessibility (Fig. 8b).

The structure of the ramp (that has a 5.7% slope) is made of steel and consists of vertical uprights, horizontal

TRAVERTINE   BEOLA GRIGIA   WATER   GREY GRANITE   VEGETATION
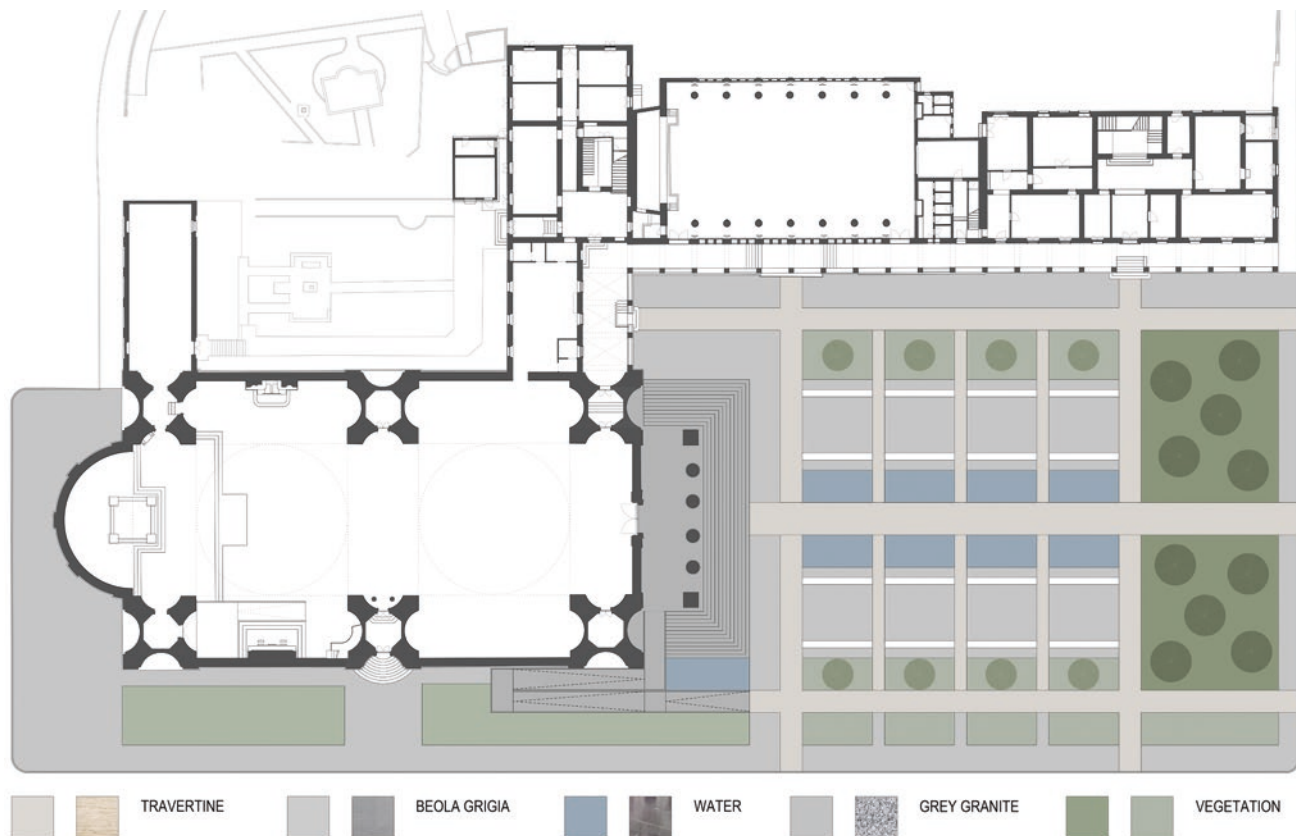
Fig. 7 The new design of the square in front of the Benghazi Cathedral to guarantee the site's physical and cultural accessibility
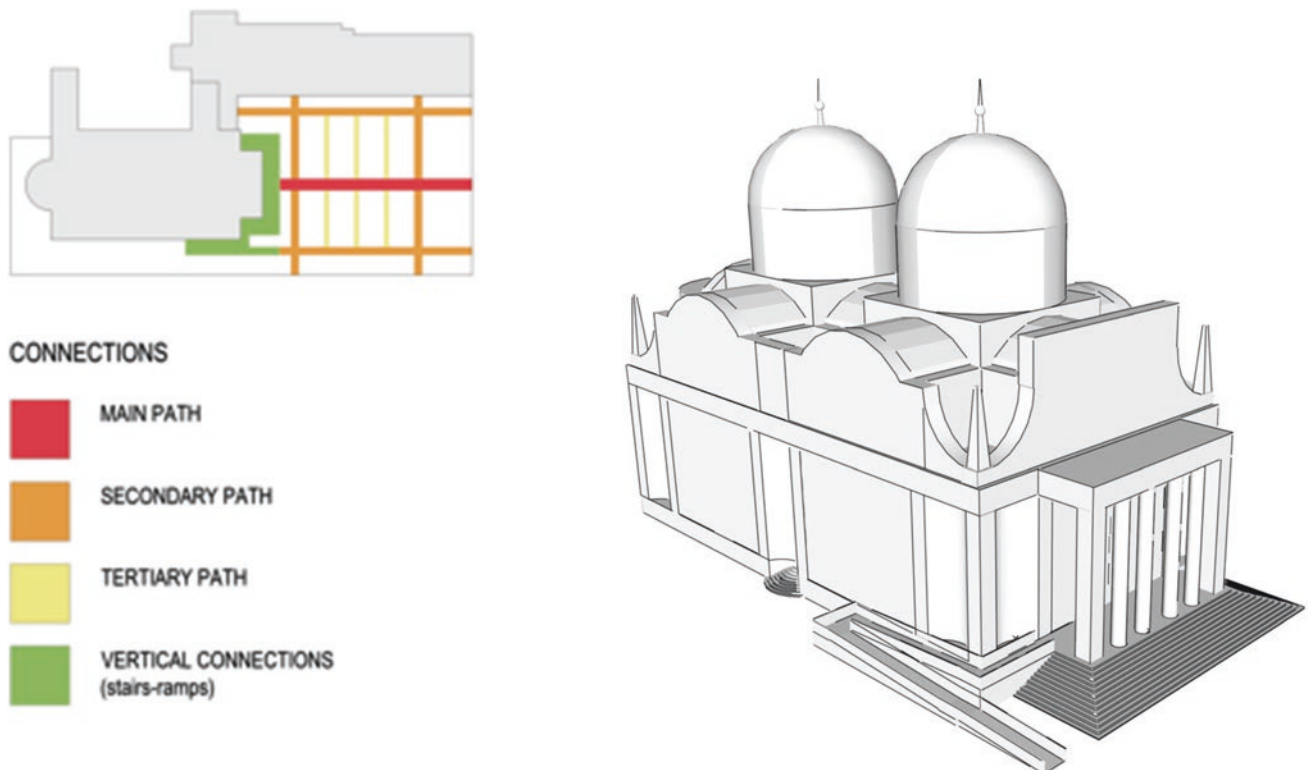
Fig. 8 a The system of new paths in the square, linking the buildings on the site (cathedral, monastery, and bishop's palace). **b** Three-dimensional model of the cathedral with the integration of the ramp at the main entrance

crossbeams, and bracing. In order to make the project recognizable as a modern addition without losing its relationship with the existing building, the cladding on the ramp's sides is travertine slabs, engraved to recall the stone ashlars, arranged in horizontal courses. The walking surface is made of gray granite slabs, to establish a dialogue with the existing staircase, also made of this material. The entire system (ramps and landings) is equipped with a 100 cm high balustrade made from extra-clear glass.

5 Conclusions

After the devastation caused by the civil war, Libya can now think about the reconstruction phase, which must balance the legitimate aspiration to modernize with the need to safeguard and enhance the important testimonies that the country's centuries-old history has left visible in its cities as footprints of various ages, from the oldest to the most recent. The richness of these traces lies precisely in the fact that they are stratified. They are the memory and the identity of Libyan people, therefore the reconstruction must take them into account.

As argued above, this implies, at least for historic centers, that an appropriate period of time must be devoted to in-depth study and knowledge of the areas to be

reconstructed, from the wider urban scale to the detail of each building. The study will allow for the evaluation of the potential of existing buildings and the possibility for including their protection and reuse in the more general redesign of the cities. The study will also make it possible to evaluate the most appropriate restoration methods for each building, studied according to characteristics and level of deterioration or destruction, without resorting to a "as it was and where it was" reconstruction, which would distort authenticity by favoring a false copy devoid of cultural value and formal quality.

Experience teaches that the conflict between protection of the past and innovation tends to blur if the former is considered an opportunity and not a constraint. In this regard, we can only agree with the statement that, "Considering the footprints of the past, conserving them, doesn't mean freezing the status quo: it means managing change in an open and farsighted way" (Della Torre, 2020).

With regard to Benghazi's old historic center, an important part of it indubitably consists of Italian buildings dating back to the early twentieth century—and the cathedral is one of these. Its reuse has been analyzed using a methodology that applies to a large-scale project of the whole Italian historic district, indicating attention directed to the future in a dimension that aspires to combine and to balance conservation and legitimate transformation (Treccani, 2012).

Attempts to share efforts for its protection within the framework of a Libyan-Italian cooperation project find meaning in the reinterpretation of these testimonies of the past Italian colonial presence. Abandoning any ideological legacies, this joint effort would be a further step toward recognition of a cultural heritage of memory and identity common to the two countries, which are therefore both responsible for its protection and transmission to the future (Pretelli et al., 2017).

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Hebron's Old Markets Among Past and Present

Haya S. Nasereddin, Ghassan J. Dweik and Sara T. Tamimi

Abstract

The Islamic State has concerned with market planning to achieve economic, social, and environmental sustainability features. The traditional markets in the old city of Hebron are a sample of the Islamic markets, which were full of life due to their famous crafts. This study aims to document Hebron's traditional markets and their locations in both Mameluke and Ottoman eras. The study also aims to outline the Khans and the public squares associated with these markets and to illustrate examples of these markets. The study further evaluates the sustainability measures of the planning and design of the old city's traditional markets in Hebron in the past and present. Furthermore, the need for conserving the cultural heritage has led to an explanation of the existing political, economic, and social situation in the old city, which has been reflected in the market's typologies. The study has mentioned the expected results of stating laws and regulations and supporting business investments in the old city markets. This contributed to increasing the level of sustainability required, by enhancing social and economic factors to preserve the cultural heritage for markets.

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1 Introduction

The market is generally a necessary facility for the life of the community in the cities as it provides people's essential life requirements. The word Market refers to the place where all types of goods can be sold (Hmood, 2017). Swilem mentioned that the market could be a group of shops or booths around a mosque, shops can be aligned on both sides of the main road, or in a building containing small shops like Khans. These markets or Khans contain a particular type of goods or crafts (Swilem, 1988).

The Arabs had extensive experience in planning markets during the pre-Islamic period, and this was manifested in their markets like the Okath market. Undoubtedly, they have been greatly influenced in their trade toward Sham, India, and Yemen, which had reflected in the planning of their markets (Othman, 2018). Moreover, the Omayyads approached Romans in market planning in Damascus. The markets were planned depending on the main street (Qasabah) and shops on both sides of the main road. Islamic planning regulations were in reference to the rules governing the planning serving the public interest (Hakim, 2013). Their markets were specialized, which affected the architectural form and general planning of the market (Hakim, 2013).

Hebron City had been an important commercial center in the southern region of Palestine. Therefore, continuous trips toward Al Hijaz Cities from Syria and Egypt which have passed through Hebron City have played a prominent role in their revitalization and products, which was proven by the presence of their products in Palestine in Jerusalem and Jordan in Al-Karak. In addition, the encouragement of the Mameluke sultans significantly affected the commercial situation of the city, markets were built, Khans were established, and the sultan's pond for the watering of pilgrims was created (Amro, 2011).

2   A Brief History of Hebron

Hebron City is one of the most dominant cities in southern Palestine. Located 35 km to the south of Jerusalem as shown on the map of Palestine (Fig. 1) and Hebron governorate (Fig. 2) as follows. Hebron has a Mediterranean climate with hot summers and wet cold winters with temperatures reaching their peak of around 29 °C in summer, temperatures have scored a minimum measure in winter of around 3 °C and rarely below 0 °C (Weather, 2019).

The city was first founded in the early bronze era. Hebron City dates back more than 6000 years when the Canaanites founded it in Tel-Rumeida. Moreover, it was particularly distinguished in Islamic times, of equal importance to the city of Jerusalem due to its association with the person of the Prophet Ibrahim, who lived in Hebron and bought the Cave of the Macfilla, where he, his wife, and his children were buried. This cave is an essential part of al-Haram al-Sharif (Ibrahimi mosque) (Alsayed, 1998). Nowadays, Hebron is the largest Palestinian city in terms of area and population, Hebron is 42 km² and has about 215

thousand residences, while the governorate has more than 684 thousand inhabitants according to the statistics of 2016 (PCBS, 2017). Figures 3 and 4 show the different old and new urban fabrics of the city of Hebron.

The city has a unique economic importance and had always been famous for its industries and trade. The city of Hebron significantly evolved during both the Mamluk and the Ottoman Eras. Glass industry and stained glass manufacturing were most famous at the time of the Ottomans. As proof, the city participated in the international industries exhibition held in Vienna back in 1873, where pots and vases made of colored glass were exhibited (Abu-Siriya, 1995).

Hebron City has significant importance regarding its historical sites and architectural heritage, the city was classified as an international heritage site by UNESCO in July 2017. The Islamic planning characteristics appear in Hebron. Firstly, the mosque is directed by the main street (Qasabah). Secondly, specialized markets were located on both sides of the main road with a longitudinal pattern (Abu-Siriya, 1995). Finally, the main market (Qasabah) was

Fig. 1 Palestine map showing Hebron in the middle (Khabar Press, 2022)
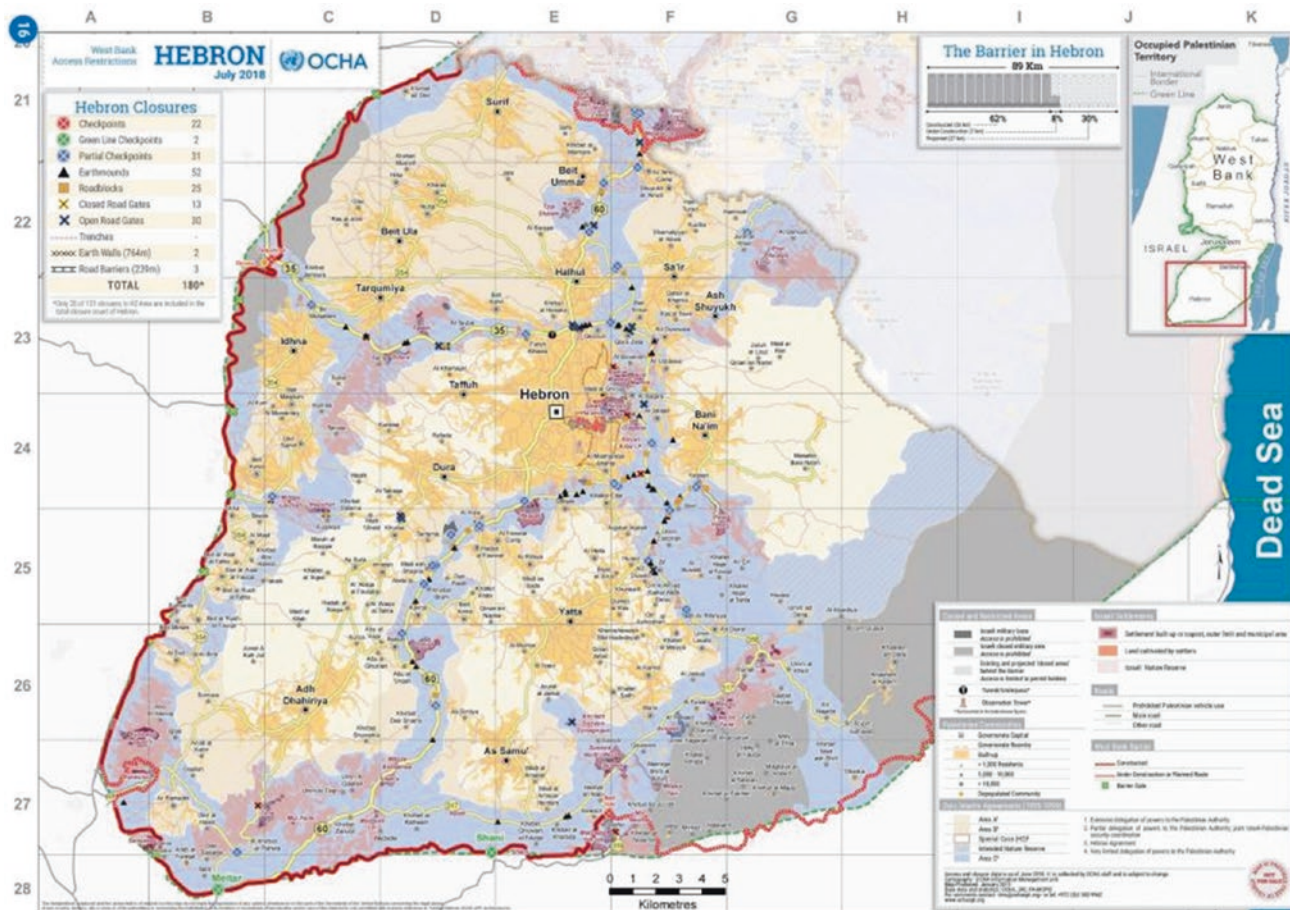
Fig. 2 Hebron governorate map (ARIJ, 2003)

surrounded by houses that were built in quarters forming the neighborhoods behind the commercial market (Dweik & Shaheen, 2017; Shaheen, 2018). Figure 5 shows the relationship between the markets and the neighborhood, and it also represents the old city's map nowadays.

3 The Economic Foundations of Hebron Old City

_ Agriculture: Since ancient times Hebron City was known as a city surrounded by agricultural lands with different terrains. The city's administrative boundaries are located in three different climatic zones, which enriches the diversity of its agricultural production. It was famous for growing grapes, figs, almonds, and olives, which has formed an essential economic craft. The city was moreover known for growing grains. Agricultural lands have exceeded 338,400 km^2 in 2007, resulting in a percentage exceeding 30% of the total income of agricultural lands in the Westbank (A tourist path project in the Hebron governorate, 2011; Abu-Siriya, 1995).

_ Industry: Hebron is well known for its handcrafts, which was reflected in the names of the neighborhoods and markets of the city. It is worth mentioning that the industrial process was the most significant link between both agriculture and trade. Some traditional administrations have relied on agricultural products, such as olive and sesame to extract oils. Others have relied on animal production, especially lambs, to promote industries related to leather dying, yarn, and other famous crafts including pottery, clothing, aluminum, building material like concrete and stone, local tiles manufacturing, and steel industries (Grube & Michell, 1978).

_ Trade: Abu-Siriya described trade as the chore economic profession of Hebron. Even the peasants and the surrounding Bedouins were heading to its market to either sell their products or purchase their needs. The location of Hebron contributed to refreshing the commercial traffic by performing as a passage for the convoys of pilgrims and merchants. The markets of the old city of Hebron were built in both the Mameluke and Ottoman periods after shifting the city from Tel-Rumeida to Wadi Al-Khalil (Abu-Siriya, 1995). Figures 6 and 7 show images of the city's market nowadays.

Fig. 3 The old city of Hebron, showing Al Ibrahimi Mosque (Alamy, 2022)

_ Tourism: The city of Hebron relies less on tourism as an economic source of income. However, the city has multiple tourist and religious sites and attractions. These include the Ibrahimi Mosque, Al Ramah, and the Mascoup Orthodox Church with the famous Ibrahim Oak tree. Cultural attractions include the old city's museums, Al Sultan's pool, and the Turkish bath, in addition to the old city itself regarding its planning and architecture.

4　The Markets Structure

Grube and Michell stated that there were three main characteristics of the typical Islamic market structure, which are the streets network, secured with a gate, and contained hotels (Khans) (Grube & Michell, 1978). The market structure in the old city was the same as in Mameluke and Ottoman Eras, except for the number of markets.

4.1　Markets in the Mameluke Era

The Mamelukes established three main markets in the old city of Hebron (Meshal, 2011). It was noted that these markets were specialized in terms of sold products, such as Al-Hosarih Market to sell rugs; Al-Zayaten Market to produce and sell oil products, olives; and Al-Ghazel market for yarn and cotton products, as shown in Fig. 8.

4.2　Markets in the Ottoman Era

Hebron was the second-most significant city in Palestine after Jerusalem in the Ottoman era. Hebron received great attention from the Ottomans. They have constructed multiple Khans in and around Hebron and Jerusalem (AbuKhalaf, 1983; Guler, 2016).

Fig. 4 The modern Urban expansion in Hebron (Alamy, 2022)

1. Al Sawaknih
2. Al Aqqaba
3. Al Akrad
4. Al Qazazen
5. Bani Dar
6. Al Hoshia
7. Al Mohtasibh
8. Al Khadm
9. Al Qalaa
10. Al Masharqa
11. Qaiton

old city
1:4000

Public park   Markets   Ibrahimi mosque   graveyards   major checkpoints   settlements
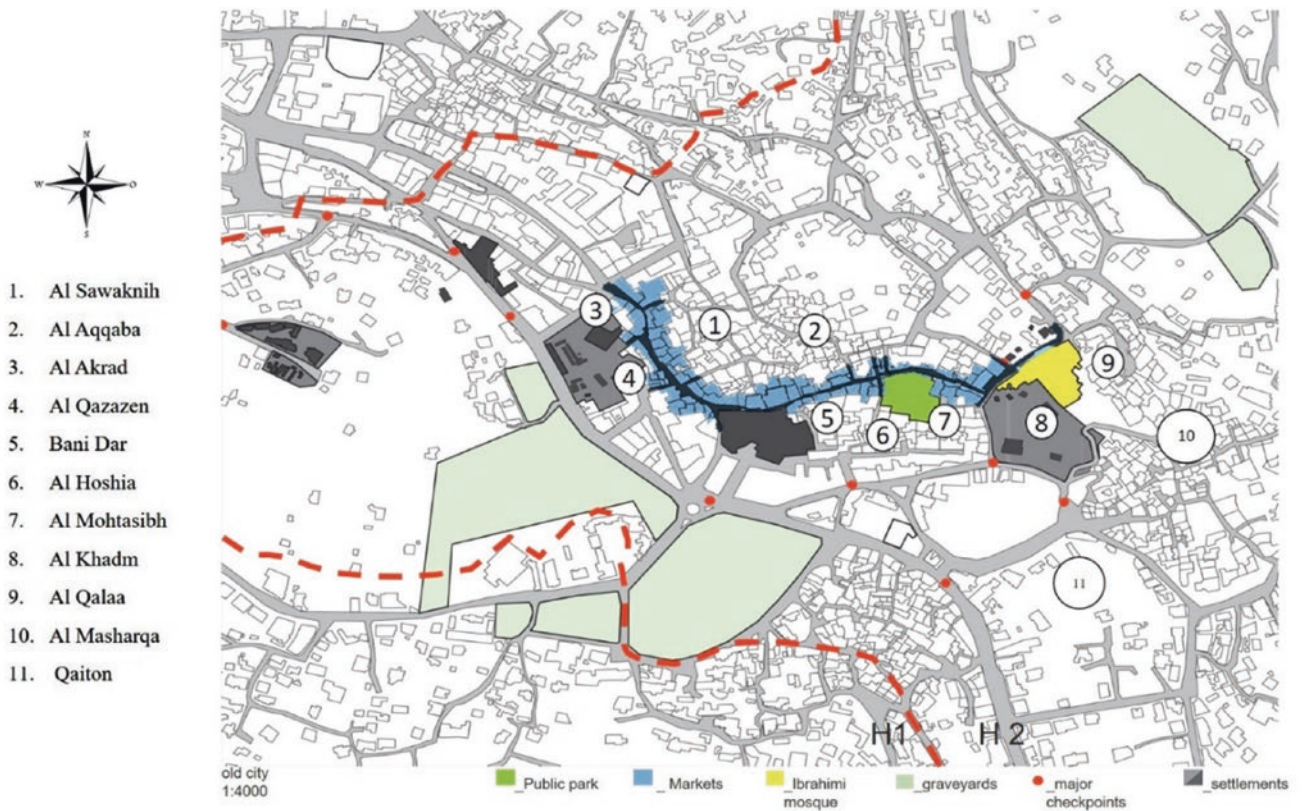
Fig. 5 The relationship between the markets and the neighborhoods [Researcher, 2021]

Fig. 6 Local markets in Hebron (Dweik et al., 2011)

Fig. 7 Local markets in Hebron (Dweik et al., 2011)

Fig. 8 Markets in the Mameluke era [Researcher, 2021]

Fig. 9 Markets in the Ottoman era [Researcher, 2021]

Crafts production and manufacturing methods were developed in the Ottoman era. Accordingly, the market structure in the city has expanded. New markets were created in the Ottoman era to correspond to that era's needs (Dweik & Shaheen, 2017). Figure 9 shows the markets in Ottoman era.

_ Al-Qazazen Market (The glass market): It is located in the Neighborhood of Al-Qazazen, which is famous for making glass, and is considered the central market in the city. Many roads branched from it leading to Khan Shaheen and Al-Atm Market (Al-Atm Market consists of Al-Zayatin Market, Al-Hosarih Market, and Al-Ghazel Market).

_ Al-Khodar Market (The vegetable market): It consisted of two rows of stores and was considered the heart of Hebron City and its most vital location. The Bedouins and villagers used to bring their agricultural and animal products to the merchants. This market is currently closed because of the presence of the settlements around it.

_ Al-Iskafia Market (The shoe manufacturing market): This market is located in the Aqqaba neighborhood and contains two rows of stores. In 1989, two new rows were constructed parallel to the first market. Al-Iskafia Market is specialized in the leather industries such as shoes, water buckets, and pickers (Dweik & Shaheen, 2017). The market name is attributed to the cobbler.

_ Al-Laban Market (The dairy products market): It is close to the market square in the south of the city. It is specialized in selling dairy products such as milk, cheese, butter, Jameed, and others.

_ Al-Attarin Market (The herbal market): It was also called "Jamal al-Din Al-Afghani's market", it is located in the Al Mohtasibh neighborhood where shops are lined up

Fig. 10 Bazaar Market (Ajrod Market) (Britannica, 2022)

on either both sides selling spices, herbs, medicines, etc. (A tourist path project in the Hebron governorate, 2011).

_ Bazaar Market (Ajrod Market): It was located in the castle neighborhood, adjacent to the western castle wall. It contained a square where shops used to sell grain. In 1964, it was demolished during the expansion process by the Jordanian Department of Antiquities to expand the square that is located in front of the Ibrahimi Mosque as shown in Fig. 10.

5   The Hotels (Khans)

Al-Khan, a Persian word of origin, is a house inhabited by merchants. Also, it means the store of goods, bars, shops, or hotels. Khans (also known as the caravanserai) are the type of buildings that aimed to protect merchants, travelers, and pilgrims. Khans served as a shelter for their lodges and animals as well. They moreover played an essential role in the expansion of the Islamic state back then.

In Palestine, many Khans were constructed over the years. They performed as an essential bridge between the traditional trade roads and military roads of Egypt and Syria. Khans were first established in larger cities along with military and commercial roads. In the Mameluke era, four main Khans were established at the heart of the city (HRC 2008).

These Khans were.

_ Khan Shaheen: Located to the west of the vegetable market in the ancient city of Hebron, it performed as two entrances to the old city, an entrance to the market center from Al Shuhada Street and another entrance from the vegetable market. The Khan was later demolished by the owners and was replaced by new stores were built in the market (A tourist path project in the Hebron governorate, 2011). In 2000, the Israeli military forces closed these entrances, creating a dead-end street with its entrance from Al-Qazzazin Market (Abu Wardeh, 2017; Bader, 2018).

_ Khan Souq Al-Hosaria: The Khan is located et al. Hosaria Market and consists of two floors, open toward the courtyard, accessed from the main street through a gate (Abu-Sobeih et al., 2011; Dweik, 2014). The shops were wrapped around the courtyard from three sides. Additionally, it contained a guarding room and a stone staircase leading to the first floor with a living room as illustrated in Fig. 11.

Fig. 11 Khan Souq Al-Hosaria (Abu-Sobeih et al., 2011)

Fig. 12 The Khans' locations [Researcher, 2021]

Fig. 13 Obligatory closed shops in Al–Shuhadaa st. and the old city

Fig. 14 Obligatory closed shops in Al–Shuhadaa st. and the old city

_ Khan Al Dweik: The Khan is close to the market square, and it consists of two levels: the ground floor was for commercial purposes and the first floor was for the residences of the owners. This khan was intended to serve the merchants and people who worked in the leather industry (Dweik, 2014).

_ Khan Al-Khalil: In 682Ah/1283Ad, Sultan Seif Eddine Qalawoun established a khan to serve the visitors and merchants in Hebron (Amro, 2011). This khan was constructed in the neighborhood of Bani Dar and was considered a reviving element for commerce in the city, containing multiple products and industries. Furthermore, this khan was attached to a square called Bab al-Khan Square, which had hosted many occasions for the city's citizens (Dweik, 2014).

Figure 12 shows the locations of the khans on the old city map.

6 Challenges Facing the Markets of the Old City

The Old City is currently facing many challenges that have affected its sustainability in general and the sustainability of its markets in particular. The majority of these limitations were due to the presence of the Israeli occupation at the heart of the old city, which had negatively affected the sustainability of the city. These challenges were summarized as follows:

_ Settlements at the heart of Hebron and attacks on merchants: A report prepared by the HRC (Hebron Rehabilitation Committee) stated that the attacks of the settlers on merchants and clients inside the Old City had been a significant reason for merchants leaving the old city seeking new shops in safer areas, which has led to an impairment in the economic movement. Also, about 512

Fig. 15 Obligatory closed shops in Al–Shuhadaa st. and the old city

Fig. 16 (down right) Settlements established in the vegetable market (HRC, 2010)

shops were closed by military orders. Currently, 1,141 out of 1,829 shops were forced to close either because of the turbulence in the city or because of the lack of customers (HRC, 2010, Figs. 13, 14, 15 and 16).

_ Poor socio-economic bonds: The old city was recently fragmented by more than 930 new families. Most of these families are economically poor or low-income families, these inhabitants have moved to the old city to benefit from the services provided by the Hebron rehabilitation committee. For example, charge-free water and electricity services, or free accommodation. Moreover, other healthcare and continuous food supply were also provided.

For these reasons, residents of low-income and non-native families were proven of having no feeling of belonging to the city, which reduces their desire to contribute to enhancing the economic situation in the Old City (Jabari, 2011).

_ Unspecialized use of shops: Most of the market characteristics in the Islamic cities were related to maintaining each market specialization. In the past, shop occupancies were classified according to their sold goods and the public interest. On the other hand, nowadays, the old city markets contain a random variety of goods. This negatively affected the urban image of old markets and caused hygiene problems due to exposed unharmonized goods.

_ Unplanned ownership of stores: Investors generally tend to buy shops with no intentions of working in such shops, increasing the number of closed shops and slacking the vitality of the Old city shops. Consequently, these traders are performing as additional burdens on the sponsors and the residents of the old city both alike (Fig. 17).

7   Conclusion and Recommendations

This study aims at highlighting the structures and characteristics of local markets in Hebron City between the past and present. The historical background of local markets allows a wider understanding of the markets' typologies and provides a better understanding of their revival.

This study concludes to evaluate the current situation of the main markets in the old city of Hebron to provide multiple recommendations for local authorities, municipalities, and other related committees to achieve the goal of the conservation of the old city markets.

Achieving the needed urban and architectural sustainability of the old city of Hebron requires achieving multiple requirements for the residents of the city and their needs to be fulfilled. Therefore, investments in the Old City should be encouraged. Therefore, the study proposes multiple recommendations to be considered for the revival and conservation of local markets particularly, and the old city generally.

Residents of the old city need to be culturally connected to the old city's history and origins. Whether they were original residents of the old city or not, they shall be able and urged to support the economic cycle and maintain social sustainability levels. Achieving this requires the Hebron Rehabilitation Committee and local societies to encourage and enhance the level of awareness of the importance of the inherited architectural heritage in the old city in general and markets in particular. Therefore, more advising workshops and encouraging activities need to be arranged by the local rehabilitation committee and the municipality.

Moreover, the local municipality and organizations need to try to create and support activities, local and seasonal festivals, and social occasions to contribute positively

Fig. 17 The shop's usage in the old city of Hebron nowadays (HRC, 2010)

to the development of the region and improve its financial situation on one hand. On the other hand, this will motivate residents from other districts of Hebron to visit the old city consequently.

The study further recommends additional efforts to be escorted for achieving the overall goals of the sustainability of the old city of Hebron requires additional economic sustainability considerations. For example, the cooperation from local authorities in reducing the prices of essential goods by proposing a supporting fund for goods bought from the old city, like reducing taxes. Another example of economic sustainability is the revival of tourism in the old city, through the support of local handicraft industries, and the development of the city's tourist map and connecting it to other tourist attractions in other near Palestinian cities like Bethlehem and Jerusalem tracks is also essential. This will contribute to the development of economic, cultural, and social sustainability pillars.

These considerations must be achieved without neglecting the protection of the urban environment by establishing appropriate design and planning standards for the region and removing professions and industries that could harm the urban fabric, which in terms hurts the structure of old buildings in particular and the markets in general.

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The Preservation of the Heritage Value of Territories Related to Production Landscapes. The Case of Sancti Petri, Cádiz (Spain)

Julia Rey-Pérez and Benito Sánchez-Montañés

Abstract

The fishing village of Sancti Petri in Chiclana de la Frontera (Cádiz, Spain) is located in a territorial enclave that acquires a certain singularity due to the combination of factors that make it up. This fact is reinforced by the synchronic and diachronic relationship established between the village and its surroundings. The result is a place of considerable heritage interest, but at the same time of great complexity, formed by a wide range of activities, interests, and objectives developed by the societies that have settled there. The historical survival of a productive environment (fishing and salt flats) has been detected, together with strong defensive and strategic importance, along with realities framed by a mythological component present in the collective memory of the place. More recently, the environment has been shaped by the development of leisure activities and the infrastructures linked to them. Added to this is a geographical reality with a very specific character. Therefore, the proposal of this research is to identify, from several approaches and scales, the different heritage elements that characterize the fishing village of Sancti Petri and the territory in which it is located, being aware of the landscape approach that demands in-depth knowledge of a territorial enclave of these characteristics. The results reveal not only the diversity of layers and heritage meanings offered by the elements that make up the site, both individually and collectively, but also their fragile state of conservation and the complexity of their management and administrative protection. The main conclusion is that the amount of information generated from a methodology that has explored the territorial, urban, architectural, and intangible components invites us to synthesize the information obtained and systematize it in terms of heritage values and attributes. Only from this perspective will it be possible to design strategies for the active protection of a place of this conceptual complexity.

1 Introduction and Issue

An academic workshop conducted throughout 2021 has produced a significant amount of information and data, allowing us to know in detail the reality, evolution, and state of the fishing village of Sancti Petri in Chiclana de la Frontera (Cadiz, Spain). As a result, this study offers evidence of an enclave of great patrimonial interest, due to the combination of factors that constitute the uniqueness of the place and the relationship it establishes with the environment in synchronic and diachronic terms. This knowledge places us in a very fruitful line of research, whose state and prospective we present in this communication.

There are complex heritage sites whose valuable elements are scattered throughout the territory. The importance of these enclaves is not the result of the mere sum of the value of their resources, but of the value of the interaction of the whole and the meaning that this interaction produces. This is the case with the landscape we study. We necessarily use the figure of "heritage landscape" (Silva & Fernández, 2017), given that we find a scattered enclave in the territory, which accumulates a lot of elements that may be considered

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as heritage, both material and immaterial (Veldpaus & Roders, 2014), and whose accumulation in time and space is only readable by means of a tool that allows one to put into perspective the totality of these patrimonial elements and vectors. This approach is also supported by the dimension that the concept of heritage has acquired to this day, where the number of cultural attributes and values reinforces even more this idea of heritage landscapes and where those who enjoy (or suffer) and manage it are also incorporated as another set of elements in this process of patrimonialization (Rey-Pérez, 2017).

Elements that do not fit the unitary idea of heritage as a monument and the tourist systems that derive from it (Prats, 1998) suffer a chronic state of abandonment and undervaluation. This is the case with the twentieth-century heritage and the so-called "invisible heritage". It suffers from an already characteristic situation of incomprehension on the part of a majority of society and of the bodies that would be in charge of its characterization and protection (Sánchez-Montañés & Castilla, 2020), frequently is not just a case of underestimation, but of open opposition to its preservation and a choice for its substitution for a new reality. This often puts it at risk of trivialization or disappearance. Only people, scholars, and groups directly related to the memory that collects the specific patrimonial resource are usually aware and propose their defense. This is the case with industrial architecture and historical landscapes of production (Sobrino, 2010) such as Sancti Petri, among many other examples of modern heritage. The work that we have been doing reveals an increasingly consolidated line of thought and a consistent field of academic works, which proposes the need to create instruments to patrimonialize and safeguard the landscape, understood as an extensive cultural fact on the territory, from agencies at all levels (from local to international) and through documents that reflect a global consensus. In cases like the one we propose here, both topics, production sites and landscape, come together in the same complex reality. This is a common situation, as many production systems are infrastructures dedicated to the extraction of primary goods that are found in the territory, and this is the reason why it is important to develop and implement a systematic approach to this aforementioned reality of "production landscapes", as a tool to reveal and consequently protect such important systems to get a complete picture of the societies that created them and the territories where they are placed.

In the region of Andalusia since the turn of the century, the administration has made some attempts to manage these territorial heritage spaces that require a holistic and transdisciplinary approach. This has been the case of the landscape intervention in the Bolonia inlet (Cádiz) (Fernández-Baca et al., 2007), where a key conceptual leap forward was made at the methodological level with the drafting of the Guía del Paisaje Cultural de la Ensenada de Bolonia (Salmerón, 2004). However, in the last 15 years no case study with these characteristics has been undertaken in the Andalusian region, which makes it necessary to emphasize the need to address this problem from the academic sphere.

2 Sancti Petri

The village of Sancti Petri is a settlement at the mouth of the sea channel of the same name ("Caño de Sancti Petri"), which connects the bay of San Fernando to this point of the open coast, marked by the presence of an islet. The coast is made up of sandy beaches and a complex system of marshlands and water channels that deserve the consideration of "Natural Space of Interest". The natural environment is highly anthropized by historic salt flats that transform the seawater tidal marsh and pine forests. It is framed in the coastal territory of the Bay of Cadiz, of great environmental relevance, with biotopes of great value, protected by various figures such as the Natural Park of the Bay of Cadiz, the Natural Sites of Isla del Trocadero and Marismas de Sancti Petri (Figs. 1 and 2), and other smaller figures, such as Special Conservation Area and Place of Community Importance (Luna & San Román, 2013).

Not less important is its history, with settlements dating back to the dawn of culture. In the specific area of Sancti Petri, there are documented settlements from Islamic times, although scattered archaeological remains speak of a human presence, at least since classical antiquity (Higueras-Milena, 2021). These remains and some classical texts have fed the general assumption that in the islet the Phoenician-Greek Temple of Melkart-Herakles was placed (Estrabón, 2007).

The known settlement is linked from its origin to the almadraba. The "almadraba" is a traditional fishing system based on tuna traps by the coast, developing from roman times and still in use in the area, as well as in other parts of the Mediterranean (famously in Sicily) and southern Spain and Portugal. This technique has been practiced in the Gulf of Cadiz for at least the Middle Ages and at some point has been the basis for the economy and trade of the coastal region. The importance of tuna fishing during Roman times is beyond question. Various settlements have been found with factories dedicated to tuna processed products, such as the valued GARVM. These remains are supported by many classical texts describing the activity. The main archaeological places are in the vicinity of BAELO CLAUDIA and MELLARIA (Villalobos & García, 2003). Moreover, it must be noticed how the Roman currency coined in the cities of the area showed the figure of a tuna.

This settlement has been variable over time, from informal and temporary premises to industries and dwellings
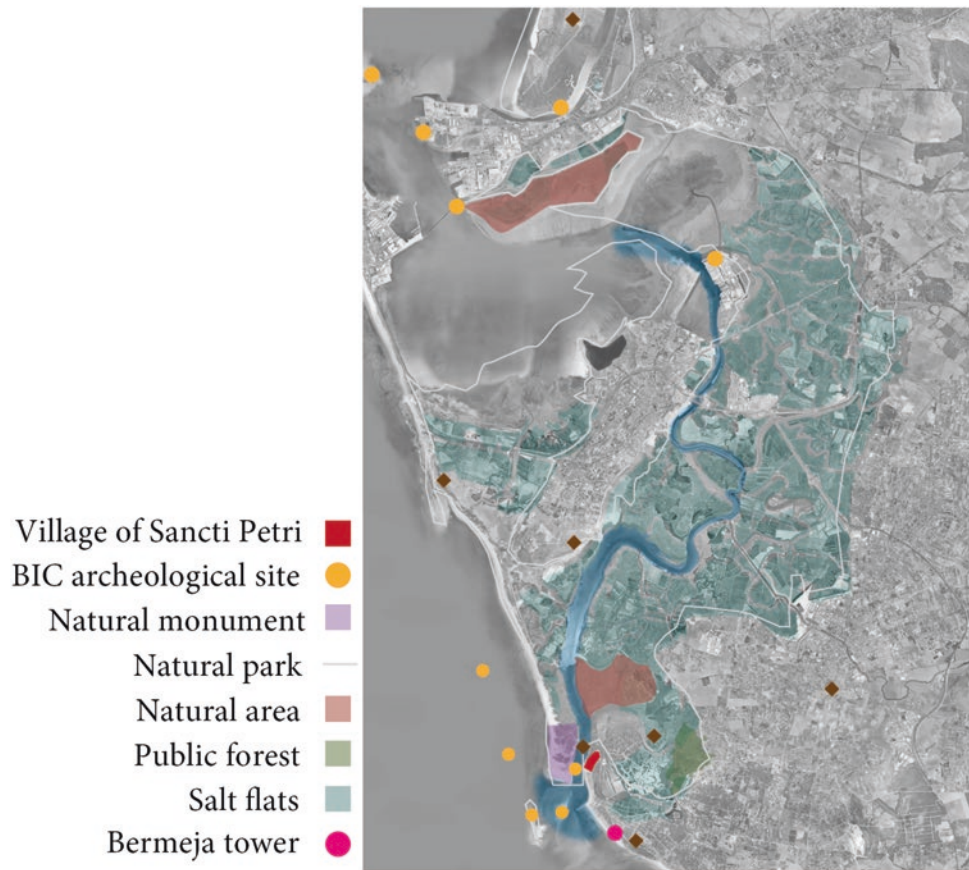
Fig. 1 Heritage assets in the Sancti Petri settlement area (De la Fuente Peñalver, 2022)

Fig. 2 Orthophotography of the village of Sancti Petri. National Aerial Orthophotography Plan 2013 (Instituto de Estadística y Cartografía de Andalucía. Consejería de Economía, Hacienda y Fondos Europeos, 2022 December)

devoted to fishing and documented from the first third of nineteenth century. Although practically all the current remains belong to the time of the Consorcio Nacional Almadrabero (CNA), a public company dedicated to tuna fishing and canning around the Spanish coast, that built in the 1920s a productive settlement with fishing areas, residential and processing industry in addition to the port. It is important to understand that this "chain" of "almadrabas" marked the coastal line with a structure of productive points, following the migratory route of the tuna shoals. This particular enclave developed until its abandonment at the end of the last century. The Consorcio quits the activity in 1974 and private ventures and fishermen unions and associations tried to keep on, languishing for two more decades.

We find a detailed description of this historical process in Del Pozo (2008, p. 227 et seq.). This enclave constitutes a complex and extensive set, dedicated to production, with implications ranging from the territorial to the construction of a social and cultural landscape. As mentioned above, this has to be understood linked to a rich fabric of historic significance and identity. It is a reality that allows a reading of certain keys (such as the culture of production, working migrations, or the tunny fishery) that involve the totality

of the Mediterranean shores and a good part of its history. However, the material remains of the settlement are in a process of very significant deterioration and ruin. Many of these have disappeared and those that exist are at risk of disappearance or trivialization for the sake of real state speculation and a poor idea of development, which uses the flag of "recreational uses" for the people, namely, a yacht harbor and marina with commercial uses and luxury hotels (Fig. 3). All this purposes under a situation of little awareness of the value of the remains and a panorama of clearly insufficient protection instruments in the local regulation, derived from the Plan Especial ENC-08 Poblado de Sancti Petri-Istmo de Sancti Petri (a local specific regulation), promulgated by the Chiclana de la Frontera City, which is the administrative district where the peninsula is located.

The "Real de la Almadraba de Santi Petri" ("Real" is an old-fashioned word for "settlement", derived from the royal foundation of certain encampments and premises) is an enclave of great functional complexity where very diverse activities, interests, and objectives have been verified and maintained over time by different cultures. We can find the historical survival of a productive environment around fishing and salt production, together with a great defensive and strategic importance due to the existence of the rod, which

Present uses of the village

1. Guardian's house
2. Church of the Virgen del Carmen Atunera
3. Fishermen's Association
4. Social groups
5. Hospitality
6. Sancti Petri Yacht Club
7. Surfboard rental company
8. Old water tank
9. Ruins
10. Illegal occupation
11. Houses in a state of collapse(ANC time)
12. Administrative
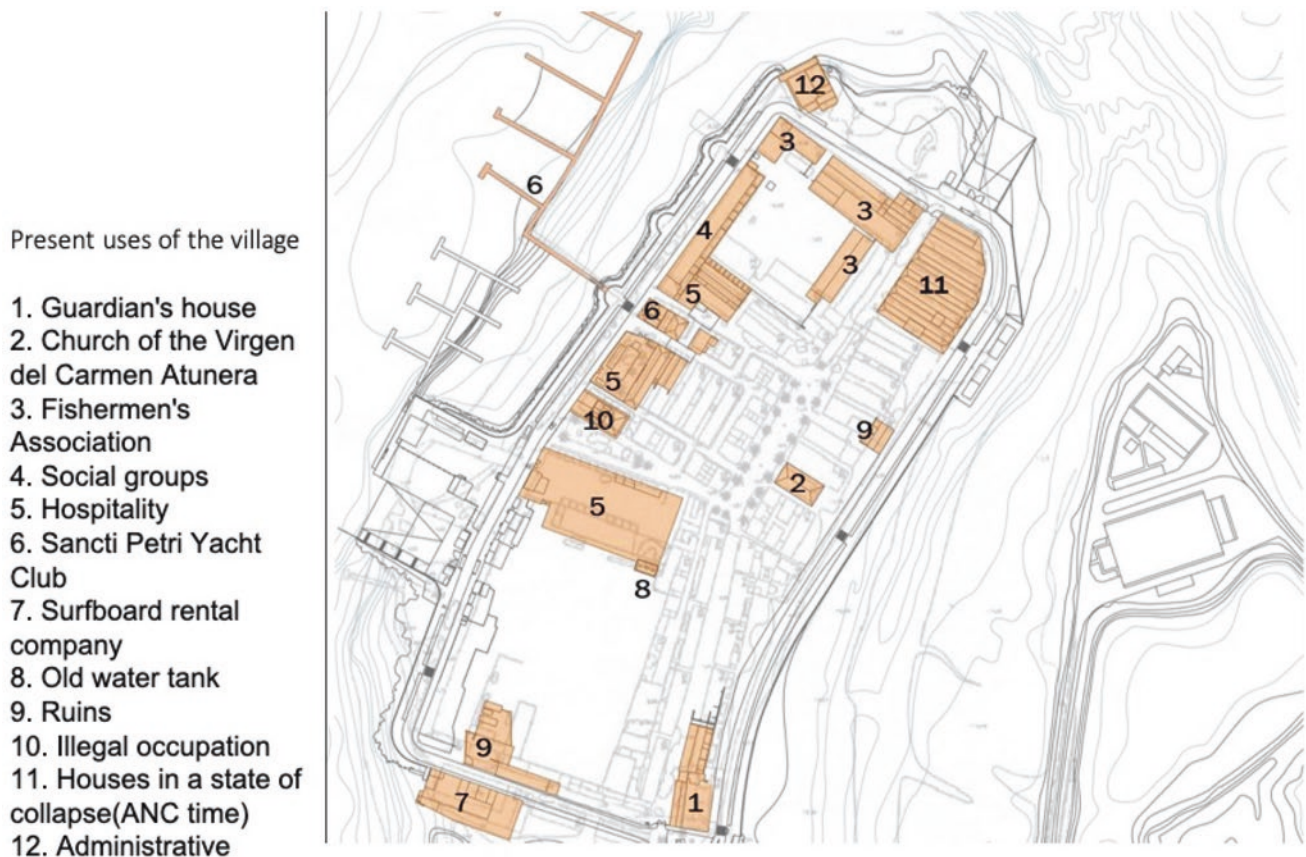
Fig. 3 Present uses of the village of Sancti Petri (Fernández Múñoz, 2022)

gives navigable access to the Bay of Cadiz and the islet, as a fortified element controlling such access. This strategic character is due to the relevance of this bay as one of the main safe harbors for the Spanish Royal Navy, and this channel was a weak point in its defence. This importance is perpetuated until the artillery forts of the twentieth century. To this historical reality is added the existence of a collective memory of mythological order, linked to the supposed existence of the mentioned Phoenician and Greek temple of Melkart-Herakles on the islet, which keep its attraction during roman times (famously, Julivs Caesar visited it), a most relevant center of pilgrimage and devotion during the antiquity. Temple of great importance that is collected in multiple classic texts (Strabo (3.5.3 and 9) is the most referenced), but whose location is only a scholar hypothesis. Nowadays, this theoretical situation is very controversial and archaeology seems to fix in a different location (Belizón et al., 2021), although it still conforms the mythological roots of the place.

More recently, the area of Sancti Petri Peninsula and its surroundings has developed leisure infrastructures linked to extensive urbanization of holiday housing and marina. This reality constitutes a great pressure on the heritage landscape and remains, in terms of demand for use, property speculation, and tensions on the existing and potential protection figures that seek to safeguard the landscape and its anthropic elements. All this makes us propose a multilayered reading of the set, suitable for a patrimonial analysis, which we propose to assess in this study and its successive phases (Fig. 4).

3 Research Proposal

Addressing the binomial heritage territory involves approaching the research from different scales and points that allow us to understand the dimension of the patrimonial value attributed to these places. For this reason, three scales of approach have been proposed for the object of study: a territorial approach, an urban approach, and an architectural approach, where the identified attributes can be both tangible and intangible, and where the perception of citizenship is incorporated as an innovative approach in heritage management. Therefore, a first phase of analysis is proposed where an approximation will be made to the territory to which the settlement is connected. This study

Fig. 4 State of the buildings in the town of Sancti Petri (Fernández Muñoz, 2022)

seeks to identify those attributes linked to natural elements (flora and fauna), with the orographic and maritime component and with other heritage elements that are linked to the territory and the landscape (the fortress, bunkers, defensive towers, archaeological remains…). A second moment of this phase of the assessment will be dedicated to the urban part of the settlement; the field of research focuses on the conceptual design of the Sancti Petri village with the aim of knowing the singularities of a settlement design and built *exnovo* at the beginning of the twentieth century (although some coincidences and alignments suggest that finally some previous structures were integrated; this point has to be verified). Thirdly, the study of the typology of the architecture of the compound will allow one to know the different forms of life that were given in the place, as well as to know in depth the building typology linked to the Almadraba (Vioque, 1997) and what remains of it. In this phase, the intangible dimension of the heritage takes a main role, as the ways of life, uses, functionality, gender matter, and the full understanding of the human life in the place are fundamental sources of knowledge and meaning for the patrimonial characterization of the place. Transversely, these studies and approaches will reveal the existence of another layer of intangible heritage related to the territory, production, and festive ceremonial manifestations incardinated in that place. This wide-ranging study will also allow us to recognize the state of conservation in which the identified tangible attributes are found. Finally, the work cannot be done solely from the administration for a complete approach to these heritage landscapes, hence the need to incorporate a participatory process where all the possible agents in the process and social groups and institutions will be involved, to know the perception of the citizens about this heritage landscape.

In the second phase, with this information collected, it is possible to identify the cultural attributes and values of the different patrimonies found, as well as the values obtained from the territorial relationship established between these patrimonies. In this parallel phase, a SWOT matrix will be developed on these realities, which will provide us with information on the threats and weaknesses of these places, as well as their strengths and opportunities, a key issue for working in the future in an active guardianship.

Finally, the third phase will identify strategies to manage these heritage landscapes, focusing primarily on production, but obtaining valid conclusions for any heritage landscape, and prevent further deterioration and abandonment of these complex heritage sites. Valuing sites with this unique heritage will allow us to identify strategies for protecting and planning the future of this enclave, appropriate to ensure its economic, social, and environmental sustainability.

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Approaching Heritage Preservation for Future Generations

Teng Wai Lao

Abstract

It has been proposed that Outstanding Universal Values (OUV) define the concept of cultural heritage. Yet, statements of OUV are often inadequately informative because they are unable to fully reflect the value and meanings that heritage holds for its respective communities. Thus, these official statements often leave the public struggling to understand and connect with their heritage. This difficulty causes the ethical question 'Who and what is involved in heritage preservation?' to become increasingly complicated and difficult to answer. To approach this question, it is fundamental to understand the relationship between a community and its heritage. It is proposed here that the concepts of 'we' and 'others' suggest five distinct incentives that can foster the building of connections between members of a community and their heritage and thereby motivate the preservation of that heritage. Building these connections allows a sense of belonging to develop and encourages feelings of responsibility towards heritage. I argue that such developments on part of community members can do more to raise public awareness of the value and meanings of heritage than can institutional commitment to their definitions of cultural heritage and statements of OUV. Moreover, consensus, which ultimately could benefit preservation initiatives is more likely to arise from public commitment rather than from statements or definitions. Examples from both tangible and intangible cultural heritage are used to substantiate the argument.

Keywords

Cultural heritage · Preservation · Ethics · Public heritage recognition · Enhancement

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1 Introduction

In recent decades, the preservation of heritage has become a concern within the heritage sector. This increasing attention is not only due to the accelerating destruction of heritage in conflicts, but also the growing recognition of the significance of heritage to its respective communities. This essay will address one of the most debatable ethical questions in this field: Do we have a duty to preserve cultural heritage for future generations? We will see that, in a multicultural world, this is not a simple question which could be easily answered with a yes or a no. One reason for this complexity is that the question itself raises several other philosophical questions, such as 'who are "we"?' and 'what is involved in heritage preservation?' with which experts struggle when faced with the need to make decisions. Kiddey suggests that 'cultural heritage practices are used to document the social value of places and environments and to draw out culturally specific meanings and attachments' (2017, p. 2). Agreeing with her suggestion, which stresses the function of cultural heritage, and applying this to our focal question, it could be seen as an agreement and proclamation to seek shared common values within global communities. These values can be characterized in terms of social, religious, political and economic goods relevant to promoting heritage preservation and inculcating a sense of responsibility. These values are significant because they are the medium for people to understand the connection between themselves and heritage. To be more specific, people will depend on these values to determine whether the heritage belongs to their culture or not. However, it is unrealistic to seek to understand the shared common values held by everyone, since values are dependent on many factors and variables. This makes approaching heritage preservation from the perspective of values difficult, but it is nonetheless necessary. Difference in valuation and ethical considerations will cause any assessment of a particular situation to involve a high level of complexity. Given this difficulty, it seems impractical to

examine each shared value, although it is surely actionable to achieve the goal of heritage preservation through enhancing the relationship between people and heritage by consolidate the concept of 'we[1]' through examining a range of shared values, and thus motivating the recognition of 'our' heritage. Building connection among 'us' allows a sense of belonging to develop that provides the common ground needed for a sense of community responsibility towards heritage to grow and mature.

In this essay, I will argue that we have a duty to preserve cultural heritage for future generations but with limitations caused by the recognition that choices of priority will heavily affect people's willingness to preserve. The essay will discuss five incentives that are the key factors affecting the process of heritage preservation. In the first part of the essay, I define cultural heritage from international authorities' and specialists' perspectives and explain the general ideology of heritage preservation. Then, in the next part I identify and evaluate who has the duty to preserve cultural heritage by discussing how the sense of belonging is formed from seeking shared common values, allowing people to recognize their own heritage and thereby affecting the process of preservation. Three incentives that will positively enhance a sense of belonging and foster a sense of responsibility towards heritage preservation and two incentives that are better categorized as threats which limit the work of heritage preservation will be discussed in the second part. To clarify, the term 'cultural heritage' in this essay refers to both tangible and intangible cultural heritage which are equally important in the context of preservation and continuity. Diverse examples of cultural heritage such as the Bamiyan Buddha[2] in Afghanistan, the Peking Opera,[3] the Roman aqueduct[4] in Segovia, Spain and the Uluru rock[5] in Australia will be used to substantiate the discussion.

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[1] The term 'we' and its pronouns (us, our, and ours) represent an idea of agreements among people who have a consensus on recognizing shared common values and feel responsible for their heritage.

[2] It is part of the Cultural Landscape and Archaeological Remains of the Bamiyan Valley which has been inscribed as World Heritage Site since 2003 after the destruction in 2001 by Taliban (UNESCO, 2003).

[3] Peking opera is a representative cultural expression of China, transmitted from generation to generation and recognized by the community concerned as part of its heritage. It has been inscribed since 2010 on the Representative List of the Intangible Cultural Heritage of Humanity (UNESCO, 2010).

[4] The Roman aqueduct of Segovia, probably built c. A.D. 50, is remarkably well preserved. It has been inscribed on the World Heritage List as Old Town of Segovia and its Aqueduct since 1985. (UNESCO, 1985).

[5] Uluru, or Ayers Rock, is a massive sandstone monolith in the heart of the Northern Territory's arid 'Red Centre'. It stands in the park called Uluru-Kata Tjuta National Park which has been inscribed since 1987 on the World Heritage List (UNESCO, 1987).

2   Definitions of Cultural Heritage

To begin with a quote from the World Heritage Centre (WHC), 'Heritage is our legacy from the past, what we live with today, and what we pass on to future generation. Our cultural and natural heritage are both irreplaceable sources of life and inspiration' (1972). This understanding is widely noticed and believed in modern society due to the outstanding status of the organization which leads the trend of the heritage sector globally since it was established. The statement tries to show the idea of cultural continuity and to raise public awareness of the relationship between people and heritage by informing heritage highly relates to our identity and lives. However, this statement does not really help the public to understand and recognize their cultural heritage due to lack of details. For example, WHC suggests that heritage should be passed on to future generations, but it does not provide an explanation of what should be passed on and how this mission should be achieved. What is involved in extending? Who is involved? How to preserve? These are the major ethical questions that the statement unable to answer after bringing up the idea of preservation. Undoubtable, WHC does express their ambition through this statement on promoting the significance of heritage and enhancing the idea of heritage preservation. Unfortunately, this statement is vague and difficult for the public to follow, and this makes it less useful in practice. Based on the WHC's statement, UNESCO has given a more critical definition for management. It defines cultural heritage as the monuments, groups of buildings, and sites that have Outstanding Universal Value (OUV) from the historical, aesthetic, ethnological, or anthropological perspectives (1972). This definition has narrowed the concept of heritage given by WHC, but, because this is for management purposefully, it only recognizes properties that fit the standards of UNESCO so-called OUV as heritage. While it is difficult for people to know the exact meaning of OUV and its functions. Personally, ICOMOS proves the best definition for the public to understand the meaning of cultural heritage, which includes the idea of both tangible and intangible heritage in its definition. It explains 'Cultural heritage is an expression of the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values' (ICOMOS, 2002). ICOMOS's definition has simply touched on the ethical questions of heritage preservation, which indicates that the community should be involved in heritage preservation and that their ways of living should be preserved in order to pass them on to the future generations.

Besides international organizations' definitions, Oxford dictionary defines heritage as the 'property that is or maybe inherited' (2018) which seems the deeper meaning of

heritage is undefined. Smith suggests that often people do not have a clear idea of what heritage is and mostly have the perception of '"old", grand, monumental and aesthetically pleasing sites, buildings and artefacts' (2006, p. 11). This perception not only shows that people are unfamiliar with the idea of cultural heritage, but also highlights that public involvement in heritage preservation projects is insufficient. To increase and develop the ideas of heritage preservation, it is necessary for people to understand what heritage is and how heritage relates to their lives. If people know the connection between themselves and heritage, the work of preservation is easier to be executed owing to sense of belonging and responsibility. Although Smith mentions that there is no such thing called heritage theoretically since everything could be heritage depends on how its values are interpreted and expressed (2006), from my point of view, heritage is the legacy from the past which witnessed and proved the history of a certain period in a certain area. The meaning behind the names given by modern scholars and organizations should be noticed and promoted. The reason why heritage is considered as heritage is primarily because it holds distinctive meanings and values in relation to social, economic, political, and historical aspects for its communities and surroundings. Its significance should not be simply summarized in statements. Missing or separating contents and contexts from the heritage will not be able to present the heritage fully and will also affect people's recognition of their heritage. Furthermore, Kiddey explains that 'Everyone has heritage' (2017, p. 3). If people think they do not have one, it is because they have not yet recognized it. Although UNESCO has set OUV for people to review and manage cultural heritage in formality (1972), the reasons for people recognizing heritage go far beyond the statement of OUV (SOUV). In other words, people recognize their own heritage through their understanding and memory by themselves. The OUV would only help to understand the general importance of the site, yet personal connection and sense of belonging are hard to form from SOUV as its primary usage is for management and tourism aspects. The evaluation of individual heritage recognition and disagreement on heritage recognition will be discussed, respectively, in the next part.

Defining heritage is not easy, and preserving heritage is even more complicated. As mentioned above, the statement of the WHC does show the idea of preserving heritage. The Article 4 of the Convention Concerning the Protection of the World Cultural and Natural Heritage responds that state parties to the convention have 'the duty of ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural heritage' (1972). Also, Article 5 recommends adopting a general policy to assign cultural heritage a function or a role in the community's life (1972). From these articles of the Convention of Protection of Cultural Heritage, UNESCO and its state parties have demonstrated their commitment towards heritage preservation and have emphasized the strong connection between communities and their cultural heritage. It is essential for international authorities to comprehend the concept of heritage preservation and receive formal training to effectively manage preservation projects. Although noticing that there are numerous approaches to heritage preservation, it is difficult for the public to reach a consensus due to different understandings and senses of belonging. People understand and recognize heritage based on their own understanding and perceptions. Hence, there are no absolute correct ways of managing and preserving. However, due to the raise of public awareness in preserving heritage for future generation, conflicts between different opinions are enlarged and the question of 'Do we have a duty to preserve cultural heritage for future generation?' remains unsolved.

3 Whose Heritage?

The following will attempt to identify who has the duty to preserve cultural heritage. I will argue that individuals should feel obligated to preserve cultural heritage for future generations, supported by three incentives. However, there are also two disincentives that may discourage people from engaging in preservation efforts. Feather mentions that 'cultural heritage is for everyone' (2006, p. 14), but, from my point of view, people less likely recognize all cultural heritage as their 'own' heritage. Because the process of self-heritage recognition is inherently biased and heavily driven by individuals' cultural, social, economic, and political backgrounds. Everyone has their own understanding of cultural heritage and seeks what best aligns with their understanding and identity as heritage. As a result, people may not actually share the same cultural heritage for the same reasons and purposes. Because of these differences in people's in understanding and recognition of cultural heritage, balancing different opinions on preservation becomes problematic. Preservation becomes selective to satisfy multi-ethnic needs, and the questions of what to preserve and why to preserve are determined on a case-by-case basis. Basically, the idea of preservation nowadays is only applied to people who recognize cultural heritage as their legacy and this people is classified as 'we' of whom sharing common values and understandings whereas 'others' refers to people who has objections. This classification is not due to discrimination or racism; it is because of the differences in perspectives on what is valuable. Therefore, it cannot be guaranteed that everyone recognizes and acknowledges the duty of preserving heritage for future generations. And yet, Feather's statement highlights an ambitious goal of

preserving heritage. It will be achievable if the concept of 'we' is widely practiced. As soon as the concept of 'we' is applied, sense of belonging and responsibility to the heritage will be created simultaneously when people understand what their own heritage is. The next paragraphs are going to show three incentives that determinatively relate to the concept of 'we' in preserving heritage and two incentives that would cause limitations. Examples will be provided for justifications.

4   The Five (Dis)Incentives

The first incentive for people to recognize heritage as their legacy and preserve it is to have cultural and religious consensus. Culture and beliefs are the most influential and effective factors in fostering a sense of belonging towards heritage since. This is because cultural heritage has the power to enrich social life and facilitate transmission (Sørensen & Carman, 2009). People who recognize their own heritage because of cultural and religious aspects have an extraordinarily strong emotional connection with heritage. They usually see their heritage as part of their history and commemoration of tradition, hence they will feel responsible for preserving heritage for future generations due to a sense of belonging and wish for continuity. Although Kiddey explains that cultural heritage works are often used to challenge previous beliefs or written histories (2017), cultural heritage should be seen as the medium of cultural and social continuity, as well as the demonstration of the existence of these communities and ethnic groups. These cultural and religious consensuses are inclusively applied to both intangible and tangible. Since ICOMOS highlights the increasing importance of intangible cultural heritage with 'intangible heritage should be made incarnate in tangible manifestations' (2003, p. III), many scholars stress on the interdependency of the tangible and intangible cultural heritage. Tomaszewski suggests tangible cultural heritage is built on intangible cultural heritage (2003). She indicates the relationship between both types of cultural heritage and the fundamental of intangibles which cannot be omitted in the preservation of heritage. The major significance of intangibles is that it creates a strong emotional cohesion through exercises which allow people to experience different traditions and ways of living of other cultures directly and immersively. Eventually, the concept of 'we' embedded in intangibles can be better perceived after certain experiences. For example, the Peking Opera, which was inscribed on the Representative List of the Intangible Cultural Heritage of Humanity in 2010, is understood as a Chinese traditional storytelling from which reflects issues of history, politics, society, and daily life. It aspires to inform while entertaining (UNESCO, 2010; Fig. 1). The

Fig. 1 Peking Opera (UNSECO, 2010)

opera is transmitted largely not only through systematic student training in China but also through performances for those who are new to it, acting as receptors during the event. People's interests may be induced during the performance and may form a weak connection with the heritage by showing personal interest towards specific cultural and social consensuses.

Continue with the idea of personal interests, which is the second incentive of preserving heritage. To clarify, the term 'personal interests' refers to people who are inspired by different heritage experiences and feel they would like to develop into hobbies (Fig. 2). The experiences could be any heritage site visits, cultural events, hands-on sections and other ways of knowing about cultural heritage and these are not necessarily familiar to people's own identity and culture. It is an attitude of wishing to know and willing to transmit for heritage preservation and cultural continuity. According to Poria, Butler and Airey, the two most common reasons for visiting heritage sites and experiencing

Fig. 2 Foreigners learning Peking Opera (China Daily, 2019)

cultural events are education and entertainment (2004). Although the reasons for visiting are important for site promotion and sustainability, it is more important to ensure that people have the chance to develop personal interests in heritage and then form a sense of belonging. Applying the concept of 'we' and 'others' here, if saying that people who does not have a consensus of recognizing as 'we', while his/her personal interests are the opportunities given that might affectively turn them from 'others' into 'us'. By showing the interests to understand shared common values of the heritage and willingly to form connection with heritage. Thus, a sense of responsibility will be shaped and developed when they begin to have a consensus about the heritage that they are interested in.

Furthermore, profitability is another incentive for people to preserve heritage. Timothy and Nyaupane stress that cultural heritage is not randomly preserved; rather, it is selectively used and reshaped (2009). Undeniably, heritage is now being developed as a tool for social proclamation, political propaganda, and economic gain, to some extent. Often people have neither the consensuses nor personal interests towards heritage, hence they could be seen as 'others' according to the proposed concept. Nevertheless, they recognize the significance of cultural heritage in society and utilize it to accomplish specific objectives. As these individuals strive for benefits, they will promote and preserve the heritage within the module they have planned. One of the most successful examples of profiting from heritage is cultural tourism, specifically heritage tourism. Gibson from National Trust for Historic Preservation defines 'heritage tourism' as 'traveling to experience the places, artefacts and activities that authentically represent the stories and people of the past and present. It includes cultural, historic, and natural resources' (2014). Heritage tourism does bring a lot of attention towards heritage, but the idea of heritage preservation remains weak among visitors' minds. For instance,

the Uluru Rock in Australia was inscribed as World Heritage Site because of its cultural and religious significances. It is a fundamental aspect of the traditional belief system of the Anangu Aboriginal people, who are considered one of the oldest human communities in the world. The place is famous for spiritual and natural experience which attracts over 250,000 visitors per year (Whitford & Becken, 2017; Fig. 3). However, as for any political and economic decisions made by the government, a substantial number of visitors decide to climb on the sacred rock in Anangu culture (Reid, 2017). The act of climbing does not only causes physical harm the rock by affixing handles, but also goes against the religious practices of the Anangu people. Therefore, if heritage tourism disrespects the cultural and social implication of the heritage, could people be enhanced knowing the significance of the heritage and form a sense of belonging? And could profitability be recognized as an act of preservation? This is another arguable ethical question which considers authenticity and integrity. Coming back to the point, profitability gives the chance for 'others' to know the values of people's heritage via promotion, but promotion is not necessarily mean the heritage is being preserved well because it is preserved for private benefits rather than cultural continuity. Yet, it is doubtable that profitability is a proper way to preserve heritage despite seeing it as an incentive for people to preserve.

As I describe in previous paragraphs, idea of heritage preservation is not always eligible for everyone due to various concerns such as religions, politics and cultures. Many cases failed to seek agreements between 'we' and 'others' during conflicts, this is where limitations of heritage preservation occur. Although I recognize that I have a duty to preserve and promote cultural heritage for future generations, many might disagree with my opinion due to two major incentives. I summarize those two disincentives as the differences in understanding of values and opposing for

Fig. 3 Tourists climbing the Uluru Rock (BBC, 2019)

Fig. 4 Bamiyan Buddha before
destruction (left) and after
destruction (right) (UNESCO,
n.d.)

the sake of opposing. Both will affect the sense of responsibility towards heritage and usually result in dismissing the duty to preserve. According to Oxford dictionary, the term 'duty' is defined as the responsibility to do something (2008). When people lack a sense of responsibility to a certain heritage, they will also dismiss their duty to preserve. However, 'one attitude to the past was not more valuable than another' (Sørensen & Carman, 2009, p. 19). There is no universal consensus on what should be preserved because different communities have different values. The Bamiyan Buddha (Fig. 4) is a good example that illustrates conflicts between people who do not share common values and are ultimately unable to preserve cultural heritage for the future generations. From the perspective of 'we' who aim to protect and preserve cultural heritage, the destruction of the Buddha statue was a tragedy in our history. In recognition of the statue's historical importance, UNESCO inscribed it as a World Heritage Site after its destruction. Because 'we' think that 'we' have lost a valuable which should be passed down to our decedents. Conversely, Taliban claims that they did not feel remorse about the destruction, according to what they called, 'a piece of art' (Crossette, 2001, p. 19). They mentioned that it was unacceptable to preserve a statue while their children are dying. For them, harmful things need to be destroyed and thus they demolished 'our' valuables based on 'their' understandings.

Preserving cultural heritage is hard and balancing between different opinions is more challenging. The actions of the Taliban have sparked further ethical discussions regarding the preservation of cultural heritage and the choice of priorities. Should we put humans first, then preservation of cultural heritage? Or vice versa? In the case of Taliban, their priority is 'ideology first then the economy' (Crossette, 2001, p. 19) whereas UNESCO claims it has

'duty of ensuring the identification, protection, conservation, preservation and transmission to future generations of the cultural and natural heritage' (1972, Convention Article 4). This led to a difficult situation for UNESCO and other organizations to persuade Taliban to preserve the Buddha statue for boosting local economy or other profitability. Unfortunately, nothing could be done in the negotiation if the priorities already vary. The differences in choice of priority will result in different duties. Duty really depends on people's priority, and it is culturally, socially and economically determined. For example, the Roman aqueduct in Segovia, Spain is a World Heritage Site which is famous for its incredible architectural techniques and the landscape. It is also famous for its legend which the local heritage sector and government use for promotion to attract visitors. Yet, this act has offended Catholics residents of the town because the legend is related to Satan, the devil in their beliefs (Jones, 2019). The disagreement between people will simply fit into the 'we' and 'others' concept. The local heritage sector and government wish to promote the site with the project of Satan's statue whereas residents feel against and petition the court for cancellation. The project against religious would rarely allow Catholics residents recognize the Roman aqueduct as their heritage. As a result, they might feel that they do not have a duty to preserve such an offensive building for future generations.

5   Conclusion

To conclude, the meaning of cultural heritage is differently defined depending on the purpose the definition is going to serve. Yet neither the statement of WHC nor the definition of UNESCO provide a specific explanation of cultural heritage to the public for heritage recognition and preservation.

Many people remain ignorant or unclear about what cultural heritage is and thus they do not recognize their duty to preserve. The idea of heritage preservation emerges when more attention is given to the connection between heritage and people. Due to differences in cultural, social, economic and political backgrounds, we are not able to assume that everyone automatically has a sense of belonging towards heritage and feels a responsibility to preserve it. The duty to preserve cultural heritage for future generations is not always intelligible to 'others' who disagree with the values embodied by heritage. For example, both the Taliban in Afghanistan and the Catholic residents in Segovia are the 'others' who hold divergent views on the decision to promote and preserve cultural heritage. They disregard the values of cultural heritage when decisions are made that go against their priorities. The choice of what to prioritize comes into play when people decide what is valuable and what is worth preserving according to their sense of belonging. Although I hold that we have a duty to preserve, I would not say everyone has the same duty to preserve if they do not share the same values and priorities as we do. Cultural and religious consents, profitability and personal interests are the incentives that might enhance self-heritage recognition and encourage willingness to preserve, but these might also be affected by choices concerning priority. Lastly, heritage 'is perceived as being preserved for all' (Lavoie, 2003, p. 3). The concepts of 'we' and 'others' do not signify mutually exclusive points of view, and it is fundamental for heritage preservation to balance different opinions to maximize the chance of successful preservation through a win–win solution where all stakeholder priorities can be comfortably satisfied.

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Mapping the Role of Jordan's Governmental Institutions and NGOs in the Inscription of As-Salt City on the UNESCO World Heritage

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Abstract

As-Salt City in Jordan has undergone four nomination attempts in the last 30 years before its successful inscription on the UNESCO World Heritage List (WHL) in July 2021. The first attempt was initiated in the 1990s by a local NGO which was deferred. This was followed by an international NGO in 1994, which did not reach further than putting the city on the tentative list. In 2016, local authorities took the lead in submitting another nomination which was also deferred. It wasn't until 2020 that the last nomination was successful with the city's inscription on the WHL. This paper provides new insights into how the concept of the Outstanding Universal Value (OUV) for As-Salt City has evolved during the subsequent nomination attempts and negotiated between different actors and with UNESCO. The roles of different actors in the nomination attempts are chronologically mapped to understand the conflicting priorities of different stakeholders and how these triggered various urban regeneration processes in the city. The results of semi-structured interviews conducted in 2020 with key stakeholders (including the nomination files' coordinators) are also presented to provide an understanding of the different actors' positions regarding the OUV and how this latter shifted over time.

Keywords

World Heritage List (WHL) · Stakeholder's role · NGOs · Outstanding Universal Value (OUV) · As-Salt City · Jordan

Acronyms and Abbreviations

UNESCO	United Nations Educational, Scientific and Cultural Organization
WHL	World Heritage List
OUV	Outstanding Universal Value
ICOMOS	International Council on Monuments and Sites
WHS	World Heritage Site
UN	United Nations
USAID	United States Agency for International Development
DDP	Distinctive Destination Program
NGO	Non-Governmental Organization
SGM	Salt Greater Municipality
ASCDP	As-Salt City Development Projects Unit
SDC	Salt Development Corporation
RSS	Royal Scientific Society
JICA	Japanese International Cooperation Study
CCSR	The City Core Special Regulation
MoTA	Ministry of Tourism and Antiquities

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1 Introduction

One of the most notable initiatives for cultural and natural heritage preservation that has reached universal recognition is the UNESCO 1972 World Heritage Convention (WHC) in France (UNESCO, 2020). This convention is widely recognized as the foremost instrument for identifying and protecting the outstanding cultural and natural world heritage within the World Heritage List (WHL) for present and

future generations (Rao, 2010). In order to be inscribed on this list, the nominated properties must meet the threshold of an Outstanding Universal Value (OUV), which is identified by UNESCO operational guidelines as '*cultural and/ or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole*' (UNESCO, 2019, p. 20). It is known that the evolution of the notion of the OUV was a result of the worldwide strategy and thematic studies in order to encourage a range of diverse typologies, cultures and public engagements, see (Aa, 2005) and (Jokiletho, 2008). However, Cameron (2020) and Rao (2010) reveal that with time, the interpretation in identifying World Heritage Sites has moved from the '*best of the best*' towards '*representative of the best*'. This would be contrary to the '*uniqueness*' factor that is crucial in the identification of the OUV (IUCN, 2006). Therefore, the interpretation of what constitute as an OUV is still under continuous discussion. This is in addition to how that OUV is negotiated within the international platforms such as the UNESCO and within different actors locally. Listing can interfere with many regeneration scenarios with regard to timing, location and/or the involved parties. On one hand, acquiring the WH status support receiving financial assistance and expert advice from the World Heritage Committee (UNESCO, 2020) increased international attention, improved tourism and a sense of national pride. On the other hand, the inscription might also include urban regeneration processes that will attempt to celebrate and consume the values assigned to the city once it is inscribed or even nominated on the WHL. In doing so, other heritage values are excluded (Cameron, 2020), and therefore it might unintentionally provoke urban issues such as gentrification, touristification, social exclusion and many others. These in turn lead to a reduction in the supply of affordable housing, as well as dramatically increase the number of visitors, emphasizing the sudden development of the tourism industry without much consideration to other equally important sustainability dimensions. Different stakeholders within the city will start following an agenda for development that correlates with their priorities and their understanding of city values including the OUV. Therefore, mapping the negotiation of different stakeholders' values and priorities during the nomination processes is particularly important in the process of WH nomination.

The case in focus in this paper is As-Salt City in Jordan. This is a timely case study due to its recent inscription on the WHL in July 2021 after four attempts in the last 30 years. The first attempt was initiated in the 1990s by a local NGO which was deferred. This was followed by

the Japanese International Cooperation Agency (JICA), an international NGO that managed to put the city on the tentative list in 1994, but never submitted or pursued the inscription any further (JICA, 2003). In 2014, the local authorities took the lead to submit another nomination file in 2016 focussing mainly on the tangible attributes of the site, consisting of a number of heritage buildings as representatives of an eclectic architecture in As-Salt during its golden era under the Ottoman Empire. This file was deferred in 2017 (Antonillie, 2015). It wasn't until the fourth attempt in 2020 with a completely different OUV focussing on intangible attributes (Urban hospitality and the harmony between religions) that the city was finally inscribed on the WHL in 2021 (Daher, 2019). What has happened in As-Salt during the subsequent nomination attempts and what will happen in the near future are extremely critical to understand how do stakeholders adhere, reject and prioritize certain values before and after the inscription on the WHL. The dynamics of the changing OUV and the different actors' relationships with the nomination process have resulted in the UNESCO WH listing to act as a powerful catalyst for urban regeneration projects in As-Salt. This has manifested in the fluctuation of key actors' roles and decisions with regard to urban policies, revitalization and regeneration projects, especially towards the tourism sector to ensure the successful inscription on the WHL. The nomination itself has created aspirations for a new horizon of mega-scale projects such as the initiation of a series of uncoordinated urban development projects, scattered in the city centre (ASCDP, 2016). These urban actions include the acquiring and demolishing existing mixed-use buildings in the city centre for developing tourism-oriented projects that are out of scale and not sympathetic to the nature of the city. It also led to the displacement of two primary schools, apartment buildings, institutional and religious buildings, monasteries and a local market to the suburbs. This has altered the liveliness of the centre by alienating the local community and removing a part of its intangible heritage associated with the place affecting the social and cultural qualities. As-Salt case study is a unique opportunity to observe the conflicting priorities of different key actors for the future urban regeneration of the city that has already started even before the city's nomination on the WHL is confirmed, and the evolution of those values during and after the inscription in 2021. It provides new insights into how the concept of the Outstanding Heritage Value for As-Salt City has evolved, as promoted by different actors locally and negotiated with UNESCO. Finally, it highlights the role of different factors (e.g. funding, managerial system, etc.) in changing and influencing the decisions associated with urban regeneration processes in WH listing.

2   Methodology

The city of As-Salt is used as a case study offering a living laboratory where the roles of different actors in the four subsequent World Heritage nomination attempts (1993/94, 2003/2004, 2014/16 and 2019/20) are chronologically mapped. A layered investigation of stakeholders' values for the last 30 years (1991–2021) since the very first nomination attempt has started. Chronological content analysis is selected here to map and trace the nomination history and link the variable factors influencing the shift in the OUV within the different files. This is also linked in the change of the heritage discourse—due to the emergence of new values or the disappearing of others—on the Urban regeneration projects in the city. Both secondary and primary data were collected, this includes archival research of maps illustrating the transformation of the site as well as direct observation and photographic records of the site. A series of interviews with governmental and non-governmental key stakeholders were also conducted in November 2020 while the city was nominated but not yet inscribed on the WHL. The interviewed stakeholders are as follows:

- Four representatives from governmental institutions including the Municipality of As-Salt (SGM)/As-Salt City development projects unit (ASCDP), and the Directorate of Tourism and Antiquities (MoTA).
- Two interviews with the most active NGOs in As-Salt: Salt Development Cooperation (SDC) and the Royal Scientific Society (RSS).
- Five interviews with well-established academics and experts of As-Salt City.
- Three interviews with the experts who were involved as coordinators of the different UNESCO world heritage nomination files were submitted in 1994, 2016 and 2020.

- Fifty representatives of the local community living and/or working within the boundaries of As-Salt City centre. The local community sample consisted of 28% of traders and merchants from the city centre, 39% of local residents, as well as 33% of school and university students. 40% are female and 60% percent are male participants. In terms of religion, 88% of the community interviewees are Muslims and 12% are Christians. The age groups are 6% less than 20 years old, 58% between 20 and 40 years old, 22% between 40 and 60 years old and finally 14% are more than 60 years old.

Within the unprecedented events brought about by COVID-19 pandemic, all interviews were conducted using Zoom online platform. A link to a self-administered questionnaire was circulated to the local community members of As-Salt via (WhatsApp) as the most accessible online platform that is convenient to the participants. This sample was reached mainly through the most relevant NGO (Salt Development Corporation), the Municipality licensing department and Balqa Applied University. The data was analysed using chronological content analysis. To facilitate the process of extracting information, the researchers used the qualitative data analysis tool NVivo 12 software to code responses, and link them to the existing data in order to cover the gaps in the city's nomination history.

3   As-Salt City Nomination on the WHL

As-Salt City in Al-Balqa Valley in Jordan occupies a historically strategic position in relation to trade routes and networks. It is located at the intersection of the Amman Jerusalem Road and with Al Hijaz Railway Station (Daher, 2019), see Fig. 1. The establishment of a castle at such
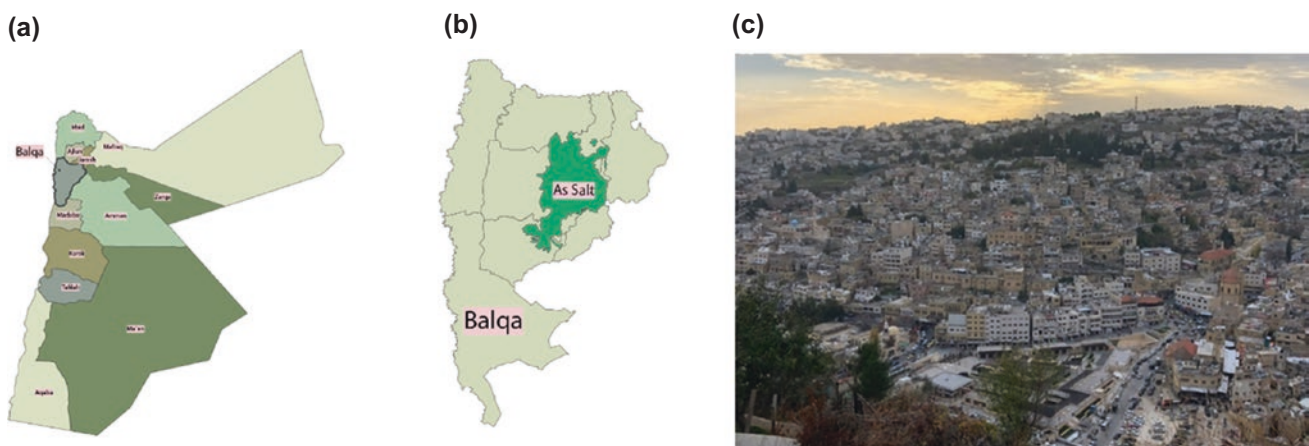

Fig. 1 **a** Balqa Valley location within Jordan (Daher, 2019); **b** As-Salt location within the Balqa Valley (Daher, 2019). **c** A view for As-Salt City centre taken from Al-Salalem Mountain (ElFaouri, 2020–2021).

Fig. 2 **a** As-Salt Golden architecture; **b** Elderly playing the traditional game of Manqala in Sahet Al-Ain; **c** Hammam Street market; **d** Urban townscape of As-Salt showing the harmony of Muslims and Christians (ElFaouri, 2020–2021)

an early date as the second millennium BC indicates that the area has been inhabited for a long time (Shair et al., 1981). As-Salt City is the first civilized urban settlement in Transjordan and was a regional Ottoman capital on the East Bank of the Jordan River (Antonelli, 2016) and a thriving urban southern Ottoman frontier (Daher, 2019; Fakhouri & Haddad, 2017).

The city of As-Salt is exceptional because it still has a vibrant living tangible and intangible heritage which makes it different from any other Jordanian cities such as Jerash and Petra, where heritage sites are on the outskirts of the cities (Noriaki, 2014). The city was established during the Ottoman *Golden era* estimated between 1865 and 1925 when an élite of merchants—mostly coming from Nablus/Palestine—played a significant role in its development (Khirfan, 2013). They were interested in the region because of its safety and strategic location on the trade routes under the Ottoman administration (Antonillie, 2015). These merchants formed an emerging social class with their significant fortune gained from trading farming products within the markets of the Levant, the Ottoman Empire and Europe. This new middle class upgraded the settlement from an agricultural village to a sophisticated city (Noriaki, 2014). The new city was a cluster of ornamented yellow limestone structures built with the local stone of As-Salt Quarries, known for its high workability. As-Salt has currently 657 buildings that were built in that golden era according to the study made by the Royal Scientific Society (RSS) in 1991. This is considered as the largest number of heritage buildings in one city within Jordan in terms of the density of heritage buildings per geographical area (RSS, 1991). Furthermore, people of As-Salt continue to carry the daily lifestyle and hospitality spirit including the behaviour with guests and generosity, see Fig. 2c (Daher, 2019; Noriaki, 2014). The traditional game of Manqala in played in Sahet Al-Ain, see Fig. 2b. The urban townscape of As-Salt is also an evidence of the harmonious coexistence of Muslims and Christians, see Fig. 2d. Therefore, As-Salt has been found by many worthy of being on the UNESCO WHL, the next

section presents the four subsequent attempts that were made for the city by different stakeholders.

3.1 (1993–1994): The First Attempt to Nominate the City on the WHL by the Royal Scientific Society (RSS)

As-Salt was the first city in Jordan to receive initiatives in order to study and preserve heritage (Fakhouri & Haddad, 2017). It all started when As-Salt Development Corporation (SDC) was established in the early 80s as a non-profit association and an active NGO. SDC was an initiative by a number of popular and powerful civil society members keen to keep the tangible and intangible heritage of As-Salt, and assisting the inhabitants' aspirations for an urban, social, cultural and industrial development (SDC, 2020). SDC was the primary umbrella for civil society organizations that sponsored the implementation of different initiatives and studies for heritage preservation in the city centre. Its first initiative in the 1980s consisted of approaching a high-end architecture and engineering company in Amman (Dar Al-Handaseh) in order to develop a master plan between 1984 and 1986 for the historic town. In 1989–1990, SDC collaborated with As-Salt Greater Municipality (SGM) and approached the Royal Scientific Society (RSS)—another NGO based in Amman—in order to conduct a survey and to document the architectural and urban heritage of As-Salt. This study was funded by the Ministry of Planning (MoP) and was the first comprehensive effort to understand the values and details of the architectural and urban heritage of As-Salt (Daher, 2019). This was followed by a project funded by the USAID to enable SDC in order to start the '*First Tourism Development Project*' between 1990 and 1994. The project started with the first rehabilitation of As-Salt small mosque in Hammam Street, see Fig. 3a. It was then followed in 1991 by a project to restore Toukan building on Al-Midan Street for adaptive reuse to operate as As-Salt Antiquities Museum through the architectural

Fig. 3 First Tourism Development Project **a** The small mosque restoration **b** Skafea Street before and after the USAID project (RSS, 1991)

office of Tahan and Bushnaq in Amman (ASCDP, 2016). This project also included enhancing the visual appearance of the urban spaces by restoring/rehabilitating the facades of the heritage buildings in Hammam Street and unifying the buildings' appearance by introducing standardized wooden doors, shutters, shading devices and signage, see Fig. 3b.

The first WH nomination file was submitted by the Royal Scientific Society (RSS) in 1994 under the title of '*The Old City of As-Salt*' (UNESCO, 2021). While working on the city during the early 90s, the RSS recognized the potential of the city to be inscribed on the WHL, the main aspects covered by the OUV were the historic core urban fabric including the landmarks from the city architecture that is dated to As-Salt *Golden Era* in the late eighteenth century and the early nineteenth century. The file focussed on the spatial configuration of the stairs, roads and heritage buildings. This nomination was examined by the Bureau of the WH committee, who adopted the following decision at its 19th session:

> The Bureau decided to defer this proposed nomination until such times as the State Party is in a position to confirm that appropriate protective measures, based on the Plan of Action of 1990, have been adopted and are being effectively implemented (ICOMOS, 2021).

This deferral has marked the end of the first attempt, and the end of the RSS work in As-Salt. The file was never resubmitted or examined in the following years.

3.2 (2003–2004): The Second Attempt to Nominate the City on the WHL by the Japanese International Cooperation Agency (JICA)

In 1994, Jordan signed the peace treaty with Israel which influenced the nature of developments proposed by international donor agencies and adopted by national

policymakers. It is important to illustrate that this peace treaty marked the beginning of international donors' interest to invest in tourism in Jordan and in As-Salt (Daher, 2005). In the years 1994–1996, the Japanese government through its donor agency JICA conducted a study in the title of *the tourism development plan in Jordan* which promoted the enhancement of country's tourism industry (JICA, 2003). This included the urban heritage and tourism development projects in the cities such as the *Historic Old Salt Development*, *Amman Downtown Tourist Zone* and *Karak Tourism Development*. JICA also funded *the second tourism development project* in 2004–2007 headed by the Ministry of Tourism and Antiquities (MoTA) (Khirfan, 2013). This project included renovating street facades, pedestrianizing Hammam Street, adjusting buildings' entrances, paving schemes, designing stormwater schemes, constructing tourist outposts, rehabilitating 7 km tourist corridors and furnishing four public squares, see Fig. 4b for the stair pavement schemes (Sa'id & Khattab, 2018). The project also included the rehabilitation and of the Abu Jaber heritage house to a *museum of daily life* also called *Historic Old Salt Museum* (Daher, 2005), see Fig. 4c.

JICA also saw potential in As-Salt to be put forward on the WHL, so they attempted to prepare a file for the city in 2003 under the title '*The Old City of Salt*' but the file was never actually submitted or published (JICA, 2003). ICOMOS evaluation report showed that the city has been put on the tentative list on 13 January 2004 which indicates a strong level of commitment in submitting the file (ICOMOS, 2021). However, the file was overlooked and was not supported by the local authorities. The OUV submitted in this file was based on As-Salt being the only example that can represent the culture and history of modern Jordan. It has been the first capital of Jordan and contains the most intact piece of the urban fabric, as well as

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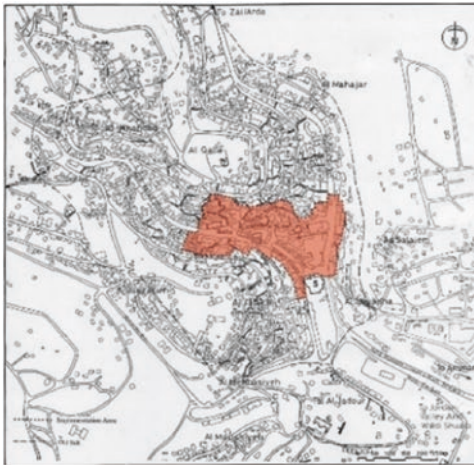
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Fig. 4 **a** JICA proposed property to be nominated on the WHL (JICA 2003). **b** The second tourism development projects by the Ministry of Tourism and Antiquities (MoTA) (JICA, 2003)—the location of renovated stairs, **c** Historic Old Salt Museum

the closeness and warmth of its inhabitants that are part of Jordanian culture, see Fig. 4a for the proposed property (JICA, 2003). Both nomination attempts (RSS in 1993 and JICA in 2003) have focussed on the city's urban morphology and building typologies as the key aspects of forming the OUV. However, JICA file did also highlight the intangible heritage attributes which were later considered important in the latest nomination file and formed the essence of its OUV. After this attempt, the nomination of As-Salt was closed for 10 years till 2014.

3.3 (2014–2017): Municipality-Led Application to Nominate As-Salt on the WHL and Mega-Scale Urban Regeneration Projects

This phase marks the beginning of the authority's sensitive attention to the city's cultural heritage, and the beginning of large-scale urban regeneration projects within the city centre, hence the introduction of new actors interested to be involved in As-Salt. The administrative mechanisms in As-Salt Municipality changed in 2005 when As-Salt Greater Municipality (SGM) decided to build its institutional capacity by creating As-Salt City Development Projects Unit (ASCDP). This is a specialized unit for the management of the city centre within the organizational structure of the municipality that enjoys complete financial independence and is managed by the head of the executive committee and supreme steering committee (ASCDP, 2016). One of the connections between the ASCDP and the previously mentioned SDC is that they both have the same chairman as the head of the higher steering committee of ASCDP and the president of SDC. The mayor of As-Salt

greater municipality is the head of the executive committee for ASCDP right under the head of the steering committee (SDC, 2019). Since the establishment of this unit, ASCDP became the main umbrella to initiate and engage with the management of the heritage sector instead of SDC (the NGO) which shifted its focus to tourism and the development of local community enterprises. The points of strength of the ASCDP unit included having the managerial governance since it is executively under the umbrella of the municipality, but in the same time, having also more financial flexibility than the governmental departments. This made it easier to make decisions and get approvals. Since then, mega-scale development projects started being visible (ASCDP, 2016).

The mega-scale projects started in 2008–2012, MoTA and the local municipalities initiated the '*The Third Tourism Development Project*' funded by the World Bank (WB3) (Fakhouri & Haddad, 2017). A high-end architectural company based in Amman called *Bitar consultancy* designed a project in 2005 that aimed at reviving the urban centre of the city from an economic and social point of view and linking it with the surrounding urban spaces (Khirfan, 2013). The project included the removal of three existing modern administrative buildings (the police station, the post office and the Education Ministry building) that were erected in the 60s as well as the great mosque. The demolitions was done in order to expose and clean the three heritage complexes behind them, and design a new plaza with contemporary impressions. This is in addition to the demolition and reconstruction of As-Salt Great Mosque (Fakhouri & Haddad, 2017). It is important to highlight that Sahet Al-Ain public space is a site of historical significance in As-Salt. The demolished buildings were built in the 60s after the demolition in 1965 of Ottoman buildings by the

Fig. 5 **a** Sahet Al-Ain project (before and after), **b** The reconstruction of the great mosque (before and after) (ASCDP, 2016), **c** The archaeological findings under Sahet Al-Ain Project (Fakhouri, 2017)

Council of Ministers of that period (Tarif, 2015). These buildings include the Saraya in the Kurdish quarter which was built in 1889 and housed the Ottoman governor's offices, the court for the district, and was the meeting space for the municipal council (Daher, 2019); the Great Mosque (next to the English Hospital) and Wekalet Al-Sukkar along with other heritage buildings (Tarif, 2015). Archaeological remains under the Sahat Al-Ain Plaza were found during construction, but were buried and were not taken into consideration as another layer of the history of the site that can add to the city's heritage values, see Fig. 5. In fact, in 2010, some of the downtown workers from the local community held a strike to stop the acquisition and demolition of the commercial buildings, where their shops were located (Fakhouri & Haddad, 2017). The demolition did indeed make some beautiful Ottoman buildings visible and reduced traffic to the city centre. However, the link between Sahet Al-Ain and the heritage buildings could have been done and the visual enhancement of the environment around the plaza could have been achieved without the need for completely demolishing all of the governmental buildings of the 1960s which are in themselves an architectural heritage of that era. As to the mosque enhancement scheme, the new facelift for the Mosque with the added floors exaggerated the scale of the building. This project is an example of stakeholders' priorities at the time that focussed on the tangible heritage that belongs to the golden era only and neglects archaeological evidence, the history of the site and the needs of the local community and its attachment to the site.

In 2010–2012, JICA started a basic Survey for As-Salt cultural resources under the *Japan Overseas Volunteers Cooperation* (JOVC/JICA). A catalogue of 1019 heritage buildings and sites was published, providing basic information about the materials used, the buildings' numbers and locations, the state of conservation (Fakhouri & Haddad, 2017). The work of JICA was followed with '*Salt*

Eco-museum (SEM) Plan: For Sustainable Community Development'. A concept that was based on the interaction between visitors and the local population (i.e. addressing local cuisine and ways of living by introducing guests to the authentic traditional houses of As-Salt). Three trails were implemented within the project: harmony trail (re. coexistence), daily life trail (re. living traditions) and educational trail (re. the various schools). The eco-museum's information and interpretation centre is located at the *Historic Old Salt Museum* as a point of departure for visitors, where leaflets and brochures are distributed. Trained tour guides from the local community accompany the visitors through the different features of the historic city (SDC, 2019).

Furthermore, in 2012–2014, *CulTech* office for heritage and conservation in cooperation with SGM started '*Heritage4Development (H4D)*' project. This project has led to the finalization and official approval of a register for historical sites and buildings in As-Salt. Around 4400 buildings were surveyed and a Geographic Information System (GIS) database was produced through the World Bank project and the EU-funding scheme (Cultech, 2014). The grading system used in the GIS database to evaluate and assess the heritage buildings into 5 tiers, see Fig. 6a. The criteria used for grading refer to the significance of the building (architecturally, historically, etc.) and with the levels of interventions. In addition, a manual was developed for the preservation of the historic city centre, including related cards for conservation action (Cultech, 2014), see Fig. 6b.

In 2014, the nomination of As-Salt on the WHL has been led by As-Salt Greater Municipality (SGM) who doubled its efforts and dedication to complete the nomination process. This was partially due to the change of the administrative mayor of As-Salt Municipality who was enthusiastic about the heritage of As-Salt. SGM requested help and advice from UNESCO office-Amman to recommend an external expert. A well-experienced Italian expert was appointed
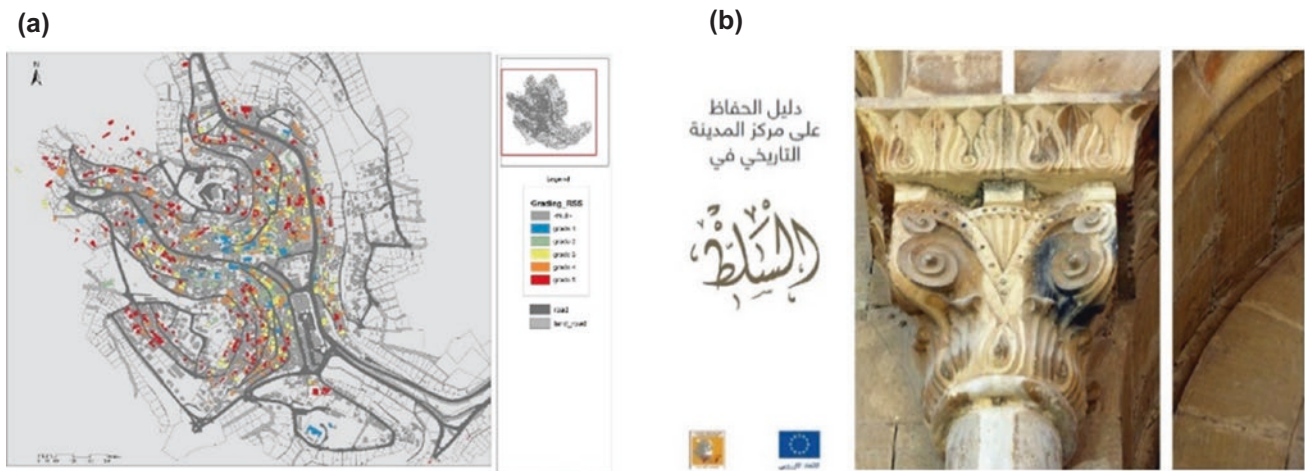
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Fig. 6 **a** GIS Grading of heritage buildings (ASCDP, 2016), **b** As-Salt manual for the preservation of the historic city (Cultech, 2014)

by the UNESCO to provide technical support and cooperate with the Jordanian government and complete an assessment of opportunities and strengths for a potential OUV for As-Salt that can lead to a successful nomination on the WHL. The municipality took the lead in regenerating the city heritage centre by introducing mega-scale development projects starting with Oqbe Bin Nafe' urban project. The project was initially proposed in 1991 by RSS and was followed in 2007 by the acquisition of mixed-use buildings in the area including a school through compulsory purchase by the municipality. These existing buildings were demolished. However, several building owners refused to sell and evacuate the site and went to court to settle the compensation amount. This process was concluded in 2014 when the decision was made in the favour of the municipality (ElFaouri, 2020–2021). During the 7-year time gap (2007–2014), the site of the demolished school remained as open space, used as an unofficial car park with a capacity that exceeded 300 parking lots. Oqbe Bin Nafe' school was built in the late 1950s and started its operation in 1960s.

The decision to demolish it was controversial, particularly among researchers and academics. It was the only primary school at that time inside the city centre (Shomali, 2014), with a building that was reminiscent of the 1960–70s modern architecture heritage, especially on an institutional level. This is another example that illustrates how the yellow limestone buildings of the Ottoman era took priority as well as the UNESCO nomination at the expense of other forms of heritage buildings such as the 1960s school which was demolished despite its historic and architectural value in the collective memory of many generations within the city. Other than the school, the municipality and ASCDP unit have managed to complete the compulsory purchase and the demolition of all existing buildings within the urban area of 13,900 square metres known as Oqbe triangle, see Fig. 7. The design of the new project was done by a high-end architectural and engineering office in Amman called *Dar Al-Handasah*. The project includes a visitor centre, open landscaped urban spaces and an underground parking project, it also includes the pedestrianization of a street

(a)   **(b)**   **(c)**

Fig. 7 **a** Oqbe Bin Nafe' project: phase one/location (ASCDP, 2016). **b** Oqbe Bin Nafe school and surrounding buildings in the early 90s (Shomali, 2014). **c** The designed project (ASCDP, 2016)
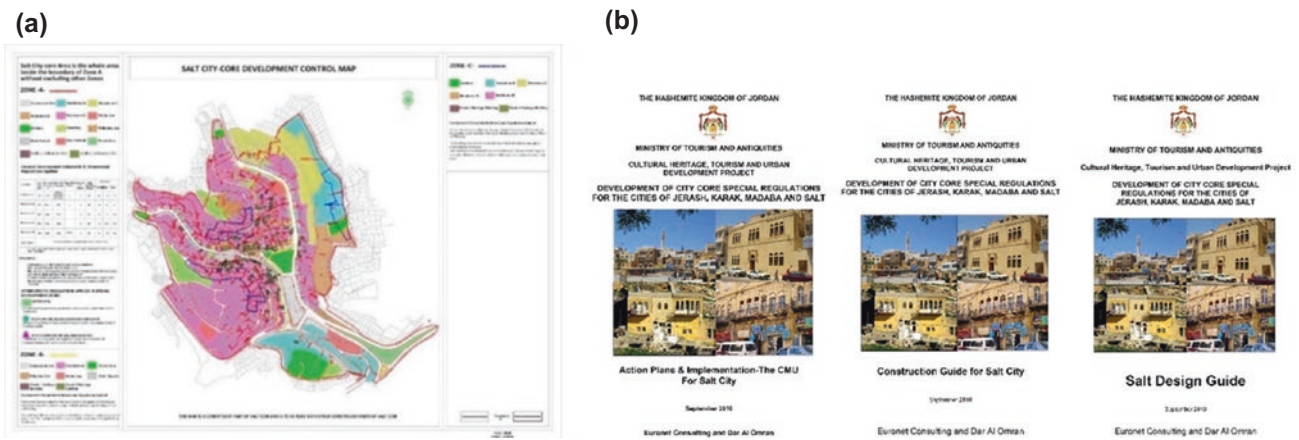
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Fig. 8 **a** As-Salt City Core Development Control Map and Land use. **b** Accompanied guideline volumes (Euronet & Al-Omran, 2010)

adjacent to the project (ASCDP, 2016). The designed shops in the new project were intended to be allocated for the beneficiaries and merchants of the local community who were occupying the site before its demolition. However, the number of the new shops is much lower than the demolished ones. This project has therefore attracted strong criticism from the local residents and shopkeepers in the city centre and raised questions on its economic and cultural impact for the local community (Shomali, 2014).

On 24 March 2015, a delegation of As-Salt municipality with UNESCO representatives from Jordan hosted an official ceremony under the patronage of senators and Ministers, as well as the Department of Antiquities (DoA). The ceremony aimed to present a road map for the preparation of the WH nomination file for As-Salt. This road map outlined the steps that need to be taken by the government to ensure the success of the future nomination through the cooperation of different institutions with different mandates (UNESCO, n.d.). To prepare for the nomination, the *City Core Special Regulations* (CCSR) were endorsed in 2015 by the Ministry of Municipalities and Rural Affairs, the Higher City Planning Council of Jordan and As-Salt Greater Municipality. The aim was to provide the city with the necessary technical and managerial support and commitment that are needed to nominate the city on the WHL (Antonelli, 2016). The CCSR were introduced to complement existing laws such as Jordan heritage and archaeology protections laws; the cities, villages and buildings planning law No.79 of 1966, the antiquities law No. 21 of 1988 and its amendments, and the law of architectural and urban protection no.5 of 2005 (ASCDP, 2016). In fact, these CCSR were introduced between 2008 and 2010 to several historic towns in Jordan such as Jerash, Karak, Madaba and As-Salt. However, As-Salt was the only city that endorsed and followed them in 2015 (Fakhouri & Haddad, 2017). Furthermore, the CCSR included a land-use control map,

see Fig. 8a and various volumes including an analysis report, a construction guide, a design guide, a guide for public realm and an action plan, see Fig. 8b.

The nomination file was submitted in 2016, under the title of 'As-Salt Eclectic Architecture (1865–1925) Origins and Evolution of an architectural language in the Levant' with seven volumes of supportive documents. The nominated properties consisted of 22 buildings scattered around As-Salt historic city centre as a representation the city's outstanding universal value, see Fig. 9. A unique architectural language which can be considered as important evidence of the flow of knowledge within the Ottoman Empire (UNESCO, 2015). This nomination file was fully supported by the local authorities with a generous budget allocated to it, followed by additional grants and funding opportunities to support the launch of the nomination road map.

Immediately after the submission of the nomination file, As-Salt was the first Jordanian city to win the *Distinctive Destination Program* (DDP) in 2016 organized by the Ministry of Tourism and Antiquities (MoTA) and the United States Agency for International Development (USAID). Funds and enterprises were allocated to the local community and the municipality to develop tourism facilities. USAID has described it as '*tourism development programme to offer visitors experiences that reflect its unique heritage and attractions*' (JordanTimes, 2017). Furthermore, the municipality started producing documentation books and flyers, it already published three books in 2016, 2018 and 2019, respectively (ASCDP). As the 2016 nomination file was mainly focussing on the eclectic architecture of a number of important buildings in the city, local authorities were more interested in getting grants/ funds to restore and rehabilitate those nominated landmark buildings. As-Salt municipality had already acquired two of the heritage buildings (Al-Jaghbeer house and Falah Al-Hamad) through compulsory purchase and is planning to
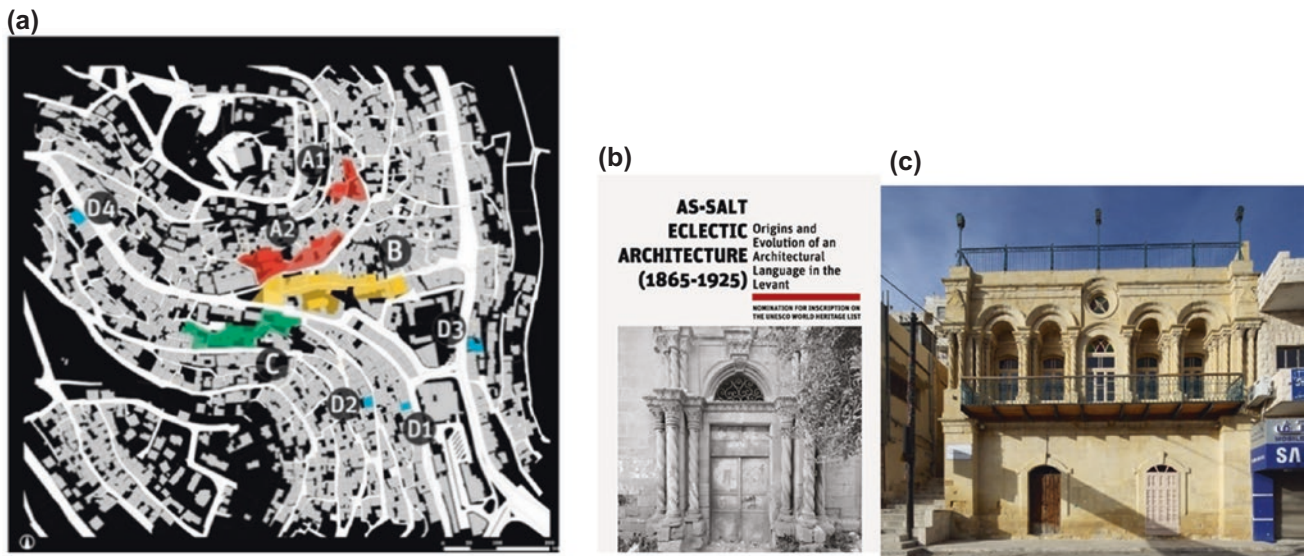
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Fig. 9 **a** As-Salt world nomination file in 2016 'As-Salt Eclectic Architecture (1865–1925) Origins and Evolution of an architectural language in the Levant' (Hanna, 2015), **b** The nomination file, **c** Moasher House which was one of the buildings nominated in the file

rehabilitate them as a digital museum and a heritage renovation academy, respectively (ASCDP, 2016). Several rehabilitation and adaptive reuse projects were initiated by the private sector such as the opening of many cafés, restaurants and guest houses (e.g. Gerbal restaurant, Eskandarane café, Beit Aziz bed and breakfast, and many others) which supported the increasing internal tourism.

In July 2017, the tourism minister headed Jordan's delegation to the 41st session of the UNESCO's World Heritage Committee, in the Polish city of Kraków. Despite all efforts put in place, the advisory body of the International Council on Monuments and Sites (ICOMOS) overruled the nomination of As-Salt in 2017 and suggested not to inscribe the site. However, after numerous stakeholder lobbying, this was later overturned by the amendment of allies to *deferral* during the world heritage committee session (WHS, 2020; ASCDP, 2016).

> In Decision 41 COM 8B.13, the World Heritage Committee deferred the nomination to allow the State Party to: a) Develop a comparative analysis including similar properties in the Levant and in the area of influence of the Ottoman Empire, b) Redefine the criteria, in order to demonstrate what makes this architectural heritage important or exceptional among other historic cities in the region, as the cradle of a new amalgamated expression of different styles, c) Modify the boundaries of the nominated property, in order to be read as parts of a coherent whole, d) Further elaborate on the definition of the Outstanding Universal Value of this architectural heritage, in order to be considered an exceptional case in the process of modernisation (ICOMOS, 2021, p. 1).

ICOMOS had many concerns regarding the nominated properties for not being able to be read them as a coherent urban whole, but rather fragmented urban parts (UNESCO, 2017). ICOMOS states that the authenticity of the buildings

is at risk due to the fragmented quality of the selected components without showing how these buildings may connect, as well as not having a comprehensive proposal for the urban landscape treatment. Rather, it focussed on the architecture of the buildings as scattered and separated components without paying attention to the public spaces, squares and corridors that link these buildings and play a vital role in reviving the city (Zalloom & Tarrad, 2020). The records highlight that the nominated buildings are considered authentic as regards to the architectural forms, styles, designs, decorations and materials which reflect the Levant architectural style. However, there were concerns about the urban landscape and the manner in which contemporary usages reflect their original use (Almatarneh, 2013).

Concerns were also raised on the definition of the OUV that does not represent an exceptional case within the influence of the Ottoman empire. ICOMOS Decision (41 COM 8B.13) asserts that a buffer zone is essential to link the nominated buildings and integrate them together (UNESCO, 2017). Many scholars and researchers commented that the file neglected important assets from As-Salt intangible heritage such as the harmony between Muslims and Christians and the importance of the public squares, the paths and the stairs as key elements in linking the city centre with its surrounding neighbourhoods and in giving the city its unique identity, see Almatarneh (2013); Zalloom and Tarrad (2020). Local plazas and streets such as Al-Ain Plaza and Hammam Street are the beating heart for the city, a liveable space that connects the city centre with its neighbouring areas, a space where people socialize and elderly sit and practice their favourite hobby, playing the game of

Manqala (a Turkish game introduced to the city more than 500 years ago), all this collective memory should play a role in the nomination file (Almatarneh, 2013).

3.4 (2019–2021): The Successful Inscription on the UNESCO WHL Led by As-Salt Authorities

One year following the deferral in 2018, a second attempt for nomination was submitted in February 2019 with completely different heritage values, different experts and different files (UNESCO, 2021), see Fig. 10. The state party including mainly As-Salt Greater municipality (SGM), decided to hand the file over to a local expert, *Dr. Rami Daher* from *TURATH: Architecture & Urban Design Consultants*. The new file started from a new blank page, dismissing completely the previous file. The new OUV of the 2020 file depends on criteria ii, iii and was associated to the strong link between its intangible attributes (tolerance and co-habitations among Muslim and Christian communities, urban hospitality and socio-urban welfare system) and tangible attributes (significant architecture and urban morphology) during the *golden era* of the city (Daher, 2019). It is important to highlight that while the file submitted in 2016 had a conservation plan based on the preservation and restoration of the 22 buildings within the following 5 years, the 2020 file conservation management plan focussed on the urban revitalization of the city.

This new nomination file is under the title of 'As-Salt: The Place of Tolerance and Urban Hospitality' (Daher, 2019). It was marked as incomplete in 2019 due to not following UNESCO nomination strict format (technical

reason). However, the same file was submitted again in February 2020, with the required format (Daher, 2019). ICOMOS as the advisory body for UNESCO asked for additional information including an additional comparative analysis that was delivered shortly after in February 2020. A meeting with ICOMOS board took place in the Ministry of Tourism through Skype in October 2020, in addition to representatives from different other Ministries. ICOMOS was satisfied with the new file and recommended a reviewer/expert to visit the city. The visit was postponed several times due to the COVID-19 Pandemic, and finally took place in early December 2020 (ElFaouri, 2020–2021). On 18 March 2021, the advisory body (ICOMOS) report recommended that As-Salt be inscribed on the WHL on the basis of criteria ii, iii (ICOMOS 2021), and in 27 July 2021, the World Heritage Committee of the United Nations Educational, Scientific and Cultural Organization (UNESCO) voted to inscribe the Jordanian city of As-Salt as '*the Place of Tolerance and Urban Hospitality*' on the World Heritage List. This news was celebrated around Jordan as an important national achievement (Albawaba, 2016).

This last round of As-Salt nomination also triggered more urban regeneration projects that focussed on the beautification of the city's urban fabric and the improvement of the tourism infrastructure. *Oqbe Bin Nafe'* Project—mentioned earlier—was followed in 2018 by a second project phase (Oqbe Bin Nafe' phase 2), and a third phase (Oqbe Bin Nafe' phase 3) in 2019 and 2020, respectively, see Fig. 11.

In phase 2, SGM decided to extend the project to include several multi-story buildings (5–7 floors), demolish them and design an extension of public plazas with sitting areas and one-story shops. Phase 3 included the SGM acquiring the Latin school that surrounds the Latin church at the rear

(a)

(b)

As-Salt
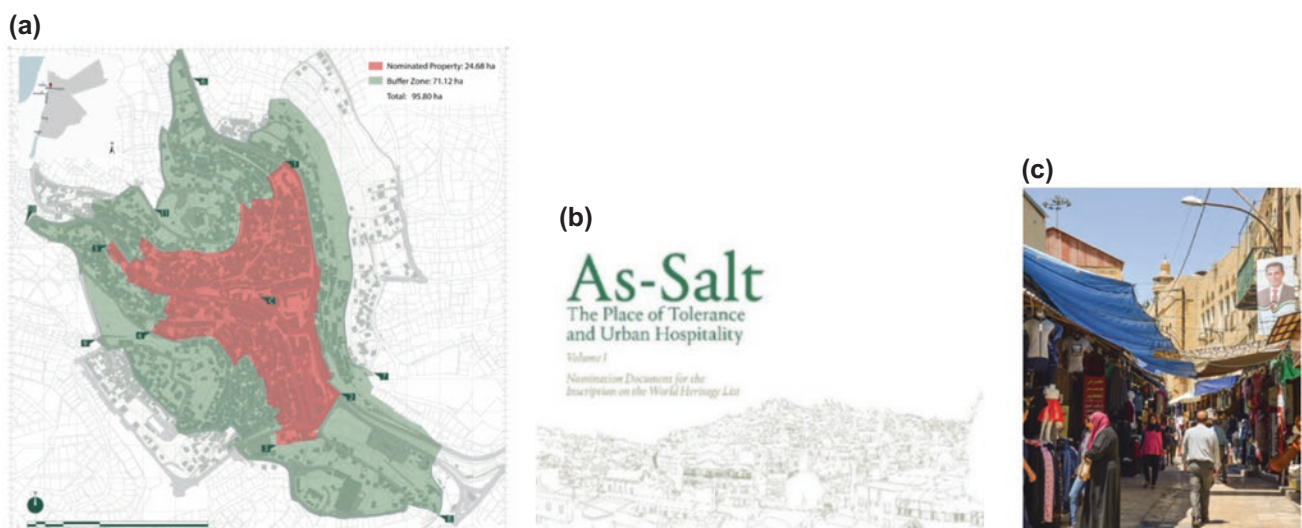The Place of Tolerance
and Urban Hospitality

(c)

Fig. 10 As-Salt World Heritage Nomination File in 2019 in the title of 'As-Salt the Place of Tolerance and Urban Hospitality' (UNESCO, 2020). **a** the nominated property, **b** the nomination file cover, **c** local lifestyle in As-Salt (Daher, 2019)

Fig. 11 Oqbe Bin Nafe' project phase 1 highlighted in green, phase 2 highlighted in red and phase 3 highlighted in yellow (ElFaouri, 2020–2021)

Fig. 12 **a** Oqbe bin Nafe' Project phase 1: the closed gates of the project, **b** Oqbe bin Nafe' phase 2: the start of the construction process, **c** stalls and informal parking (El Faouri, 2022)

of the project to demolish it and widen the open spaces as well as exposing the church. The researcher's visits to the site in March 2022 revealed that although Oqbe Bin Nafe' project phase 1 was completed in 2021, all the project gates are closed and there is no accessibility to the site facilities nor the shops it possesses, see Fig. 12a. In fact, it was elaborated in the interviews that the merchants who were offered to take the shops in the on-ground projects refused to resume their agreement with the municipality due to the high rent and operation expenses and preferred to take their business elsewhere. Even though phase 1 is not operating as

designed, phase 2 has just started the construction process without carrying out a risk assessment or SWOT analysis of why the project is closed and what other considerations are to be taken in phases 2 and 3. During the prolong time that these urban projects have taken, construction areas are used as informal parking and stalls, see Fig. 12b, c. The role of UNESCO here is also unclear as the project is in the heart of the inscribed property, the only contact UNESCO made with the state party is regarding the allocation of a site manager that will be responsible to develop the monitoring report which will start 3 years after the inscription.

4 Investigating Key Stakeholders' Perspectives Towards the World Heritage Nomination in November 2020

By interviewing one of the first nomination file coordinators (1993/1994), it was explained that the shortcomings of this file were: first, there was no GIS database to geographically set the boundaries and specify the site coordinates accurately. Second, there were not enough laws protecting the site, the file was done by an NGO and not supported by the local authorities, and therefore the suggested 1990 action plan that accompanied the file, which was the basis of the management plan, couldn't be adopted (WHS, 2020). Third, the integrity was affected by the *modern building* integrated into the site (ElFaouri, 2020–2021). Therefore, the file was not successful, and it was not manageable to fulfil those shortcomings within the following few years. Authorities at the time lacked the resources needed to guarantee the inscription and that also continued to the second nomination attempt by the other NGO (JICA).

It wasn't until 2014 that the municipality took serious commitments towards the nomination. During the interviews regarding the two attempts led by the municipality, it was elaborated that the reasoning behind the shift in the OUV from the 2016 file to the 2020 file was a political and technical decision above all since the 2016 file was not going to succeed. During the 41st session of the World Heritage Committee in 2017, there was a side meeting with Jordan officials, Jordan ambassador, representative of ICOMOS international and the chief of evaluation section. It was concluded in that meeting the necessity to work on other OUV possibilities like intangible heritage. The directives of the WHC recommendations were to take care of the various features and the dynamics of the city and link them with urban elements of the site in order to emphasize the

historical story of the city. One of the Lebanese consultants/reviewers elaborated the need to emphasize the intangible values of heritage as the 2016 file '*did not catch the essence of As-Salt*'. The 2016 file coordinator stated that: '*This change was legitimate, while the first file was stronger in terms of the uniqueness, as hospitality can be found in other cities in Jordan, but it was needed to include intangible issues that were not highlighted clearly in the prior file*'. On the other hand, the 2020 file coordinator stated '*there was no management plan submitted in 2015*' (ElFaouri, 2020–2021). The fact is, there was a management plan, however, it was relying on the input of the CCSR which was at that time recently endorsed by law. In 2020, a detailed management plan was added with clear policies and strategies that addressed future awareness, maintenance, conservation, renovation, training, as well as different relevant to the architectural and urban settings (Daher, 2019).

According to multiple researchers and academics '*a group of Salti experts started to volunteer to help conserving the city in the 2014–2017 WH nomination file but were never followed on, all efforts to local experts reaching out to put their experience to help the city were eventually discouraged and never based on*'. When authorities (SGM, MoTA) were asked whether the community was involved in the WH nomination files, they stated that there were a few meetings with presentations about the WH file submitted in 2016, but these meetings were not systematic. However, when the local community interviewees were asked about the level of community participation in the heritage-led urban regeneration project, half the respondents mentioned that they have rarely or never been consulted or invited to participate in decision-making processes about the future of their city centre, see Fig. 13. Only 16% of the respondents did acknowledge some form of public consultation taking place, such as public awareness events and announcements of projects through social media.

The results of the local community questionnaire revealed that 40% of the respondents were not aware of the nomination file being submitted to inscribe the city on the WHL. However, the majority of the respondents (60%) were generally very eager for As-Salt City to be on the WHL. They predicted that the successful inscription would provide the following advantages, see Fig. 14.

Fig. 13 Responses from the local community on the existence of any community participation in the heritage-led urban regeneration in As-Salt (n = 50) (ElFaouri, 2020–2021)
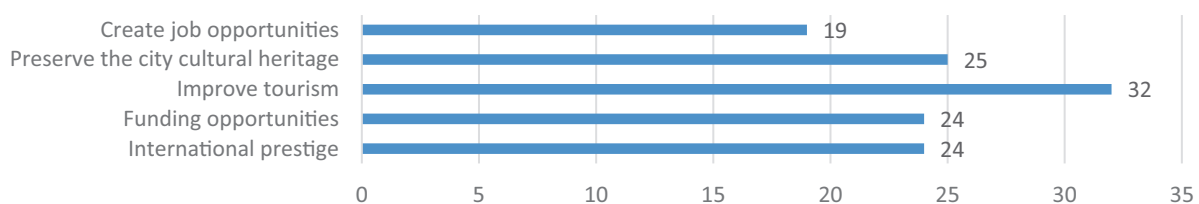
- Always or Often 8 — 16%
- Sometimes 16 — 32%
- Rarely / Never 26 — 52%

Fig. 14 The Community perspective on the advantages that follows the inscription of As-Salt on the WHL (n = 50), please note that the numbers at the end of the bars indicate how many individuals have selected this option (ElFaouri & Sibley, 2022)
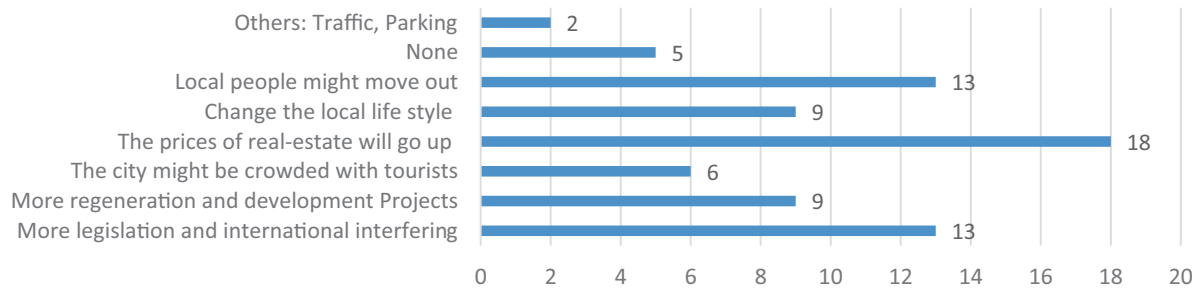
Fig. 15 As-Salt Community perspective on the disadvantages of inscribing the historic centre of As-Salt on the WHL (n = 50), please note that the numbers at the end of the bars indicate how many individuals have selected this option (ElFaouri & Sibley, 2022)

When asked about the disadvantages of being a world heritage city, most respondents were concerned with the increase in the prices of real estate the implementation of more restrictive legislations, and the likelihood of displacement of the local population of the city through gentrification, see Fig. 15.

Finally, interviewees were asked an open-ended question about what would happen if the city were listed. The word frequency analysis revealed that the increased tourism to the city was a main outcome. On the other hand, 5.7% of the respondents mentioned that nothing would change in the city. It was interesting within the empty option; one respondent was cynical by stating that '*the inscription of the city on the WHL would only just bring fame and money for the decision makers or authority figures involved in the submission*'.

5   Results

There are multiple reasons why stakeholders desire the city to be inscribed on the list including the eligibility to receive financial assistance or expert technical opinion, many of the local community in As-Salt City considered the nomination to have a positive impact as it led to the establishment of heritage protective law in the city. As-Salt would become more popular in the eyes of national and international tourists. The nomination itself has already marked the beginning of aesthetic enhancement projects in the city centre (ElFaouri, 2020–2021). However, in all the above situations, the emphasis is usually on a prime static value which is—in this case—the Outstanding Universal Values associated with the nomination files. The problem is this value is changing with the different nomination files and the different file coordinators.

The shifting in stakeholders' decisions and the changing of the OUV in the different nomination files has led to changing the conservation and management plans that accompanied the files. This is very critical because it shows that the changing of the conservation policy in the city is based on the singularity of the OUV which clearly changes with time. In addition to the introduction of new approaches or the disappearing of others, emphasizing the beautification exercises rather than upgrading the quality of the urban fabric and the well-being of its community. Thus, jeopardizing values that are important to other stakeholders such as the local community and neglecting the connection between the tangible and intangible dimensions of heritage. This is evident from the displacement of the local community to other parts of the city through compulsory purchase and demolition of mixed-used buildings in both Sahet Al-Ain and Oqbe bin Nafe' projects, and the long delay of 10 years that was needed to complete the compensation process and start the construction of the new buildings.

The involvement of all stakeholders in the decision-making process is crucial within the nomination process. This should also include consultation and surveys, and in a systematic manner, rather than informing the local communities through social media. It is key here to introduce the concept of resilience by retaining some of the intangible heritage and the character of the city, and by revealing the impact of neglecting other values though promoting one dominant value, which is usually the outstanding universal value (OUV). Furthermore, the mechanism of receiving funding in the city is usually articulated to a purpose from the sponsor's agenda and has many limitations and restrictions, and it is highly important to have non-negotiable values to the city master plan and have some guidelines to manage this process. On another level, from the end of the golden era (1885–1935) to the present time, the city has been developing gradually. What is commonly called now *new buildings* were actually built in the courtyard of the *old buildings*, they were integrated within the urban fabric and became part of the city's urban fabric. What the municipality is doing is sterilizing that urban fabric from the *existing new white buildings* without paying attention to any other values or any stories within, other than enhancing the visibility of the yellow limestone buildings. There are many factors affecting local communities; there is the size and pace of tourism development

before and after the designation as a heritage site, as well as the conditions and restrictions imposed on communities, and the rapid increase in the number of international and domestic tourists. These factors lead to many impacts that are directly or indirectly related to the local community in that local tourism and where to direct the authorities support towards designation as a World Heritage Site (Al-Bqour, 2020). A careful study of the capacity of a heritage city to welcome that increased number of tourists should also be considered in the following few years. Advantages from sustainable tourism should be balanced with maintaining the local community in place and monitoring the real estate prices.

6 Discussion and Conclusion

The adoption of UNESCO World Heritage listing is supposed to be a tool for raising the level of awareness among relevant parties, raising the level of protection and conservation given to heritage properties (García-Hernández, 2019). However, the conflicting priorities of different stakeholders in the process of WH nomination due to their different agendas and purposes in the conservation policies may lead to a contrary result and to lose the OUV that has led to the WH inscription in the first place. In the case of As-Salt in Jordan, this can be reflected in the different and separated projects scattered around the city centre. These projects were led by different stakeholders without a comprehensive master plan for the development of the city at different stages of the nomination processes. Thus, gentrifying the local communities which contradict the purpose of protecting cultural and natural heritage promoted by UNESCO. Furthermore, the interpretation of how WH sites are identified, what is the OUV and how is it negotiated within the WH platform internationally and within different actors involved locally are still under continuous discussions (ElFaouri & Sibley, 2022). The continuous change in the OUV and the change in the conservation and management plans following it can be very dangerous and needs careful considerations. Therefore, the role of Jordan's Governmental Institutions and NGOs in the inscription of As-Salt City on the UNESCO World Heritage List and the different nomination file attempts is extremely important. It was highlighted in the responses of interviewees from the local community that As-Salt is different from any other UNESCO-inscribed sites in Jordan such as Petra where the Department of Antiquities is the main stakeholder managing the site. Therefore, it is especially important to indicate here that in As-Salt, it is difficult to understand the relationship between different parties such as the municipality, the directorate of tourism, Salt Development Corporation and

As-Salt development projects Unit, among others, and the coordination of their agendas and activities. Mapping the negotiation of these stakeholders' values and their priorities during the nomination processes provides useful insights in such complex situations, especially where heritage is a living urban site. In order to demonstrate these insights, Table 1 traces the history of As-Salt nomination history on the WHL, it summarizes and illustrates the four nomination attempts mentioned earlier:

As seen from Table 1, the first and second nomination attempts were led by NGOs, both focussed on the city as a cohort but were not supported by the authorities in As-Salt, and therefore they did not progress to the final stages in the nomination processes. The role of those two NGOs was then disappeared and did not have an active role in the later files, although many of the aspects mentioned in both files were also highlighted in the successful file in 2020. The nomination was then closed for almost 10 years. The last two nominations were both led by the municipality of As-Salt manifested in ASCDP unit as the main state party, but with different nomination files, property boundaries, coordinators and different OUV. This was done in a very short time from the submission of the first file in 2016 highlighting the tangible aspects of As-Salt heritage to the submission of the second file in 2020 highlighting intangible aspects on the city, which opens many questions on how they prioritize their values and selected the OUV associated. It is particularly important to indicate that the OUV of the file that led to As-Salt successful inscription in 2021 was connected to the strong link between its intangible attributes (tolerance and co-habitations among Muslim and Christian communities, urban hospitality and socio-urban welfare system) and tangible attributes (significant architecture and urban morphology) during the Golden Age ranging from the 1860s to the middle of the 1920s (Daher, 2019). Those intangible attributes of hospitality and harmony between religions might be interpreted differently by different stakeholders, therefore jeopardizing that delicate connection between tangible and intangible heritage. In fact, many academic criticized the terms used to manifest these intangible attributes such as *Urban hospitality* or the *tolerance* between religions. Many found them confusing and could be interpreted in many ways. The interesting part is that the shift in the OUV from tangible heritage in 2016 to intangible heritage in 2020 has however not altered the vision for the city's future. The tourism-focussed projects initiated in the first nomination attempt have not been changed. They continue to take place without considering the fact that the local community is the ultimate carrier of the intangible heritage recognized as the outstanding heritage value of the city. Urban regeneration is still focussing on tourism infrastructure and acquiring buildings while

Table 1 The history of As-Salt City nomination on the WHL

Date	Property	Coordinator	Criteria	Title	OUV (Brief)
1993–1994	Site	Royal Scientific Society (RSS)		The Old City of As-Salt (ICOMOS, 2021)	The historic core Urban fabric including the landmarks from the city architecture that is dated to As-Salt Ottoman golden era
Deferred before evaluation					
ICOMOS Bureau-require 1990 action plan to be adopted by the authorities (ICOMOS, 2021)					
2003–2004	Site	Japanese International Cooperation Agency (JICA)	iii, iv, v	The old city of Salt (JICA, 2003)	As-Salt is the only example that can wholly represent the culture and history of modern Jordan. It has been the first capital for it. It contains the most intact piece of urban fabric related to Jordanian culture which is represented in the interlocking urban fabric of the city and the closeness and warmth of its inhabitants (JICA, 2003)
Not submitted—the file was only put on the tentative list on 13 January 2004					
2014–2017	Groups of buildings	UNESCO Italian Expert	ii, iii	As-Salt eclectic Architecture (1865–1925) Origins and Evolution of an architectural language in the Levant	The rapid transition of As-Salt from a rural settlement to a city and the eclectic architecture of As-Salt emerging from the local and the effect of the surrounding cities (unique architectural language) can be considered as important evidence of the flow of knowledge within the Ottoman Empire (Antonillie, World Heritage Nomination File: As-Salt Eclectic Architecture (1865–1925) Origins and Evolution of an architectural language in the Levant, 2015
2015 Added to Tentative list					
2015 Revision					
2017 Advisory body overruled (ICOMOS) suggested not to inscribe and overturned by amendment to deferral					
2017 Deferral (WHS, 2020); (UNESCO, Operational Guidelines for the Implementation of the World Heritage Convention, 2012); (UNESCO, Basic Texts of the 1972 World Heritage Convention, 2005) (ASCDP, 2016)					
2019–2021	Site	Local Expert	ii, iii	As-Salt the Place of Tolerance and Urban Hospitality	The strong link between its intangible attributes (tolerance and co-habitations among Muslim and Christian communities, urban hospitality and socio-urban welfare system); and tangible attributes (significant architecture and urban morphology) during the Golden Age ranging from the 1860s to the middle of the 1920s (Daher, 2019)
2019 Incomplete—not examined					
2020 Resubmitted see (WHS, 2020); (UNESCO, Operational Guidelines for the Implementation of the World Heritage Convention, 2012); (UNESCO, Basic Texts of the 1972 World Heritage Convention, 2005)					
On Tuesday, 27 July 2021, the World Heritage Committee of the United Nations Educational, Scientific and Cultural Organization (UNESCO) voted to inscribe the Jordanian city of As-Salt as '*the Place of Tolerance and Urban Hospitality*' on the World Heritage List					

(El Faouri, 2022)

compensating their occupants to move out. The city centre is gradually being transformed with the proliferation of hotels, bed and breakfast accommodations, souvenir shops, and many other tourist-oriented leisure and catering facilities. This is threatening the spontaneous genuine experience leading to the disappearance of intangible heritage for

financial profit, and potentially puts at risk the wider context of the tangible heritage (Orbasli, 2009).

Thus, it is critical in every city that has already been inscribed on the WH list or pursuing that inscription to highlight the values appreciated by the local communities as equal as the OUV associated with the site, especially if

this OUV is related to the intangible heritage. The local communities should be acknowledged as the carrier of that intangible heritage and losing it would lead to losing the OUV. Furthermore, the role of UNESCO is not clear during the nomination process and after the inscription, UNESCO should have been involved in the first stages of putting the site on the tentative list after the inscription. An inventory of all the heritage values that the site offers should be done in the first stages with the support of the WH convention and the advisory bodies to decide what are the most important values that cannot be jeopardized and their relationship to the identified OUV. There should be guidelines and recommendations with regard to the different aspects of the site and the roles of each stakeholder in managing the site. Three years is a long period of time for the first monitoring report to take place, the allocation of a site manager should also be included as a proposal in the nomination files. Furthermore, there is a need to develop a multi-stakeholders cooperation mechanism to first develop a comprehensive understanding of both the tangible and intangible heritage of the city as well as to ensure the well-being of the local communities while maintaining the connection between the tangible and intangible heritage.

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Governmental and Non-governmental Organizations and the Management Process of Historic Cities in Algeria

Hassina H. Sidi Mammar

Abstract

Classified Protected Areas, the historic towns in Algeria constitute the focus of the efforts of the state, civil society, and international organizations. The involvement of the various stakeholders in the heritage policy in Algeria is today supported and regulated, but also encounters some difficulties. The objective of this study is to analyze the degree of involvement of the various stakeholders. It aims to develop an observation of the role of governmental organizations and non-governmental organizations in the process of planning and enhancement of cities and historic centers in Algeria. This work contributes to the enrichment of the current debate governing the involvement of stakeholders in the conservation of historic cities. It falls within the guidelines of the various charters and recommendations, in this case the approach to the historic urban landscape. This research is based on a qualitative approach, by studying the legislative process and the institutional framework governing the historic cities in Algeria, and by addressing the case study of "the old town of Sidi El Houari" in Oran. However, this research demonstrates the important role of heritage associations and intergovernmental NGOs in the preservation and conservation of historic centers and towns, alongside the administrative role of governmental organizations. This study affirms the importance of encouraging the integration of non-governmental organizations in the management process of these historic cities. It proposes the creation of a direct coordination between the two models of organizations (governmental and non-governmental), and to give a formal status for the various intergovernmental organizations. It also suggests the creation of a National Urban Forum of NGOs, and to ensure better involvement and collaboration between public and private actors in the conservation of historic cities, while complying with international guidelines.

List of Acronyms

NGO	Non-governmental Organization.
PPSMVSS	Permanent plan for safeguarding and enhancing the protected sector (plan permanent de sauvegarde et de mise en valeur de secteur sauvegardé).
ANSS	National Agency for Safeguarded Sectors (Agence Nationale des Secteurs Sauvegardés).
OGEBC	Office for the management and exploitation of protected cultural property (Office de Gestion et d'Exploitation des Biens Culturels protégés).

1 Introduction

The importance of the involvement of different stakeholders in heritage conservation is increasingly felt. The efforts to achieve their goals and improve heritage interventions vary from state to state. To this end, the various international charters and recommendations recommend guidelines for better management of historic cities and better involvement of public and private actors. This study is intended

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as an analysis of the degree of involvement of the various heritage stakeholders in Algeria, by comparing with international guidelines and the inventory of fixtures in other countries. The objective of this study consists of an observation of the role of governmental organizations and nongovernmental organizations in the planning process and enhancement of historic cities and centers in Algeria.

This work contributes to the enrichment of the debate governing the involvement of stakeholders in the conservation of historic cities. It is part of the current debates on heritage, and the directives of the various charters and recommendations, in this case the directives of the Historic Urban Landscape approach of 2011. However, based on a qualitative approach and the survey method, this study establishes an observation of the situation of NGOs and their role in heritage management. It also examines the legislative and institutional framework governing the safeguarded sectors, and the various stakeholders in Algeria, on the one hand, and discusses the example of "*the old town of Sidi El Houari*" in *Oran* as a case study, on the other hand. Today, and given the importance of the involvement of all actors in the management of urban heritage, several countries have set up partnerships between public and private actors, as the case of Italy, Germany, and Egypt. We can cite the example of the foundation of the "Stichting Stadsherstel Paramaribo" which reflects a partnership between the organization responsible for the management of the historic city and the first bank in the country. It ensures the restoration and reuse of historic monuments, and contributes to the preservation of the historic landscape (UNESCO, 2013).

On the other hand, the consideration of NGOs by the authorities is more and more perceptible, and materialized by the fact of granting NGOs an official status in the planning process. It is the same for national bodies, as for international organizations represented by national committees in several countries. With the same objective, and in order to facilitate the collaboration of different organizations, some countries have an Urban Forum of NGOs, which is currently one of the essential parameters of city management.

The important role of the various stakeholders and organizations has already been mentioned since the Nairobi Recommendation in 1976. The recourse to the assistance of international, intergovernmental, and non-governmental organizations, in particular, the Documentation Center of UNESCO, the ICOM, and the ICOMOS, is one of the guidelines of the Recommendation, in addition to the need to develop a national preservation policy, a legislation, and an heritage body.

However, any multilateral or bilateral cooperation can be concretized by: exchanges of information, the organization of internships with scholarships, the implementation of major projects to safeguard historic sites, and a mutual assistance between countries (UNESCO—Nairobi Recommendation, 1976). Furthermore, associating the contribution of the public authorities with that of private actors is one of the points raised in the 1976 Recommendation, but today it constitutes one of the main stages of the Historic Urban Landscape HUL approach of 2011: *Establishing local partnerships and management frameworks for each of the actions* (HUL approach. 2011. Step 6).

In addition, the importance of the role of GOs and NGOs is a part of the application of the various traditional and innovative tools, which are defined according to the HUL Recommendation: *Civic Participation tools; Knowledge and Planning tools; Regulatory tools; Financial tools* (HUL Approach. 2011. Article 24). These organizations are mobilized to adapt these tools to the local context specific to each historic city, and to ensure the development and dissemination of tools and good practices for the conservation and preservation of historic cities.

It is also clear that government agencies are concerned with developing planning and regulatory tools, unlike nongovernmental institutions and associations which wish focus their efforts on developing the civic participation tool and the financial tool. This sharing of responsibilities seems be balanced from a theoretical point of view, but in reality, this is not the case.

The voluntary aspect of non-governmental organizations, and the direct contact with heritage and its users constitute the essential factor testifying to a greater consideration and sensitivity to heritage. To this end, the involvement of NGOs in the planning and regulatory process is now strongly recommended.

At the international level, intergovernmental and international organizations provide technical and financial support in order to contribute to the preservation and enhancement of historic towns and sites. We quote the International Council on Monuments and Sites (ICOMOS), the International Center for the Study of the Conservation and Restoration of Cultural Property (ICCROM), and the International Council of Museums (ICOM).

Algeria is one of the state parties to the World Heritage Convention, which it has ratified since 1974. Periodic reports and state of conservation reports are regularly transmitted, and concern the monuments and sites inscribed on the World Heritage List as the M'Zab Valley and the Casbah of Algiers, in addition to the archaeological site of Tipasa.

However, the involvement of these international institutions in the management of historic cities is not sufficiently facilitated in countries where there is an absence of national committees representing these bodies. To this end, and in order to benefit from better international collaboration, these international organizations must benefit from a formal status in the process of planning and management of safeguarded sectors.

2 The Legislative and Institutional Framework of Safeguarded Sectors in Algeria and the Various Stakeholders

The analysis of the legislative process and the institutional framework governing historic cities in Algeria shows that a new policy for safeguarding these cities and urban or rural real estate complexes has been established since Law 98-04 (Fig. 1). According to chapter "Life and History: Challenges on Urban Conservation and a Possible Solution: CaseStudies on Historic Quarters in Beijing and Shanghai, China" of this law, these safeguarded sectors are created and delimited by decree taken on a joint report of the ministers

responsible of culture, of the interior and local authorities, of the environment, and of the town planning and architecture. These safeguarded sectors must have a Permanent Plan of Safeguarding and Enhancing the Safeguarded Sector PPSMVSS (Ministry of Culture, 1998) (Law 98-04. Article 43). The development of the PPSMVSS is entrusted to a design office or a duly qualified architect in according to the regulations relating the project management concerning protected immovable cultural property (Ministry of Culture, 2003) (Article 5. Executive Decree No. 03-324 of October 5, 2003 on the procedures for establishing the PPSMVSS).

The approval of the permanent plan for safeguarding and enhancing the safeguarded sector "PPSMVSS" is different
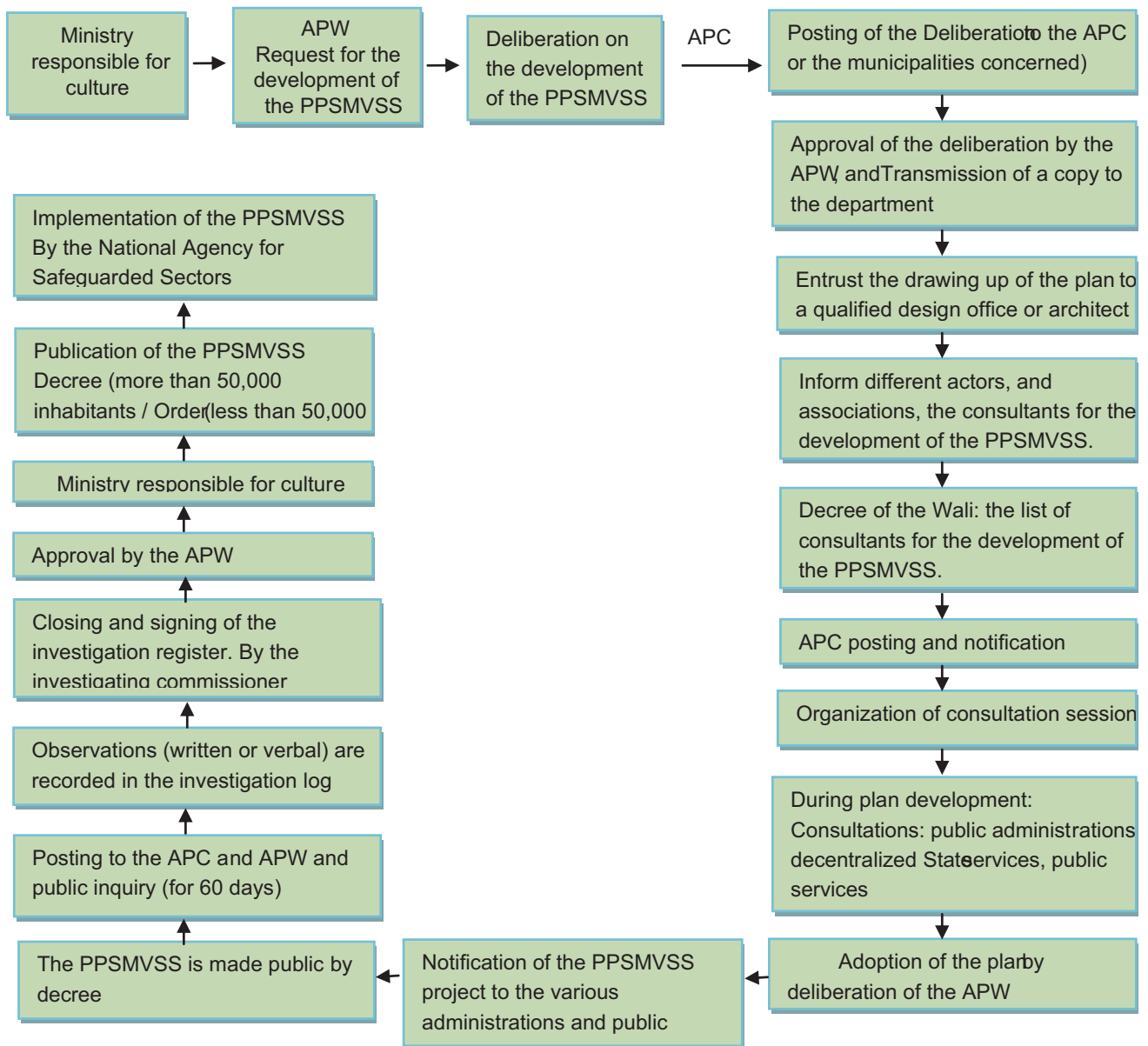

Fig. 1 Procedure for developing the PPSMVSS and the various stakeholders. Developed by Author

depending on whether the safeguarded sector has more than 50,000 inhabitants, requiring approval by executive decree taken on a joint report of the ministries already mentioned, or by order, for the protected sectors with less than 50,000 inhabitants (Ministry of Culture, 1998) (Law 98-04. Article 44). Furthermore, the creation of a safeguarded sector can be proposed by local authorities or associations to the Ministry of Culture (Ministry of Culture, 1998) (Law 98-04. Article 44).

According to this law, the following must be consulted during the development of the permanent plan of safeguarding:

(A) **In Respect of Public Administrations**, the decentralized services of the State responsible for: urban planning, architecture, and housing; tourism, traditional crafts; land use planning and the environment; domains; religious affairs and wakfs; transports; public works; trade; agriculture; and hydraulics.

(B) **Under Public Bodies and Services**, the services responsible for: energy distribution; water supply and sanitation; transports; protection and enhancement of cultural property (Ministry of Culture, 2003) (Executive Decree No. 03-324 of October 5, 2003 on the procedures for establishing the PPSMVSS. Article 7).

It is also important to inform various presidents of chamber of commerce, trades and crafts, agriculture, and presidents of professional organizations, associations which propose, by their statutes, to act for the protection and promotion of cultural property, in order to describe the list of legal persons who have requested to be consulted on the development of the PPSMVSS (Ministry of Culture, 2003) (Article 6. Executive Decree No. 03-324 of October 5, 2003 on the procedures for establishing the PPSMVSS).

However, the management of these safeguarded sectors is provided by the "National Agency for Safeguarded Sectors", created by Executive Decree No. 11-02 of January 05, 2011 establishing the national agency for safeguarded sectors and fixing its organization and operation. It is a public establishment with an administrative nature placed under the supervision of the Ministry of Culture. Its main mission is to ensure the implementation of permanent plans for the safeguarding and enhancement of safeguarded sectors at the national level.

Developed and created since the 1990s (Northey, 2017), heritage associations in Algeria are an essential element in the protection of these ancient cities, long threatened with ruin and even destruction. However, the creation of a National Urban Forum of NGOs will aim to ensure collaboration between these associations, and public involvement

in the conservation of historic cities, and to fall within the guidelines of the Agenda of Habitat III. Some efforts are being made in this direction, but this requires an interest from all organizations, their involvement, and their organization.

3 The Case of the Old Town of Sidi El Houari: Stakeholders and Institutions

The protected sector of the old town of Sidi El Houari constitutes the old and historical center of the city of Oran, the second city of the country. It was created by Executive Decree No. 15-13 of 2015, creating and delimiting the safeguarded sector of the old town of Sidi El Houari.

The file for classifying the old town as a sector to be safeguarded was presented to the General Secretariat of the Government by the "Sidi El Houari workshop". This workshop brought together academics, members of associations, the OGEBC, AECID Technical Assistance in Oran, design offices… and other members in collaboration with the Department of Culture of the wilaya of Oran.

Furthermore, the drawing up of the Permanent Plan has now been relaunched, and carried out by a specialized consultancy firm, selected following a national call for tenders issued by the Department of Culture, and which acts as project manager, and the APC of Oran as project owner (Table 1).

With the objective of preserving, promoting, and enhancing heritage, heritage associations and other organizations in Oran contribute to setting up cultural and artistic events that illustrate the richness and diversity of heritage (according to the list of the ministry of culture, among the 75 associations in Oran, 5 are specialized in heritage). Due to the rich heritage of the city of Oran, several associations and organizations have worked in this area. Here we quote:

– **The Bel Horizon-Santa Cruz Association**: Created in 2001, is considered as a combination of action and advocacy in favor of the "safeguarding and rehabilitation of the historical heritage of the city of Oran (Fig. 3).
– **The Sidi El Houari Health Association (Santé Sidi el Houari)**: Created in 1991, and is located in the historic district of Sidi El Houari. It develops several projects aimed at the protection, conservation, and maintenance of heritage. It also provides a worksite school and develops various partnerships (Fig. 2).
– **The Cervantes Institute of Oran**: Benefiting from the support of the Spanish Embassy and in collaboration with the Cervantes Institute of Algiers and the Ministry of Culture and the Arts, it contributes to the preservation

Table 1 The involvement of the various actors in the management of the safeguarded sector

SS management steps/stakeholders	Creation of saved sector (ranking)	Development of the PPSMVSS plan	Implementation of the PPSMVSS plan	Conservation projects	Ongoing maintenance
State and government institutions	– Ministry of Culture – National Commission of conservation – Department of Culture – APC – APW	– Client: APC/Department of Culture	– National Agency for Safeguarded Sectors ANSS – ANSS annexes	– Department of Culture – APC	– Office of the management and exploitation of cultural property OGEBC
Non-governmental organizations	– Sidi El Houari workshop. (Group of academics, members of associations, the OGEBC, AECID Technical Assistance in Oran, design offices.)	– Private design office/qualified architect (project manager)	/	– Intergovernmental organizations – Private companies – Design officer	– Heritage Associations – Private companies – The inhabitants of the neighborhood

Fig. 2 Santé Sidi el Houari Association is besieged at the historic site it has restored

Fig. 3 Contribution of the Bel Horizon Association as part of raising awareness of the city's heritage

of the architectural heritage and fortifications of Spanish origin, located at the level of the city of Oran. Moreover, the inclusion of the fortifications of Oran in the world heritage is at the center of a collaborative work project between Algeria and Spain. The institute also includes a rich documentation relating to the Spanish period of the city (Fig. 4).

4 Toward Better Government Policy and Effective Stakeholder Engagement

This study suggests setting up a heritage policy based on three supports:

1 Accentuate the Policy of Coordination Between Governmental and Non-governmental Organizations, and ensure cooperation between public and private actors,

Fig. 4 The Cervantes Institute of Oran

within the framework of partnerships. This coordination must also be strengthened by the establishment of offices representing the various associations and private organizations within the Ministry responsible for culture and state bodies dealing with heritage.

2 Grant a Formal Status to the Various Intergovernmental and International Organizations: In this case, the creation of national committees representing NGOs, and the strengthening of their involvement in the management and planning process of the safeguarded sectors.

3 The Creation of a National Urban Forum of NGOs: This will make it possible to organize meetings in order to exchange experiences and to specialize and accentuate the objectives.

5   Conclusion

Through this study, we note that the role of the governmental institutions of the state in Algeria is simply administrative, apart from some acts of preservation carried out by the new organizations established, for this purpose, since the law 98-04, such as ANSS and OGEBC.

Furthermore, we note the role, which become increasingly important of heritage associations and private organizations and offices, and their impact in the preservation of historic cities. NGOs present themselves as significant actors in the management of historic centers. Moreover, the situation of pandemic that hits the world recently has amply demonstrated this. Can we say that this situation has even reinforced this role; highlighted it; and given it a global, formal, and essential stamp.

However, this study proposes the creation of a direct coordination between the two models of organizations (governmental and non-governmental), with the possibility of representation of private institutions and associations within state bodies, and vice versa, and of giving a formal status to the various intergovernmental organizations such as ICOMOS and ICOM. This coordination must also be strengthened by developing partnerships between public and private actors.

This study also suggests the creation of a National Urban Forum of NGOs in Algeria, in the aim of ensuring public involvement in the conservation of their historic cities, developing collaboration and the exchange of experiences, to specialize and accentuate the objectives, and thus complying with the directives of the Historic Urban Landscape Approach.

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